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EVALUATING THE PERFORMANCE OF MOROCCAN SOCIAL INCUBATORS: AN SFA ANALYSIS OF YOUTH PLATFORMS UNDER THE NATIONAL INITIATIVE FOR HUMAN DEVELOPMENT

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Abstract. *Purpose* – This study focuses on the evaluation of youth platforms as an important social incubator of the National Initiative for Human Development (NIHD) in Morocco, particularly to promote social entrepreneurship and support very small enterprises (VSE). Numerous social incubators have been created to support social entrepreneurship and foster innovative and effective socio-economic relations. However, their impact remains limited, raising questions about their performance.

Research methodology – Based on a sample of 40 NIHD youth platforms, the stochastic frontier analysis (SFA) method was applied to measure their technical efficiency (TE), and then the determinants of the TE obtained were analysed by a regression using the Tobit model.

Findings – The results indicate that management costs (MC), the number of accompanied project holders (APH) and income improvement actions in social and solidarity economy (IIASSE) have a significant impact on the creation and development of VSE or cooperatives. In addition, the experience of the platform manager has a positive influence on TE, while age has no significant effect.

Research limitations – The conclusions of the study may not be entirely applicable to the current situation of NIHD youth platforms in Morocco, because they are based on data available at a time conditioned by an exceptional context (e.g., post-covid; government austerity policy, etc.).

Practical implications – This study provides public policymakers and platform managers with actionable insights into optimizing resource use and improving platform operations. Policymakers can use the findings to allocate funding more effectively, prioritize support services like income improvement actions, and identify platforms that serve as benchmarks for best practices. Additionally, the study highlights the importance of experienced platform managers, guiding recruitment and training policies to improve platform outcomes.

Originality/Value – The study paves the way for future research aimed at exploring in more depth the underlying mechanisms of the efficiency of NIHD youth platforms.

Keywords: development, incubator, SFA, social entrepreneurship, technical efficiency.

JEL Classification: O10, L26, C10, D61.

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1. Introduction

Social entrepreneurs are often celebrated due to their achievements and described as heroes, leaders, innovators, systems changers and so on (Dionisio, 2019; Hockerts, 2017). However, very few social entrepreneurs would succeed without a supportive ecosystem. Social entrepreneurs, like most other things in life, are often inspired by people, innovations, the work and creativity of others (Prokopenko et al., 2024; Parwita et al., 2021). Likewise, to make it happen, it needs providers of funds and advice, labor, sector experts, lawyers, accountants, volunteers, benefactors, etc... The sophistication and maturity of ecosystems have an impact on the emergence of social entrepreneurs, depending on country-specific environmental, political, economic and financial factors (Carriles-Alberdi et al., 2021). The day-to-day interactions of individuals at the micro-level play a key role in the creation and sustainability of new social venture (Roundy & Lyons, 2022; Thompson et al., 2018). They require a comprehensive approach involving different actors and elements. Cooperation between the state, the private sector and social actors is essential to create favorable conditions for social entrepreneurship and foster sustainable economic and social growth. Within this context, Morocco is continuing its efforts to develop the field of social entrepreneurship by speeding up the operationalization of youth platforms created as part of the Royal Initiative "National Initiative for Human Development (NIHD)" in its third phase 2019–2023. These platforms give young people easier access to information, networking and entrepreneurial opportunities. The great importance attached to these newly created platforms has called into question their efficiency in increasing opportunities for social entrepreneurship and their contribution to supporting very small enterprises or cooperatives. The need to measure the performance of these actors is much in demand in order to understand their contributions to society and the national economy (Chmelik et al., 2016). However, performance evaluation in public social entrepreneurship incubators is complex, given the need to take into account their dual economic and social purpose and the multiple dimensions of performance. So, how can we measure the performance of the youth platforms NIHD created in Morocco?

To address the above, a quantitative study was conducted to measure the performance of the "Youth Platforms NIHD" in terms of efficiency, as one of the public social incubators in Morocco, based on a parametric method called Stochastic Frontier analysis (SFA), as an evaluation tool that a Moroccan public decision-maker can use to identify the most efficient platforms in terms of promoting social entrepreneurship during the year 2023, and then a regression via the tobit model was applied to study the impact of experience and age on the efficiency value determined.

2. Literature review

The terms social entrepreneurship and incubation are becoming increasingly important in the sphere of research and in political discourse (Trabskaia et al., 2023; Collavo, 2023). Cooperatives, social enterprises, associations, foundations and other eco-citizen initiatives express a desire to create new socioeconomic relationships through an efficient and innovative incubation ecosystem. Additionally, inclusive development in social entrepreneurship presents the interlinking of economic growth, sustainability, and social inclusion, especially on issues related to nature management (Kostetska et al., 2021). It couples public access to natural resources with commercially driven social undertakings that aim at the redistribution of values toward the needs of society (El Maaqili & Ouchen, 2024a).

Innovation and entrepreneurial ecosystems have evolved as the cross-section and combination of strategic management, innovation theories and the economic theory of production (Petchenko et al., 2024), and their positioning as vital components of economic development is founded upon adaptability and the intersection of expertise that complements the ecosystem itself. Moreover, novel approaches, such as social marketing, constitute a pivotal mechanism in advancing social entrepreneurship by promoting institutional engagement with critical societal challenges and fostering collaborative ecosystems (Bukanov et al., 2019). It facilitates the integration of state, private, and social actors to create innovative socioeconomic relationships. Nevertheless, the need for performance evaluation models, underlines that there is much scope for potential growth in combining state policy, cooperation regarding incubation programs, and entrepreneurial practice in developing sustainable socio-economic growth where innovation (e.g., open-innovation) and inclusiveness represent decisive drives toward sustainable development (Saidi & Madhat, 2024; Demircioğlu & Özgüner, 2022).

