

# Agents in land use models: Identifying a suitable typology for households under limited data conditions

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# Agenda

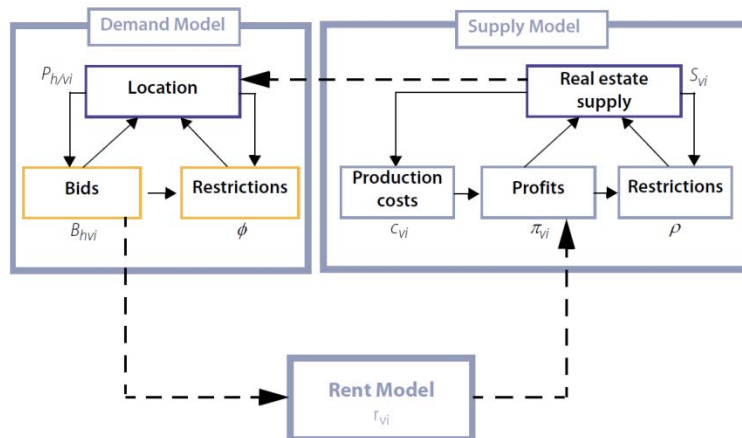
- Land use modelling: Why and how?
- Attributes influencing location choice
- Creating a typology: Constraints and challenges
- Typology for households for Berlin
- Conclusion and Outlook



# The land use model: A brief overview

## Model characteristics

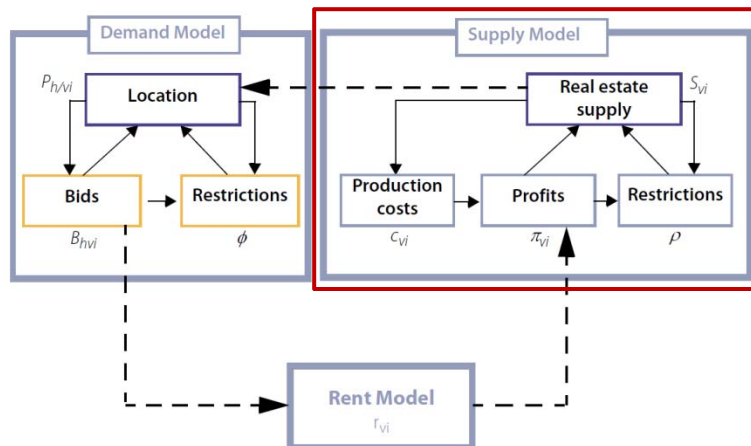
- Discrete choice model, which simulates the probability that a household/ firm locates in a certain real estate and zone
- Bases on bid-auction theory
- Originally developed for Santiago de Chile (MUSSA)



# The land use model: A brief overview

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## Supply Model

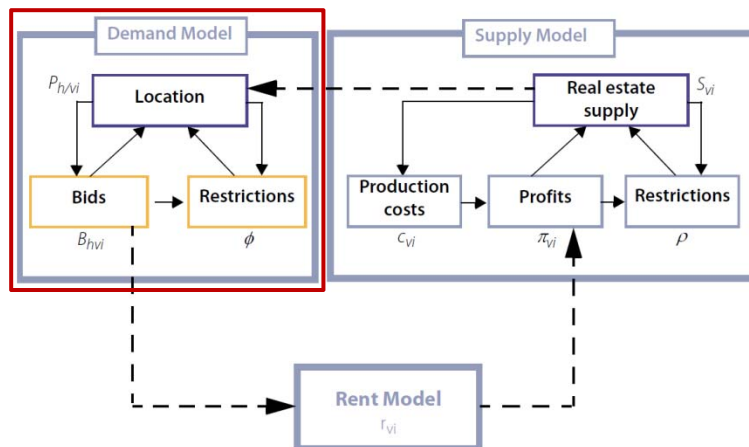
- Determines the number of real estate to built in a zone
- Decision is based on a maximisation of profits and restrictions



