COST-BENEFIT ANALYSIS OF ALGERIA'S STARTUP SUPPORT POLICIES: A DETERMINISTIC EVALUATION (2020-2030)

ANALYSE COUTS-BENEFICES DES POLITIQUES DE SOUTIEN AUX START-UP EN ALGERIE : UNE EVALUATION DETERMINISTE (2020-2030)

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Abstract
Algeria's post-2020 startup policies aim for economic diversification. This deterministic Cost-Benefit Analysis (CBA) evaluates them over 2020-2030 under a Moderate Scenario (7% real discount rate). It quantifies discounted costs (foregone revenues, admin, financing) and benefits (employment, innovation proxies, taxes). The analysis yields a negative Net Present Value (NPV) of -16.7 B DZD and a Benefit-Cost Ratio (BCR) of 0.70, suggesting quantifiable costs outweigh benefits under these assumptions. High administrative costs and foregone revenues are key drivers; benefits rely heavily on employment projections. This baseline assessment highlights potential cost-effectiveness challenges and the need for probabilistic analysis.

Keywords: *Cost-Benefit Analysis (CBA), Startup Policy, Startups Algeria, Economic Diversification, Policy Evaluation*
JEL Codes: *H43, O38, L26, H25, O25*

Résumé
Les politiques algériennes post-2020 de soutien aux start-up visent la diversification économique. Cette Analyse Coûts-Bénéfices (ACB) déterministe les évalue sur 2020-2030 selon un Scénario Modéré (taux d'actualisation réel de 7%). Elle quantifie les coûts actualisés (manques à gagner fiscaux, frais administratifs, financement) et les bénéfices (emploi, proxies d'innovation, impôts). L'analyse aboutit à une Valeur Actuelle Nette (VAN) négative de -16,7 milliards DZD et un Ratio Bénéfices-Coûts (RBC) de 0,70, suggérant que les coûts quantifiables dépassent les bénéfices selon ces hypothèses. Les coûts administratifs élevés et les manques à gagner fiscaux sont des facteurs clés ; les bénéfices dépendent fortement des projections d'emploi. Cette évaluation de référence souligne des défis potentiels de coût-efficacité et le besoin d'une analyse probabiliste.

Mots-clés : *Analyse Coûts-Bénéfices (ACB), Politique de soutien aux start-up, Diversification économique, Évaluation des politiques publiques*
Codes JEL : *H43, O38, L26, H25, O25*

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Introduction

Algeria's economy has long sought diversification away from hydrocarbon dependency. Since 2020, a key strategy has been the active promotion of a national startup ecosystem through a series of targeted tax incentives, financing mechanisms, and institutional support structures. This strategy builds upon a legal framework developed over two decades, initially defining SMEs[1] and later establishing specific criteria and support mechanisms for them[2]. Key elements underpinning the current startup focus include the formal legal definition and labelling process for startups[3], the introduction of simplified joint-stock companies (SAS) suiTableau for startups[4], and the creation of a dedicated ministry[5] overseeing the knowledge economy, startups, and micro-enterprises. Supporting infrastructure includes frameworks for business incubators[6], technology parks[7], intellectual property protection[8], broader investment incentives[9], research promotion[10], and integration with higher education[11].

Building on that foundation, this research conducts a formal economic evaluation of these startup-oriented policies using a Cost-Benefit Analysis (CBA) framework. Specifically, this article presents a *deterministic* evaluation, focusing on a single 'Moderate Scenario' designed to represent the most plausible outcomes based on central estimates for key parameters. The analysis spans the period 2020-2030, evaluating the efficiency of the policy package from a societal perspective.

The key research questions addressed in this deterministic analysis are: 1) What are the estimated direct fiscal costs and other quantifiable economic costs associated with Algeria's startup support policies under moderate assumptions? 2) What are the estimated quantifiable economic benefits (e.g., employment, innovation proxies, tax revenues) generated by these policies under moderate assumptions? 3) Based on these moderate assumptions, do the discounted economic benefits justify the discounted economic costs over the 2020-2030 period? 4) What are the main drivers of costs and benefits in this baseline scenario?

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[1] Loi n° 01-18 du 12 décembre 2001 portant loi d'orientation sur la promotion de la Petite et Moyenne Entreprise.

[2] Loi n° 17-02 du 10 Janvier 2017 portant loi d'orientation sur le développement de la petite et moyenne entreprise.

[3] Décret exécutif n° 20-254 du 15 septembre 2020 portant création du comité national de labellisation des « Start-up », « Projet innovant » et « Incubateur ».

[4] Loi n° 22-09 du 5 mai 2022 modifiant et complétant l'ordonnance n° 75-59 du 26 septembre 1975 portant code de commerce.

[5] Established through Décret présidentiel n° 20-54 and n° 20-55; merged and reorganized via Décret présidentiel n° 22-305; attributions defined by Décret exécutif n° 23-107 and n° 23-108.

[6] Décret exécutif n° 03-78 du 1er mars 2003 fixant les conditions et modalités de création et de fonctionnement des pépinières d'entreprises.

[7] Décret exécutif n° 20-77 du 8 avril 2020 modifiant et complétant le décret exécutif n° 04-91 du 1er avril 2004 portant création, organisation et fonctionnement de l'Agence nationale de promotion et de développement des parcs technologiques.

[8] Ordonnance n° 03-07 du 19 juillet 2003 relative aux brevets d'invention; Ordonnance n° 03-06 du 19 juillet 2003 relative aux marques.

[9] Loi n° 22-18 du 24 juillet 2022 relative à l'investissement.

[10] Loi n° 15-21 du 30 décembre 2015 portant loi d'orientation sur la recherche scientifique et le développement technologique.

[11] Arrêté n° 1275 du 27 septembre 2022; Arrêté n° 025 du 5 janvier 2023.

The methodology employs standard CBA techniques, discounting future streams of costs and benefits to their present value (PV) at the beginning of 2020 using a 7% real discount rate. This deterministic evaluation provides a crucial baseline assessment of the policy package's economic performance, setting the stage for probabilistic subsequent analysis that explores the impact of parameter uncertainty.

