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Tools for the selection of microeconomic from socioeconomic rentability

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Abstract. The aim in this research paper is to propose useful and practical criteria to answer the question of targeting aid of a micro-economic structure: Generating Activity of Revenues type. To achieve this goal, an attempt is made to construct macro and micro indices linking the capital of a Generating Activity of Revenues with the update, which allowed us to obtain:
- A socioeconomic partition of structures constituting the fabric of Generating Activity of Revenues.
- Indices based on the global rentability permitting to order these structures of this basis notion.

Keywords: generating activities of revenues, macrostructure index, microstructure index, rentability, current value.

1 Introduction and Objectives

According to the United Nations Programme for Development (UNDP), the proportion of people living below the threshold of extreme poverty in the world has decreased from 43% in 1990 to 22% in 2008. Similar results to those of the World Bank report, which shows that more than 40 developing countries have recorded increases in the value of their Human Development Index (HDI) much higher than those considered; which illustrates the reduction of poverty, and that the world has already reached the main target of eradicating poverty prescribed by Millennium objectives for the development. However, 22.4% of the world's population lives on less than 1.25 dollar per day whereas early 1980s, 52.2% lived under this threshold, i.e. 1.3 billion people always live under the extreme poverty line, nearly quarter of the world's population (Banque, 2000/2001) (Kim, 2 avril 2013) (PNUD, 14 mars 2013).

The reduction of poverty is becoming the priority orientation of public policy. From this perspective, several strategies and programs to combat this phenomenon are implemented to revive economic growth, to improve living conditions, to strengthen human capital, and to ensure sustainable development[1] (Lachaud 1, 2000) (Lachaud 2, 2000).

This latter approach has lifted the simple optical balance in the short **term which does appease the problems and not solves** them radically towards a broader vision of a long-term development. In this framework, and to achieve sustainable social development, the Generating Projects of Revenues represent a means in this way as they have multidimensional implications (Fikri, 22 octobre 2011)(economic, social, health, cultural ...) on the population, weak economically and therefore socially. In Assuming that we have financial resources (either by the state or by non-governmental

[1] INDH is a social and economic policy program, as an example applied to Morocco.

organization or private sector) a major problem lies on which can by translated in the following questions:

- **According to what criteria can we help a micro-project to help the poor in a sustainable manner?** (Majda Fikri, 2011)
- Can we achieve economic and social rentability at the same time?

In this research paper we have constructed several mathematical tools to contribute and answer these two questions.

2 Scheduling criteria

2.1 Targeting help problem

One of the problems is that; for a decision maker to choose[2] to finance fully or partially a GAR[3] class and justify his choice economically, we consider mathematical tools based on performance, rentability and the impact on the population. An active member of GAR is an effective way to give a meaning to the notion of sustainable development because the main objective is to save the members of the GAR of poverty, helping them develop rentable projects economically and hence choose among the projects those that have the possibility to achieve a gain and get them integrated into a society of production/consumption instead of help/consumption.

The latter situation becomes heavy and unbearable by public and private finances taking into account the current world conjecture (Sen, 1993) (Sen, 2000).

2.2 Criteria of ordonnement for GAR class from the current value

2.2.1 Current value obtained from the balance

The decision to help finance any legal microeconomic structures[4] is based on its economic interest, and therefore the calculation of rentability. This latter depends on the project and the involved costs and the gains that provides. If the sum of gains is greater to the various costs, particularly of the investment, it is natural to say that it is rentable.

Our goal in this section is to build a tool to measure the profitability that allows to select from the GAR possible, the one that characterizes this notion better.