Various evaluation studies have delved into the determinants of incubator program efficiency, shedding light on their pivotal role in fostering socio-economic growth through the creation, development, and success of very small enterprises (VSEs). However, the multifaceted objectives driving the establishment of incubators introduce a layer of complexity, rendering the interpretation and comparability of efficiency outcomes particularly challenging as indicated by Hewitt and Van Rensburg (2020). In productivity assessment, traditional methods like time study and production monitoring provide valuable insights into output productivity; yet, they often fail to fully assess the efficiency of a system and its operating managers. Technical efficiency (TE), as seen in production frontier[1] functions, offers a broader perspective by comparing actual output with input resources. According to Farrell (1957) to assess technical efficiency, researchers must compare observed production levels to the ideal production level established by the production frontier. Hoffmann et al. (2016) explained that this approach enhances understanding of resource utilization and performance optimization in production dynamics.

Efficiently managing resources to maximize their utilization while minimizing waste is at the core of technical efficiency, as described by Ghali et al. (2016) and Djimasra (2009) in their agroeconomics studies. This entails adeptly orchestrating available resources to achieve peak performance, especially in scenarios where resources are scarce. Within economic literature, methodologies outlined by Coelli et al. (2005) provide practical frameworks for estimating production frontiers and gauging technical efficiency. Two main methods are commonly adopted and widely used in the literature: one is the parametric approach, an econometric method called stochastic frontier analysis (SFA), and the other is the non-parametric approach, based on programming mathematical, known as data envelopment analysis (DEA) (Cooper et al., 2007).

The SFA approach was developed by Meeusen and Van Den Broeck (1977) and by Aigner et al. (1977). Bogetoft and Otto (2011) provide a good introduction, which indicates that a stochastic frontier[2] is formulated to enable comparisons between different firms, facilitating

[1] The *production frontier* gives the maximum possible output for any given set of inputs under ideal conditions. It is the basis upon which the efficiency is measured for specific units in this case, the NIHD youth platforms.

[2] The *stochastic frontier* extends the production frontier to include a random error term representing statistical noise and other exogenous factors, not under the control of platforms due to general economic conditions or unexpected stresses. This stochastic part constitutes a considerable difference of SFA from the nonparametric approaches like DEA and thus an applicability especially to real-world cases containing such variability.

the assessment of each firm's performance within a specific group or sector. Průša (2010) employed SFA to evaluate the Czech SME efficiency and the results revealed systemic inefficiencies, highlighting their reliance on labour over capital and limited utilization of intangible assets. Huang et al. (2021) evaluated the technical efficiency and influencing factors of agricultural SME in China, which they found that Labour, fertilizer application, and diesel fuel are the direct factors of impact. Additionally, Silva et al. (2024) used SFA to study the TE ranking of entrepreneurship activities and new firm creation in European countries (e.g., Lithuania, Estonia and the Netherlands), and found that, socioeconomics variables (e.g., labour productivity, capital productivity, education) impacts the efficiency regarding the country's context, i.e., financial crise or stable, through the application of the tobit model regression. Rare studies have, up to now, applied SFA in the analysis of efficiency regarding public entrepreneurship incubators, especially in the developing regions like North Africa and Eastern Europe. This gap indicates important need for studies in these regions to better understand the contextual dynamics regarding efficiency and performance in the public-sector incubation initiatives.

3. Research methodology

3.1. The choice of the stochastic frontier analysis (SFA)

The choice of the parametric method, i.e. SFA, turns out to be the most relevant, given the possibility of specifying the functional form of the production function for each output (Fongue et al., 2014). This facilitates the transition from technical efficiency to efficiency focused on selective parameters, which it's explored in this article. Favoring SFA over DEA for incubators performance analysis is also supported by the stochastic nature of entrepreneurship support ecosystem (Trabskaia et al., 2023; Collavo, 2023), the typical two outputs (VSE creation and VSE development), the multiple incubation services inputs, and the alignment of SFA's assumptions with incubators' performance analysis, including non-increasing returns to scale and an adaptive frontier passing through the origin (Lamb & Tee, 2024).

In this regard, the efficiency of "the NIHD youth platforms" was studied in Morocco, as public incubator, by estimating via the Stochastic Frontier Analysis (SFA) method, the production function which links the level of production with chosen inputs, focusing on technically efficient (a_i) of these platforms, namely those capable of producing the highest level of output conditional on input usage levels (Coelli et al., 2005). Therefore, the observed output (y_i) is related to the production function $f\left(x_{i;}\beta\right)$, and the input x_i as follows:

$$y_i = a_{i,} f(x_{i;}\beta) \quad 0 < a_{i,} \leq 1 , \tag{1}$$

where β, is unknown parameter to be estimated. The basic empirical framework of SFA is a regression specification involving a logarithmic transformation of the production function that adds a random error term, vi, where production is bounded from above by the stochastic frontier $f\left(x_{i;}\beta\right)e^{Vi}$, and $u_i = -\ln\left(a_i\right) \geq 0$ represents the unit-specific technical inefficiency.