1.- Theoretical Framework

The Cost-Benefit Analysis (CBA) framework used in this study draws upon several established economic theories that inform the evaluation of policies aimed at fostering innovation and entrepreneurship.

1.1.- Innovation Economics and Endogenous Growth Theory

Endogenous growth theory ((Romer, 1994); (Lucas, 1988)) posits that sustainable economic growth is driven by internal factors like technological innovation and human capital accumulation. Policies supporting innovative startups, as seen in Algeria, align with this view by attempting to stimulate knowledge creation and productivity gains, addressing potential market failures in innovation (Stiglitz, 2015). Evaluating the costs versus the benefits (including innovation proxies and productivity impacts) helps assess the policy's contribution to endogenous growth drivers.

1.2.- Entrepreneurial Ecosystem Theory

This perspective ((Isenberg, 2011); (Spigel, 2017)) views startup success as dependent on a complex network of factors (finance, talent, regulation, culture). Algeria's multi-pronged approach (tax breaks, funding, legal reforms) reflects an ecosystem strategy. The CBA framework attempts to capture the costs of building this ecosystem (administrative costs, financing) against the benefits generated by the startups operating within it (jobs, revenue, innovation).

1.3.- Resource-Based View of Entrepreneurship

Firms compete based on their unique resources and capabilities (Barney, 2001). Startups often face resource constraints. Government policies, such as tax exemptions (financial resources) and incubator support (human/knowledge resources), aim to alleviate these constraints. The CBA evaluates the cost of providing these resources against the economic value generated by the startups that leverage them.

1.4.- Public Finance and Optimal Taxation Theory

Optimal taxation theory (Mirrlees, 1971) guides the design of tax systems to maximize welfare while minimizing distortions. Tax incentives for startups represent "tax expenditures" – implicit government spending through the tax code. The CBA directly quantifies the cost of these expenditures (foregone revenue) and compares it to the intended benefits (e.g., increased economic activity, future tax revenues from successful firms), assessing their efficiency relative to alternative uses of public funds (Wilson, 1999).

1.5.- Institutional Economics

Formal rules (laws) and informal constraints (implementation practices) shape economic outcomes (North, 1990). The effectiveness of Algeria's startup policies depends not only on their design but also on the institutional capacity for implementation. While the CBA primarily measures financial flows, understanding the institutional context helps interpret the results, particularly the significant administrative costs and potential gaps between policy intent and outcomes.

1.6.- Economic Diversification Theory

For resource-dependent economies like Algeria, fostering non-resource sectors is crucial for stability and sustainable growth ((Gelb, 2010); (Cherif & Hasanov, 2014); (Sachs & Warner,

1995)) (Sachs & Warner, Natural Resources and Economic Development: The curse of natural resources, 2001). Startup support policies are a key tool in this strategy. The CBA assesses whether the costs of promoting these new ventures are justified by their contribution (quantified through proxies like job creation, value added, innovation) to the diversification goal within the analysis timeframe.

2.- Policy Context Under Evaluation

This economic evaluation focuses on the core package of tax incentives and financing mechanisms implemented by Algeria since 2020 specifically targeting labeled startups. The legal framework for these incentives has evolved significantly through successive Finance Laws. Initial comprehensive tax exemptions for corporate profit tax (IBS) and value-added tax (TVA) were introduced in 2020[12], alongside the creation of a dedicated support fund, the "Fonds d'appui et de développement de l'écosystème start-up"[13]. These exemptions were expanded shortly thereafter to include professional activity tax (TAP), global income tax (IRG), and single flat tax (IFU), and a special allocation account (n° 302-150) was established to finance various ecosystem support activities[14]. Subsequent finance laws formalized these exemptions, granting labeled startups exemptions from TAP and IRG/IBS for four years from obtaining the label, with a possible one-year extension upon renewal[15].

More recently, incentives have been added to promote R&D investment, open innovation collaborations between established companies and startups, exemptions on transfer fees for asset acquisition, and extended tax exemption periods for labeled business incubators from two to four years[16]. Key financing mechanisms include the public venture capital Algerian Startup Fund (ASF), the aforementioned Special Allocation Account (302-150), and support for the business incubator framework, which also received tax exemptions[17]. Additionally, a legal framework authorizing crowdfunding was established in 2023 to diversify funding sources[18]. Eligibility for these specific benefits hinges on obtaining the official "Startup" label according to criteria set by decree[19].

For the purpose of understanding the CBA parameters, the key policy elements being evaluated include:

- The "Startup Label": Granted by a National Committee based on criteria including innovation, age (max 8 years), size (max 250 employees), and growth potential (Executive Decree 20-254). This label is the gateway to accessing specific benefits.
- Tax Exemptions: Labeled startups benefit from significant exemptions, primarily:

[12] Loi n° 19-14 du 11 décembre 2019 portant loi de finances pour 2020, Art. 69.
[13] Loi n° 19-14 du 11 décembre 2019 portant loi de finances pour 2020, Art. 131.
[14] Loi n° 20-07 du 4 juin 2020 portant loi de finances complémentaire pour 2020.
[15] Loi n° 20-16 du 31 décembre 2020 portant loi de finances pour 2021; Loi n° 21-06 du 8 juin 2021 portant loi de finances complémentaire pour 2021; Loi n° 22-24 du 25 décembre 2022 portant loi de finances pour 2023.
[16] Loi n° 23-22 du 24 décembre 2023 portant loi de finances pour 2024; Loi n° 24-08 du 29 février 2024 modifiant et complétant la loi n° 23-22 du 24 décembre 2023 portant loi de finances pour 2024.
[17] for incubator tax exemption strengthening: Loi n° 21-06 du 8 juin 2021 portant loi de finances complémentaire pour 2021, Art. 87.
[18] Règlement COSOB n° 23-01 du 17 août 2023 relatif à l'activité de conseiller en investissement participatif (crowdfunding).
[19] Décret exécutif n° 20-254 du 15 septembre 2020 portant création du comité national de labellisation des « Start-up », « Projet innovant » et « Incubateur ».

