

Decision Support Methods for Public-Private Partnerships: An Application to the Territorial Context of the Apulia Region (Italy)

Pierluigi Morano and Francesco Tajani

Abstract In this paper, a methodology to support decisions of Public Administrations in the defining of planning parameters of urban regeneration initiatives to be implemented with the involvement of private investors is applied. The decision support method proposed borrows the logic of the Break-Even Analysis. The model is applied to an urban area located in a city of the Apulia Region (Italy), which has been promoting urban redevelopment policies, as well as investing significant public funding. The results highlight the simplicity and flexibility of the model, the phases of which are easily implementable in any territorial context. The work must be attributed in equal parts to the authors.

Keywords Break-even point · Urban redevelopment · Public-private partnership · Decision support method

1 Introduction

The Apulia Region has been promoting urban regeneration, acknowledging in the regional laws (L. No. 21/2011; L. No. 14/2009; L. No. 21/2008) national and Community directives, enacting specific regulations (L. No. 13/2008), investing significant public funding (e.g.: Call for Integrated Programs for Redevelopment of the Suburbs, referred to BURP No. 81/2006; Call for Urban Redevelopment Program for sustainable housing rent, referred to BURP No. 137/2008; axis VII of the PO FESR 2007–2013).

This broad regulatory and financial initiative has produced remarkable results in the programs supported by regional and national funding, but it has been unable to significantly influence the ordinary activities of local governments. Urban renewal

P. Morano · F. Tajani (✉)

Department of Science of Civil Engineering and Architecture, Polytechnic of Bari, Bari, Italy
e-mail: francescotajani@yahoo.it

P. Morano

e-mail: pierluigi.morano@poliba.it

has difficulty to spread through adequate programs, especially in initiatives indicated by the prevailing investment of the private entrepreneur, who seems to prefer new buildings even in the current crisis of demand (Calabrò and Della Spina 2014b; Morano and Tajani 2015).

In fact, urban renewal is a more complex process than realising new constructions and requires a strong change of mentality in entrepreneurial and administrative behavior, a focused use of public funding and development of assessment tools that allow to define valid intervention programs, along with their quick and certain approval (Calabrò and Della Spina 2014a; Tajani and Morano 2014). The use of the same evaluation tool for both the public operator and private investor acknowledges the need to adopt the same methodology and language for both the determination of the reciprocal advantages as well as the definition of the negotiating agreements.

In order to promote urban regeneration initiatives that require private involvement, Break-Even Analysis is applied. This method is characterized by its simplicity and flexibility of use, with it being easily implemented to any local context. In international literature, and specifically in the Anglo-Saxon territory, there is a broad range of scientific applications of Break-Even Analysis (Dean 1939; Ingraham 1951; Colantoni et al. 1969; Adar et al. 1977; Conine 1986; Kee 2001). In the Italian context, Break-Even Analysis has been mainly applied to the business sector as well as in several engineering fields (Guatri 1994; Pratali 1996; Luciano and Ravazzi 1997; Mella 1998).

This research is divided into three parts. The first presents a case study, concerning the urban regeneration of a private property located in a Municipality of the Apulia Region; the investment and context in which it is inserted are described, and the essential elements of the Program Agreement formalized between the Public Administration and the private investors are illustrated. In the second part, the steps for the implementation of the model with reference to the case study are developed: (i) collection of the physical-planning and market data of the investment and construction of the financial balance of the initiative; (ii) organization of the financial balance in “fixed” and “variable” items; (iii) determination of the weighted mean values of the prices and variable costs and analysis of the break-even point. In the third part, the results are discussed and some considerations on the outputs obtained are made.

2 The Case Study

The case study concerns the urban redevelopment of a private area of 23,084 m², located in a Municipality of the Apulia Region. The redevelopment initiative includes a variant of the urban destination currently established by the General Regulatory Plan of the Municipality—area for health and hospital facilities. In particular, the new urban destination provided for the realization of public facilities and private buildings in the area.

The area has a flat morphology. The context in which it is located is equipped with infrastructures as well as public and private services: in particular, the area is adjacent to the public hospital, a position that has influenced the choice of the new public functions. The predominant construction typology in the reference area is represented by buildings with the ground floor used as private warehouses and four floors intended for residences.

