Factors Influencing the Effectiveness of Municipal Waste Management Expenses
Are municipal decisions effective?
Case study in the Czech Republic

Jana Soukopová, Michal Struk, Jiří Hřebíček
Content of paper

- Introduction
- Municipal solid waste (MSW) and its management
- Municipal solid waste expenditure (MSWE)
- Developments of models of MSWE
- Choosing appropriate parameters
- Results and discussion
- Conclusions
MSW generation in general

- Municipal solid waste (MSW) is mostly from its nature a by-product of citizen consumption.
- Problem is that as societies get richer, they tend to consume more goods, resulting in more waste and expenditure.
- A complex and important current environmental issue, however might be overlooked by general public.
- Municipal solid waste generation differs in European Union countries.
Previous research concerning MSW

- Mostly focus on the technical parts of the issue but only little to consideration of the economic aspects;
- Beigl et al. (2008) reviews 45 modelling approaches for MSW generation, Lebersorger & Beigl (2011) quantified impacts of household structure etc.;
- Hřebíček et al. (2013) proposed integrated model of waste management with socioeconomic parameters;
- Parameters usually identified as important cover population, income level, or household characteristics etc.
- MSW is a notable problem in fast-developing regions
MSW management in the Czech Republic

- MSW – mixed MSW produced by citizens is mostly collected in **trash bin** (not recyclable waste, not business waste);
- **Municipal government is responsible** for dealing with such MSW (companies in case of business waste);
- Municipalities contract specialized waste companies (public, private, or mixed) and pay them for the service;
- Municipalities can charge fees in order to cover these expenditures (per capita, per house, per trash bin, etc.);
- Usually each house has its own trash bin (except shared trash bins for condominiums).
Objective of the paper

- Analyze how municipal solid waste expenditures (MSWE) are affected by various sociodemographic characteristics of municipalities: Population and Area covered; Age groups of population; Economic in/activity; Student status, Retired status; No. of flats in houses / condominiums; No. of flats used for recreation

- Base on linked open data estimate models calculating MSWE at municipal levels using multiple linear regression

- Use only linked open data of eGovernment of the Czech Republic (Czech Statistical Office, Ministry of Finance)
Case study: Chosen sample of municipalities

Sample thresholds:

- **654 municipalities from the South Moravia Region**
  - Basically all municipalities under 10,000 population
  - Several municipalities dropped due to the missing data, etc.

- Data from national census of CZSO (2011)
  - Population and Area covered; Age groups of population; Student status; Economic in/activity; Retired status; No. of flats in houses /condominiums; No. of flats used for recreation

- Data from Ministry of Finance, Municipal expenditure, etc.
Results 1 - age structure

Effects of age structure on MSWE (significant results):

- **Low contribution** by 0-19 age group
  - Especially in case of 15-19 subgroup
- **High contribution** by 20-29 and 30-39 age group
- **Rather low contribution** by 40-49 and 50-59 age group
- **Very high contribution** by 60-69 age group
  - Especially in case of 60-64 subgroup
- Low to very low contribution by 70+ age group (nonSig)
Results 2 - housing structure, etc.

- 2 categories of flats – in houses or condominiums
  - Additional category of recreational flat
- Flat in a house cca 30% less MSWE than flat in condominiums
- Recreational flat cca 50% less MSWE than flat in condominiums
- Rather high contribution to MSWE by unemployed
- Economic activity decreases MSWE contribution
Results 3 - aggregated data

- More population – decreasing $\bar{\text{MSWE}}$
- Larger area – increasing $\bar{\text{MSWE}}$
- Higher % of flats in condominium – increasing $\bar{\text{MSWE}}$
- Higher % of recreational flats – increasing $\bar{\text{MSWE}}$
- Higher % of retired people – increasing $\bar{\text{MSWE}}$
Discussions

- We have created several models for estimating MSWE in the given sample of municipalities
- **Age and housing structures have influence on MSWE**
- Effects of parameters have intuitive interpretation

- Currently it is most common to charge a fixed level per capita fee in each municipality, that usually does not fully cover expenditures related with MSW management
  - Increased top fee limit in 2013
Conclusion

Calculated **results can explain what are the determinants behind MSWE**, which can be utilised in designing policies/charging schemes in MSWM, like:

- Variable charges according to age
- Charges per flat instead of per capita

- Potentially more efficient, but politically challenging

- Another use of such estimations is for predicting MSWE, or comparison/benchmarking between municipalities
Thank for your attentions
Questions?

Prof. Dr. Jiří Hřebíček
Institute of Biostatistics and Analyses
Masaryk University
Brno, Czech Republic

hrebicek@iba.muni.cz