Application of the SFA method requires the choice of a functional form of the production function and a unit-specific inefficiency model, ui. In this study, the specification of the Cobb-Douglas (CD) function in logarithmic form was used, due to its simplicity and ease of interpretation (Maniriho et al., 2020; Meeusen & Van Den Broeck, 1977), with varying elasticity of factor substitution of production. In accordance with Coelli et al. (2005) the CD specification implicitly assumes that technical change is constant and linked to y. The function $f\left(x_{i;}\beta\right)$ of the CD specification is as follows:

$$\ln y = A_0 + \theta_t + \sum_{\eta=1}^{N} \beta \ln x_n, \tag{2}$$

where $A_0 = \ln\beta_0$. In basic stochastic production frontier models, production is specified as a function of a non-negative random error which represents technical inefficiency, and a symmetric random error which accounts for noise. A version of stochastic frontiers with a time-invariant inefficient were tested in this study, for which Battese and Coelli (1988) proposed a maximum likelihood (ML) estimate of the following normal-truncated model:

$$\ln y_i = \beta_0 + \sum_{n=1}^{N} \beta \ln x_n + \varepsilon_{it}, \tag{3}$$

$$\varepsilon_{it} = v_{it} - u_i \quad i = 1,\dots,N \quad t = 2,\dots,T.$$

In this Equation, y_i represents the production of the i^{th} structure; x_i is a K×1 vector containing the logarithms of the inputs; β is a vector of unknown parameters; ε_{it} is the estimate of the error of which, v_i is a symmetric random error to take into account statistical noise; and u_i is a non-negative random variable associated with technical inefficiency. The parameters of the stochastic frontier function were estimated by the maximum likelihood method using FRONTIER 4.1 software (Kumbhakar et al., 2021).

3.2. Data and sample

In this study, a sample of 40 NIHD youth platforms as public social incubators, was selected. Even though Morocco counts 256 urban cities, each of which has a specific platform, many of them are not yet active or operational. In order to ensure the most rigorous methodology, the managers of all the platforms were contacted via email. Five of the 80 that responded back, were excluded after verification with the Moroccan Press Agency (MAP), the only reliable public institution that furnishes an integrative report from these sites, for the incoherence of the data they supplied. The final sample of 40 active platforms was chosen randomly from the pool of operational platforms, with the condition that every single one of them would have an equal chance of being selected. This minimizes selection bias, providing a representative and homogeneous sample.

3.3. Input-output variables

For the choice of input and output variables, this study takes into account the existing literature (Collavo, 2023; Messeghem et al., 2018) the input and output elements correspond to the units to be evaluated, the data is publicly trusted and each variable can be quantified for analysis. In this regard, to better study the efficiency of the platforms, the input variables chosen in this study are: the "MC" management costs in millions of dirhams (MAD), which 60% is for the creation services (MC1) and 40% is for the development services (MC2), the number of accompanied project holders "APH" and the number of improvement income actions in the social and solidarity economy (SSE) "IIASSE"; the output variables chosen are: the number of very small enterprises (VSE) or cooperatives created "VSECC" and the number of VSEs or cooperatives developed "VSECD".

3.4. Research model

This study evaluates the efficiency performance of the 40 selected platforms for the year 2023, based on data obtained from MAP reports and the managers of those platforms. According to the choice of output variables, two production functions were established to evaluate the SFA model as follows:

- For the VSECC Production function:

$$\ln(VSECC) = \beta_0 + \beta_1 \ln\left(MC1\right) + \beta_2 \ln\left(APH\right) + \varepsilon_{it}; \tag{4}$$

$$y_1 = VSECC;\ x_1 = MC1;\ x_2 = APH.$$

- For the VESCD Production function:

$$\ln(VSECD_i) = \beta_0 + \beta_1 \ln\left(MC2\right) + \beta_2 \ln(IIASSE) + \varepsilon_{it}; \tag{5}$$

$$y_2 = VSECD;\ x_1 = MC2;\ x_2 = IIASSE.$$

H1: *The SFA method facilitates the efficiency measurement of NIHD youth platforms.*

Once the estimation of technical efficiency had been done using the software FRONTIER 4.1, a regression with the Tobit model using Eviews software was carried out on the 40 technical efficiency values, TE, as a function of several variables, among which were age and experience of the manager of the platform, with the purpose of establishing the influence they have on the value of TE determined. In this second stage, the Tobit model has been chosen because the dependent variable, which is technical efficiency, results in data that are censored between 0 and 1 (Tobin, 1958). The Tobit model handles such data appropriately, hence yielding unbiased and consistent estimates of the relationship of efficiency with explanatory variables like experience and age of managers. The above two-stage procedure using SFA and Tobit regression presents an appropriate framework for carrying out an evaluation of efficiency and, by extension, factors that affect it, and therefore, impact the performance of platforms (Liu et al., 2024).

H2: *The manager's experience has a positive impact on the efficiency of the NIHD's youth platforms.*

H3: *The manager's age has a positive impact on the efficiency of the NIHD's youth platforms.*

4. Results

4.1. Technical efficiency analysis

4.1.1. Production function of the output "very small enterprises or cooperative created" y1 = VSECC)

The results of the maximum likelihood (ML) estimation of the VSECC production function (New created VSE and cooperatives) are as follows (Table 1):

$$\ln(VSECC) = -0.486 + 0.239 \ln\left(MC1\right) + 1.003 \ln\left(APH\right) + \varepsilon_{it}.$$

- *Management costs 1* (*MC1*; *Input No. 1*)*:* The coefficient for management costs b_1 is 0.23916485, with a t-ratio of 2.1778378. This indicates that management costs have a significant impact of 5% on the production function. A five percent increase in management costs allows a 0.24% increase in the number of VSEs or cooperatives created.
- *Accompanied project holders* (*APH*; *Input No. 2*)*:* The coefficient associated with the number of accompanied project holders b_2 is 1.0038470, with a t-ratio of 10.041773. The statistical significance at 1% suggests that the number of accompanied project holders has a significant effect on the production function, of which a one percent increase in the number of APH implies an increase of 1.004% in the number of VSEs or cooperatives created.
- *Gamma:* The value of Gamma is estimated at 0.99, close to 1, indicating a strong positive correlation between the variables of the model, which means that high values of results (output) are generally associated with high values of inputs (resources used). The gamma value is obtained by maximum likelihood (ML), indicating that 99.99% of the variability in the number of VSEs or cooperatives created is attributable to technical inefficiency resulting from the combination of inputs (MC1; APH). The likelihood ratio (LR) test also confirms the presence of technical inefficiency, with a value of 5.59934, lower than the critical chi-square value at 8.273 (Kodde & Palm, 1986). The gamma value provides information on the deviation from the production frontier, mainly explained by technical output (VSECC) inefficiency.

