

“Urban Development Funds in Europe – Opportunities, Structures, Operations”

Presentation Luxembourg 24 January 2013

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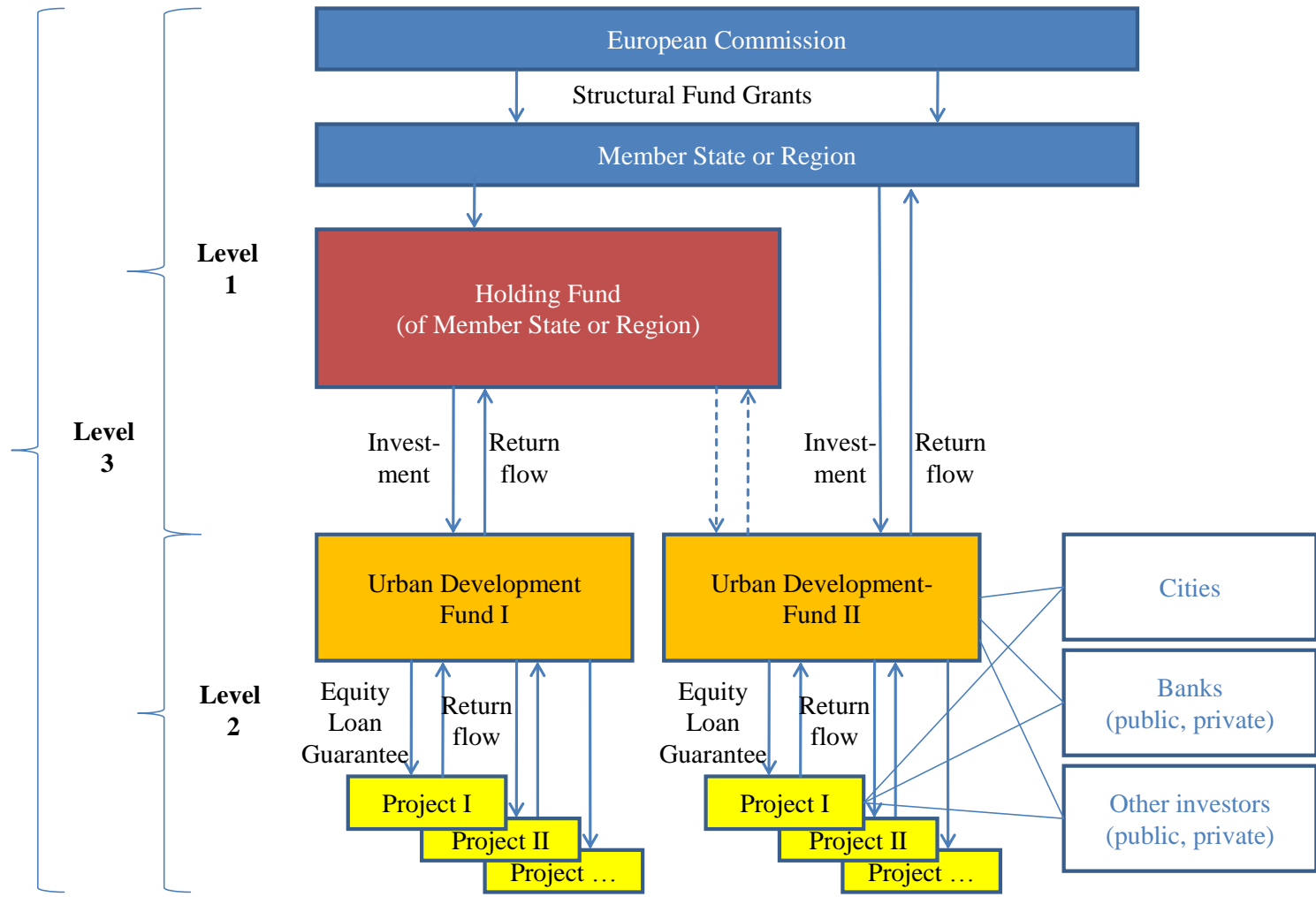
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JESSICA – Initiative to promote the use of financial engineering instruments for sustainable urban development → Invest Structural Funds in Urban Development Funds

- 1. Introduction
- 2. Research approach
- 3. Distance
- 4. Movability
- 5. Imperfections
- 6. Results



Level 1 = Macroeconomic Level

Level 2 = Microeconomic Level, Level 3 = „Added Value“ of JESSICA

Idea:

We want to determine where the employment of UDFs is a suitable means to fund urban development by considering three aspects

- **Distance:**
Need for urban development based on the distance to a benchmark defined through a set of indicators

- **Movability:**
Funding efficiency to separate funding targets which need technical assistance first (e.g. due to governmental failures) and those which should be supported financially

- **Imperfections:**
Appropriate funding instruments depending on the underlying market imperfections (resulting in market failures): grants for mere external effects or monopoly, revolving instruments for combination of these two imperfections with incomplete information

→ “The **DMI Approach** for Urban Development Funding”

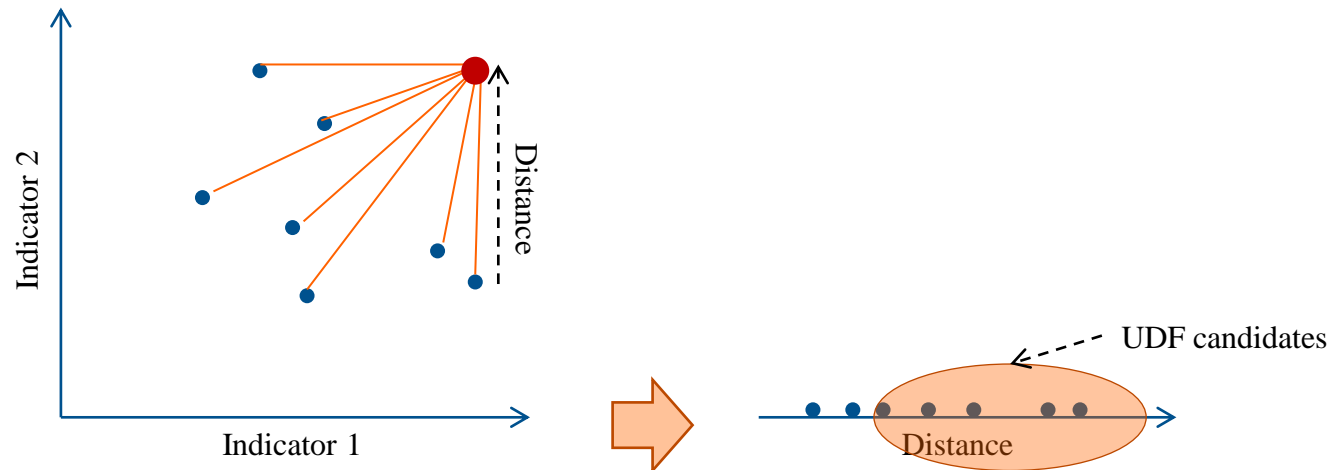
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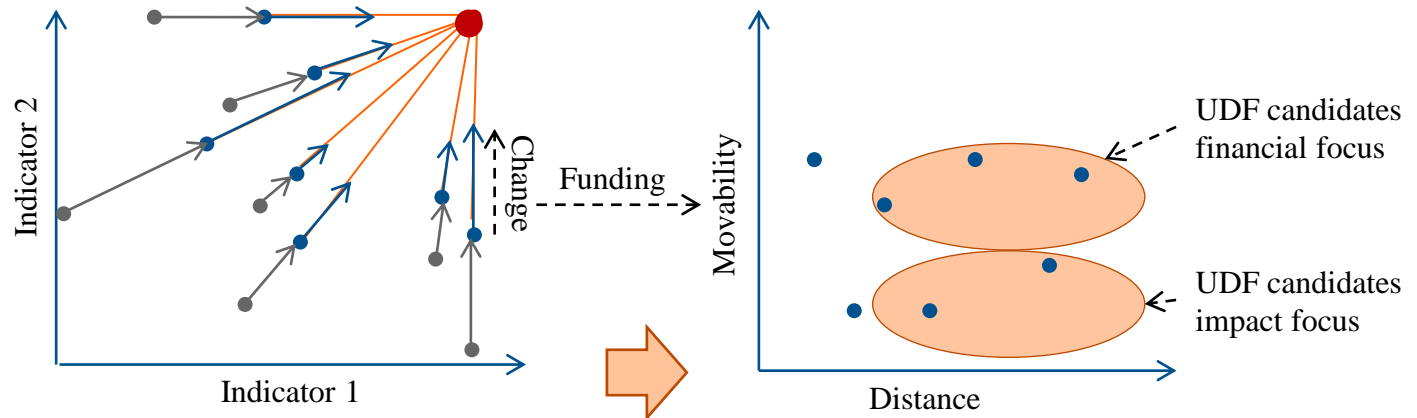


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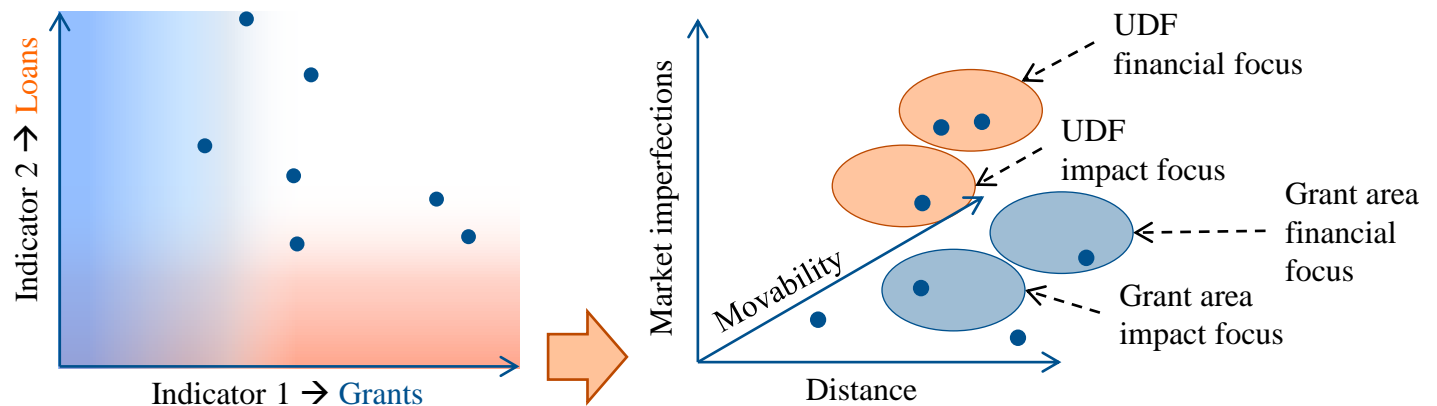