Currently occupied by a few buildings in disuse, the study area is immediately buildable. Both due to its location and extension, the entire project area represents an element of mediation between the town board and the entrance areas to the city, but because of its general state of disuse, it is still considered an abandoned area.

The urban area variant was defined with the Program Agreement approved by Regional Decree No. 540 of 06.27.2012. The variant confirms the original destination established by the General Regulatory Plan of the Municipality—area for health and hospital facilities—only for a part of the total surface, precisely for 7,600 m², divided into 6,100 m² for the realization of a public multifunctional health structure and 1,500 m² for the construction of a private health structure. For the remaining 15,484 m², a housing development is planned, divided between the private surface for the construction of five buildings with the ground floor intended for commercial activities and five floors for residences, and the surface for public facilities (according to Ministerial Decree No. 1444/1968) and public connecting roads, and social housing as additional public work.

The planning parameters of the housing development identified by the Program Agreement and the commitments of the private investors are as follows:

- (i) the free transfer of 6,100 m² in favor of the Local Health Company (ASL), for the realization of a public multifunctional health structure;
- (ii) the realization of the housing development over an area of 15,484 m², in compliance with the volumes and surfaces provided by the Urban Executive Plan annexed to the Program Agreement. In particular, the project involves the construction of 26,198.92 m³ of private volumes to be sold on the free market, of which 20,360.10 m³ are intended for residences, and 5838.82 m³ are intended for commercial activities;
- (iii) the free transfer in favor of the Municipality of the surfaces for public facilities that are located in the housing development (primary and secondary urbanizations and public connecting roads), for a total of 7,150 m²;
- (iv) the realization of the primary and secondary urbanizations, constituted by public parking and connecting roads (2,636.96 m²), public green facilities (2,571.04 m²) and a nursery school (1,941 m²);
- (v) the payment of the local planning fees for the properties to be sold on the free market;
- (vi) the realization and subsequent free transfer in favor of the Municipality, of a building of four floors to be intended for social housing, for a total volume of 2,911 m³.



Fig. 1 General plan of the investment with the specifications of the public and private surfaces

The planning parameters for the construction of the public and private health structures are those established by the Technical Regulations for the implementation of the General Regulatory Plan of the Municipality.

The general plan of the investment under analysis, with the specifications of the functions in the public and private surfaces, is shown in Fig. 1.

3 Implementation of the Break-Even Analysis

The three steps for the implementation of the Break-Even Analysis to the case study are developed below: (i) collection of the physical-planning and market data of the investment and construction of the financial balance of the initiative; (ii) organization of the private investor's balance in "fixed" and "variable" items; (iii) determination of the weighted mean values of the prices and variable costs and analysis of the break-even point.

3.1 Physical-Planning and Market Data of the Investment

In Table 1, the main physical-planning data of the investment under analysis are summarized.

The total area of the investment, equal to 23,084 m², is divided by 32.7% in the surface for private buildings to be sold on the free market (=7,551 m²), by 3.39% in

Table 1 Physical-planning data of the investment

Total surface for housing development (excluding private and public health structures)	15,484 m ²
Total volume (free market residential, social housing, commercial)	29,109.92 m ³
Construction index	1.88 m ³ /m ²
Gross floor area of social housing	970.00 m ²
Volume of social housing	2,911.00 m ³
Gross floor area of private housing	6,786.70 m ²
Volume of private housing	20,360.10 m ³
Gross floor area of commercial use	1,534.10 m ²
Volume of commercial use	5,838.82 m ³
Surface of primary and secondary urbanizations	7,150.00 m ²
– public parking and connecting roads	2,637.96 m ²
– public green facilities	2,571.04 m ²
– nursery school	1,941.00 m ²
Surface of public facilities	7,150 m ²
Surface of private parking	4,421.00 m ²
Surface of private facilities	5,926.00 m ²
Footprint area of the nursery school	775.00 m ²
Appurtenant area of the nursery school	1,491.00 m ²
Volume of the private health structure	3,750.00 m ³
Footprint area of the private health structure	600.00 m ²
Appurtenant area of the private health structure	900.00 m ²
Gross floor area of the private health structure	850.00 m ²

