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Supporting Public-Private Partnership for economic and financial feasibility of urban development

Alessandra Oppio[a,*], Francesca Torrieri[b]

[a] *Deparment of Architecture and Urban Studies, Politecnico di Milano, via Bonardi 3, 20133 Milano, Italy*
[b] *Deparment of Industrial Engeneering, Università degli Studi Federico II, piazzale Tecchio 2, Napoli, Italy*

Abstract

The paper is focused on the allocation of the surplus generated by the urban development intervention with the purpose of pointing out the advantages both of the private developer and of the local authorities within the context of negotiating Public private Partnership. In order to support Public Administration in dealing with private developers, the paper proposes an evaluation method based on the measurement of an indicator of capital gain's fair allocation whose robustness is tested by risk analysis.
The methodological approach is applied to a renovation project in the city of Milano as pilot case study for verifying its potential in supporting complex negotiation characterized by risk and uncertainty.

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Keywords: Economic and financial feasibility, Public Benefit, Private-Public Partnership, Urban regeneration

1. Introduction

In the last years many European cities have developed complex urban interventions through innovative forms of cooperation between the public and private sector. Differently from the traditional ones, typically represented by local government outsourcing public works to private companies, these kind of Public Private Partnership - PPP

* Corresponding author. Tel.: +39.02.23995176; fax: +39.02.23995400
E-mail address: alessandra.oppio@polimi.it

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(Green Paper, 2006) allow public and private sectors to work together for a common interests so to produce goods and services, while sharing risks, costs and resources (Copiello and Stanghellini, 2011).

Within this context the paper proposes an evaluation method for supporting the definition of the agreement between local authorities and private developers, considering the capital gain created by urban plans.

The paper is divided into three parts. The first describes the evaluation method used for exploring the negotiating power of local authority and private developers through an indicator based on the expected capital gain from the investment. In addition, a risk analysis has been performed in order to test the robustness of this indicator. The second section proposes an application of the evaluation method on a recent integrated plan (P.I.I.) in the city of Milano, developed on the basis of an agreement between a private developer and the municipality of Milano. The results are critically discussed under the perspective of a fair allocation of the advantages stemming from the urban development interventions. Finally, the last section draws up conclusion and outlines future research lines.

2. Evaluation method

In the context of negotiating PPP the focus is on the allocation of the capital gain generated by the urban development intervention with the aim of pointing out the advantages both of the private developer and the local authorities. The agreement between the two parties should be as fair as possible with reference to the strategic vision of the municipality about the public city defined by town plans and programs, the risk of the development project and the increase in land value generated by development project.

According to the model defined by Micelli (Micelli, 2004; 2011), the private and public advantage and their negotiating power should be estimated on the basis of the capital gain arising from the intervention, as described by the following formula:

$$Bpr = Vap - Vaa - Bpu$$

$$Bpr + Bpu = Vap - Vaa$$

$$\Delta r = Bpr + Bpu$$

And

Where
Δr = Capital gain
Bpr = private benefit
Bpu = public benefit
Vap = Land value after the development of P.I.I
Vaa = Land value before the development of P.I.I

To measure the balance between public and private partnership a quantitative indicator is evaluated on the bases of the following formula:

$$L = (\Delta r - Bpu) / \Delta r$$

In order to ensure a balanced allocation of the entire capital gain the incidence of the difference among the capital gain and the public benefit on the capital gain (L) should be equal to 0.50.

Given the presence of risk and uncertainty within urban development project appraisal (Morani P., Tajani F., 2013), this indicator (L) has been subjected to a test of robustness. The methodology proposed is referred to a deterministic approach (sensitivity analysis, scenario analysis) and a Quantitative Risk Analysis (QRA) (Saltelli *et al*., 2004). Deterministic sensitivity and scenario analysis are traditionally used to identify critical variables considering percentage variation of the input data and consequent results in the output of the model (Kahneman, D., & Tversky, A. 1979). In scenario analysis more variables vary simultaneously considering "optimistic and pessimistic" scenarios. But deterministic analysis is not able to consider all possible values of the variables, limiting