Table 1. Efficiency analysis of the VSECC production function (source: Frontier 4.1 software)

Variables & Parameters		Maximum Likelihood (ML) Estimator		
		Coefficient	Error-Standard	T-Ratio (TR)
Constant	β_0	−0.48619281	0.32115946	−1.5138673
Management costs 1 (x_1 = MC1)	β_1	**0.23916485****	0.10981757	**2.1778378****
Accompanied project holders (x_2 = APH)	β_2	1.0038470***	0.099967108	**10.041773*****
Sigma square		**0.96917550*****	0.096668929	10.025719
Gamma		**0.99999999*****	0.000017370	57568.084
Likelihood Ratio (LR)		5.59934000		
Log likelihood function y_1 = VSECC		−29.215202		

Note: ***Significant at 1% statistically (TR > 2.576); **Significant at 5% statistically (1.96 > TR > 2.576); *Significant at 10% statistically (1.64 > TR > 1.96).

These results reinforce the reality that nearly all the variations in platform effectiveness are attributable to managerial inefficiencies in the structure rather than exogenous ecosystem-based factors. The extremely *high gamma* value asserts that platform effectiveness is extremely heavily driven by operating decisions, financial policies, and managerial efficiency rather than by exogenous economic circumstances or economy-wide trends. It also does not detract from the stochastic frontier application-the fact that the LR test was statistically significant implies that such variation in performance of the platforms is systematic and not the result of random noise. Aside from statistical significance, the effect of MC1 illustrates the of the input of financial resources into the incubation program process. It is thus possible for these locations to offer extensive advisory services, training programs, and infrastructure to the entrepreneurs, which, in effect, increase VSE and cooperatives of establishment. It is actually the extremely high coefficient of APH that speaks to the sufficiency of the intensity and quality of the accompaniment of the project holder and of his successfulness. The fact is that such results make one notice the need for quality mentorship networks, financial resources at one's disposal, and even administrative support for social organizations. In fact, this has also been depicted by the fact that well-planned platforms with structured systems of support are actually more efficient and that budgetary investment targeting and improved support infrastructure are justified. The most efficient platforms according to the efficiency ranking scores (see Appendix Table A1) are Kenitra 0.99969096, Fez 0.94823269, and Taounate 0.93183293, which is nearer to 1, showing that these have maximally utilized the resources available. The least productive are Ifrane 0.08335264 and Aousred 0.20397439, reflecting inadequate use of their resources. It is also for an optimized financial mix, organized management, and better-established entrepreneurship support networks that the efficient platforms are Taounate, Fez, and Kenitra. Moreover, they were located within the zones with high entrepreneurial activities, hence providing the entrepreneurs with far greater opportunities regarding networking as well as access to markets. Whereas the underperforming platforms, i.e., Ifrane and Aousred faced more structural issues like having less finance, a poor management system, or geographical disadvantage reducing the entrepreneurial opportunity. These disparities are significant making the SFA method a crucial tool facilizing the selectivity of policy intervention in adjusting such inefficiencies in low-performing economies, which confirms the Hypothesis 1.

Table 2. Technical efficiency scores of platforms (VSECC)

1 > AND > 0.7	0.7 > AND > 0.5	0.5 > AND > 0.3	0.3 > AND
10 Platforms	6 Platforms	14 Platforms	10 Platforms
25%	15%	35%	25%

The results relating to the technical efficiency scores calculated by the FRONTIER 4.1 software show an average level of scores. The average technical efficiency amounts to 49.11%, this level confirms the average technical performance of the results concerning the creation of VSE and cooperatives. Indeed, 25% of platforms record an efficiency score between 1 and 0.7, 15% have a score which varies between 0.7 and 0.5, while 35% of youth platforms display a technical efficiency score which varies between 0.5 and 0.3 and finally 25% have a score less than 0.3 (Table 2).

4.1.2. Production function of the output "very small enterprises or cooperative developed" (y2 =VSECD)

The results of the maximum likelihood (ML) estimation for the production function of the VSE and developed cooperative results are (Table 3):

$$\ln(VSECD) = 0.461 + 0.239\ln\left(MC2\right) + 0.866\ln\left(IIASSE\right) + \varepsilon_{it}.$$

- *Management costs 2* (*MC2*; *Input No. 1*)*:* The coefficient for management costs b_1 is 0.23958380, with a t-ratio of 2.2075439. Statistical significance at 5% indicates that a 5% increase in management costs is associated with a 0.24% increase in the number of VSEs or cooperatives developed.
- *Income improvement actions in SSE* (*IIASSE*; *Input No. 2*)*:* The coefficient associated with IIASSE b_1 is 0.86657397, with a t-ratio of 5.3352786. The statistical significance at 1% suggests that a one percent increase in the number of IIASSE is associated with an increase of 0.867% in the number of VSEs or developed cooperatives.
- *Gamma: The Gamma value is estimated at 0.99009561, with a standard deviation of 0.016026929 and a high t-ratio of 61.777002* (*>2.576*). This value, very close to 1, indicate a positive correlation between the variables (Inputs-Output) of the model. The gamma value (γ) obtained by the maximum likelihood (ML) of the stochastic frontier production model suggests that 99.01% of the variability in the number of VSEs or cooperatives developed is linked to technical inefficiency resulting from the combination of inputs (MC2; IIASSE). The likelihood ratio (LR) test also confirms the presence of technical inefficiency, with a value of 7.34, lower than the critical chi-square value at 8.273 (Kodde & Palm, 1986).