Let C the capital invested by a structure of financial aid GAR, consider the investment generates cash inflows rated R and outflows recorded D over the years $t \in \{1,2,..,T\}$ with T is the estimated life equip.

$$V_A = R - D \qquad (1)$$

If we assume that S_T is the value of the equipment end of period T and k the discount rate future value V_F , and if we denote by R_i flow back to the year i and D_i to the output stream, we get:

[2] We consider a decision maker any moral or natural person who has the legal status to finance this type of micro-economic structure.
[3] In this research paper we refer to a generating activity of revenues by GAR.
[4] There are several legal frameworks and laws to define a social GAR. The model example in Morocco is the social cooperative or association whose objectives is non- profit. ..

$$R = \sum_{i=1}^{T-1} \frac{R_i}{(1+k)^i} + \frac{S_T}{(1+k)^T} \quad and \quad D = \sum_{i=1}^{T-1} \frac{D_i}{(1+k)^i}$$

so we can write (1) as:

$$V_A = \sum_{i=1}^{T-1} \frac{R_i}{(1+k)^i} + \frac{S_T}{(1+k)^T} - \sum_{i=1}^{T-1} \frac{D_i}{(1+k)^i} \qquad (2)$$

This allows to deduce that the net present value of a investment V_N is the difference between the net gains updated and recorded net costs C_T knowing $C_T \leq C$, the economic balance gives:

$$V_N = V_A - C_T \qquad (3)$$

2.2.2 Ordonnement criterion and construction of a canonical partition

Let Ω set of GAR possible or alternatives and $V_{N,j}$ the net present value of the GAR j noted A_j if the decision maker chooses the viable GAR in the set Ω he is choosing A_{J_1} GAR which achieved:

$$V_{N,J_1} = \sup_{A_j \in \Omega} V_{N,j} \qquad (4)$$

This choice is possible because this value is the upper bound of a finite set Ω. In an iterative manner we set $\Omega_1 = \Omega$ and $\Omega_2 = \Omega_1 - \{A_{J_1}\}$ and choose the GAR A_{J_2} which achieved:

$$V_{N,J_2} = \sup_{A_j \in \Omega_2} V_{N,j}$$

We will continue the same way until the last of the GAR that: $\Omega_{l+1} = \Omega_l - \{A_{J_l}\} \neq \emptyset$

knowing that $\Omega_1 = \Omega$ and $\Omega_N = \{A_{J_N}\}$ with $N = \text{card}\,\Omega$ and $\sup_{A_j \in \Omega_l} V_{N,j}$ is reached

$$1 \leq l \leq N-1.$$

So we built the first criterion to order Ω it allows you to choose the one which carries V_{N,J_1} and classify GAR's choice (4) this operation allows you to switch of V_{N,J_l} to $V_{N,J_{l+1}}$ and order the whole structure.

Consequently, we have the following partition:

$$\Omega = \cup_{l=1}^{N} \Omega_l$$

with $(\Omega_l)_{1 \leq l \leq N}$ a sequence of sets decreasing satisfying:

$$\Omega_{l+1} \subset \Omega_l \text{ and } \Omega_l - \Omega_{l+1} = \{A_{J_l}\}$$

with $\{A_{J_l}\}$ is the singleton sets by:

$$\{A_{J_l}\} = \{\text{GAR} \,/\, V_{N,J_l} = \sup_{A_j \in \Omega_l} V_{N,j}\}$$

consequently the set of all GAR is written in this form

$$\Omega = \bigcup_{l=1}^{N} \{A_{J_l}\}$$

this writing is a canonical ordered partition of Ω.

2.3 Microstructure Criteria

It is possible to make a choice to support and invest in financing the all GAR of set Ω, for taking this one reference value 1 in the following manner:

Recall that C the global capital, and C_j capital A_j GAR, let

$$I_j = \frac{V_{N,j}}{C_j}$$

Definition [**Profitability index of GAR**] is called index profitability micro-structure the ratio of the current value future cash flows and capital:

$$I_{p,j} = \frac{V_{N,j} + C_j}{C_j} = I_j + 1 \qquad (5)$$

Obviously this amount is set to the reference value of 1, indeed, $I_{p,j}$ changes sign and we have three possible cases:

- $I_{p,j} < 1 : (I_j < 0)$ It is an economic loss, but the GAR can achieve social gain (integration population ...).
- $I_{p,j} = 1 : (I_j = 0)$ There is a loss of present value of the estimated capital or the costs of not location and the cost of inflation, but this situation better than the first.
- $I_{p,j} > 1 : (I_j > 0)$ GAR realize an economic gain.