the analysis to specific once. A new approach to risk analysis that is QRA can help both in quantifying the source of uncertainty in the input data, and in determining the uncertainty of the output. It effectively accounts for every possible value that each variable within the model can assume by use of continuous probability distribution function (PDF). Following the definition of Saltelli, global sensitivity analysis is consider as "The study of how uncertainty in the output of a model (numerical or otherwise) can be apportioned to different sources of uncertainty in the model input", while 'uncertainty analysis', focuses rather on quantifying uncertainty in model output (Flyvbjerg, 2005). The objective is to calculate the combined effect of variability and uncertainty in the model parameters in order to determine a probability distribution of the total model itself. The advantage of QRA is the possibility of differentiating the feature of risk information in term of output criteria such as the negotiating power of PPP (L) by probability distribution. The technique used in this work for carrying out the QRA is a Monte Carlo simulation which involves a random sampling method concerning each different probability distribution selected for the model under analysis. Using an iteration procedure, with the help of a specific software (@risk 6 Palisade), each probability distribution is sampled in a way that it reproduces the original shape of distribution. A schematic representation of how @risk software performs a Monte Carlo Simulation within the context of investment evaluation strategies is shown in Fig.1.

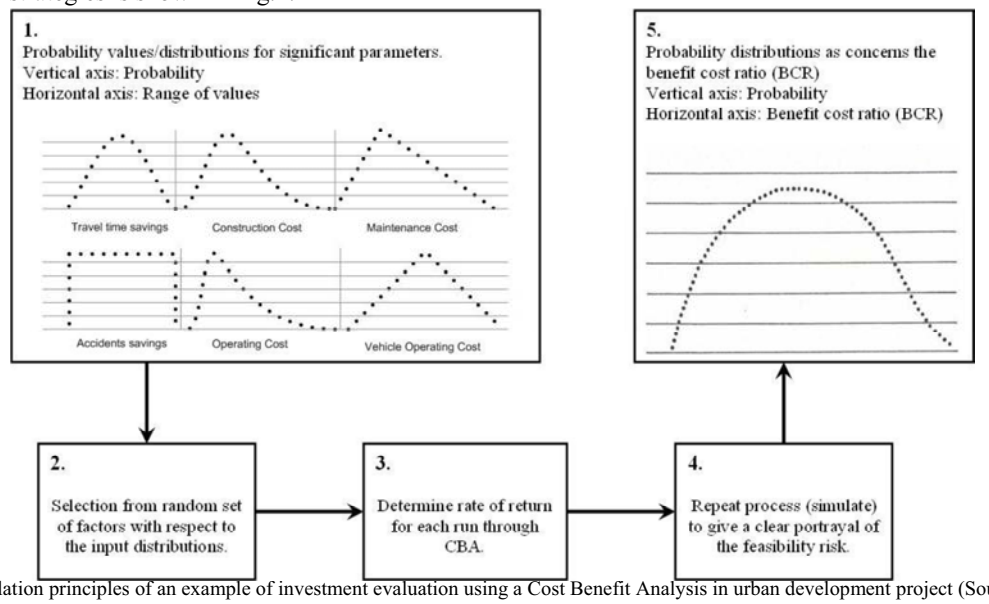


Fig. 1. Simulation principles of an example of investment evaluation using a Cost Benefit Analysis in urban development project (Source : Adapted from Salling, 2011)

As is shown in figure 1, the first step of the simulation process is to define the critical variable and to assign for each variable a PDF. The PDF can be empirically defined on the base of the expert judgment or derived by the literature. In the specific context of an urban development project investment, a typical source of forecasting error is the so-called "optimism bias", or the tendency of evaluators to underestimate the development costs and overestimate the benefits such as market asset price. Therefore, several urban redevelopment project have led to huge cost overruns and/or real estate demand under runs. The second step regards the selection from a random set of factors with respect to the input distribution through a Monte Carlo simulation. The final step concerned the estimation of the performance indicator (L) and finally repeat the process to give a clear portrayal of the feasibility risk. The methodological approach previously described will be applied to a case study regarding the renovation project of "Cascina Merlata" area with the aim to analyze the variability of the public-private benefit on the basis of a normal distribution function for each public benefit and capital gain input.