- Corporate Profit Tax (IBS) exemption for 4 years, renewable for 1 year.
- Value Added Tax (VAT) exemption on commercial transactions.
- Professional Activity Tax (TAP) exemption (Note: TAP was abolished for all businesses from 2024, impacting the calculation).
- Potential exemptions from Global Income Tax (IRG) or Single Flat Tax (IFU) depending on the startup's structure and revenue.
- Exemptions from customs duties and import VAT on specific equipment acquired for startup activities.

The duration and scope of these exemptions directly inform the calculation of foregone fiscal revenue costs.

- Financing Mechanisms: Public funds are channeled to startups through several key mechanisms whose costs (outlays, administration) are included in the CBA:
  - Algerian Startup Fund (ASF): A public venture capital fund providing equity/quasi-equity financing (up to 150 million DZD per project).
  - Special Allocation Account (302-150): Dedicated budget line for ecosystem support activities (studies, prototyping, incubation).
  - Wilaya (Provincial) Investment Funds: Managed by entities like Finalb, providing capital contributions to SMEs/startups at the regional level.
- Loan Guarantees: While not a direct funding source, guarantees provided through mechanisms like the Fonds de Garantie des Crédits aux PME (FGAR) reduce risk for lenders and represent a contingent liability for the state, the expected cost of which is estimated in the CBA.

Other related policies (e.g., simplified company structures like SAS, intellectual property laws, educational initiatives) form the broader context but are not directly costed or benefit-quantified in this analysis, although they contribute to the overall ecosystem performance. The CBA focuses on the direct financial implications of the tax exemptions and dedicated funding/guarantee schemes for labeled startups.

3.- Methodology

3.1.- Cost-Benefit Analysis Approach

This study employs a Cost-Benefit Analysis (CBA) framework to evaluate the economic efficiency and overall value of Algeria's startup support policies initiated from 2020. CBA provides a systematic method for identifying, measuring, and comparing the costs and benefits associated with these policies over a defined period. To ensure comparability of flows occurring at different times, all monetary values are converted to their Present Value (PV) equivalent. The point for PV calculations is the beginning of 2020.

The core calculation involves discounting future costs and benefits back to their present value using the standard formula:

$$PV = \sum_{t=0}^{T} \frac{X_t}{(1+r)^t}$$

Where:

- PV represents the Present Value calculated at the start of 2020.
- X_t represents the real (inflation-adjusted) value of either costs (C_t) or benefits (B_t) occurring in year t.
- t is the time index in years, where $t = 0$ corresponds to the year 2020.

- T defines the time horizon of the analysis, extending to the end of 2030. Therefore, the summation runs for 11 periods (t=0 to t=10).
- r is the real discount rate applied to future values.

Discount Rate (r = 7%): For this deterministic baseline analysis, a real discount rate of 7% per annum is utilized. This rate reflects the time value of money and the estimated social opportunity cost of capital invested in the startup policies within the Algerian context. It is chosen based on considerations of typical returns on alternative public investments, international benchmarks for middle-income countries, and the inherent risk profile of innovation-focused projects (World Bank, 2016); (Gollier & Hammitt, 2014); (Abiad et al., 2015)). All cost and benefit streams are expressed in constant 2020 prices before discounting (OECD, 2018).

All monetary figures are presented primarily in Algerian Dinars (DZD), with approximate US Dollar (USD) equivalents provided for context using a exchange rate (e.g., 1 USD = 135 DZD).

Decision Criterion: The primary metric for assessment is the Net Present Value (NPV), calculated as:

$$NPV = PV(\text{Benefits}) - PV(\text{Costs}) = \sum_{t=0}^{T} \frac{B_t}{(1+r)^t} - \sum_{t=0}^{T} \frac{C_t}{(1+r)^t}$$

A positive NPV (NPV > 0) indicates that the projected economic benefits outweigh the costs in present value terms under the scenario's assumptions.

3.2.- Data Sources and Collection

This deterministic analysis relies on quantitative and qualitative data from official national sources and repuTableau international databases for the period 2015-2030 (historical and projected). Key sources include:

- **Fiscal Data:** Algerian Finance Laws (2020-2025) for budget allocations, tax incentive details, and official tax expenditure reports (Statement "H"); UNU-WIDER Government Revenue Dataset (UNU-WIDER, 2024) for fiscal context.
- **Macroeconomic Data:** World Bank Development Indicators (WDI) (World Bank, 2024) for GDP, labor market statistics (e.g., youth unemployment), economic structure, and digital infrastructure metrics; ONS Algeria (Office National des Statistiques, 2024) for complementary national data.
- **Innovation Metrics:** Global Innovation Index (GII) reports (WIPO, 2024) and (WIPO, 2024) for patent data; Scimago Journal Rank (Scimago Lab, 2024) for publication data; The Conference Board (The Conference Board 2024) for productivity data.
- **Startup Ecosystem Data:** Official figures on labeled startups from the Ministry of Knowledge Economy, Start-ups and Micro-enterprises; data from the Algerian Startup Fund (ASF) website; reports from regional ecosystem observers (e.g., MAGNiTT, Wamda).

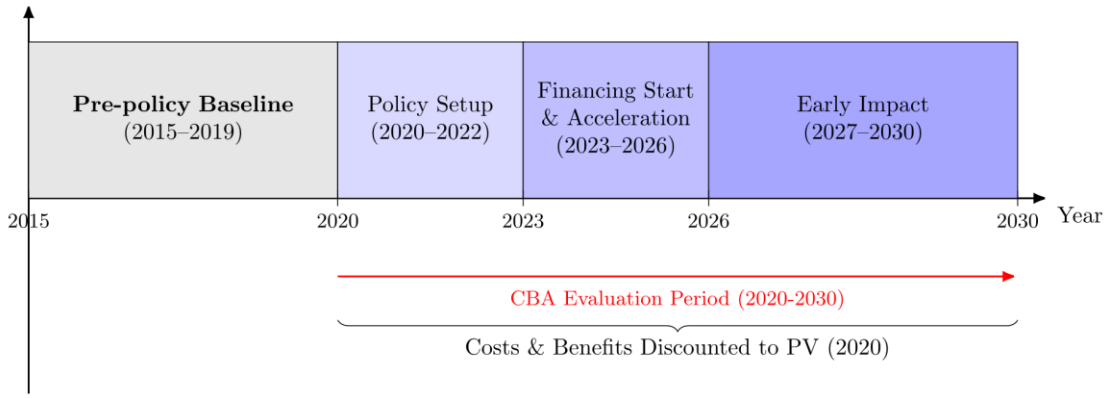
Data from 2015-2019 is used primarily to establish baseline trends or counterfactuals where applicable. The core CBA calculations use data and projections for 2020-2030.