We summarize the relationship between the sign of $I_{p,j}$ and the notion of economic gain in the following table:

	$V_{N,j}$	**Economic Gain**
$I_{p,j} < 1$	*negative*	*not realizable*
$I_{p,j} = 1$	*null*	*neutral situation*
$I_{p,j} > 1$	*positive*	*realizable*

For social gain, all situations are open in three cases. Subsequently, our goal is to exploit index profitability to build another partition structure Ω.

2.4 Algorithm optimal or admissible choice

A natural question arises, how to define an order of priority between GAR finance performing all $I_{p,j} > 1$?

From the previous entries, we have a partition Ω as follows:

$$\Omega = \Omega_{<1} \dot{\cup} \Omega_{=1} \dot{\cup} \Omega_{>1}$$

which: $\Omega_{<1} = \{\text{set of } A_j \text{ verifying: } I_{p,j} < 1\}$

$\Omega_{=1} = \{\text{set of } A_j \text{ verifying: } I_{p,j} = 1\}$

$\Omega_{>1} = \{\text{set of } A_j \text{ verifying: } I_{p,j} > 1\}$

The profitability index is used to construct a partition Ω and distinguish that which is rentable in economic meaning, that is to say $I_{p,j} > 1$.

Hence, with this choice we have built a second criterion of partition of Ω, based on the calculation of the profitability index $I_{p,j}$.

It is obvious that if we apply the first criterion and the second, we obtain a highly interesting classification between GAR achieving a better discount with index profitability than 1, that is to say, if we couple the two criteria, we get the A_{J^*} GAR satisfying the two following conditions simultaneously:

$$V_{N,J^*} = \sup_{A_j \in \Omega} V_{N,j} \quad and \quad I_{p,J^*} = \sup_{A_l \in \Omega_{>1}} I_{p,l}$$

The first criterion helps us to choose the GAR verifying the best value discount, the second helps us to choose GAR performing the best index of profitability, this way we get a finer classification. Also we note that:

$$\sup_{A_j \in \Omega} V_{N,j} = \sup_{A_j \in \Omega_{>1}} V_{N,j}$$

that:

$$I_{p,j} = \frac{V_{N,j} + C_j}{C_j} \text{ and } \Omega_{>1} = \{\text{set of } A_j \text{ verifying: } I_{p,j} > 1\}$$

It means that the selection of GAR by the first criterion is the structure $\Omega_{>1}$. Therefore, if there is A_{J^*}, which is an optimal choice, we obtain:

$$A_{J^*} = A_{J_1}$$

but obviously, it is possible that A_{J^*} does not exist in this if we work in the class $\Omega_{>1}$ and the following choice of decision maker (permissible range), we search the GAR verifying:

$$\sup_{A_j \in \Omega_{>1}} V_{N,j}$$

or

$$\sup_{A_l \in \Omega_{>1}} I_{p,l}$$

We can search the GAR which verifies the best value discount or GAR verifying the best index profitability using a programming language, if we use the Matlab example, the 'sort' to sort the elements of a vector as follows:

Algorithm for selecting the optimal or admissible GAR

```
>> V = [  ] the capture of current
>> I = [  ] input indices profitability
>> [OV, PV] = sort (V)
>> [OI, PI] = sort (I)
```

with: - OV: contains the sorted vector V

- OI: contains the sorted vector I.
- PV: positions contains elements of the vector OV in the vector V.
- PI: positions contains elements of the vector OI in the vector I.

if OV(1) = OI(1) then J^* = OV(1) and we have a solution optimal, if not the GAR OV (1) realized the best value discount and GAR OI(1) realized the best index profitability.