3. Case study

3.1. The decision context

In the last years, Milano, as many others European cities, has experienced the renewal of abandoned areas and brownfields. These processes have been carried out within negotiating partnership between local authority and private developers. The agreement between the two parties is defined on the basis of the increase in land value generated by the urban development. As in Italy town planning has been transferred from the State to the Region, this matter has been addressed according to different procedures and legal frameworks. In Lombardy Region, the most used kind of negotiated public-private partnership (PPP) is the Integrated Intervention Plan (PII), whose main requirements are the functional mix, the environmental and landscape quality, in addition to the coexistence of different typologies of interventions and financial sources. Actually, the city of Milano has been involved into around 200 PII. Half of these have been carried out with a buildable surface of more than 3.500.000 smq.

The case study under investigation in this paper regards the PII named "Cascina Merlata", an area located in the North-West part of the city of Milan, close to the universal exposition site. Given the presence of three underground stations, the proximity to the Milan-Turin highway and the future interventions aimed at improving its accessibility, Cascina Merlata represents a strategic location for hosting public functions, as well as hotel and offices mixed within the residential settlement of the existing city.

The urban development intervention provide the area with a functional mix based on residential function, social housing included, offices, hotel and public functions, as a urban park, gardens, squares, bicycle paths and services (Fig. 2).

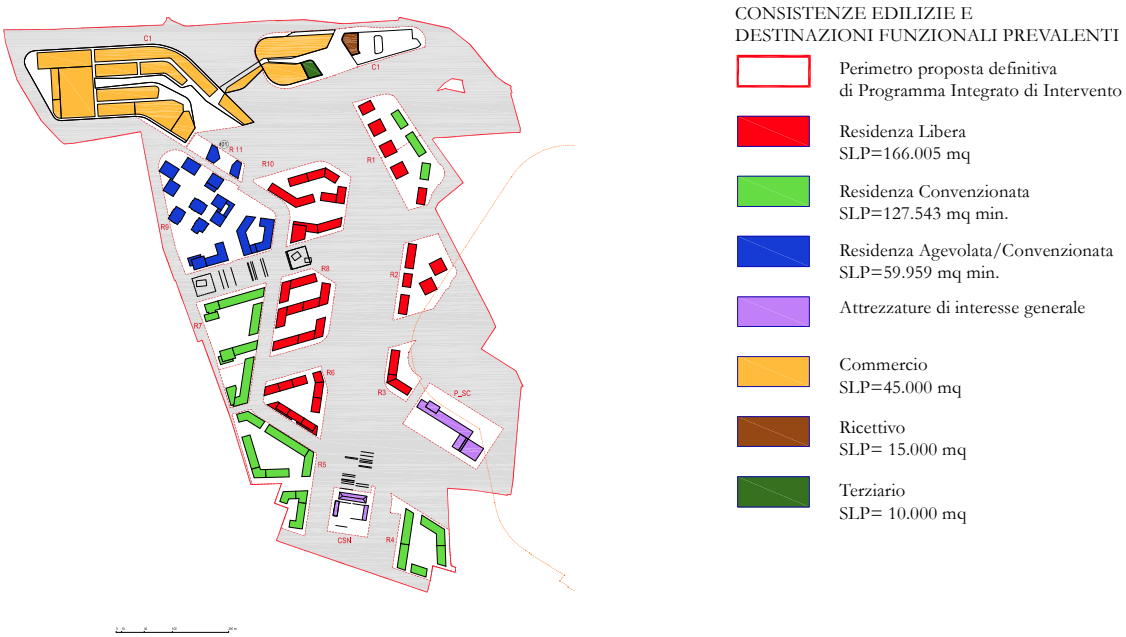


Fig. 2. The Masterplan of P.I.I. Cascina Merlata 2011.
Source: AdP-Accordo di Programma Regione Lombardia, Comune di Milano, Euromilano.