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- **Imperfections:**

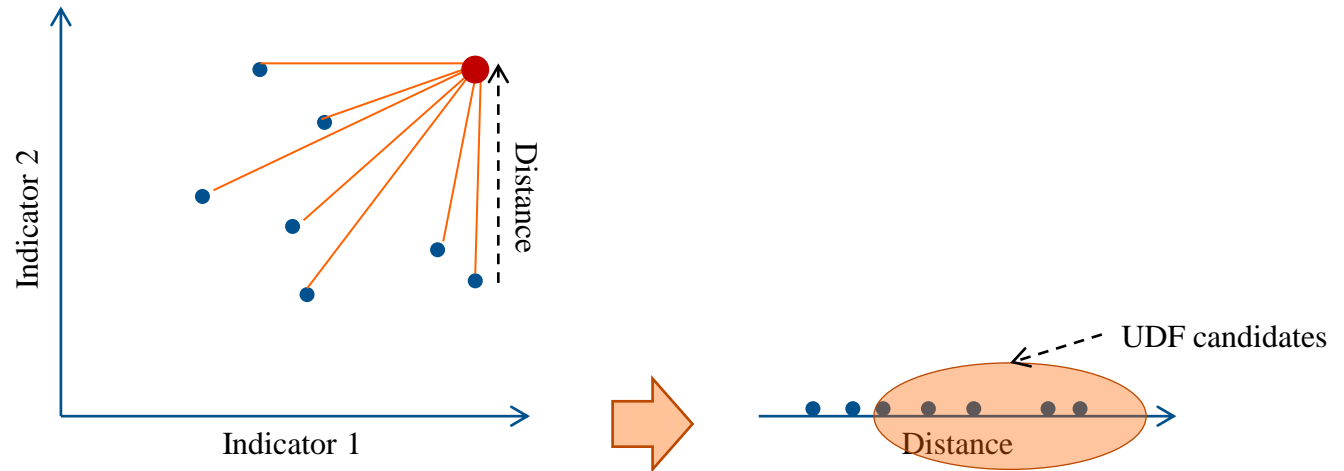
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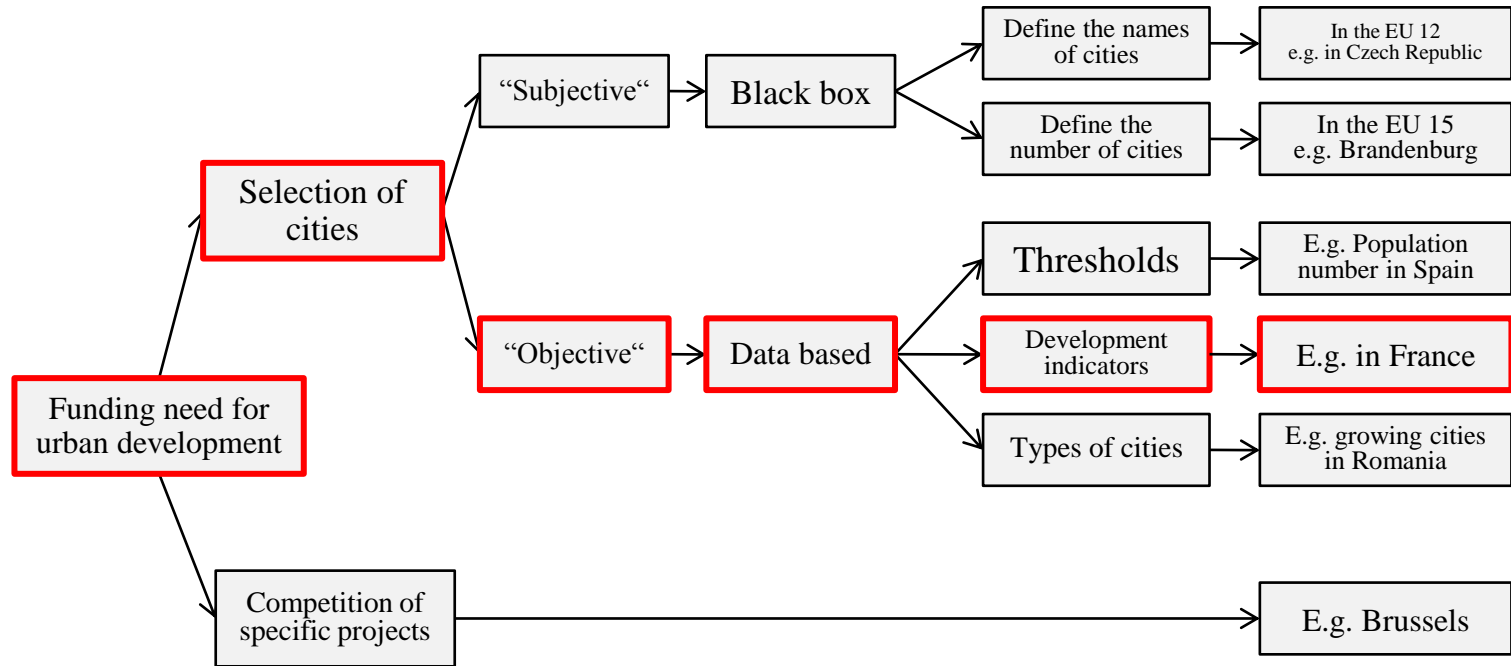
→ “The **DMI Approach** for Urban Development Funding”

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- **Distance:**
Need for urban development based on the distance to a benchmark defined through a set of indicators

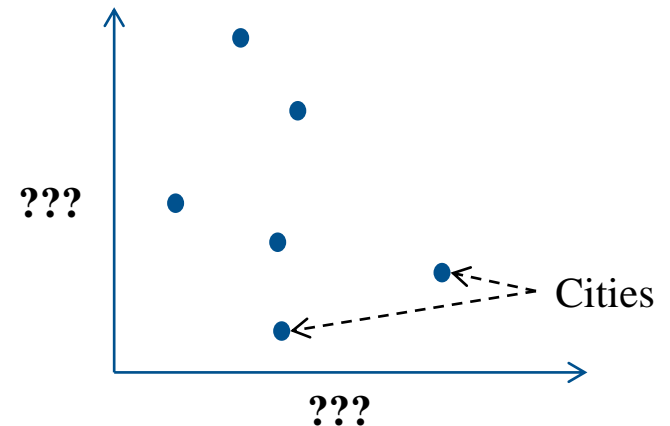


ERDF funding determination from the OPs:



We apply the idea of determining funding targets by using indicators

→ **Which indicators** are appropriate to **quantify** the differences among cities with respect to urban development?



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- Evaluation of non-monetary aspects is always a critical issue
- The two extremes for sustainability comparisons are:

Highly aggregated indexes
 → Difficult interpretation of results due to neutralisation effects!

Large indicator sets
 → Impossible to handle enclosed information when maintaining all items!

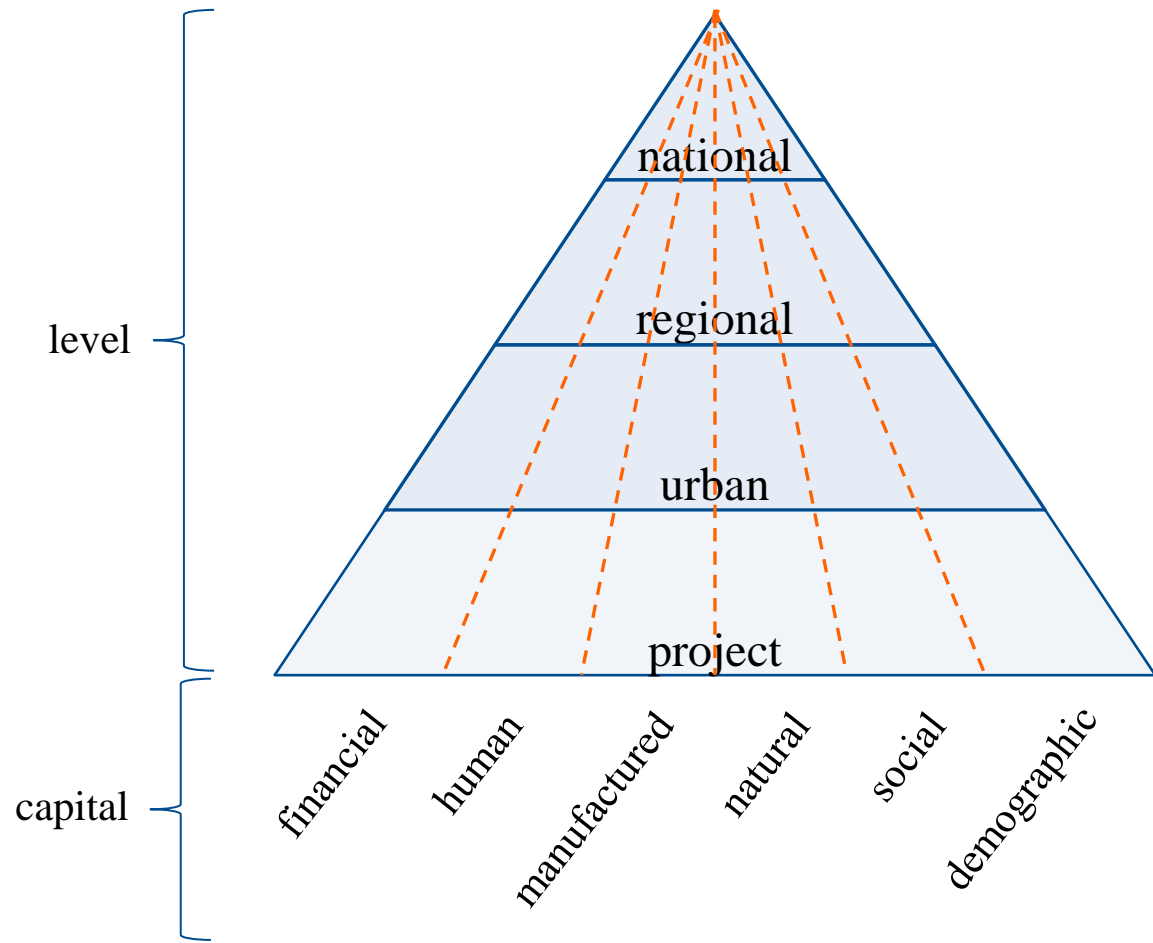
- Middle way: methods combining lower complexity with better clarification of the cities' relative positioning in sustainability:

Framework approach
 → Reduction of complexity as a compromise!