the surface for social housing (=783 m²), by 26.4% in the surface for the public health structure (=6,100 m²), by 6.50% in the surface for the private health structure (=1,500 m²), by 31% in the surface for public (=7,150 m²). Both the surface for public facilities (=7,150 m²) and the surface for private parking (=4,421 m²) satisfy the national regulatory limits, amounting respectively to 5,239.79 m² for public facilities (art. 3, Ministerial Decree No. 1444/1968) and 2,619.89 m² for private parking (L. No. 122/1989).

Table 2 summarizes the market data that occur for the development of the private investor's balance. The data were collected by municipal technical regulations and market surveys. The quantities with the unknown "x" (local planning fees, construction costs of free market residential, construction costs of commercial, residential sale, commercial sale) will be determined by the model.

3.2 Organization of the Private Investor's Balance in "Fixed" and "Variables" Items

The analysis of the costs and the revenues shown in Table 2 has allowed for the organization of the private investor's balance in "fixed" and "variable" items outlined in Table 3. The amounts for the implementation of the Break-Even Analysis are highlighted in bold: the total fixed costs ($C_f = 5,036,447$ €), the fixed revenues from the sale of the private health structure ($R_f = 1,360,000$ €), the unit variable

Table 2 Market data for the development of the private investor's balance

Costs	Unit cost or percentage	Quantity
Land purchase	48.86 (€/m ²)	23,084 (m ²)
Taxes and notary fees	11 (%)	1,127,884 (€)
<i>Sub total A</i>		
Local planning fees		
Residential, commercial, private health structure	48.12 (€/m ²)	x (m ²)
<i>Sub total B</i>		
Construction costs		
Free market residential	1,100 (€/m ²)	x (m ²)
Commercial	900 (€/m ²)	x (m ²)
Private facilities	40 (€/m ²)	5,926 (m ²)
Social housing	1,000 (€/m ²)	970 (m ²)
Public green facilities	40 (€/m ²)	2,571 (m ²)
Public parking and connecting roads	80 (€/m ²)	2,638 (m ²)
Nursery school	550 (€/m ²)	775 (m ²)
Private health structure	1,100 (€/m ²)	850 (m ²)
Appurtenant facilities of the private health structure	40 (€/m ²)	900 (m ²)
Total construction costs (<i>Sub total C</i>)		
Technical and general expenses (<i>Sub total D</i>)	9 (%)	Sub total C
Total costs (before financial charges and profit) [<i>Sub total (A+B+C+D)</i>]		
Financial charges	6.50 (%)	Sub total (A + B + C + D)
Normal profit of the private investor	20 (%)	Total revenues
Total costs		
Revenues	Unit price	Quantity
Residential sale	2,200 (€/m ²)	x (m ²)
Commercial sale	2,000 (€/m ²)	x (m ²)
Sale of the private health structure	1,600 (€/m ²)	850 (m ²)
Total revenues		

Table 3 Organization of the private investor's balance in "fixed" and "variables" items

Fixed costs	
Land purchase	1,127,884 €
Taxes and notary's fees	124,067 €
Construction private facilities	237,040 €
Construction social housing	970,000 €
Construction public green facilities	102,840 €
Construction public parking and connecting roads	211,040 €
Construction nursery school	426,250 €
Construction private health structure	935,000 €
Construction appurtenant facilities of the private health structure	36,000 €
Local planning fees for the construction of the private health structure	40,902 €
Technical and general expenses	262,635 €
Financial charges	290,788 €
Normal profit of the private investor on the private health structure	272,000 €
Additional request	–
Total	5,036,447 €
Variable unit costs	
<i>Free market residential</i>	
Local planning fees	48.12 €/m ²
Normal profit of the private investor	440.00 €/m ²
Technical and general expenses	99.00 €/m ²
Financial charges	81.06 €/m ²
Construction	1,100.00 €/m ²
Total	1,768.18 €/m²
<i>Commercial</i>	
Local planning fees	48.12 €/m ²
Normal profit of the private investor	400.00 €/m ²
Technical and general expenses	81.00 €/m ²
Financial charges	66.89 €/m ²
Construction	900.00 €/m ²
Total	1,496.01 €/m²
Unit revenues	
Residential sale	2,200.00 €/m²
Commercial sale	2,000.00 €/m²
<i>Fixed revenues</i>	
Revenue from the sale of the private health structure	1,360,000.00 €