3.3.- Timeframe Analysis

The analysis adheres to the following timeframes:

- **Pre-policy Baseline Period (2015-2019):** Used to establish historical trends and inform counterfactual projections (e.g., for patent growth). Costs/benefits from this period are excluded from the CBA calculation.
- **CBA Evaluation Period (2020-2030):** The core 11-year timeframe for identifying, quantifying, and evaluating all policy-related costs and benefits. All flows within this period are discounted to their PV at the start of 2020.

Figure 1: Defined Time Periods for Policy Evaluation



Source: author

This period covers the policy implementation phase and allows for observation of early to medium-term impacts as initial startup cohorts mature. refer to the appendices and Ensure the text description is robust.

3.4.- Analytical Approaches

This article focuses on a **Deterministic Base Case Scenario** evaluation.

- **CBA Framework:** The core methodology involves identifying, quantifying, monetizing, and discounting costs and benefits attribuTableau to the policies over 2020-2030, culminating in the NPV calculation (Section 4.1).
- **Deterministic Base Case Scenario:** This analysis uses a single set of 'Moderate' assumptions for all key parameters (startup entry rates, survival rates, financial performance, job creation, etc.). These assumptions represent central estimates based on available data and plausible projections, as detailed in subsequent sections. The results presented are specific to this scenario.
- **Counterfactual Estimation (Simplified):** Where necessary (e.g., for estimating policy-attribuTableau patent growth), a counterfactual baseline is projected using simplified time-series analysis (e.g., AR(1) model) based on pre-policy (2015-2019) trends.
- **Exclusion of Probabilistic Analysis:** The limitations of the deterministic approach and the need for probabilistic analysis are acknowledged.

3.5.- Cost and Benefit Components

The CBA identifies and quantifies the following major cost and benefit components under the Moderate Scenario.

Cost Components:

- *Direct Fiscal Costs:* Foregone revenue from tax exemptions (IBS, VAT, TAP until 2023, IRG/IFU) for labeled startups during their 5-year exemption period.

- *Indirect Fiscal Costs:* Foregone customs duties and import VAT on eligible equipment imported by exempt startups.
- *Administrative Costs:* Estimated overhead costs of managing the support ecosystem, derived from attributing portions of relevant ministry budgets (MKES, Ministry of Industry agencies).
- *Direct Financing Costs:* Outlays from public/quasi-public venture capital sources (ASF, Special Account 302-150, Wilaya Investment Funds) treated as costs in the year of disbursement.
- *Guarantee Costs:* Estimated expected losses from loan guarantees provided via FGAR to labeled startups, net of commissions.

Benefit Components:

- *Direct Employment Benefits:* Monetized value (based on estimated salary premium) of direct jobs created in active labeled startups.
- *Innovation Benefits (Proxy):* Monetized value of policy-attribuTableau patent applications, using an R&D cost proxy and a social spillover multiplier.
- *Economic Contribution Benefit (Proxy):* Estimated direct Value Added (VA) generated by labeled startups after they exit the tax exemption period.
- *Post-Exemption Tax Benefits:* Estimated tax revenue (IBS, VAT, IRG) collected from labeled startups after their 5-year exemption period ends.

Qualitative costs and benefits (e.g., ecosystem maturity, broader diversification impacts, displacement effects) provide context but are not included in the quantitative NPV calculation.

3.6.- Startup Cohort Projections (Moderate Scenario)

Estimating the number of active startups (A_t) is fundamental. This deterministic analysis uses only the **Moderate Scenario** parameters: the key survival rates (e.g., 70% after 1 year, declining to 20% after 5 years). refer to the appendices and ensure the rates are clearly stated in the main text.

New Entrants (N_y, Moderate): Number of newly labeled startups per year.

- 2020-2023: Derived from official cumulative data (100, 524, 278, 1398).
- 2024-2026: Assumed acceleration phase (1600, 1800, 1800).
- 2027-2030: Assumed maturation phase (1800 per year).

Active Startups (A_t, Moderate): Calculated using $A_t = \sum_{y=2020}^{t} \left(N_{y,\text{Mod}} \times S_{k=(t-y),\text{Mod}}\right)$. This yields the number of total active startups, exempt active startups ($A_{t,\text{exempt}}$, age 0-4), and tax-paying active startups ($A_{t,\text{taxpaying}}$, age 5+) used in the cost/benefit calculations. The specific annual values are presented in the Results section (Tableau 1).

Tableau 1: Adopted Startup Survival Rates (S_k)

Scenario	S_1 (1yr)	S_2 (2yr)	S_3 (3yr)	S_4 (4yr)	S_5 (5yr)	S_6 (6yr)	$S_{k\geq 7}$ (7+ yrs)
Moderate	70%	50%	35%	25%	20%	15%	10%

Note: Survival Rates (S_k, Moderate): The percentage of a cohort surviving after k years

Source: Own elaboration

3.7.- Parameter Estimation (Moderate Scenario)

The CBA calculations rely on central estimates for key operational parameters specific to the Moderate Scenario. These were derived using official data where available, supplemented by

secondary sources, regional benchmarks, and informed assumptions (detailed within the step-by-step calculations in Sections 5 and 6). Key parameters include:

- Average tax liability per exempt startup (by age/regime).
- Average import values and participation rates (by age).
- Administrative cost allocation percentages (e.g., 33% of MKES Promo budget).
- Average funding amounts and rates for VC/guarantees.
- Average jobs per active startup (e.g., 6 jobs).
- Average salary premium per job (e.g., 0.3 M DZD).
- Patent valuation proxies (e.g., 2.0 M DZD R&D cost, 2.0 spillover multiplier).
- Average Value Added per tax-paying startup (e.g., 4.0 M DZD).
- Average tax revenue per tax-paying startup (e.g., 1.80 M DZD).