➡ Use the framework approach for funding decisions and funding efficiency analyses!

➡ **But how can we obtain a small set of useful indicators to determine the differences of cities? By searching for intersections of existing sets?**

Definition of level and capital categories for the systematisation of existing indicator sets:



➔ **Systematic comparison** of existing indicator sets!

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Existing indicator sets

Comparison of existing indicator sets arising from different organisations, researchers, nations and describing sustainability indicators on several levels: urban, national or any.

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Indicators	Ekins Medhurst	OECD 2005	United Nations Cap. Based	United Nations Policy Based	United Nations Small Set	Indicator Report D 2010	Urban Audit Key Indicators
HUMAN CAPITAL							
Educational attainment broken down by gender and age	X	X	X	X	X	X	X
Education expenditure		X					
Enrolment in post-secondary education			X		X	X	X
Education participation rates		X					
Life expectancy (health adjusted)	X	X	X	X	X		
Infant mortality/immunization against childhood diseases	X						
Nutritional status of population (obese)	X					X	
Exposure to air pollution	X						
Health and environment related health expenditure	X						
Extent of drugs/alcohol abuse	X					X	
Premature mortality (by gender, key illnesses, suicide)	X			X		X	
Index of changes in age-specific mortality and morbidity			X		X		
Number of deaths in road accidents per 10000 population							X
Real per capita human capital			X		X		
Number of start-up businesses	X						
Ratio of entrepreneurs/population	X						
Employment rate (age, population, working-age population)		X		X		X	X
Activity rate (male, female full-time equivalents)	X						
Proportion in part-time employment							X
Self-employment rate							X
Unemployment (rate, level, gender, age)	X	X		X			X
Absenteeism;	X						
Worker productivity	X						
Long-term unemployment	X						
Multi-factor productivity growth rate		X					
Number of patents taken out from innovations being developed	X						
Net employment created or safeguarded	X						
Brain import/export	X						
Research & Development expenditure (public, private)				X		X	
Success rate of training (% finding employment on completion)	X						

➔ Few indicators are represented in multiple sets

➔ Problem of size differences in the sets

➔ Sub-categories are represented erratically

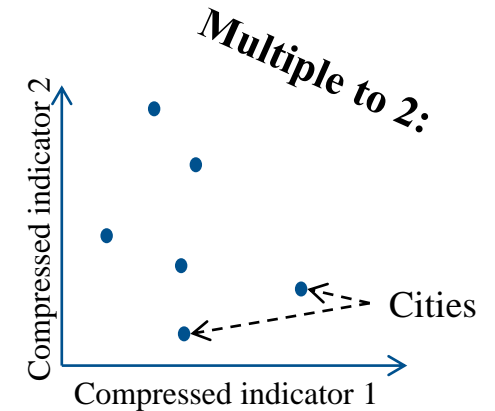
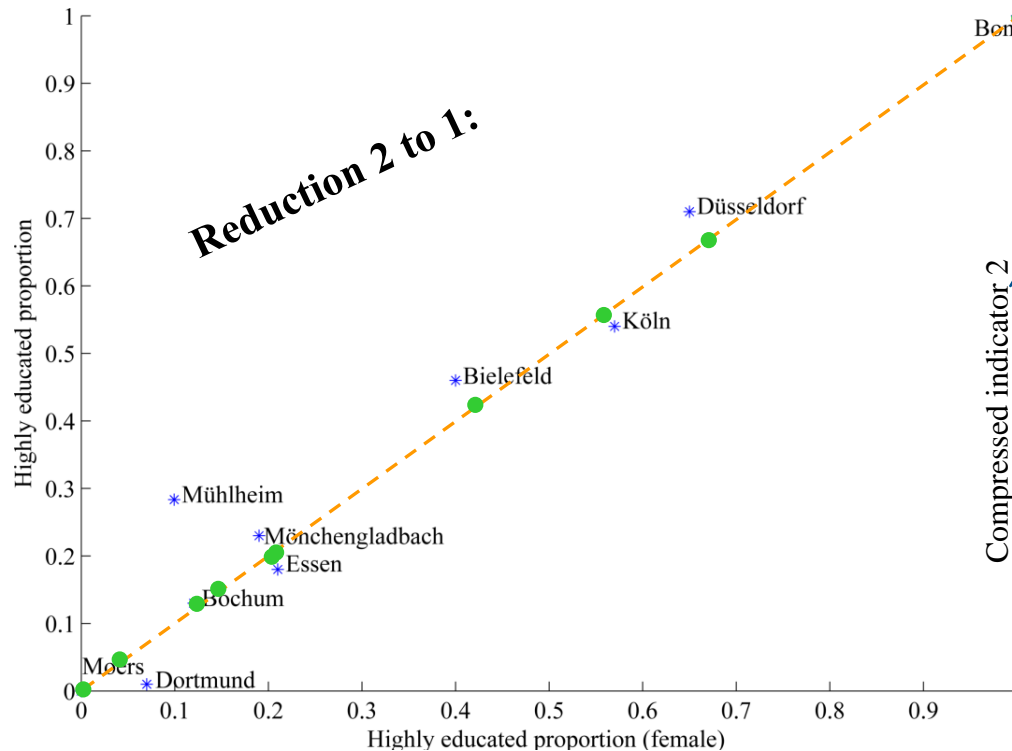
➔ Need for methods which help to determine a smaller number of indicators for the sustainability comparison of funding targets!

Method:

We employ a **principal component analysis**

→ transforms differences that are originally defined in a complex, multidimensional manner into a small number of dimensions

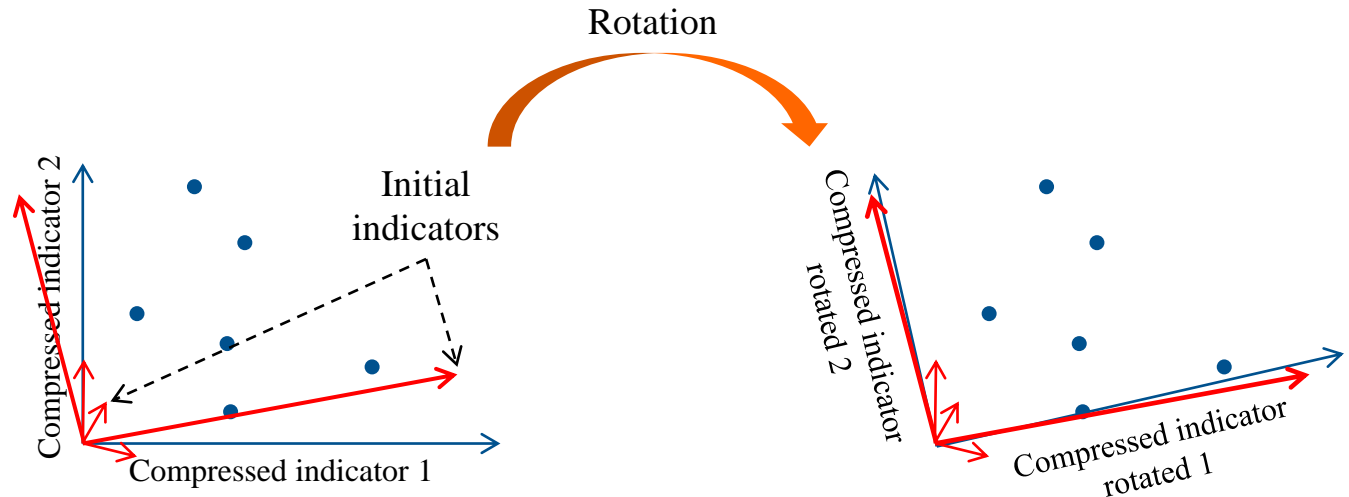
→ compressed indicators



Method:

Facilitation of interpretation possibilities: **rotation technique**.

→ Identification of the influences of the initial indicators on the new dimensions.



Initial indicators with high influences have a **strong explanatory power** for the differences among the cities analysed → “**determining indicators**”.

STUDY: Data to test our method

Data: Urban Audit Key Indicator Set for core cities – Indicators for the quality of life of European cities – from the Eurostat database

QoL and sustainability definitions of existing sets are fluent!

Problem: Data availability variations → Final basis for analyses (averaged):

Nation	# Time frames	# Cities	# Indicators
CR	5	7	21
France	3	32	21
Germany	5	36	26
Italy	5	29	20
Netherlands	4	13	19
Poland	5	25	20
Romania	5	14	13
Spain	5	19	21
Turkey	2	24	9
UK	3	29	10

+ **Accuracy limits** for the PCA and influence after rotation

→ **244 partial analyses**

Each Analysis identifies those indicators which explain the differences between one nation’s cities for one time frame and one combination of limits.

The **final results** are those initial indicators being among the most often ones selected due to their explanatory power.

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Results in decreasing order:

Capital	Selected indicator
Manufactured	Number of stops of public transport
Environmental	Proportion of solid waste
Environmental	Number of days with high ozone concentration
Social	Proportion of nationals born abroad
Demographic	Total population change over 1 year
Human	Highly educated females
Demographic	Total annual population change over 5 years
Social	Domestic burglary
Social	Car thefts

- All **initial capital categories** are covered and the indicators fit well to general **political debates**.
- Selected indicators are more or less **equally spread** among all aspects of urban life as covered by the initial indicator set.
- Overall results show that it is not necessary to compare cities by all 46 initial indicators, but that those **9 indicators are good representatives** for the differences among cities in the countries analysed.