Table 3. Efficiency analysis of the VSECD production function (source: Frontier 4.1 software)

Variables & parameters		ML Estimator		
		Coefficient	Error-Standard	T-Ratio (TR)
Constant	β_0	0.46118324	0.62659482	0.73601508
Management costs 2 (x_1 = MC2)	β_1	**0.23958380****	0.10852957	**2.2075439****
Income improvement actions in SSE (x_2 = IIASSE)	β_3	**0.86657397*****	0.16242338	**5.3352786*****
Sigma square		**0.97132362*****	0.25539700	3.8031912
Gamma		**0.99009561*****	0.01602692	61.777002
Likelihood Ratio (LR)		7.3386512		
Log likelihood function y_2 = VSECD		−31.349218		

Note: ***Significant at 1% statistically (TR > 2.576); **Significant at 5% statistically (1.96 > TR > 2.576); *Significant at 10% statistically (1.64 > TR > 1.96).

Findings from the VSECD production function indicate that performance of youth platforms depends more upon their internal managerial practices than on the prevailing economic conditions. More precisely, the closeness of gamma value to 1, or 0.99009561, suggests that what motivates the platforms' performance is the way resources are managed and allocated, rather than the overall state of the economy. This is further supported by the statistically significant LR test, which suggests that performance differences across platforms are systematic and not a result of random variations. The other important point that comes up through significance of the coefficients is that of the management costs, MC2, which points to the monetary input in the development phase of the social entrepreneurship projects. The platforms that devote sufficient investment to development services, including training, infrastructure, and advisory services, are the ones that create positive effects regarding VSE and cooperative development. Once more with a high value of coefficient, IIASSE refers to the necessity of focused efforts on income enhancement activities in the social and solidarity economy. These include market access initiatives and financial literacy programs that are vital for the long-term viability of the VSEs and cooperatives. The most efficient platforms are Nouaceur with 0.9492241, Beni Mellal with 0.8908875, and Ifrane with 0.8686321, showing signs of optimal use of resources and satisfactory management practices. Less efficient are Moulay Yaacoub 0.1750382 and Skhirate-Temara 0.1324539, which, very often, results from structural problems such as insufficient finance, weak managerial structure, or inappropriate location. These types of inequalities require the application of policies aimed at eliminating various inefficiencies of the less efficient platforms by, for example, providing more finance, training programs, and better infrastructure. Successful high-efficiency platforms allow for practical insights and best practices which may be applied to low-efficiency platforms to improve their performances for, at the end, a proper ecosystem to develop social entrepreneurship.

Table 4. Technical efficiency scores of platforms (VSECD)

1 > AND > 0.7	0.7 > AND > 0.5	0.5 > AND > 0.3	0.3 > AND
11 Platforms	10 Platforms	7 Platforms	12 Platforms
27%	25%	17.5%	30%

With an average efficiency estimated at 52.64%, these data highlight an overall moderate technical performance (see Appendix Table A2). However, significant variability is observed among the platforms studied: around 27% display a high level of efficiency, with scores between 1 and 0.7, while 25% are in an intermediate range, between 0.7 and 0.5. At the other end, around 17.5% of youth platforms have relatively low technical efficiency, with scores oscillating between 0.5 and 0.3, while almost 30% of platforms fall below this threshold. critical of 0.3 (Table 4).

4.2. Analysis of the impact of age and experience of the platform' manager on technical efficiency values

4.2.1. VSE or cooperative created output

Using the Tobit model on the 40 technical efficiency values as a function of two explanatory variables, i.e., age and experience of the platform manager (Table 5), it seems that the experience shows a significant coefficient of 0.022692 with a p-value of 0.0316 less than 5%, suggesting a strong positive relationship between experience and technical efficiency of the platform, which indicates that the experience of platform managers plays a crucial role in improving their technical efficiency. On the other hand, age do not seem to have significant effect (P-value = 0.1679 > 5%). The constant (C= 0.6717880) is significant (p-value = 0.0041), reflecting a positive technical efficiency base for platforms independently of other factors. Also, the Log-likelihood' value (2.2936972) indicates a good fit of the model to the data.

Table 5. Regression according to the Tobit model for VSECC (source: adapted from Eviews software)

Variable	Coefficient	Std. Error	Z-Statistic	p-value
EXP01	−0.022692	0.010558	−2.14918	0.0316
AGE	−0.008303	0.006021	−1.37990	0.1679
C (constant)	0.671788	0.233930	2.87175	0.0041
Error distribution				
SCALE	0.228486	0.025545	8.944272	0.000000
Mean dependent variable	0.491110	S.D dependent variable		0.245906
S.E. of regression	0.240669	Akaike		0.835915
Sum squared residual	2.085646	Schwarz		0.854203
Log likelihood	2.239697	Hannan-Quinn		0.846380
Avg. Log likelihood	0.057342			

The analysis of the residuals' normality (such as the Skewness test reflecting the asymmetry close to 0 and the kurtosis close to 3) indicates that the distribution of the residuals is very close to that of a normal distribution (Table 6). The Jarque-Bera test confirms it (Jarque & Bera, 1980), with a statistic coefficient of 0.976301 and a p-value of 0.6137600 (>5%), thus, the residuals follow a normal distribution, which means that the Tobit model is well specified and that the results can be considered reliable.