2.5 Macro-structure Criteria

The above analysis is a comprehensive analysis of funding, which can or can't be profitable economically, this stage depends on the writing index j, our goal now is to construct a macro-structure index that is to say that which characterizes [5] Ω. In fact we can build on the $I_{p,j}$ an index of all structure Ω from which the following definition:

Definition [Profitability index of a class GAR] Profitability index is called macro-structure of a class of GAR Ω_l index defined as follows:

$$I_{p,\Omega_l} = \frac{\sum_{j=1}^{N} V_{N,j}}{\sum_{j=1}^{N} C_j} + 1$$

Remark: One of the advantages of this index is a to compare overall different economic structures, in fact, to compare the profitability of the structure Ω_l with the structure of $\Omega_{l'}$ we consider the difference:

$$I_{p,\Omega_l} - I_{p,\Omega_{l'}}$$

the sign of this quantity clarifies that which is profitable overall. otherwise said, this index can allow is to say that in a region GAR type Agronomy better than Craft or vice versa. For example, table 2 is an extract from the Statistical Yearbook of the region of Al Haouz Marrakech (Royaume du Maroc, 2010) gives the social capital of cooperatives of wood and plants as well as the export volumes of 2010 :

Craft	Capital (DH)	Export (DH)
Wood	2736257	27863962

[5] The rationale of the test macrostructure because it characterizes Ω, without addressing its elements one by one. It is a way to compare the profitability GAR with another structure (an GAR agricultural structure and other structure GAR crafts for example).

Plants	1084769	5709996

Table 2

recall that $V_N = V_A - C_T$ therefore $I_{p,\Omega_l} = \frac{\sum_{j=1}^{N} V_{A,j}}{\sum_{j=1}^{N} C_j}$

If we assure that the statistics of GAR are identical to those of cooperation in macroeconomic, and if we assure that the gains are reduced only to export, we obtain the following table :

Craft	I_{p,Ω_l}
Wood	10.18
Plants	5.26

We note that for the region of Marrakech-Tensift-Al Haouz it is better to encourage and sponsor wood GAR.

Proposition: For each structure GAR Ω, there are two critical values $I_1$and I_N as:

$$I_{p,\Omega_l} \in [I_N, I_1]$$

This result is simple, since it suffices to take:

$$I_1 = \frac{NV_{N,J_1}}{C} + 1 \quad \text{and} \quad I_N = \frac{NV_{N,J_N}}{C} + 1$$

with:

$$V_{N,J_1} = \sup_{A_j \in \Omega_l} V_{N,j} \text{ and } V_{N,J_N} = \min_{A_j \in \Omega_l} V_{N,j}$$

2.6 Classification of the elements of the structure Ω

Our aim in this section is to classify all of generating activities of revenues constituting the class Ω based on their net present values to achieve this goal, we introduce two following definitions:

Definition [absolute gap] For every Ω we define the value δ as absolute difference of profitability by:

$$\delta = I_1 - I_N$$

δ is positive by construction, this gap provides information on Ω as follows:

If δ tends to 0, we deduce that the net present value of the GAR is almost constant for all elements of Ω, whereas, if δ is very large compared to 0 ($\delta \gg 0$) , it reflects that there are some GAR in Ω more profitable than others, an unidentified interest of this gap.

In the economic sense, that δ tends to 0 or δ is very large compared to 0 is a little vague, for greater accuracy, we introduce the relative gap defined by:

Definition [Relative gap] For each Ω, we define the value δ_r as relative gap of profitability by:

$$\delta_r = \frac{\delta}{I_1} = 1 - \frac{I_N}{I_1}$$

Obviously, from the definition of δ we have $\delta_r \in [0,1]$.

Classification GAR classes using the relative gap

For a class GAR Ω, if δ_r is nearest to 1, then there is a strong variation between different GAR, that is to say, there are those which more profitable than others whereas, if δ_r tends to 0, we conclude that the net present value is almost constant for all GAR for structure Ω.