There are two possibilities to check the robustness of the results namely the in detail analysis of the variation among time frames and countries.

- **Time frame variation:** We found several consistencies where the indicators are selected in two subsequent time frames or with an interruption of only one period. However, development naturally influences the determinants of differences among cities and this strengthens the idea of continuously adapting the small indicator set.
- **Country variation:** Comparing the selected indicators among the nations analysed yields the definition of clusters (if possible).

Netherlands Romania Turkey UK Spain

Poland France

The results reveal the need for country or cluster specific small indicator sets for more detailed analyses of urban differences.

➡ Method of determining indicators' identification has to be **adaptable** to time and country specific structures!

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- We developed a method to identify a small number of indicators that adequately represent differences among one nation's cities.
- The overall analysis points out that a small set of nine indicators is generally sufficient to determine the differences.
- The results are plausible in the context of current political debates and existing general indicator sets.
- However, the application needs to be checked constantly and adapted over time and space.

→ The results are the **inputs** for the **comparison of sustainability** in order to determine the **DISTANCE** between cities!

STUDY: Italian cities in the Urban Audit

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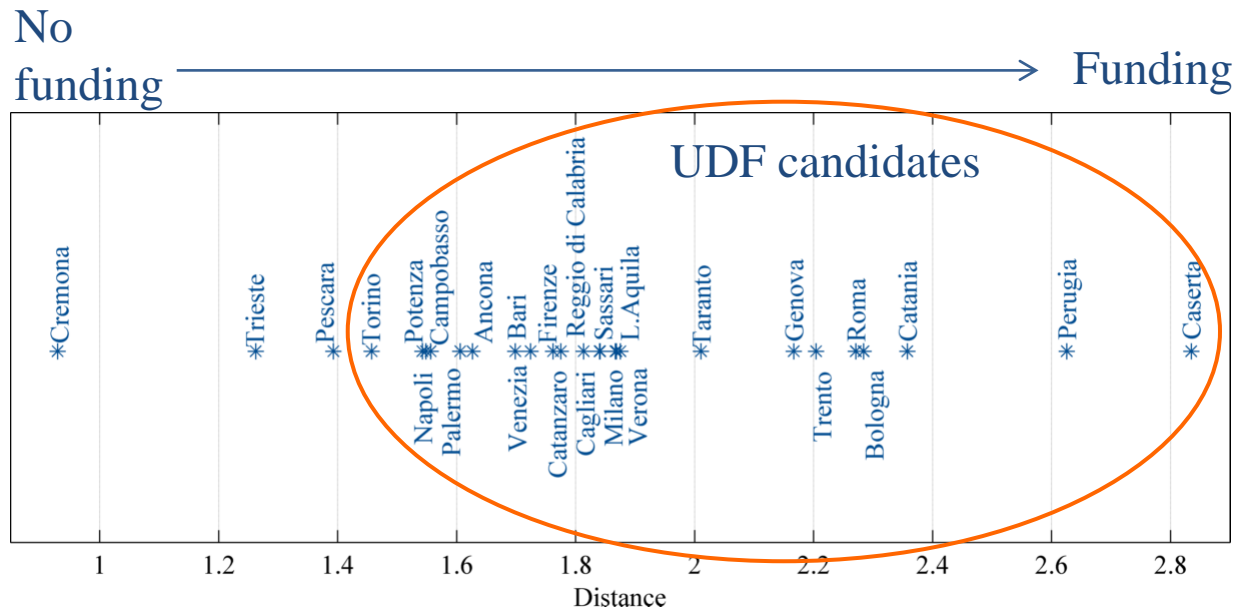


Cities available
Ancona
Bari
Bologna
Cagliari
Campobasso
Caserta
Catania
Catanzaro
Cremona
Firenze
Genova
L'Aquila
Milano
Napoli
Palermo
Perugia
Pescara
Potenza
Reggio di Calabria
Roma
Sassari
Taranto
Torino
Trento
Trieste
Venezia
Verona

STUDY: Distance for Italian cities

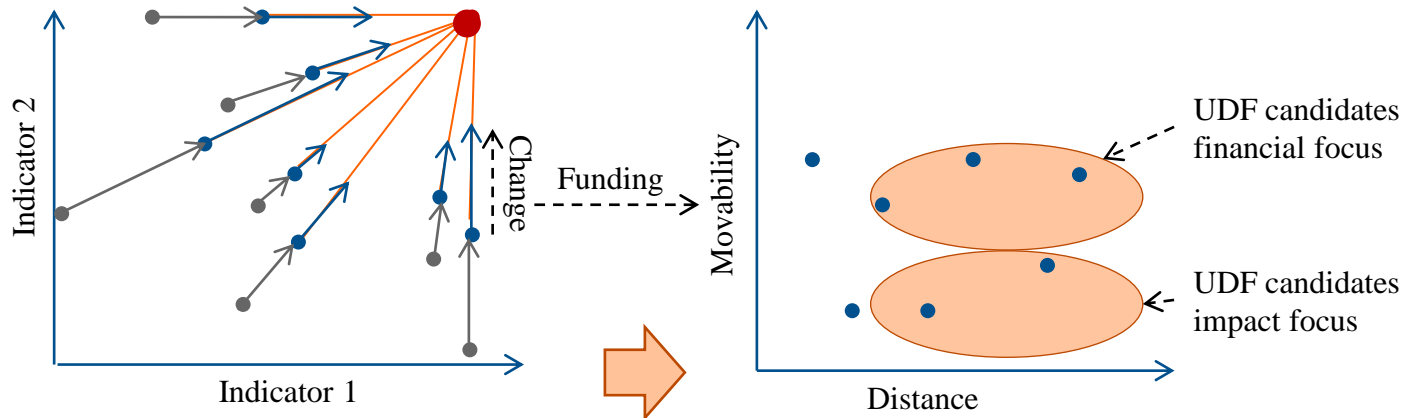
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- All of the nine indicators which are available for Italy as basis (only 5 due to data gaps)
- A benchmark city is defined by the best value for each indicator among all cities included in the analysis
- The distance to this benchmark is the sum of all components
- The results for the Italian Urban Audit cities are:



- Open question: How to set the limits for the distance that defines the cities to be supported? Proxy: Half of the maximum distance!

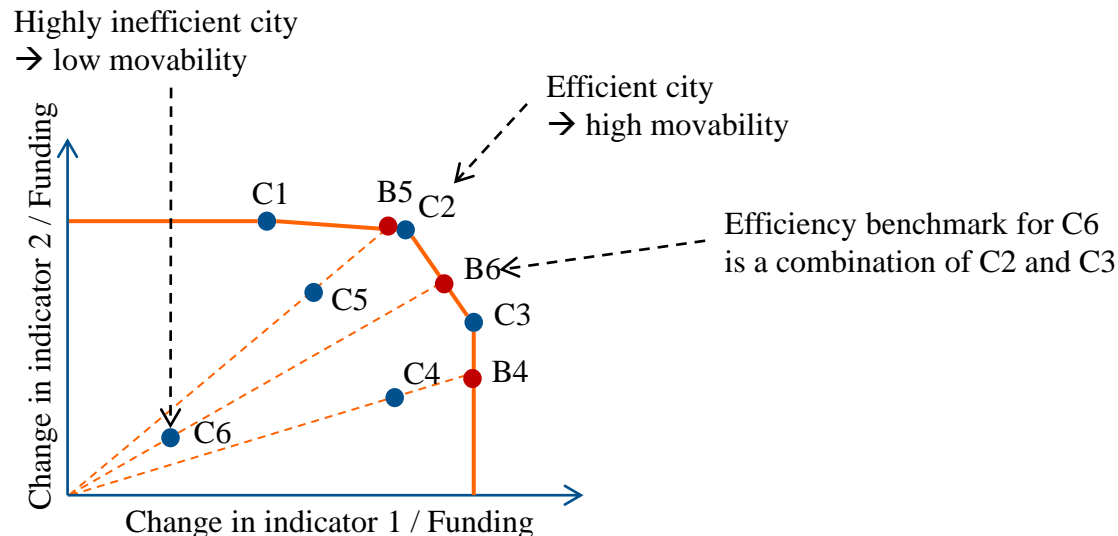
- **Movability:**
 - Funding efficiency to separate funding targets which need technical assistance first (e.g. due to governmental failures) and those which should be supported financially.
 - Compare the changes in the indicators from the last to the current period with the amount of funding obtained in the last period
→ Movability of cities through funding measures!
Problem: “static approach”



- Cities with high movability can further be supported mere financially.
- Cities with low movability need in addition help to improve the impact of funding measures.