In 2013 the agreement between the Local authority and the private developer has been subject to changes due to fluctuation in economic and financial feasibility plan, estimated on the basis of higher expectations about investment's return, before the real estate crisis.

The main changes regard the percentages to be allocated to each function: around 15.000 sqm shifted from the hotel to retail (from 45.000 sqm to 55.000 sqm) and offices increase of about the 50% (from 10.000 sqm to 15.000

sqm). At the same time, the area dedicated to public parking has been increased (from 35.000 sqm to 45.000 sqm). These changes have generated effects both on of costs side and on income for the private developer, and on the side of the benefit for local authority. More specifically, with reference to the change of the functions, the cost of public parking, retail and offices has increased (+ 0.98%) as well as the benefit of the municipality, in terms of primary and secondary urbanization costs, fees for permits and public goods (+1.58%).

3.2. The evaluation of economic and financial feasibility

Given this context, the paper is aimed at investigating the effects of functional changes on the investment profitability from a private and public perspective, through the use respectively of the Net Present Value (NPV) and the Public Benefit (PB) and the quantitative indicator (L) that reflects the balance between the private capital gain and the PB.

Eight different scenarios have been generated: 1) the first is the baseline one, corresponding to the 2011 situation; 2) the second is grounded on functions, incomes and costs of 2011 with the temporal distribution of cash flows of the 2014; 3) the third take into account the changes introduced in 2014. The remaining scenarios from 4 to 8 are based on the agreement reached in 2014 with certain changes regarding the functional mix: A) the gross floor area of all the functions has been decreased of 10%; B) the retail has been decreased and the residential function has been increased of the same quantity; C) the construction cost has been decreased by 10%, with reference to the introduction of prefabricated technical elements in order to reduce the cost of the workers; D) the hotel has been reintroduced by decreasing the surface dedicated to retail and offices.

For each of the 8 different scenarios has been calculated the NPV, the PB and the L indicator according to the following assumpions: a discount rate of 8%, an horizon time of 15 years, a constructon time of 10 years.
Furthermore, the robustness of the indicator L has been calculated.

3.3. Results

The comparative analysis of the scenarios shows that despite the PB being stable, the NPV decreases until by negative in the case of scenarios 4, 5 and 6 (Tab.1). For the scenarios with NPV>0, the cost values vary 8%, whilst the incomes of about 20%. The most satisfying scenario in terms of NPV and PB is the third scenario that derives from the last negotiation between parties after the real estate crisis. In this case, the L indicator is equal to 0.56.

Scenarios	Vap	Development costs	Bpr	PB	Vaa	Capital gain	L	NPV
1	1.398.091.820	1.179.016.668	127.879.662	91.195.490	149.255.000	219.075.152	0,58	64.196.460,00
2	1.398.091.820	1.179.016.668	127.879.662	91.195.490	149.255.000	310.270.642	0,71	127.585.860,00
3	1.405.516.820	1.185.991.568	122.829.762	96.695.490	149.255.000	219.525.252	0,56	160.233.670,00
4	1.293.807.300	1.187.642.812	9.468.998	96.695.490	149.255.000	202.859.978	0,52	-549.464.590,00
5	1.172.606.270	1.106.330.207	-30.419.427	96.695.490	149.255.000	162.971.553	0,41	-775.071.680,00
6	1.294.882.300	1.194.636.215	3.550.595	96.695.490	149.255.000	196.941.575	0,51	-567.588.140,00
7	1.293.807.300	1.109.664.100	87.447.710	96.695.490	149.255.000	280.838.690	0,66	64.196.460,00
8	1.291.834.800	1.112.425.292	82.714.018	96.695.490	149.255.000	276.104.998	0,65	6.245.510,00

Tab. 1. Analysis of the profitability of the investment from the public and private perspective: Incomes, Costs, NPV, Public Benefit, L.

With respect to the latter scenario (scenario 3) a probabilistic risk analysis is carried out with the aim to check the stability of the results obtained and measure the risk linked to the solution proposed.