The specific values and justifications are provided alongside their use in the Results sections.

3.8.- Limitations of Deterministic Analysis

This deterministic analysis, while providing a necessary baseline, has inherent limitations:

- **Single Point Estimate:** It yields a single NPV/BCR value based on one set of assumptions, ignoring the range of possible outcomes due to uncertainty.
- **Sensitivity to Assumptions:** The result is highly sensitive to the chosen central estimates for key parameters (e.g., survival rates, job creation, administrative costs). Small changes in these assumptions could significantly alter the outcome.
- **Data Gaps:** Reliance on proxies and benchmarks for parameters where specific Algerian data is lacking affects the reliability of the central estimates.
- **Ignoring Interactions:** It doesn't capture the combined effect of multiple parameters varying simultaneously.

These limitations highlight the necessity of the probabilistic analysis simulation to provide a more complete picture of the policy's potential economic performance and risk profile.

4. Analysis and Results

4.1.- Deterministic Cost Analysis (Moderate Scenario)

This section presents the step-by-step calculation of the estimated annual costs associated with Algeria's national startup support policies for the period 2020-2030, adhering strictly to the Deterministic Moderate Scenario defined in the methodology. All monetary values are initially calculated in nominal DZD unless stated otherwise.

4.1.1.- Number of Active Startups (Moderate Scenario)

The foundation is the number of active startups (A_t), exempt startups ($A_{t,\text{exempt}}$, age 0-4), and tax-paying startups ($A_{t,\text{taxpaying}}$, age 5+) based on Moderate Scenario assumptions (Section 4.6).

Tableau 2: Active Startups Breakdown (2020-2030)

Year	R_t	$A_{t,\text{exempt}}$	$A_{t,\text{taxpaying}}$	A_t (Total)
2020	100	100	0	100
2021	624	594	0	594
2022	902	695	0	695
2023	2300	1890	0	1890
2024	3900	2926	0	2926
2025	5700	3847	20	3867
2026	7500	4419	120	4539
2027	9300	4870	144	5014

2028	11100	4990	384	5374
2029	12900	5040	620	5660
2030	14700	5040	830	5870

Note: Calculated using Moderate Scenario N_y and S_k (Tableau 2). R_t = Cumulative registered. $A_{t,\text{exempt}}$ = Active age 0-4. $A_{t,\text{taxpaying}}$ = Active age 5+. A_t = Total active. Values rounded.

Source: Own elaboration

4.1.2.- Direct Fiscal Costs - Foregone Tax Revenue

This step quantifies foregone tax revenue from exempt startups ($A_{t,\text{exempt}}$) based on assumed financial profiles and tax rules (IBS, VAT, IRG/IFU, TAP until 2023). Average foregone tax per startup is calculated by age ($k = 0..4$), considering regime shifts (IFU vs. Standard).

Avg. Foregone Tax per Startup Age (Nominal DZD, Including TAP pre-2024):

- Age 0-2: 360,000 DZD (IFU regime, 3M DZD avg. turnover)
- Age 3: 640,770 DZD (Weighted: 85% IFU at 5M DZD, 15% Std at 10M DZD)
- Age 4: 681,540 DZD (Weighted: 70% IFU at 5M DZD, 30% Std at 10M DZD)

The TAP component (150,000 DZD for Standard Regime startups) is subtracted for ages 3 and 4 from 2024 onwards. Tableau 3 reports the total nominal foregone tax cost as approx. **13.5 Billion DZD**.

Tableau 3: Annual Nominal Foregone Tax Cost (2020-2030)

Year (t)	Pre-TAP Foregone Tax (Million DZD)	TAP Adjustment (Million DZD)	Final Foregone Tax Cost (Million DZD)
2020	36.0	0.0	36.0
2021	213.8	0.0	213.8
2022	250.2	0.0	250.2
2023	697.1	0.0	697.1
2024	1098.0	-5.3	1092.7
2025	1454.3	-8.1	1446.2
2026	1727.5	-14.1	1713.4
2027	1942.7	-28.3	1914.4
2028	2038.6	-32.2	2006.4
2029	2091.8	-34.4	2057.4
2030	2127.1	-34.4	2092.7
Total (Nominal)	**13677.1**	**-156.8**	**13520.3**

Note: Calculated based on $A_{t,\text{exempt}}$ breakdown by age and age-specific avg. foregone tax. TAP adjustment applied from 2024.

Source: Own elaboration

4.1.3.- Indirect Fiscal Costs - Foregone Customs Revenue

Estimates foregone customs duties and import VAT (combined 29% rate) based on assumed import participation rates and average import values (linked to ASF cap and startup age) for exempt startups ($A_{t,\text{exempt}}$ by age). Calculations in Tableau 4 conclude that total nominal foregone customs cost equals approx. **13.7 Billion DZD**.

Tableau 4: Annual Nominal Foregone Customs Cost (2020-2030)

Year (t)	Annual Cost (Million DZD	Year (t)	Annual Cost (Million DZD
2020	47.37	2026	1310.68
2021	281.83	2027	1862.37
2022	319.54	2028	1883.60
2023	836.36	2029	1885.78
2024	1606.03	2030	1885.78
2025	1803.79	**Total (Nominal)**	**13723.13**
Note: Calculated based on $A_{t,\text{exempt}}$ by age, age-specific import rates/values, and 29% duty+VAT rate.			

Source: Own elaboration

4.1.4.- Administrative Costs

Estimates overheads based on attributing portions of ministry budgets (MKES, Industry).