Table 6. Residual normality test results for VSECC (source: Eviews software release)

Statistic	Value
Mean	−0.00183
Median	−0.05686
Maximum	0.52105
Minimum	−0.37242
Standard deviation	0.23124
Skewness	0.549746
Kurtosis	2.31598
Jarque-Bera	2.794612
Probability	0.247262

4.2.2. VSE or cooperative developed output

For the VSECD model, the results (Table 7) indicate that there is a significant coefficient of 0.022391 for experience, with a p-value of 0.0458 (p-value < 5%), while age do not seem to present a significant correlation with technical efficiency (p-value = 0.1213). This shows that experience is a significant factor in improving the efficiency of platforms for this production function. Additionally, the constant (C) has a coefficient of 0.754774 reflecting a positive baseline level of technical efficiency when the other explanatory variables are zero. Moreover, the Log-likelihood value indicates a good fit of the model to the data.

Table 7. Regression according to the Tobit model for VSECD (source: adapted from Eviews software)

Variable	Coefficient	Std. Error	Z-Statistic	p-value
EXPO1	0.022391	0.011211	1.997339	0.0458
AGE	−0.009906	0.006393	−1.549387	0.1213
Constance (C)	0.754774	0.248377	3.038826	0.0024
Error distribution				
SCALE	0.242597	0.027123	8.944272	0.0000
Mean dependent variable	0.507293	S.D dependent variable		0.260413
S.E. of regression	0.255622	Akaike		0.205117
Sum squared residual	2.350439	Schwarz		0.317059
Log likelihood	−10.31344	Hannan-Quinn		0.266235
Avg. log likelihood	−0.002585			

The distribution of residuals is centered around zero, with a slight negative asymmetry (Table 8). However, no major deviation is observed. The Skewness test is 0.076550, suggesting an almost symmetrical distribution, while the Kurtosis test, with a value of 2.250106 close to 3, indicates a normal distribution. The Jarque-Bera test (0.976301) with an associated p-value of 0.613760 greater than 0.05 confirms that the residuals follow a normal distribution (Jarque & Bera, 1980). The normality of the residuals supports the reliability of the results obtained with the Tobit model applied.

Table 8. Residual normality test results for VSECD (source: Eviews software release)

Statistic	Value
Mean	−0.002239
Median	0.039803
Maximum	0.476577
Minimum	−0.474547
Standard deviation	0.245583
Skewness	−0.078556
Kurtosis	2.250106
Jarque-Bera	0.976301
Probability	0.61376

The positive and significant influence of the managerial experience factor in TE scores from the two production functions, i.e., VSECC & VSECD, as revealed by the results confirming the Hypothesis 2, suggests that a platform manager with experience can better optimize the resources used, adopt effective incubation strategies, and ensure that good decisions are made to enhance efficiency. On the contrary, irrelevance of age would imply that seniority itself is not translated into higher efficiency (rejecting Hypothesis 3); rather, practical experience, strategic vision, and problem-solving abilities weigh more in achieving success on the platform. The results thus indicate the requirement of formal training programs or competency development initiatives in order to facilitate less experienced managers in absorbing the competencies necessary for driving platform performance.

5. Discussions

5.1. Synthesis

The findings of this study highlight the crucial role of management costs (MC), accompanied project holders (APH), and income improvement actions in the social and solidarity economy (IIASSE) in determining the efficiency of NIHD youth platforms. The Stochastic Frontier Analysis (SFA) applied in this research confirms that these input variables significantly impact the creation and development of very small enterprises (VSEs) and cooperatives. These findings align with previous studies that emphasize the importance of financial and managerial efficiency in promoting entrepreneurial activities' performance. For instance, Castillo et al. (2011), Gayosa and Cabanda (2014), Charoenrat and Harvie (2013) found that financial investment in management and entrepreneurship support services positively correlates with entrepreneurial success. Similarly, Silva et al. (2024) showed that entrepreneurial outcomes in Europe are highly influenced by management efficiency and resource allocation strategies. Our findings suggest that internal management practices outweigh external economic influences, as evidenced by the strong correlation between efficiency and experience rather than macroeconomic conditions. While most efficiency studies focus on private incubators (e.g., Zapata-Guerrero et al., 2020), this research contributes to a relatively underexplored area by applying SFA to public-sector incubators in Morocco, filling a knowledge gap in social entrepreneurship evaluation. Furthermore, the Tobit regression analysis in this study underscores the role of experience in managerial efficiency, confirming findings from Matsvai et al. (2022), Tipi et al. (2021), Ripoll-Zarraga and Huderek-Glapska (2021) who showed that experienced actors are more likely to allocate resources effectively and drive managerial success in terms of efficiency, also, Qian et al. (2024) found that the entrepreneurs' experience impact positively the TE scores of their activities. However, unlike some prior studies, e.g., Kauko (2007) and Castano and Cabanda (2007) which they found that age does significantly impact efficiency, suggesting that practical knowledge and managerial expertise are no less important than age in effecting the activity's efficiency.

5.2. Future challenges and opportunities

By comparing the technical efficiency regarding the production function of VSECC and VSECD, the efficient platforms according to the two models can serve as an opportunity to became references in terms of best practices for inefficient platforms (Table 9). The notable variations between the two models are particularly evident with the Ifrane platform, considered less efficient in the VSECC model, but more efficient in the VSECD model. Furthermore, the overall mean of overall average is slightly higher in the VSECD model.