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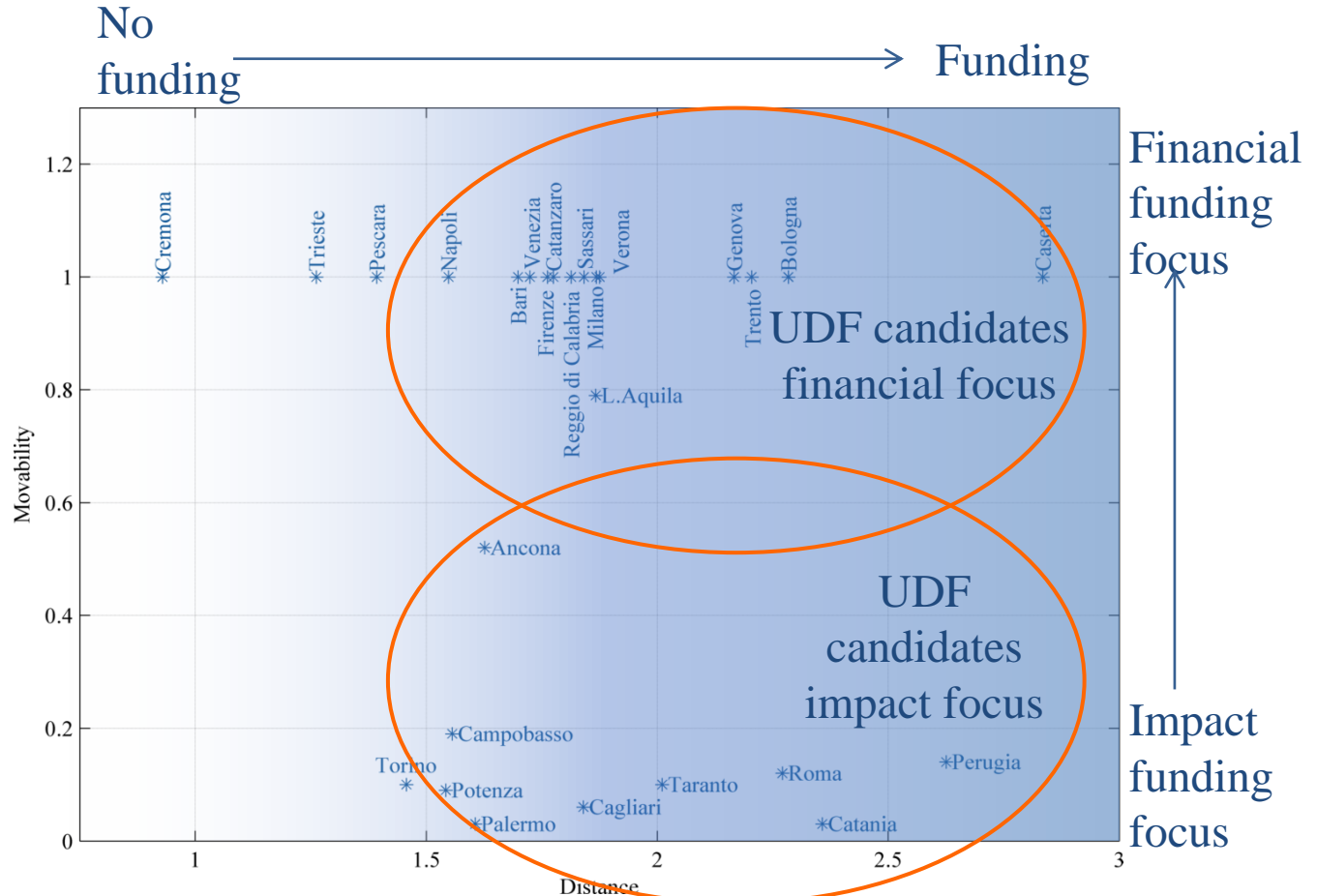
- We use a commonly known method called Data Envelopment Analysis (DEA).
- Efficiency measurement method for units of similar type (→ cities) which compares them internally without the need to specify a benchmark or weights for the different inputs or outputs.
- Cities with the highest multidimensional output (indicators) per input (funding) are denoted as efficient – C1, C2, C3.
- Inefficiency of the other cities is determined by the distance to the efficiency frontier (bold line).
- Shows how to improve efficiency as the efficiency benchmark is one (or a combination) of the cities included in the analysis.



STUDY: Distance and Movability for Italian cities

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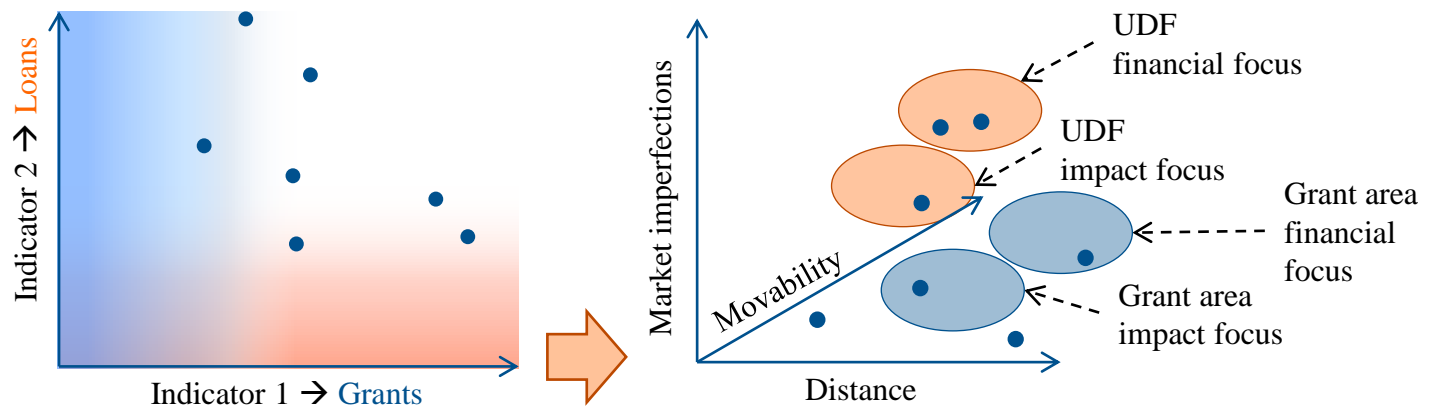
- The same indicators are the basis for the calculation of former funding efficiency
- The results for the Italian Urban Audit cities are:



- To be solved: Exact funding data for urban development.
Proxy: Share of ERDF-Funding

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- **Imperfections:**
Appropriate funding instruments depending on the underlying market imperfections (resulting in market failures): grants for mere external effects or monopoly, revolving instruments for combination of the two imperfections with incomplete information



Idea:

Classify urban capital markets according to their sensitivity to different kinds of **market failures** for the respective investment needs

- **External effects:**

Costs/benefits arising with the production of goods for uninvolved parties, such as the benefits for shop owners which gain new clients when there is a public car park constructed nearby.

- **Imperfect competition:**

Only one or very few providers/sellers of a certain good or service exist (monopoly, oligopoly, monopsony, oligopsony), e.g., the prevalent transport infrastructure monopoly in some member states.

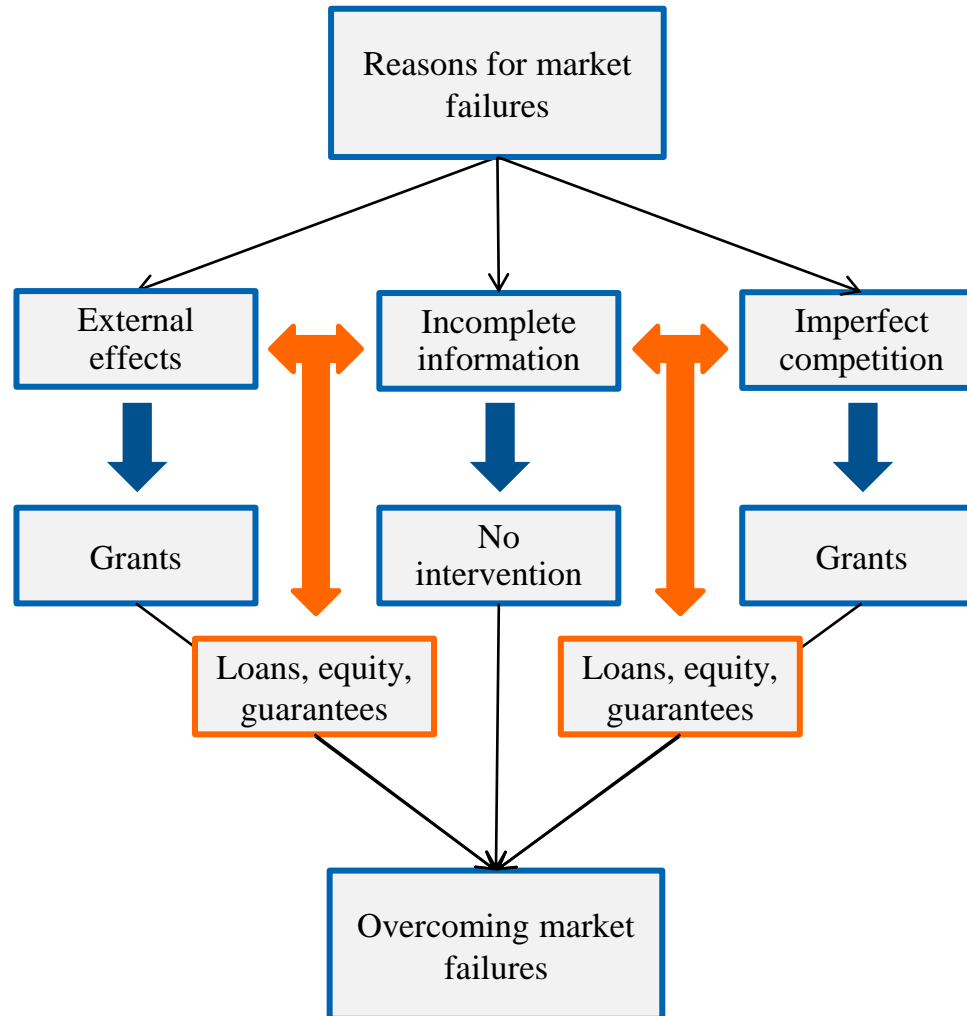
- **Incomplete information:**

Misinformation of some project participants which might result in cost overruns or benefit shortfalls, e.g., when large infrastructure projects are much more expensive as previously planned.

→ **Which combination of market failures justifies the employment of revolving financial instruments in contrast to grants?**

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Which combination of market failures justifies the employment of revolving financial instruments in contrast to grants?



→ Only the **combination** of external effects or imperfect competition **with incomplete information** justifies the intervention of JESSICA-type financial instruments!

→ We will now have a look at the **reasons** for the case of external effects and incomplete information by considering the decision problem of **loans versus grants** in the context of urban development funding!

Consider an urban development project with an initial outlay of 100 € at time $t = 0$ that leads to **expected monetary payoffs** of

$$p \cdot M = 0.8 \cdot 140.625 = 112.50 \text{ € at time } t = 1$$

with probability p and monetary success payoff M and risk neutrality!

Moreover, there are (expected) **positive external effects** due to e.g. enhanced life quality of citizens which are worth 30 € at time $t = 1$. The overall capital market interest rate i_{cap} is 15 %.

#	Time t	0	1
1	Monetary payoffs	-100 €	112.50 €
2	External effects		30 €

Apparently, private investors will not be willing to finance this urban development project, because its net present value is

$$\text{NPV} = -100 + 112.50 / 1.15 = -2.174 \text{ €}$$

and thus **negative**.