# The land use model: A brief overview

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## Demand Model

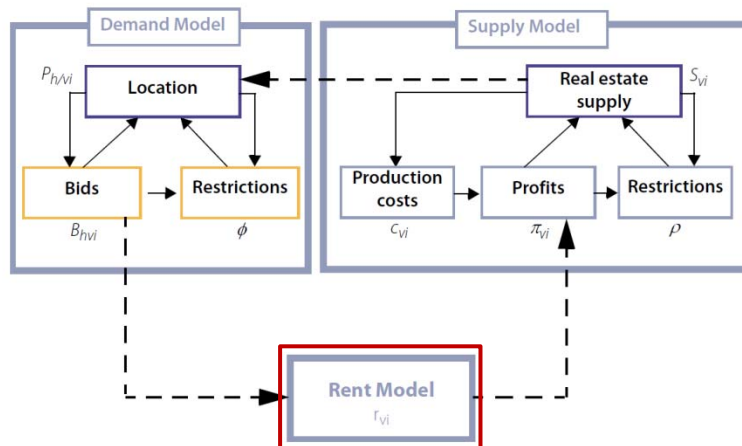
- Determines the bid every consumer makes for each available location
- Is based on the obtained utility for a consumer



# The land use model: A brief overview

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## Rent Model

- Auction identifies the highest bid → location will be assigned to the bidder
- Market equilibrium – no incentives for consumers to change locations



# Attributes influencing location choice

## Consumer characteristics

- Phase of life
- Number of persons living together
- Household income
- ...

## Location externalities

- Socioeconomic level of the zone
- Built area
- ...

## Real Estate characteristics

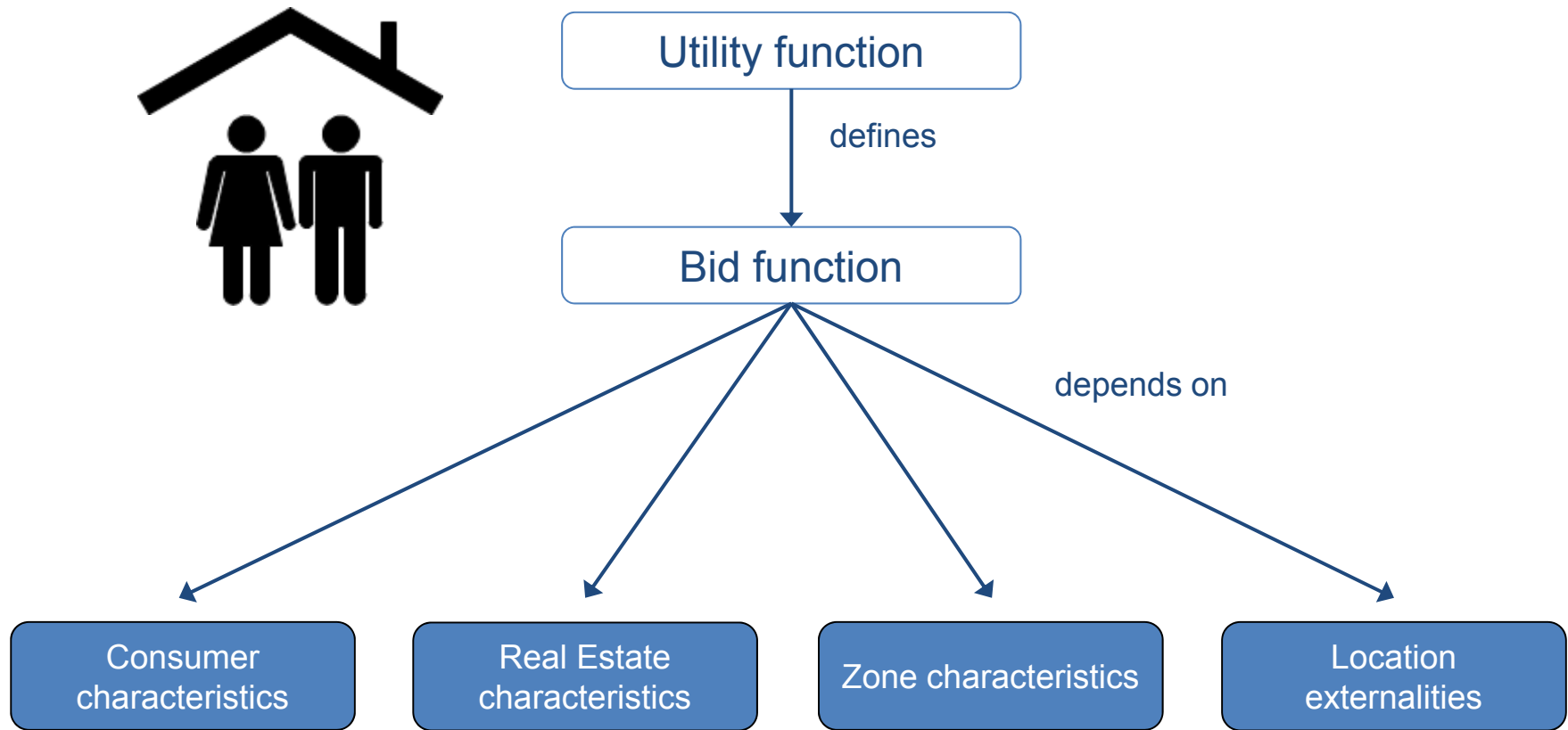
- Year of construction
- Dwelling size
- Building type
- ...