An additional area which could be analyzed is the relation of these results to the definitions of the circular economy. The concept of a circular economy is centered around resource productivity, waste generation reduction, and sustainable development, which is the reason why technical efficiency (TE) is very important (Kyriakopoulos, 2021). By using social incubators, the micro enterprises (VSE) or cooperatives they nurture can be encouraged to use eco-friendly and cost-effective production methods – and so, they can be very important in fostering circular economy principles. These low-cost alternatives, however, make it possible

Table 9. Reference platforms in terms of efficiency

Youth platforms	VSECC Technical efficiency	Youth platforms	VSECD Technical efficiency
Kenitra	Very efficient	Nouaceur	Very efficient
Fes	Very efficient	Fes	Very efficient
Taounate	Very efficient	Beni Mellal	Efficient
Tangier	Very efficient	Ifrane	Efficient
Benslimane	Efficient	Benslimane	Efficient
Sefrou	Efficient	Sefrou	Efficient
Essaouira	Efficient	Mohammadia	Efficient
Moulay Yaacoub	Efficient	Tangier	Efficient
Casablanca Hay Hassani	Efficient	Kenitra	Efficient
Ifrane	Inefficient	Meknes	Efficient
Average technical efficiency	0.49111014	Average technical efficiency	0.52649015

to achieve broad environmental and social benefits. For instance, an additional possibility of increasing the platform's operational effectiveness is the utilization of renewable energy technology. For example, platforms can install solar panels or switch to other energy conservation systems which will lower their operating costs and the carbon footprint. These measures are in line with the larger objectives of sustainable development and the aid they provide the enterprises increases the chances of their long-term sustainability (Kyriakopoulos, 2021). Furthermore, energy deprivation is one of the major barriers to the social economic development. Cheaper renewable energy technologies could be developed for the poorer communities and social incubators may play a key role. For instance, social incubators should prioritize the access to and promotion of energy-efficient products in rural areas, which can boost the residents' quality of life and economic conditions in these regions (Štreimikienė & Kyriakopoulos, 2023). Efficiency savings in use can also be targeted in the operation of the platform and entrepreneurial aid strategies as a step towards social development. In this regard, technical efficiency is very important in performance analysis (Demircioğlu & Özgüner, 2022; Zapata-Guerrero et al., 2020; Aaboen et al., 2008; Lin et al., 2009). It makes it possible to measure the optimal use of resources and, therefore, actors minimize the number of resources used to achieve a certain level of production (Farrell, 1957). They can also choose to maximize production for a given quantity of inputs (Dimitri et al., 2008). The positive effect of selected inputs on the production of results (VSECC; VSECD) validates the economic theory of production according to which results (outputs) increase with the increase in resources (inputs). At this basis, the efficiency calculation represents a challenge for the platforms' actors, where they must take into consideration this SFA model to turn it into a future opportunity aiming at optimizing theirs offered services, e.g., APH or IIASSE, without forgetting to take into account the examination of the other factors discussed above, namely the experience and age of the managers of these platforms, and also the circular economy best practices and low carbon programs integration. This last point represents another major challenge, that of identifying suitable and capable young managers with practical entrepreneurial experience who will be able to implement the changes necessary as suggested by the SFA model. This brings out the challenge of focusing on the social role of incubators in the development of the socio-economic and innovation ecosystem (Bucci & Marks, 2022). As is commonly known, social incubators operate with approaches to VSEs or cooperatives. For example, Europe's focus is on the public-private partnership type of incubators that supported the advancement of social enterprise policy and funding. In America, the emphasis is on market-oriented approaches which include supporting the expansion of social enterprises with social venture capital. In contrast, African countries concentrate on upper-bottom approaches where entrepreneurs are trained to respond to the local market needs. It is more common nowadays for social incubators to support VSEs with a variety of approaches, especially when it comes to the use of digital tools like social media (El Maaqili & Ouchen, 2024b). According to Štreimikienė et al. (2021) social media serves to increased visibility, stakeholder engagement, and market outreach. Such strategies can also be adopted by NIHD youth platforms in order to achieve greater impact on the VSEs and cooperatives that they support, as well as building stronger socio-economic ties and new marketing innovations.

5.3. Constraints and limitations

Certain limitations must be taken into account within the context of this study, The methodology used, in particular the SFA, has limitations, because it assumes only two specific production functions which may correspond partially to the reality of NIHD youth platforms in Morocco. In addition, certain important variables such as cultural aspects (e.g., ethical values; communication; etc.) or contextual aspects (e.g., characteristics of the city where the platform is implemented) specific to Morocco have not been fully explored. Adding to this, the conclusions of the study may not be entirely applicable to the current situation of NIHD youth platforms in Morocco, because they are based on data available at a time conditioned by an exceptional context (e.g., post-covid; government austerity policy, etc.).

6. Conclusions

The results of this research make several significant contributions to understanding and improving the efficiency of NIHD youth platforms as public social incubators in Morocco. First, using the Stochastic Frontier Analysis (SFA) method, this study provides an accurate assessment of the technical efficiency of platforms, which makes it possible to identify the factors that influence their performance. Secondly, the results highlight the importance of management costs and accompanied project holders' services in the creation and development of VSE and cooperatives in the social and solidarity economy. Third, by examining the impact of variables such as age and experience of the manager on technical efficiency, this research highlights that more experienced managers are more efficient in optimizing the use of resources and promoting the creation and development of small VSE and cooperatives in the social and solidarity economy. Furthermore, by identifying the most efficient platforms as references for best practices, this study offers concrete avenues to improve the performance of less efficient platforms and promote the development of social entrepreneurship in Morocco.