- MKES Costs: 33% of "Promotion" budget line + 100% of Admin budget (from Finance Laws 2023-25, projected 2026-30).
- Industry Agencies Costs: 1% of Ministry of Industry's total CP Budget (from Finance Laws, projected 2026-30).

(Detailed budget Tableaus omitted here for brevity, refer to original Section 5.4). Total Nominal Administrative Cost (2020-2030): approx. **77.4 B DZD**.

4.1.5.- Direct Financing Costs - Venture Capital Outlays

Estimates public VC outlays (ASF, Special Account, Wilaya Funds) using ASF activity as a proxy (approx. 3.6% funding rate applied to A_t) and an average investment size proxy (8.63 M DZD/project). Costs start from 2021. As shown in Tableau 5, the annual nominal direct financing cost sum up to approx. **11.3 B DZD**.

Tableau 5: Annual Nominal Direct Financing Cost (2020-2030)

Year (t)	Total Annual Cost (Million DZD)	Year (t)	Total Annual Cost (Million DZD)
2020	0.00	2026	1406.69
2021	181.23	2027	1553.40
2022	215.75	2028	1665.59
2023	586.84	2029	1751.89
2024	906.15	2030	1820.93
2025	1199.57	**Total (Nominal)**	**11287.90**
Note: Based on A_t, assumed funding rate (3.6%), and avg. funding (8.63 M DZD).			

Source: Own elaboration

4.1.6.- Guarantee Costs (FGAR)

Estimates net expected loss from FGAR guarantees for loans taken by exempt startups ($A_{t,\text{exempt}}$), based on assumed application/approval rates, EAD per loan (12 M DZD), PD (18%), LGD (100%), less commission (1%). Costs start from 2021. Tableau 6 shows a total nominal guarantee cost of approx. **11.2 Billion DZD**.

Tableau 6: Annual Nominal Guarantee Cost (2020-2030)

Year	Net Annual Cost (Million DZD)	Year	Net Annual Cost (Million DZD)
2020	0.00	2026	1444.32
2021	193.80	2027	1591.20
2022	226.44	2028	1629.96
2023	618.12	2029	1646.28
2024	956.76	2030	1646.28
2025	1256.64	**Total (Nominal)**	**11209.80**
Note: Based on $A_{t,\text{exempt}}$ and assumed guarantee parameters (PD=18%).			

Source: Own elaboration

4.1.7.- Real Costs using GDP Deflator

Nominal costs from Steps 2-6 are summed annually and converted to real costs (Base Year 2020) using Algeria's GDP deflator index (derived from historical data and Finance Law projections). Tableau 7 breaks down the calculations, in which total real cost (2020-2030) is estamtied at approx. **84.5 Billion DZD (2020 prices)**.

Tableau 7: Annual Real Costs using GDP Deflator (Base 2020=100)

Year (t)	**GDP Deflator Index**	**Real Cost** (M DZD)	**Year (t)**	**GDP Deflator Index**	**Real Cost (M DZD)**
2020	100.0	83.4	2026	152.8	10328.4
2021	115.9	812.2	2027	151.0	10999.1
2022	142.6	761.9	2028	153.0	11212.2
2023	143.8	9044.3	2029	155.1	11348.2
2024	145.1	10051.8	2030	157.2	11453.3
2025	148.0	8336.4		**Total (Real)**	**84531.2**
Note: Real Cost = Sum of nominal costs (Steps 2-6) / (GDP Deflator Index / 100). M DZD = Million DZD (constant 2020 prices).					

Source: Own contribution

4.1.8.- Present Value Calculation of Costs

The annual real costs (from Step 7) are discounted to their Present Value (PV) at the start of 2020 using the 7% real discount rate. The total tresent value of costs (PV_{Costs}) sumps up to approx. **54.8 Billion DZD**, as indicated in Tableau 8 below.

Tableau 8: Annual Present Value of Costs (7% Discount Rate)

Year (t)	**Total Annual Real Cost**	**Discount Factor**	**Present Value (PV) Cost**
2020	83.4	1.0000	83.4
2021	812.2	0.9346	758.9
2022	761.9	0.8734	665.5
2023	9044.3	0.8163	7383.0
2024	10051.8	0.7629	7668.4
2025	8336.4	0.7130	5943.8
2026	10328.4	0.6663	6881.9
2027	10999.1	0.6227	6849.2
2028	11212.2	0.5820	6525.5
2029	11348.2	0.5439	6172.5
2030	11453.3	0.5083	5822.4

Total (PV)	**54754.5 M DZD**
Note: PV Cost = Real Cost * Discount Factor. M DZD = Million DZD (constant 2020 prices).	

Source: Own contribution

4.1.9.- Summary of Deterministic Costs

The deterministic cost analysis under the Moderate Scenario yields the following aggregate costs displayed in Tableau 9:

Tableau 9: Aggregate Costs

Cost Metric	**Value** (M DZD)	**Equivalent** (M USD, approx.)
Total Nominal Cost	127190.4	942.2
Total Real Cost (Base 2020)	84531.2	626.2
Total PV of Real Costs (7% rate)	54754.5	405.6
Note: USD equivalents calculated using 1 USD = 135 DZD. PV=Present Value. M DZD = Million DZD. M USD = Million USD. Administrative costs are the largest driver.		

Source: Own elaboration

4.2.- Deterministic Benefit Analysis (Moderate Scenario)

This section estimates the quantifiable economic benefits generated by the startup support policies under the Moderate Scenario assumptions, consistent with the cost analysis (using A_t values from Tableau 1). Benefits are calculated annually in nominal DZD.

4.2.1.- Direct Employment Benefits

Estimates the value of direct jobs created in active startups (A_t), assuming 6 jobs per startup and an annual economic value (salary premium) of 0.3 M DZD per job. According to Tableau 10, total nominal employment benefit is approx. **65.8 Billion DZD**.