➔ This means that there is a need for a public **subsidy** with a **minimum** net present value of **2.174 €**. The **maximum** subsidy public authorities are willing to offer has a net present value of $30 / 1.15 = \mathbf{26.087 \text{ €}}$.

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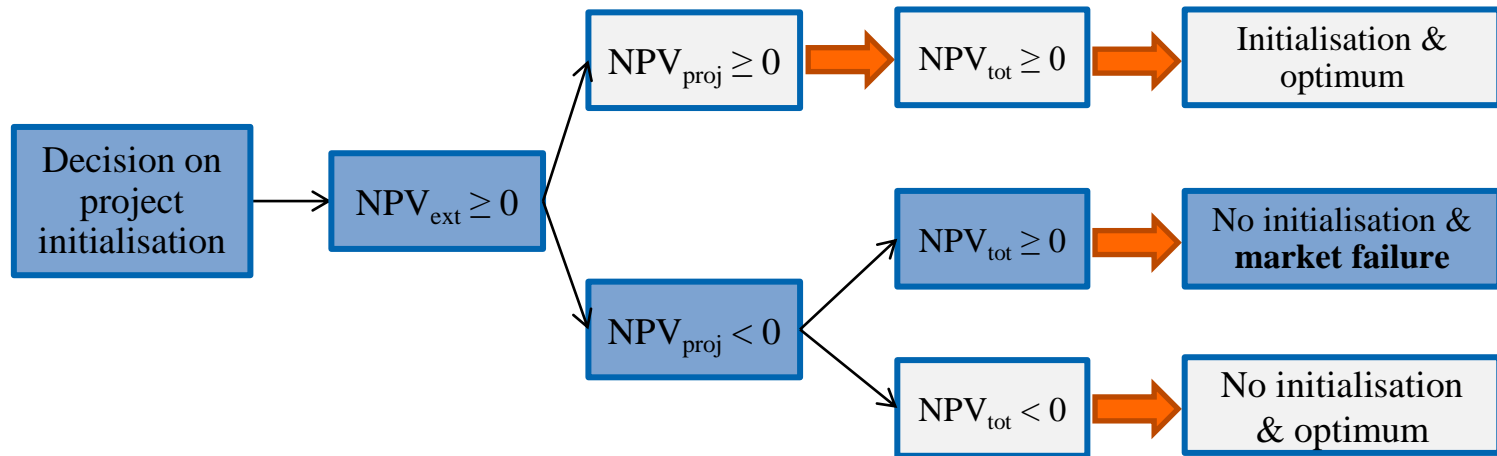
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- For decisions under risk with risk neutral agents, market values are identical to net present values of expected payoff consequences.
- **E(m)** and **E(e)**: expectation values of monetary payoffs m and external effects e of the project under consideration.
- **NPV_{proj}**, **NPV_{ext}** and **NPV_{tot}**: net present value of the project, of the external effects and of both in total.

$$\text{NPV}_{\text{proj}} = -I + E(m)/(1+i_{\text{cap}}) \text{ and}$$

$$\Rightarrow \text{NPV}_{\text{tot}} = \text{NPV}_{\text{proj}} + \text{NPV}_{\text{ext}} = -I + [E(m) + E(e)]/(1+i_{\text{cap}})$$

- Dependence of project initialisation on the different NPV-types and connection to overall welfare optima:



- A project can only be realised if the initial outlay of I is provided by public and/or private investors ($I_{\text{publ}} + I_{\text{priv}}$)
 → Which financing alternatives are possible under these conditions?

Loans versus grants

Example: Public authorities offer a minimum required subsidy of $-NPV_{proj}$ which is completely tax-financed at time $t=0$, certainty about e

#	Time t = 0			Time t = 1		(6) NPV of	(7) NPV of
	(1) Private Investment I_{priv}	(2) Public Investment I_{publ}	(3) Public Interest Rate i_{publ}	(4) Expected Repayment to Private Investors	(5) Expected Repayment to Public Authorities	Expected Payments from/to Public Authorities	Expected Payments from/to Private Investors
1	97.83	2.17	-100.00%	112.50	0.00	-2.174	0.00
2	97.47	2.53	-80.00%	112.10	0.40	-2.174	0.00
3	96.99	3.01	-60.00%	111.54	0.96	-2.174	0.00
4	96.27	3.73	-40.00%	110.71	1.79	-2.174	0.00
5	95.10	4.90	-20.00%	109.36	3.14	-2.174	0.00
6	92.86	7.14	0.00%	106.79	5.71	-2.174	0.00
7	91.94	8.06	5.00%	105.73	6.77	-2.174	0.00
8	90.74	9.26	10.00%	104.35	8.15	-2.174	0.00
9	89.13	10.87	15.00%	102.50	10.00	-2.174	0.00
10	86.84	13.16	20.00%	99.87	12.63	-2.174	0.00
11	83.33	16.67	25.00%	95.83	16.67	-2.174	0.00
12	77.27	22.73	30.00%	88.86	23.64	-2.174	0.00
13	64.29	35.71	35.00%	73.93	38.57	-2.174	0.00
14	16.67	83.33	40.00%	19.17	93.33	-2.174	0.00
15	0.00	100.00	40.625%	0.00	112.50	-2.174	0.00

#1: Classical grant

#2 – #9: Private and public financing

#10: No private financing

Equals an expected interest rate of 12.5%

- The higher I_{publ} , the higher is i_{publ} , but public monetary loss is always 2.174 € (the minimum subsidy necessary to establish the project).
- $NPV_{tot} = 23.913 \text{ €}$ → Despite monetary loss, still favourable for public authorities!
- **Loans and grants are equivalent in this example! → Modigliani/Miller (1958)**

General results for the presence of external effects:

- There are two potential ways for raising money by public authorities: **borrowing** on capital markets from private investors and **raising taxes**.
- Higher present borrowing reduces the need for present taxation, but increases taxation necessities in the future with the overall outcome from an **NPV point of view being always identical**.
- The decision between grants and loans offered by public authorities remains **irrelevant even for varying public financing behaviour**.

- **Any public loan** with an interest rate $E(i_{\text{publ}}) < i_{\text{cap}}$ can always be interpreted as a specific **combination of two financing measures**:
 - a public **grant** which need not be repaid
 - and a public **loan** with an expected interest rate according to the private capital market interest rate i_{cap} .

Preliminary conclusion:

All financing alternatives are equivalent from a **net present value point of view**. They only differ with respect to the **amount of taxes** needed at time $t = 0$ and time $t = 1$.

If all financing schemes are equivalent in the presence of mere external effects, which other capital market imperfections may render one of these financing alternatives favourable?

There may be **incomplete information** which make it difficult to evaluate monetary and non-monetary project quality. Private investors will typically be better in estimating monetary project quality than public authorities. However, private investors are not interested in quantifying external effects.

Therefore, public authorities have to incur informational costs in order to assess non-monetary consequences of projects.

If, as a consequence of this assessment, they also learn something about **monetary project quality**, this informational advantage may be of interest for private investors as well.



This means that a high public financing share could serve as a signal for a high quality project thus inducing private investors to participate in financing (establishing a so-called separating equilibrium).

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- **Up to now:** We only considered $E(m) = p \cdot M$, as p and M were known and $E(e) = e$ was common knowledge as well.
 - **Now:** probability p and external effects e are ex ante unknown to public and private (external) investors → simply considering $E(m)$ and $E(e)$ does not work anymore.
 - **But:** public authorities incur some monitoring efforts to determine p as a by-product of determining e , while private investors only know the distribution of p and e across all projects available.
 - Public authorities are not willing to simply tell the private side about the true probability of success and external effects, because they would prefer investors to be **overoptimistic**, as this would reduce the necessary private interest rate and thus make financing the urban development project easier.
- A **credible commitment device** is needed to make private investors believe public authorities' statements regarding project quality.

Example: Signaling unobservable success probability p and value of external

		Project 1 ($NPV_{tot} > 0$)		Project 2 ($NPV_{tot} > 0$)		Project 3 ($NPV_{tot} < 0$)		Project 4 ($NPV_{tot} < 0$)	
		$p = 80.00\%$, $e = 30$		$p = 75.00\%$, $e = 35$		$p = 50.00\%$, $e = 40$		$p = 40.00\%$, $e = 50$	
#	(1) Public interest rate i_{publ}	(2a) Public Investment I_{publ}	(3a) Private Investment I_{priv}	(2b) Public Investment I_{publ}	(3b) Private Investment I_{priv}	(2c) Public Investment I_{publ}	(3c) Private Investment I_{priv}	(2c) Public Investment I_{publ}	(3c) Private Investment I_{priv}
1	-100.00%	26.09	73.91	30.43	69.57	34.78	65.22	43.48	56.52
2	-80.00%	30.30	69.70	35.00	65.00	38.10	61.90	46.73	53.27
3	-60.00%	36.14	63.86	41.18	58.82	42.11	57.89	50.51	49.49
4	-40.00%	44.78	55.22	50.00	50.00	47.06	52.94	54.95	45.05
5	-20.00%	58.82	41.18	63.64	36.36	53.33	46.67	60.24	39.76
6	0.00%	85.71	14.29	87.50	12.50	61.54	38.46	66.67	33.33
7	5.00%	96.77	3.23	96.55	3.45	64.00	36.00	68.49	31.51
8	6.25%	100.00	0.00	99.12	0.88	64.65	35.35	68.97	31.03
9	-32.35%	49.28	50.72	54.46	45.54	49.28	50.72	56.86	43.14
10	-17.86%	60.87	39.13	65.55	34.45	54.11	45.89	60.87	39.13
11	-54.00%	38.36	61.64	43.48	56.52	43.48	56.52	51.76	48.24
12	-26.60%	53.30	46.70	58.38	41.62	51.09	48.91	58.38	41.62

- Project 1 and 2 need to be separated from 3 and 4! As high values of e in combination with low values of p are uninteresting for private investors.
- #9: for $i_{publ} > -32.35\%$ and $I_{publ} > 49.28$ €, private investors can be sure that they are confronted with project 1 and not project 3. For $i_{publ} > -17.86\%$ and $I_{publ} > 60.87$ € this is true for the relationship between project 1 and project 4 → successful separation from both bad quality projects requires $i_{publ} > -17.86\%$ and $I_{publ} > 60.87$ € with respect to project 1!
- Successful separation from both projects 3 and 4 regarding project 2 is only possible for $i_{publ} > -26.60\%$ and $I_{publ} > 58.38$ €.
- Finance both good quality projects with i_{publ} slightly above -17.86% and I_{publ} slightly above 60.87 €, because of a positive welfare gain! → Redeemable loans for signaling!