costs related to the residential units ($C_{\text{vu}_{\text{res}}} = 1,768.18 \text{ €/m}^2$) and those related to the commercial units ($C_{\text{vu}_{\text{comm}}} = 1,496.01 \text{ €/m}^2$), the unit selling prices of the residential units ($p_{\text{u}_{\text{res}}} = 2,200 \text{ €/m}^2$) and those of the commercial units ($p_{\text{u}_{\text{comm}}} = 2,000.00 \text{ €/m}^2$).

In Table 3, the item “additional request” that the Public Administration can advance to the private investor is also reported, the amount of which is determined by the evaluation model in relation to the financial conveniences of the investment.

3.3 *Weighted Mean Values of Prices and Variable Costs and Analysis of the Break-Even Point*

The implementation of the model requires the calculation of the weighted mean values of the quantities to be inserted into the financial analysis, in relation to the different intended uses of the investment. In the case study, the weighting of the sales prices and unit variable costs is carried out by applying the percentages established by the Program Agreement for the corresponding functions in which the total gross floor area (GFA) is divided, equal to 8,320 m² (Table 4).

The fixed costs and fixed revenues in Table 3, and the weighted mean values of Table 4 allow for the determination of the amounts of gross floor area (q^*) that the generic private investor should realize to guarantee the financial balance of the investment. Analytically, q^* may be directly calculated through the following equation, which links the break-even point to the fixed costs (C_f), the fixed revenues (R_f), the unit selling price (pu) and the unit variable cost (C_{vu}):

$$q^* = \frac{C_f - R_f}{pu - C_{vu}} \quad (1)$$

Replacing the symbols with the corresponding amounts, it can be obtained:

$$q^* = \frac{5,036,447 - 1,360,000}{2,163.13 - 1,718.00} = 8,259.3 \text{ m}^2. \quad (2)$$

The amount of GFA determines the balance of the total costs and the total revenues of the investment under analysis, and identifies the minimum threshold of the financial convenience for the private investor. Since the q^* also identifies the surfaces that the private entrepreneur should produce and sell in order to ensure the commitments established in the Program Agreement, this amount of GFA represents the balance between the financial conveniences of both the public and private entities involved in the investment.

Table 4 Determination of weighted mean unit values of prices and variable costs

Intended uses	Unit price (€/m ²)	Variable unit cost (€/m ²)	% of total
Residential	2,200.00	1,768.18	82%
Commercial	2,000.00	1,496.01	18%
Weighted mean values	2,163.13	1,718.00	

Table 5 Extract data for the detection of the break-even point

GFA (m ²)	4,000	6,000	8,000	8,320	10,000	12,000
Fixed costs (€)	5,036,447	5,036,447	5,036,447	5,036,447	5,036,447	5,036,447
Variable costs (€)	6,872,012	10,308,018	13,744,024	14,293,785	17,180,030	20,616,036
Total costs (€)	11,908,459	15,344,465	18,780,471	19,330,232	22,216,477	25,652,483
Total revenues (€)	10,012,505	14,338,757	18,665,009	19,357,209	22,991,261	27,317,514
Normal profit (€)	2,002,501	2,867,751	3,733,002	3,871,442	4,598,252	5,463,503
Total profit (€)	-1,895,954	-1,005,708	-115,462	26,978	774,785	1,665,031

For the GFA equal to q^* , the total profit is zero, since the break-even point determines the equality of the total revenues and the total costs of the investment, but the normal profit of the private investor is guaranteed.