If we have finite classes GAR $(\Omega_\mathrm{i})_{\mathrm{i}=1,..,\mathrm{M}}$, let $\Lambda = \bigcup_{i=1}^{M} \Omega_\mathrm{i}$, and let relative gap on each Ω_i by $\delta_{r,i}$, we have

$$\forall\ \mathrm{i} = 1, . . , \mathrm{M} \qquad \delta_{r,i} \in [0,1].$$

practically, we can introduce parameter ε with $0 < \varepsilon < 1$, to decompose the range [0, 1] as:

$$[0,1] = [0, \varepsilon] \cup]\varepsilon, 1 - \varepsilon[\cup [1 - \varepsilon, 1]$$

consequently we group Ω_i in subclasses as follows:

$$\Lambda = \Lambda_1 \cup \Lambda_2 \cup \Lambda_3$$

with

$$\Lambda_1 = \bigcup_{\delta_{r,i} \le \varepsilon} \Omega_\mathrm{i} \qquad \Lambda_2 = \bigcup_{\delta_{r,i} \in]\varepsilon, 1-\varepsilon[} \Omega_\mathrm{i} \qquad \Lambda_3 = \bigcup_{\delta_{r,i} \ge 1-\varepsilon} \Omega_\mathrm{i}$$

Using this combination, we have classified all GAR of class Λ using the notion of relative difference in under sets, and we can say that:

- GAR of Λ_1 almost the same net present value.
- GAR of Λ_3 have a significant variation in the present net value.
- For GAR Λ_2 the expert can estimate their variations.

Generalization Subdivision:

For more accuracy, the expert may consider further subdivision of [0, 1], it can work with a regular subdivision in this case we have:

$$[0,1] = \bigcup_{i=0}^{M-1} [\frac{i}{M}, \frac{i+1}{M}]$$

as it may take a non-regular subdivision, that is to say:

$$[0,1] = \bigcup_{J=1}^{M} [\varepsilon_j , \varepsilon_{j+1}]$$

with $0 < \varepsilon_j < 1$ and $\varepsilon_j < \varepsilon_{j+1}$ for all j=2,.., M-1 and $\varepsilon_1 = 0 \quad \varepsilon_M = 1$

In this case, we have:

$$\Lambda = \bigcup_{J=1}^{M} \Lambda_j$$

with

$$\Lambda_j = \bigcup_{\delta_{r,i} \in [\varepsilon_j, \varepsilon_{j+1}]} \Omega_i$$

- GAR of Λ_1 almost the same present net value.
- GAR of Λ_{M-1} have a significant variation in the present net value.
- For all GAR of Λ_j with 2< j< M-1the expert can estimate their variations.

3 Construction of a global index

3.1 Concept of a global index

According to the definition the profitability index $I_{p,j}$, projects with $I_{p,j} = 1$ are projects that provide only the same initial value capital, that is to say, the value of cash flows discounted. Therefore on the threshold value of 1 is between the projects to finance and those that are rejected, if we consider only the economic objective, knowing that A_j owned $\Omega_{j<1} \dot{\cup} \Omega_{j=1}$ are GAR that can check a social gain, bat not an economic one.

The dispersion around 1 is an important factor to analyze information on the nature of the GAR. If we inspire the statistical techniques (Chabert, 1989) (SILLARD, 2001) a transcript of the idea of the error of the least squares sense, helps us define a global index as follows:

Definition: Called global index I_G of a structure GAR, index defined by:

$$I_G = \frac{\sum_{j=1}^{N} (I_{p,j} - 1)^2}{N}$$

This amount is used to evaluate the variance of indices of profitability of all GAR projects in relation to the threshold 1, it measures the dispersions and the accumulation around 1. Where the value of this index in the following sense: It is independent of the GAR, more; it measures the difference between the average value, so as to give information on the decision to couple a social gain to an economic one.

From the equation (5) I_G also written as form:

$$I_G = \frac{\sum_{j=1}^{N} (I_j)^2}{N}$$

recall that

$$V_{N,J_1} = \sup_{A_j \in \Omega} V_{N,j}$$

and

$$V_{N,J_N} = \min_{A_j \in \Omega} V_{N,j}$$

and put

$$C_{min} = \min_{j=1,..,N} C_j$$

$$C_{max} = \max_{j=1,..,N} C_j$$

$$\overline{I_G} = \frac{\min({V_{N,J_1}}^2,\ {V_{N,J_N}}^2)}{C_{max}}$$

$$\overline{\overline{I_G}} = \frac{\max({V_{N,J_1}}^2,\ {V_{N,J_N}}^2)}{C_{min}}$$