The results are shown in Fig. 3; the solution proposed is represented in a normal distribution output of the L indicator, where for the Scenario 3 under analysis in a 10% of the cases an optimal equilibrium between private and public interest is reached.

The functional distribution shows that the interval of variation of the examined indicator is between 0.48 and 0.63 for the public benefit, with a mean of 0.56 and a standard deviation of 0.04. Then the scenario appears to be stable and the associated risk for the Public Administration is very low.

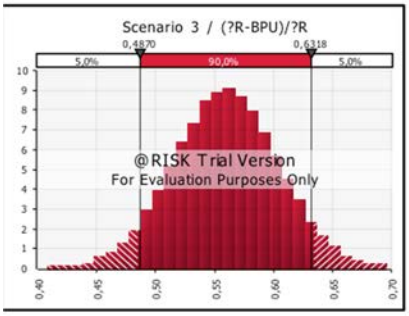
4. Conclusions

The methodological approach proposed and tested by a pilot case study seems to be a promising evaluation framework for supporting the definition of a balanced agreement between Public Administration and Private developers within the context of complex urban renovation projects. Too often local authorities base their negotiation on the primary and secondary urbanization costs and on permits fees, making the public benefit equal to their value and, thus, underestimating the percentage of the total capital gain due to them. Furthermore, the test of the robustness of the fair allocation indicator by the use of risk analysis can help public decision makers in taking a more responsible and transparent choice avoiding strategic behaviors.

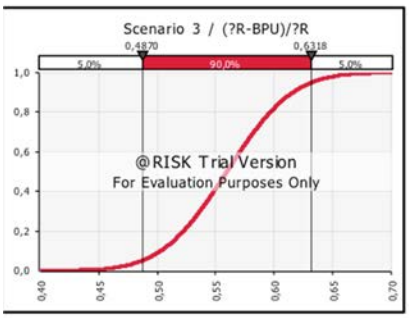
@RISK Output Report for Scenario 3 / (?R-BPU)/?R O30

Performed By: DLab

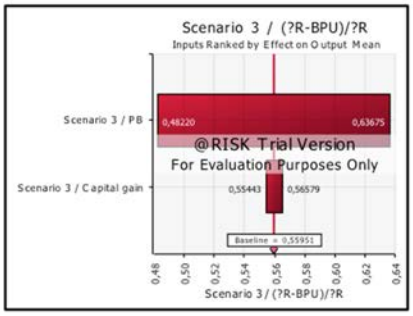
Date: lunedì 29 febbraio 2016 17.09.38



Simulation Summary Information	
Workbook Name	NUOVO CALCOLO LEVA.xlsx
Number of Simulations	1
Number of Iterations	1000
Number of Inputs	2
Number of Outputs	1
Sampling Type	Latin Hypercube
Simulation Start Time	2/29/16 17.07.40
Simulation Stop Time	2/29/16 17.07.41
Simulation Duration	00.00.01
Random # Generator	Mersenne Twister
Random Seed	1320550556
Total Errors	0
Collect Distribution Samples	All
Convergence Testing	Disabled
Smart Sensitivity Analysis	Enabled



Summary Statistics for Scenario 3 / (?R-BPU)/?R			
Statistics		Percentile	
Minimum	0,41	1,0%	0,46
Maximum	0,70	2,5%	0,47
Mean	0,56	5,0%	0,49
Std Dev	0,04	10,0%	0,50
Variance	0,001940476	20,0%	0,52
Skewness	-0,008316705	25,0%	0,53
Kurtosis	2,987517382	50,0%	0,56
Median	0,56	75,0%	0,59
Mode	0,56	80,0%	0,60
Left X	0,49	90,0%	0,62
Left P	5%	95,0%	0,63
Right X	0,63	97,5%	0,65
Right P	95%	99,0%	0,66
#Errors	0		



Change in Output Statistic for Scenario 3 / (?R-BPU)/?R			
Rank	Name	Lower	Upper
1	Scenario 3 / PB	0,48	0,64
2	Scenario 3 / Capital	0,55	0,57

Fig. 3. Output of the probabilistic risk analysis.

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