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Further result :

- Assume that public authorities are **endowed** with a fixed budget $W(n)$ for financing urban development projects.
- All features of these projects are common knowledge and are identical across all projects with the only exception of probability p of monetary success and external effects e .
- Then, public authorities will utilize **redeemable loans** for project financing instead of grants in order to signal project properties.
- In order to reduce rent extraction by private investors, public authorities will completely invest their endowment $W(n)$ in urban development projects (if possible).

➡ **Loans** are a **suitable** means of funding when a **combination** of the market failures incomplete information and external effects are prevalent.

➡ Grants, in contrast, are not able to signal sufficient project quality to private investors.

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In addition:

There seems to be **an incentive problem** which arises in the context of allocation from EU funds to national and regional levels, if some EU countries try to keep their share only in order to avoid having less funding in the next programming period.

With grants: It is better for public authorities to invest remaining funds in “bad” projects with negative NPV instead of returning the money in the case where no “good” projects are left.

With loans: Public authorities can simply invest more in “good” projects by increasing their share and interest rate, which is favourable compared to the alternative of investing in “bad” projects.

→ Revolving financial instruments also help to overcome this problem!

→ **Why do we thus not only use revolving instruments and quit grant financing?**

Example: Higher earnings volatility when using redeemable loans

- J = 6 urban development projects with independently distributed monetary outcomes.
- Same amount invested in each project, remaining money is invested on the capital market.

#	Time t = 0				Time t = 1					(8) Standard Deviation of Overall Repayment to Public Authorities
	(1) Public investment per Project I_{publ}	(2) Public interest rate i_{publ}	(3) Overall Public Project Investment $J \times I_{publ}$	(4) Public Capital Market Investment $W - J \times I_{publ}$	(5) Project Repayment to Public Authorities		(6) Capital Market Repayment to Public Authorities	(7) Overall Repayment to Public Authorities		
					(5a) Minimum	(5b) Maximum		(7a) Minimum	(7b) Maximum	
1	2.17	-100.00%	13.04	86.96	0.00	0.00	100.00	100.00	100.00	0.00
2	2.53	-80.00%	15.15	84.85	0.00	3.03	97.58	97.58	100.61	0.49
3	3.01	-60.00%	18.07	81.93	0.00	7.23	94.22	94.22	101.45	1.18
4	3.73	-40.00%	22.39	77.61	0.00	13.43	89.25	89.25	102.69	2.19
5	4.90	-20.00%	29.41	70.59	0.00	23.53	81.18	81.18	104.71	3.84
6	7.14	0.00%	42.86	57.14	0.00	42.86	65.71	65.71	108.57	7.00
7	8.06	5.00%	48.39	51.61	0.00	50.81	59.35	59.35	110.16	8.30
8	9.26	10.00%	55.56	44.44	0.00	61.11	51.11	51.11	112.22	9.98
9	10.87	15.00%	65.22	34.78	0.00	75.00	40.00	40.00	115.00	12.25
10	13.16	20.00%	78.95	21.05	0.00	94.74	24.21	24.21	118.95	15.47
11	16.67	25.00%	100.00	0.00	0.00	125.00	0.00	0.00	125.00	20.41

- Although the expected value of monetary payoffs to public authorities is always 100 € for all financing alternatives, there are great differences in volatility.
- Taxation at time t = 1 has to be increased if there is a deficit because monetary outcomes are below the target value of 100 €. For repayments exceeding this target value, taxation at time 1 could be reduced.
- Grants would reduce tax volatility to zero (#1) and thus obviously be superior to any other intertemporal adjustment strategy.

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Result:

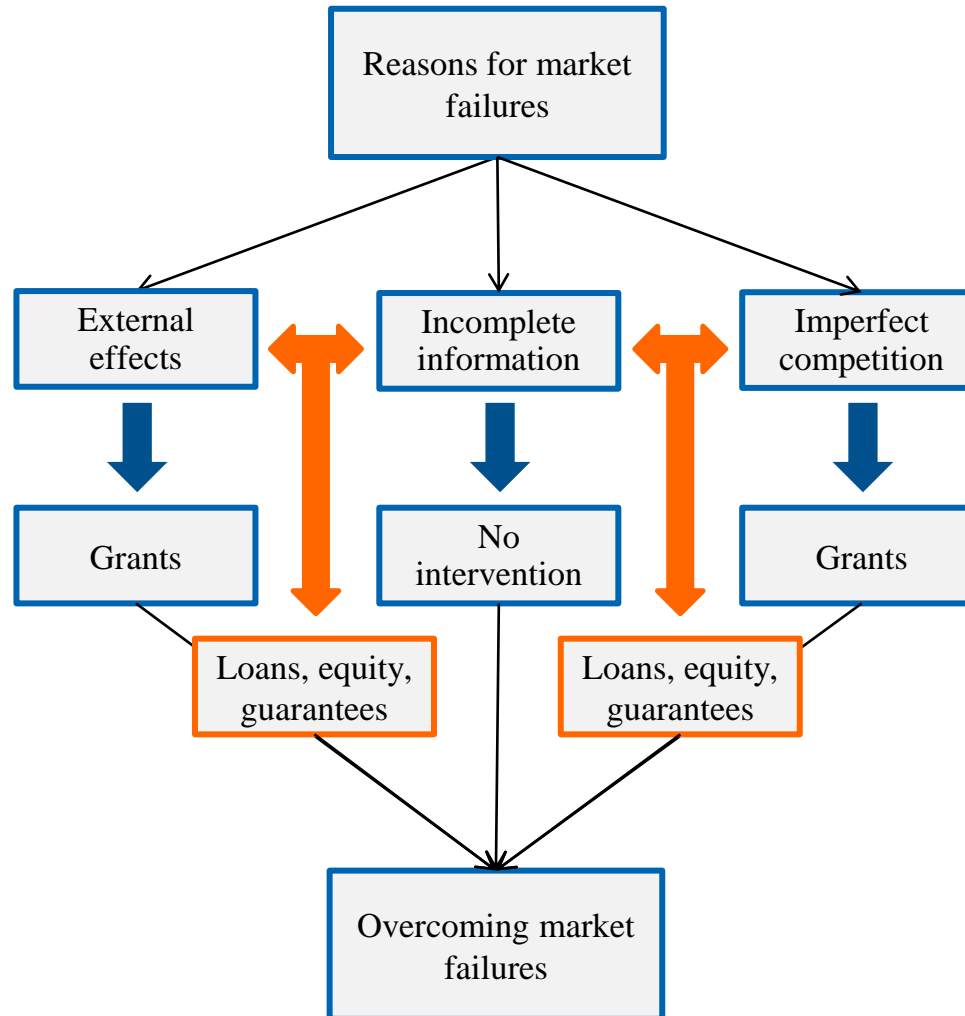
- The more public authorities rely on redeemable loans for financing urban development projects, the **higher the volatility of monetary outcomes** from project financing for public authorities.
- An increase in repayment volatility will eventually increase the volatility of the tax burden for a country's inhabitants and therefore in general **affect total welfare adversely**.
- Due to this problem, the utilization of redeemable loans as a device for mitigating problems of incomplete information between public authorities and private investors and between member states and the European Commission could be limited.

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Conclusion on loans versus grants:

- It does not matter whether to support urban development projects by grants or by loans in the presence of mere external effects. Both financing schemes are then equivalent.
- Loans are a suitable means of funding when a combination of the market failures incomplete information and external effects are prevalent.
- Grants, in contrast, are not able to signal sufficient project quality to private investors.
- In situations without incomplete information between private and public investors regarding monetary project payoffs (or even with better information on the private investors' side), we would expect grants to be the superior way of subsidizing urban development funds, because of the absence of earnings volatilities.
- It is **indeed necessary to decide between** the suitability of **grants and revolving financial instruments** depending on the underlying market imperfections!

Coming back to imperfections in general.....



→ WE HAVE JUST SEEN:
Only the **combination** of external effects **with incomplete information** justifies the intervention of JESSICA-type financial instruments!

→ The **same** holds true for the combination of **imperfect competition** with incomplete information!

→ Subsidy interventions in the case of imperfect competition should not lead to rent extraction by the monopolist without other overall welfare generating consequences – **some kind of positive external effect!**

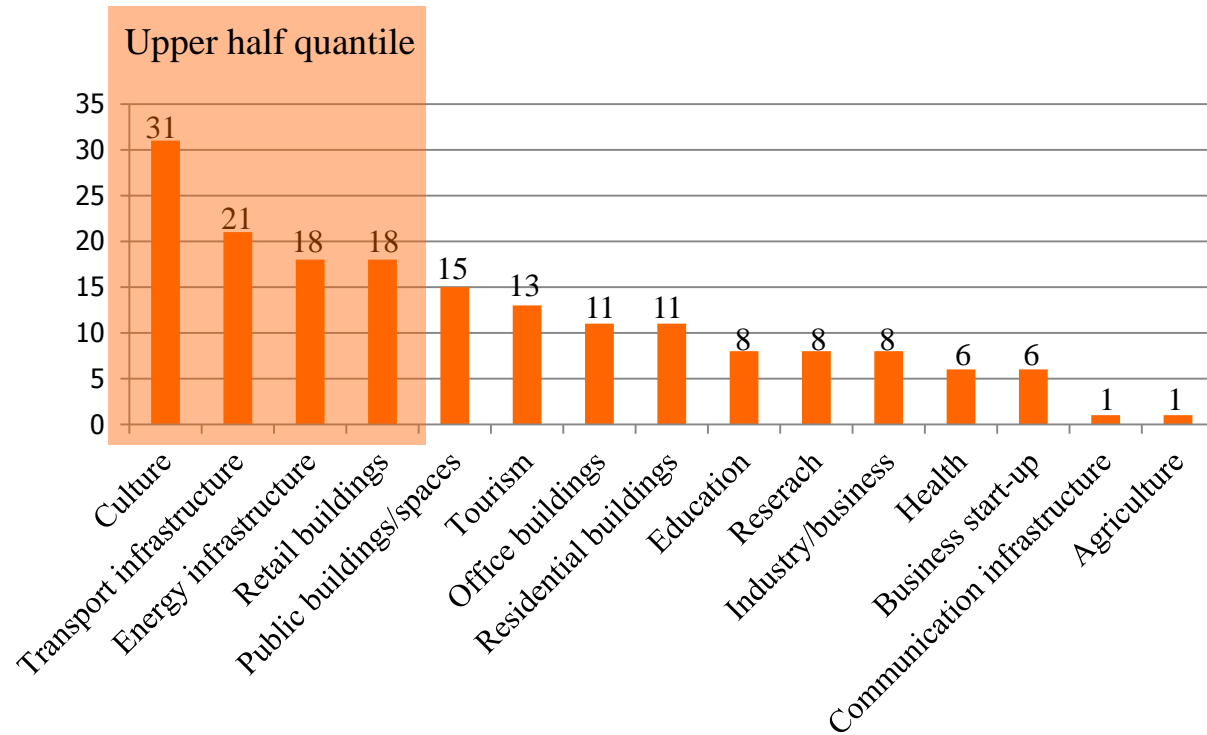
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Idea: To determine the city's type of imperfections and the suitability of JESSICA, we analyse the potential market failures for projects that cover the city's investment needs!