Considering a variation of the GFA between 4,000 and 12,000 m², so as to involve the amount of total GFA provided by the Program Agreement for the case study (=8,320 m²), in Table 5 an extract of the financial analysis is reported. Table 5 shows that the total profit is negative for a GFA between 4,000 and 8,000 m², whereas it is positive for higher values. The point of reversal of the total profit, i.e. the amount of GFA for which the total profit is equal to zero, occurs in correspondence to the break-even point, equal to 8,259.3 m².

4 Conclusions

The results obtained from the application of the evaluation model to the case study give rise to interesting conclusions.

First, it appears that, starting from the amount of GFA corresponding to the break-even point, equal to 8,259.3 m² (slightly lower than the projected GFA, equal to 8,320 m²), the priority requests of the Public Administration, initially established by the Program Agreement, can be satisfied without reducing the financial feasibility of the initiative for the private investor.

From a purely financial point of view, the advantages of the investment for the Public Administration are: (i) the values of the surfaces transferred free by the private investor—area for the realization of the public multifunctional health structure, area for public facilities, area for social housing—amounting to 685,652 €, (ii) the payment of local planning fees of the functions to be sold on the free market of the contribution on the cost of co-construction of destinations free market (residential,

commercial, private health structure), amounting to 441,299 €, (iii) the value of the public services realized by the private investor—green spaces, social housing, nursery school, public roads and public parking—, equal to 1,710,130 €. As a result, the total financial benefit of the initiative for the Public Administration, amounting to 2,837,081 €, represents 14.66% of the total revenues of the investment for the private entrepreneur.

Secondly, the extract of the financial analysis reported in Table 5 shows that, for the amount of the projected GFA, equal to 8,320 m², the initiative generates a low extra-profit, equal to 26,978 €. This amount constitutes the maximum additional request that the Public Administration can claim from the private investor, since it is compatible with the constraint of financial convenience of the initiative. Therefore, in financial terms, the project provided by the Program Agreement already represents an acceptable equilibrium solution between the private eligible volumes and the requests made by the Public Administration in terms of free transfers of areas, local planning fees, public facilities and social housing.

References

- Adar A, Barnea A, Lev B (1977) A comprehensive cost-volume-profit analysis under uncertainty. *Account Rev* 52(1):137–149
- Calabrò F, Della Spina L (2014a) The cultural and environmental resources for sustainable development of rural areas in economically disadvantaged contexts. Economic-appraisals issues of a model of management for the valorisation of public assets. *Adv Mater Res* 869:43–48
- Calabrò F, Della Spina L (2014b) The public-private partnerships in buildings regeneration: a model appraisal of the benefits and for land value capture. *Adv Mater Res* 931:555–559
- Colantoni CS, Manes RP, Whinston A (1969) Programming profit rates and pricing decisions. *Account Rev* 44(3):467–481
- Conine TE Jr (1986) The potential over reliance on break-even analysis. *J Bus Strategy* 7(2):84–86
- Dean J (1939) Cooperative research in cost-price relationships. *Account Rev* 14(2):181–184
- Guatri L (1994) La valutazione delle aziende. Teoria e pratica dei Paesi avanzati a confronto. Egea, Milan (Italy)
- Ingraham HA (1951) Elementary presentation of volume, cost and profit relationships. *Account Rev* 26(3):414–416
- Kee RC (2001) Implementing cost-volume profit analysis using an activity based costing system. *Adv Manage Account* 10:77–94
- Luciano E, Ravazzi P (1997) I costi nell'impresa: teoria economica e gestione aziendale. UTET, Turin (Italy)
- Mella P. (1998) Indici di bilancio: guida alla procedura per l'analisi e il controllo della gestione aziendale. Il Sole24Ore. Milan (Italy)
- Morano P, Tajani F, Locurcio M (2015) Land use, economic welfare and property values: an analysis of the interdependencies of the real estate market with zonal and macro-economic variables in the municipalities of Apulia Region (Italy). *Int J Agric Environ Inf Syst* 6(4):16–39
- Pratali P (1996) Le analisi economico-finanziarie della gestione: progettare il profitto. Franco Angeli, Milan (Italy)
- Tajani F, Morano P (2014) Concession and lease or sale? A model for the enhancement of public properties in disuse or underutilized. *WSEAS Trans Bus Econ* 11:787–800