Lemma: Let I_G indicates an overall structure of GAR

- If V_{N,J_1} and V_{N,J_N} have the same sign then:

$$\overline{I_G} < I_G < \overline{\overline{I_G}}$$

- If V_{N,J_1} and V_{N,J_N} have different signs then:

$$0 \leq I_G \leq \frac{C_{max}}{C_{min}} \overline{I_G}$$

Proof:

According to the signs of V_{N,J_1} and V_{N,J_N} we have the following inequalities:

- If $V_{N,J_N} \geq 0$ then

$$(\frac{V_{N,J_N}}{C_{max}})^2 \leq I_G \leq (\frac{V_{N,J_1}}{C_{min}})^2$$

- If $V_{N,J_1} \leq 0$ then

$$(\frac{V_{N,J_1}}{C_{max}})^2 \leq I_G \leq (\frac{V_{N,J_N}}{C_{min}})^2$$

- If V_{N,J_1} and V_{N,J_N} have different signs then:

$$0 \leq I_G \leq \min\left(\left(\frac{V_{N,J_1}}{C_{min}}\right)^2, \left(\frac{V_{N,J_N}}{C_{min}}\right)^2\right)$$

3.2 Dominant class of GAR

The objective of this section is to provide a technique to select the dominant class of GAR, for this, recall that Ω is written as follows:

$$\Omega_{<1}\ \dot{\cup}\ \Omega_{=1}\ \dot{\cup}\ \Omega_{>1}$$

which allows to obtain:

$$I_G=\frac{\sum_{\Omega_{<1}}(I_{p,j}-1)^2}{N}+\frac{\sum_{\Omega_{=1}}(I_{p,j}-1)^2}{N}+\frac{\sum_{\Omega_{>1}}(I_{p,j}-1)^2}{N}$$

The class $\Omega_{=1}$ has weight in this writing thus:

$$I_G=\frac{\sum_{\Omega_{<1}}(I_{p,j}-1)^2}{N}+\frac{\sum_{\Omega_{>1}}(I_{p,j}-1)^2}{N}=I_G^{\Omega_{<1}}+I_G^{\Omega_{>1}}$$

put α defined by the ratio:

$$\alpha=\frac{I_G^{\Omega_{>1}}}{I_G}$$

we have:

$$1=\frac{I_G^{\Omega_{<1}}}{I_G}+\frac{I_G^{\Omega_{>1}}}{I_G}=(1-\ \alpha)+\alpha$$

If α is close to1 we can say that the class $\Omega_{>1}$ is dominant, in the following sense:

$$I_G^{\Omega_{>1}}\cong I_G \quad \text{and} \quad I_G^{\Omega_{<1}}\cong 0$$

Or $I_G^{\Omega_{<1}}\cong 0$ is equivalent to saying that for all A_j of $\Omega_{<1}$, $I_{p,j}$ tends to 1, which gives:

$$V_{A,j}\cong C_j$$

in a similar way we can analyze the case where α is nearest to 0. According to the value of the latter, we have:

$$\Omega=\Omega_D\ \dot{\cup}\ \Omega_{Ne}\ \dot{\cup}\ \Omega_{=1}$$

with Ω_D class GAR dominant in the sense described before, and Ω_{Ne} class GAR characterized that

$$V_{A,j}=R-D\cong C_j$$

Consequently, we have a quantized value to know the dominant subclass of class GAR, more, from the two conditions:

$$V_{N,J^*}=\sup_{A_j\in\,\Omega_{>1}} V_{N,j}$$

and

$$I_{p,J^*}=\sup_{A_l\in\,\Omega_{>1}} I_{p,l}$$

we get a way to make a strategic decision select the best GAR.

4 Conclusion and perspectives

The research constructed micro-structure and macro criteria based on the index of profitability to give a quantified argument for the decision maker of relie on pragmatic and optimal decisions to help set of generating activities of revenues, according to the strategy he chooses, not subjectively, and not politically .

A numerical simulation is used to select, in all indices proposed an optimal choice or admissible activities generating revenue that the decision maker search to finance. In the prospect of obtaining reliable and practical data from ministries[6], we propose, in a future work, a numerical simulation with interpretations.

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