Tableau 10: Annual Nominal Employment Benefit

Year (t)	A_t	**Direct Jobs** ($A_t \times 6$)	**Nominal Benefit** (Million DZD)
2020	100	600	180.0
2021	594	3564	1069.2
2022	695	4170	1251.0
2023	1890	11340	3402.0
2024	2926	17556	5266.8
2025	3867	23202	6960.6
2026	4539	27234	8170.2
2027	5014	30084	9025.2
2028	5374	32244	9673.2
2029	5660	33960	10188.0
2030	5870	35220	10566.0
		Total (Nominal)	**65752.2**
Note: Based on A_t from Tableau 1, 6 jobs/startup, 0.3 Million DZD premium/job.			

Source: Own elaboration

4.2.2.- Innovation and Knowledge Economy Benefits (Patent Proxy)

Proxies innovation benefits by valuing policy-attribuTableau patent applications (difference between Moderate projection and counterfactual AR(1) trend). Assumes 2.0 M DZD R&D cost proxy per patent and a 2.0 social value multiplier, yielding 4.0 Million DZD nominal benefit per attribuTableau patent. Tableau 11 report a total nominal innovation benefit (Proxy) of approx. **13.3 Billion DZD**.

Tableau 11: Annual Nominal Innovation Benefit

Year (t)	**Attrib. Patents** ($\Delta Patents_t$)	**Nominal Annual Benefit** (Million DZD)
2020	45	180.0
2021	113	452.0
2022	157	628.0
2023	205	820.0
2024	256	1024.0
2025	308	1232.0
2026	358	1432.0
2027	404	1616.0
2028	450	1800.0
2029	494	1976.0
2030	535	2140.0
Total (Nominal)		**13300.0**
Note: Attrib. Patents = Moderate Projection - Counterfactual. Benefit = Attrib. Patents * 4.0		

Source: Own elaboration

4.2.3.- Economic Contribution Benefit (Value Added Proxy)

Estimates the direct economic contribution (Value Added) from startups surviving beyond their 5-year exemption ($A_{t,\text{taxpaying}}$), assuming an average nominal VA of 4.0 M DZD per startup per year. Tableau 12 displays total nominal economic contribution benefit equal to approx. **8.5 Billion DZD**.

Tableau 12: Annual Nominal Economic Contribution Benefit

Year (t)	$A_{t,\text{taxpaying}}$	**Nominal Benefit** (Million DZD)
2020-2024	0	0.0
2025	20	80.0
2026	120	480.0
2027	144	576.0
2028	384	1536.0
2029	620	2480.0
2030	830	3320.0
Total (Nominal)		**8472.0**
Note: Based on $A_{t,\text{taxpaying}}$ from Tableau 1 and 4.0 M DZD avg. VA/startup.		

Source: Own elaboration

4.2.4.- Post-Exemption Tax Benefits

Calculates estimated tax revenue (IBS, VAT, IRG) generated by tax-paying startups ($A_{t,\text{taxpaying}}$), assuming an average nominal tax payment of 1.80 M DZD per startup per year (based on 15M DZD turnover, 10% PBT margin, standard tax rules, TAP=0). According to Tableau 13, total nominal post-exemption tax benefit is approx. **3.8 B DZD**.

Tableau 13: Annual Nominal Post-Exemption Tax Benefit

Year (t)	$A_{t,\text{taxpaying}}$	**Nominal Benefit**	**Year (t)**	$A_{t,\text{taxpaying}}$	**Nominal Benefit**
2020-2024	0	0.0	2028	384	691.2
2025	20	36.0	2029	620	1116.0
2026	120	216.0	2030	830	1494.0

2027	144	259.2	**Total (Nominal)**	**3812.4**
Note: Based on $A_{t,\text{taxpaying}}$ from Tableau 1 and 1.80 M DZD avg. tax/startup. M DZD = Million DZD.				

Source: Own elaboration

4.2.5.- Real and Present Value of Total Benefits

Nominal benefits (Steps 1-4) are summed annually, deflated using the GDP deflator, and discounted at 7% real rate. The total real benefit, reported in Tableau 14, equals approx. **60.5 Billion DZD.**

Tableau 14: Annual Real Benefits (Using GDP Deflator)

Year (t)	**Real Benefit** (M DZD)	**Year (t)**	**Real Benefit** (M DZD)
2020	360.0	2026	6739.7
2021	1312.5	2027	7600.3
2022	1317.7	2028	8954.5
2023	2936.0	2029	10161.2
2024	4335.5	2030	11145.0
2025	5613.9	**Total (Real)**	**60476.3**
Note: Real Benefit = Sum of nominal benefits (Steps 1-4) / (GDP Deflator Index / 100). M DZD = Million DZD (constant 2020 prices).			

Source: Own contribution

4.2.6.- Present Value of Total Benefits

The value from discounting the total stream (38063.2 M DZD) is used for NPV/BCR calculation. Total Present Value of Benefits ($PV_{Benefits}$) is approx. **38.1 B DZD** as calculated in Tableau 15.

Tableau 15: Present Value of Total Benefits

Benefit Category	PV (M DZD)	Share (%)
Direct Employment	27864.7	73.2
Innovation Spillovers (Proxy)	5286.7	13.9
Economic Contribution (VA Proxy)	3199.2	8.4
Post-Exemption Tax Revenue	1438.2	3.8
Total PV Benefits (Sum of Categories)	**37788.8**	**99.3***
Total PV Benefits (Discounted Total Stream)	**38063.2**	**100.0**
Note: PV calculated by discounting respective real annual benefits at 7%. Base Year 2020. M DZD = Million DZD. *Sum of rounded category shares may not equal 100%. The value from discounting the total stream (38063.2 M DZD) is used for NPV/BCR calculation.		

Source: Own elaboration

4.2.7.- Summary of Deterministic Benefits

The deterministic analysis under the Moderate Scenario estimates the following aggregate benefits:

Tableau 16: Aggregate Benefits

Benefit Metric	**Value** (M DZD)	**Equivalent** (M USD, approx.)
Total Nominal Benefit	91336.6	676.6
Total Real Benefit (Base 2020)	60476.3	447.9
Total PV of Real Benefits (7% rate)	38063.2	282.0
Note: USD equivalents calculated using 1 USD = 135 DZD. PV=Present Value. M DZD = Million DZD. M USD = Million USD. Employment benefits are the largest driver.		