## Zone characteristics

- Accessibility
- Availability of transport modes and infrastructure
- Building density
- Social structure of the area
- ...



# Bid-function in the demand model





## Model steps

Mikrozensus 2010, Zensus 2011,  
infas, Cadastra, ...

Define a typology of consumers and  
real estate

Identifying attributes and to which  
extent they influence location choice

Data collection  
and preparation

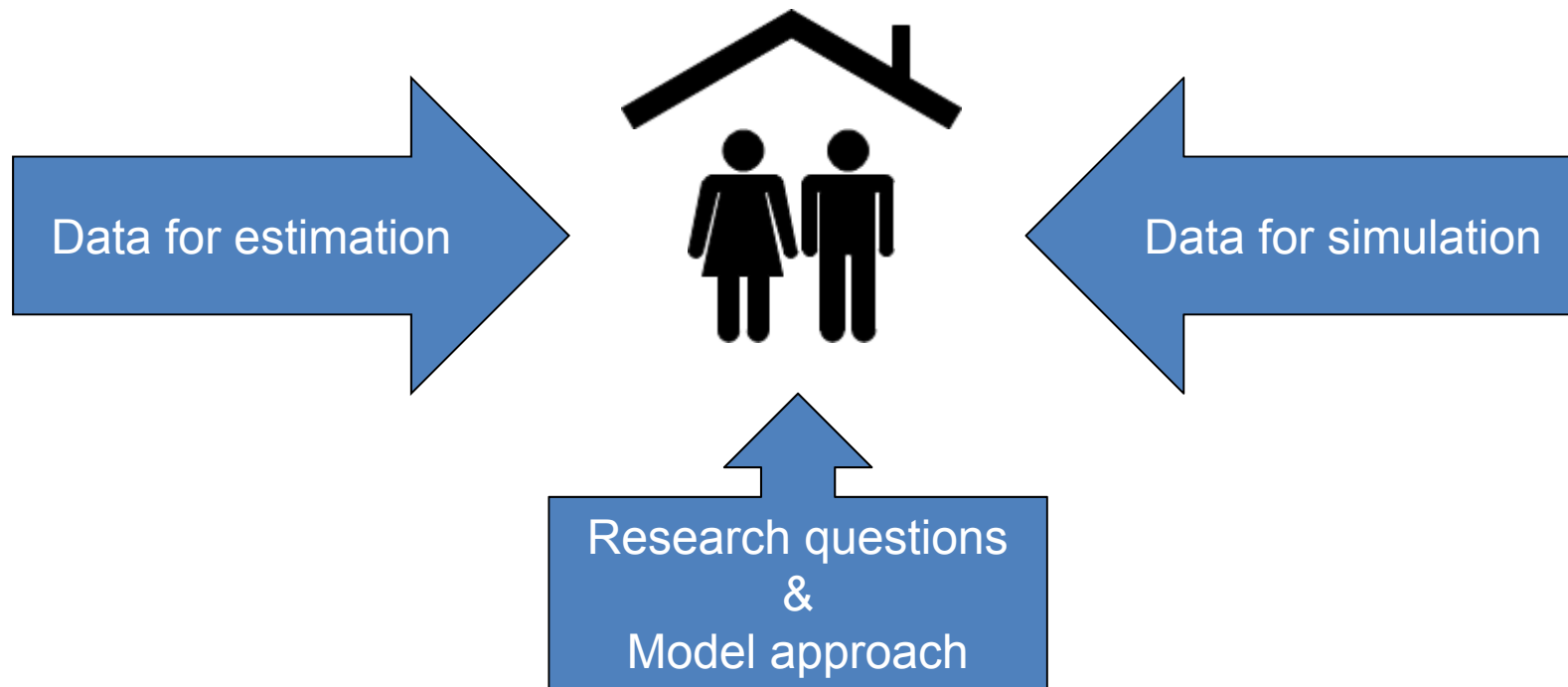
Typology

Estimation

Simulation



# Typology of households: constraints



# Typology of households: approaches



Literature review



Step by step approach



Cluster analysis



# Typology of households

		Household income in €					
Age of householder	Persons per household	less than 900	901 – 1,500	1,501 – 2,000	2,001 – 2,600	2,601 – 3,600	3,601 and more
< 30	1 person	529	348	90	41	13	6
	2 persons	11	138	59	48	41	15
	3 persons	3	24	32	19	12	3
	4 persons	0	6	15	8	5	3
	5+ persons	0	1	5	6	3	1
30 - 49	1 person	500	525	331	200	109	43
	2 persons	17	216	149	153	178	153
	3 persons	2	85	109	106	164	114
	4 persons	0	23	76	86	116	142
	5+ persons	2	3	24	49	41	46
50 - 69	1 person	498	587	252	137	63	50
	2 persons	12	208	226	288	295	288
	3 persons	0	21	29	40	52	91
	4 persons	0	8	10	13	23	56
	5+ persons	0	0	1	6	10	12