Theoretical implications

Apart from offering operational recommendations, this study contributes to the theoretical framework of social entrepreneurship and public incubators. The findings are in line with the production theory of economics in stressing that effective allocation and management of resources are key to output maximization. The study also contributes to social entrepreneurship theoretically by pointing out the role of managerial experience in improving technical efficiency, a variable that has received limited attention in the case of public incubators. The study closes the gap between theoretical efficiency models and their measurement in social entrepreneurship, thus providing a more nuanced understanding of how public incubators can maximize their activities to bring about socio-economic progress.

In addition, the study offers a new perspective by synthesizing the principles of the circular economy into social incubator research. By closing the gap between technical efficiency and sustainable behavior, this work highlights the need to eliminate waste and maximize resources in order to achieve sustainable socio-economic benefits. This conceptual advance opens up research opportunities, particularly examining social incubators as drivers of sustainable development.

7. Practical implications

On a practical level, by providing a precise assessment of the technical efficiency of NIHD youth platforms and its ranking using the SFA method, this study allows the responsible for these platforms to identify specific areas where improvements are necessary to increase their performance. For example, by highlighting the importance of management costs and services for accompanied project holders, managers can concentrate their efforts on these aspects to optimize the creation and development of VSE and cooperatives in the social and solidarity economy. Furthermore, the research provides policy-makers and platform managers with practical recommendations. The conclusions are that investment in mature management and strategic focus on income improvement strategies (IIASSE) have substantial potential to increase platform efficiency. This information could, in turn, guide policy designs, e.g., investing in training for managers or investing more financial support in platforms with notable potential for efficiency improvement.

8. Recommendations for future research

The results reported here provide a basis for further research resulting in a more detailed examination of the mechanisms of the effectiveness of public social incubators, such as the NIHD youth platforms. In addition, it would be relevant to examine the impact of public policy on the development of these platforms and to explore the possibility of introducing technological innovations to increase their efficiency of operation. In addition, the use of other approaches such as the DEA and the comparison with the SFA is an interesting area of research within the context of the efficiency measurement of the Moroccan social entrepreneurship industry. Comparison across nations can also prove to be useful in providing comparative data to make social entrepreneurship best practices and policy. The future research could also go a step further in understanding the cultural and contextual features of the social incubator performance. For example, the performance of the platform could be enhanced if the local ethics, communication cultures, and even the region itself are integrated. Moreover, these studies could be supplemented with a time sequence for the evolution of platforms efficiency, which would illustrate the enduring effects of management practices and policy changes.

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APPENDIX

Table A1. Technical efficiency value of NIDH youth platforms (VSECC) (source: Frontier 4.1 software)

NIHD youth platforms	Technical efficiency
Fez	0.94823269
Meknes	0.26278727
Sefrou	0.83584555
Taza	0.23487518
Moulay Yaacoub	0.76505017
Ifrane	0.08335264
EL Hajeb	0.44926497
Taounate	0.93183293
Boulemane	0.65381836
Nouaceur	0.57952027
Skhirate-Temara	0.35658955
Boujdour	0.52926364
Agadir	0.70240886
Kenitra	0.99969096
Oujda	0.21733074
Rehamna	0.42457330
Tangier	0.90308823
Sale	0.32926238
Figuig	0.21412316
Chichaoua	0.51927383
Ait Melloul	0.23475855
Settat	0.24496676
Titouan	0.41343715
Fhs Anjra	0.32684609
Larach	0.45254362
Khenifra	0.33968233
Berkan	0.46617395
Sidi Kacem	0.53511917

End of Table A1

NIHD youth platforms	Technical efficiency
Aousred	0.20397439
Benslimane	0.86856875
Mohammadia	0.60561141
Casablanca-Anfa	0.34658501
Casablanca Hay Hassani	0.73107762
El Kelaa des Sraghna	0.46633126
Essaouira	0.80443661
Mdiq-Fnideq	0.31596338
Beni Mellal	0.22547980
Youssoufia	0.42984040
TaTa	0.25414863
Chefchaouen	0.43867612
Average technical efficiency	0.49111014

Table A2. Technical efficiency value of NIDH youth platforms (VSECD) (source: Frontier 4.1 software)

NIHD youth platforms	Technical efficiency
Fez	0.9252673
Meknes	0.7519462
Sefrou	0.8531884
Taza	0.6563507
Moulay Yaacoub	0.1750382
Ifrane	0.8686321
EL Hajeb	0.4882368
Taounate	0.6644272
Boulemane	0.2778826
Nouaceur	0.9492241
Skhirate-Temara	0.1324539
Boujdour	0.2230409
Agadir	0.5751020
Kenitra	0.7776719
Oujda	0.6708792
Rehamna	0.1956500
Tangier	0.8190857
Sale	0.2595770
Figuig	0.3663770
Chichaoua	0.3756024
Ait Melloul	0.6875983
Settat	0.2095893
Titouan	0.6809942

End of Table A2

NIHD youth platforms	Technical efficiency
Fhs Anjra	0.4921899
Larach	0.1614677
Khenifra	0.4343417
Berkan	0.6733048
Sidi Kacem	0.5348039
Aousred	0.7210049
Benslimane	0.8650518
Mohammadia	0.8330631
Casablanca-Anfa	0.2468726
Casablanca Hay Hassani	0.2184673
El Kelaa des Sraghna	0.4207964
Essaouira	0.5067708
Mdiq-Fnideq	0.2551194
Beni Mellal	0.8908875
Youssoufia	0.6491288
TaTa	0.3385841
Chefchaouen	0.2339363
Average technical efficiency	0.52649015