- The JESSICA Evaluation Studies name potential projects for urban development.
- The three broadly represented countries are Germany, Italy, and Poland.
- Analysing their proposed projects covers a wide range of urban development activities.
- We identified 108 potential projects from 18 regional studies covering 15 categories, e.g., several types of infrastructure or cultural and educational activities.
- The results can then be used to determine a city's type of imperfection.

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Number of projects proposed in the EIB JESSICA Evaluation Studies by categories



Projects were selected for the studies by organisational, legal and financial criteria. A distinction between the appropriate funding means is generally missing.

→ We **connect** the categories to their sensitivity regarding the three kinds of **market failure!**

Classification of project categories and imperfections:

Project category	Externalities	Imperfect competition	Incomplete information	Funding type
Culture	+	-	-	Grants
Retail buildings	+	-	-	Grants
Public buildings/spaces	+	-	-	Grants
Tourism	+	-	-	Grants
Transport infrastructure	+	+	+	JESSICA
Energy infrastructure	o	+	+	JESSICA
Education	+	-	+	JESSICA
Research	+	-	+	JESSICA
Industry/business	+	-	+	JESSICA
Business start-up	+	+	+	JESSICA
Communication infrastructure	o	+	+	JESSICA
Office buildings	-	-	-	No
Residential buildings	-	-	-	No
Agriculture	o	-	-	No
Health	-	o	+	No

Example:

- Transport infrastructure
- External effects are prevalent with the connection of different locations (e.g. Lijesen and Shestalova, 2007).
- Some huge firms dominate regional and national markets (e.g. rail companies).
- Incomplete information were found in a number of studies (e.g. Flyvbjerg, 2005).

→ For some categories JESSICA-type instruments are indeed a suitable means of funding, e.g., infrastructure in general, education, and research enhancing projects!

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STUDY: Connecting indicators and market imperfections for Italy

- The identified indicators are connected to the project categories from the EIB JESSICA Evaluation Studies and the respective appropriate funding types

Selected indicator	Category for projects	Funding type	
<i>Number of stops of public transport</i>	<i>Transport infrastructure</i>	<i>JESSICA</i>	→ 1
<i>Proportion of solid waste</i>	<i>Energy infrastructure</i>	<i>JESSICA</i>	→ 1
<i>Number of days with high ozone concentration</i>	<i>Energy infrastructure</i>	<i>JESSICA</i>	→ 1
<i>Proportion of nationals born abroad</i>	<i>Culture</i>	<i>Grants</i>	→ 0.5
<i>Total population change over 1 year</i>	-	-	→ 0
<i>Highly educated females</i>	<i>Education</i>	<i>JESSICA</i>	→ 1
<i>Total annual population change over 5 years</i>	-	-	→ 0
<i>Domestic burglary</i>	<i>Culture</i>	<i>Grants</i>	→ 0.5
<i>Car thefts</i>	<i>Culture</i>	<i>Grants</i>	→ 0.5

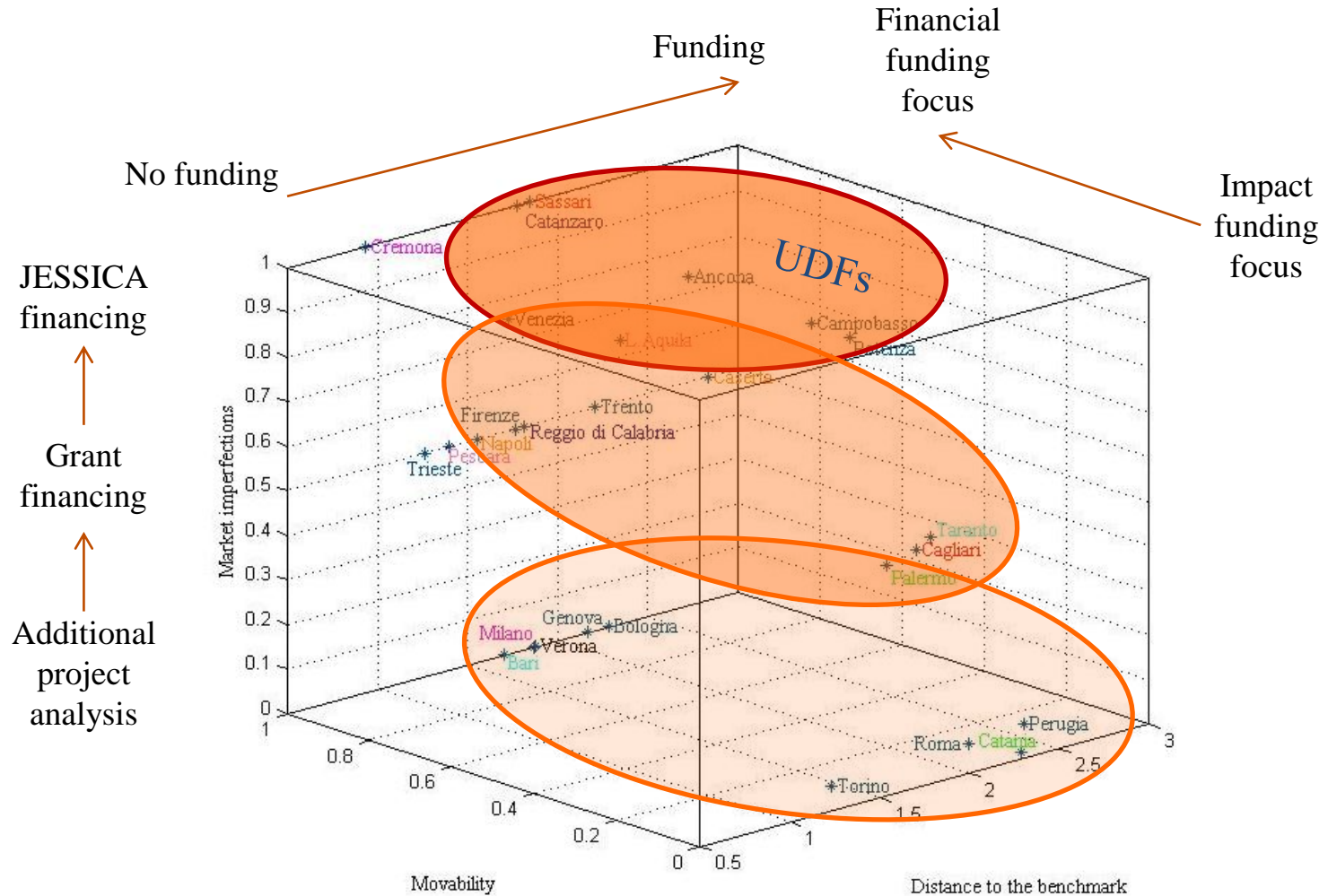
- “Imperfection value” per indicator: 1 if JESSICA-type funding is appropriate, 0.5 if grants are suitable and 0 if no direct connection to funding type can be made without further details.
- A high proportion of one indicator on the city’s distance to the benchmark gives rise to the type of imperfection of the city.
→ Average of “imperfection values”
- Problem: Aggregation to the city level!

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STUDY: Distance, Movability and Imperfections for Italian cities

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- The results for the Italian Urban Audit cities are:



Conclusion on the DMI-Approach:

- We combined three different aspects on urban development and its funding to reveal cities (and regions) which are eligible for funding and where the establishment of UDFs is a suitable means to overcome market imperfections.
- With this overall approach we achieved to merge a high number of information into a neatly arranged separation of cities.

Next “big” research steps:

- Apply the idea to more member states and also to regions. Indicators seem to be appropriate for regions as well – correlations of Urban Audit with regional indicators are high (e.g. between 0.82 and 1 for education) and can be chosen as representatives.
 - Construction of an indicator pyramid → helpful for drafting funding documents (OPs)
 - Reliable calculation of former funding → improvement of movability calculation and adaption to current funding procedures
- In addition, we plan to integrate HF (or funds of funds) into the approach: new research member Bertram Steininger → Simulation?

Working Papers:

RWTH Aachen University:

- Determining Indicators of Quality of Life Differences in European Cities
- Loans versus Grants in the Context of Urban Development Funding
- The DMI Approach for Urban Development Funding

TU Dortmund University:

- Impact Investment Management Accounting for Urban Development Funds in Europe – Going beyond Financial Returns → Extension of decision support models to include non-monetary aspects (from the OPs)
- External Benefits of Private Property-led Urban and Real Estate Development Projects → Systematisation of project external effect indicators with respect to their objective, stakeholder, spatial and time characteristics
- Integrated Plans for Sustainable Urban Development (IPSUD) for Urban Development Projects in Europe → Classification of countries according to the existence of integrated plans, JESSICA prerequisites (e.g. Evaluation Studies) and JESSICA implementation

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Thank you very much for your attention!

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