70+	1 person	181	633	230	83	31	18
	2 persons	4	73	194	268	154	73
	3 persons	0	5	4	8	7	5
	4 persons	0	0	0	0	0	4
	5+ persons	0	0	0	0	0	1

120 household types

Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2011, own calculations, N=10,499



# Typology of households: Reduction

		Household income in €					
Age of householder	Persons per household	less than 900	901 – 1,500	1,501 – 2,000	2,001 – 2,600	2,601 – 3,600	3,601 and more
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	3 persons	0	21	29	40	52	91
	4 persons	0	8	10	13	23	56
	5+ persons	0	0	1	6	10	12
70+	1 person	181	633	230	83	31	18
	2+ persons	4	78	198	276	161	83

Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2011, own calculations, N=10,499



# Typology of households: Intermediate results

		Household income in €					
Age of householder	Persons per household	less than 900	901 - 1,500	1,501 - 2,000	2,001 - 2,600	2,601 - 3,600	3,601 and more
< 30	1 person	529	348	90	60		
	2+ persons	14	169	111	164		
30 - 49	1 person	500	525	331	200	109	43
	2 persons	17	216	149	153	178	153
	3+ persons	4	113	209	241	321	302
50 - 69	1 person	498	587	252	137	63	50
	2 persons	12	208	226	288	293	288
	3+ persons	0	29	40	59	85	159
70+	1 person	181	633	230	83	49	
	2+ persons	4	78	198	276	244	

Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2011, own calculations, N=10,499



# Typology of households: Similarity Analysis

Year of construction	Amount of dwelling units per building	Dwelling size in sq m	Age of householder 30 - 49					
			Persons per household					
			1 person		2 persons		3+ persons	
			Household income in €		Household income in €		Household income in €	
		< 900	901 - 1,500	< 900	901 - 1,500	< 900	901 - 1,500	
before 1948	1 - 3	≤ 100	2.40%	3.05%	11.76%	2.31%	0.00%	2.65%
		> 100	0.00%	0.19%	0.00%	0.00%	0.00%	0.88%
	4 - 12	≤ 70	28.20%	26.79%	23.53%	18.10%	50.00%	9.73%
		> 70	4.60%	7.24%	0.00%	8.33%	0.00%	19.42%
	13 - 20	≤ 70	8.20%	8.57%	17.65%	9.26%	0.00%	0.00%
		> 70	2.60%	2.29%	5.88%	2.31%	0.00%	1.77%
	21 +	≤ 60	4.60%	2.10%	5.88%	1.39%	0.00%	0.00%
		> 60	0.40%	1.71%	0.00%	2.78%	0.00%	2.65%
1949 - 1986	1 - 3	≤ 100	0.60%	0.57%	0.00%	0.93%	0.00%	0.00%
		> 100	0.00%	0.19%	0.00%	0.00%	0.00%	0.00%
	4 - 12	≤ 70	16.60%	17.52%	11.76%	18.06%	0.00%	14.16%
		> 70	0.60%	1.33%	0.00%	3.24%	0.00%	12.39%
	13 - 20	≤ 70	7.60%	8.19%	5.88%	5.56%	0.00%	1.77%
		> 70	0.20%	0.57%	0.00%	0.93%	25.00%	4.42%
	21 +	≤ 60	16.20%	12.76%	5.88%	6.48%	0.00%	2.65%
		> 60	2.20%	3.43%	11.76%	13.43%	25.00%	18.58%
1987 and after	1 - 3	≤ 100	0.20%	0.00%	0.00%	0.00%	0.00%	0.00%
		> 100	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	4 - 12	≤ 70	2.80%	0.40%	0.00%	4.60%	0.00%	3.50%
		> 70	0.00%	0.20%	0.00%	1.40%	0.00%	1.80%
	13 - 20	≤ 70	0.80%	1.00%	0.00%	0.00%	0.00%	0.00%
		> 70	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	21 +	≤ 60	1.00%	1.70%	0.00%	0.00%	0.00%	0.90%
		> 60	0.20%	0.20%	0.00%	0.90%	0.00%	2.70%
Σ			100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

1 person	500	525
2 persons	17	216
3+ persons	4	113

- Comparison between different groups of distribution

Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2011, own calculations, N=10,499





# Typology of households: Results

Age of householder	Persons per household	Household income in €													
		less than 900	901 - 1,500	1,501 - 2,000	2,001 - 2,600	2,601 - 3,600	3,601 and more								
< 30	1 person	529	348	150											
	2 persons	183													
	3 persons						111		164						
	4 persons														
	5+ persons														
30 - 49	1 person	521					525	331	200	109	196				
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70+	1 person	185					633	230	83						
	2 persons														
	3 persons														
	4 persons											276		293	
	5+ persons														

39 household types

Source: FDZ der Statistischen Ämter des Bundes und der Länder, Mikrozensus 2011, own calculations, N=10,499



## Conclusions and outlook

- Generated typology as a first approach to aggregate different households
- Preliminary work for Census data – greater sample size but more attributes to take into account
- Cluster analysis is pending
- First results show a need for an approach with a combination of different methodologies in order to achieve a comprehensive typology



# Thank you!

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