Source: Own elaboration

4.3.- Qualitative Costs and Benefits

Beyond the quantified metrics, several qualitative factors influence the overall assessment:

Qualitative Costs / Unquantified Negative Impacts:

- Wider opportunity costs (government focus/talent diversion).
- Potential displacement effects on existing businesses (general equilibrium).
- Societal costs of startup failure beyond guarantees.
- Administrative burden experienced by startups navigating the system.

Qualitative Benefits / Unquantified Positive Impacts:

- Broader innovation impacts (culture shift, knowledge diffusion beyond patents).
- Contribution to economic resilience and diversification narrative.
- Potential for FDI/VC attraction and enhanced international image.
- Formalization effects and contribution to rule of law.
- Consumer surplus from new products/services.
- Competition effects on incumbent firms.
- Enhanced human capital and entrepreneurial skills development.
- Ecosystem maturity (network effects, support infrastructure).
- Distributional impacts (regional development, youth/gender opportunities).
- Potential (but highly uncertain) future financial returns from public equity investments (ASF, Wilaya Funds).

These factors provide important context but are not included in the NPV calculation due to quantification challenges.

4.4.- Results of Deterministic Analysis

Comparing the Present Value (PV) of total benefits (B DZD) against the PV of total costs (B DZD) from the Moderate Scenario yields the following core metrics:

Tableau 17: Project Viability Metrics (NPV, BCR, ROI)

Metric	**Value** (M DZD)	**Equivalent** (M USD, approx.)
PV Total Costs	54754.5	405.6
PV Total Benefits	38063.2	282.0
Net Present Value (NPV)	-16691.3	-123.6
Benefit-Cost Ratio (BCR)	0.70	
Return on Investment (ROI)	-30.5%	
Note: Base Year 2020, 7% real discount rate. USD equivalents at 1 USD = 135 DZD. ROI = (BCR - 1) * 100%		

Source: Own elaboration

The deterministic CBA under the Moderate Scenario assumptions yields a negative NPV (-16.7 B DZD) and a BCR well below 1 (0.70). This indicates that, based on the quantifiable costs and benefits included in this model and timeframe, the startup support policies are not economically efficient from a societal perspective.

The Return on Investment (ROI), calculated using the Present Value figures, is approximately -30.5%. This negative ROI aligns with the negative NPV and the BCR being less than 1, indicating that the project's discounted costs outweigh its discounted benefits.

Key factors driving this result include:

- **High Costs:** Particularly the estimated administrative overheads (driven by budget allocation assumptions) and significant foregone fiscal revenues.
- **Benefit Scale:** While benefits are generated (dominated by employment projections), their total discounted value is insufficient to offset the estimated costs.

- **Assumptions & Proxies:** The result hinges on assumptions regarding job creation rates/value, patent valuation, VA contribution, and financial profiles, which carry inherent uncertainty.
- **Time Horizon & Exclusions:** The 2020-2030 timeframe may not capture longer-term benefits, and qualitative impacts are excluded from the NPV.

This deterministic result provides a critical baseline assessment. It suggests potential issues with cost-effectiveness under the modeled conditions, driven significantly by administrative cost estimations and reliance on employment benefit projections. However, it represents only one possible outcome. The limitations inherent in this single-scenario analysis (Section 4.8) necessitate a probabilistic approach to understand the impact of uncertainty and the likelihood of different outcomes.

4.5.- Sensitivity Analysis

4.5.1.- Analyzing Sensitivity to the MKES Budget Allocation Threshold

Given the large impact of administrative costs, particularly the 33% allocation from the MKES Promotion budget (PV = 31.8 B DZD), we calculate the threshold percentage needed for NPV to reach zero, holding all else constant.

Required Cost Reduction = $|-16.7$ B DZD $| = 16.7$ B DZD.

Max Allowable PV from MKES Promo Cost = $31.8 - 16.7 = 15.1$ B DZD.

Threshold Percentage $\approx (15.1/31.8) \times 33\% \approx 15.7\%$.

If less than 15.7% of the MKES Promotion budget were attribuTableau as a direct cost to these policies, the NPV (under Moderate Scenario assumptions) would become non-negative. This highlights the extreme sensitivity to this specific cost allocation assumption.

4.5.2.- Analyzing Sensitivity to the Discount Rate

The analysis was repeated using 5% and 9% real discount rates to test robustness.

Tableau 18: Discount Rate Sensitivity Assessment

Real Discount Rate (%)	**PV Costs** (M DZD)	**PV Benefits** (M DZD)	**NPV** (M DZD)	**BCR**
5%	61520.0	43792.8	-17727.2	0.71
7% (Baseline)	**54754.5**	**38063.2**	**-16691.3**	**0.70**
9%	49057.0	34016.8	-15040.2	0.69
Note: PV = Present Value (Base Year 2020 M DZD). NPV = Net Present Value. BCR = Benefit-Cost Ratio. M DZD = Million DZD.				

Source: Own elaboration

The NPV remains negative across the 5%-9% range, confirming that the unfavorable conclusion of the deterministic Moderate Scenario analysis is not solely dependent on the 7% baseline rate.

5.- Discussion

The deterministic Cost-Benefit Analysis, based on the Moderate Scenario assumptions, yields a negative Net Present Value (NPV) of approximately -16.7 Billion DZD and a Benefit-Cost Ratio (BCR) of 0.70. These results suggest that, based on the specific parameters, methodologies, and quantifiable impacts included in this deterministic model, the economic costs associated with Algeria's startup support policies from 2020-2030 outweigh the quantifiable economic benefits generated within the same timeframe.

Several factors contribute significantly to this outcome:

1. **High Estimated Costs:** The analysis identified substantial costs, particularly the estimated Administrative Costs derived from ministry budget allocations, which represent a very large component of the total PV of costs. The sensitivity analysis confirmed the outcome's dependence on this assumption. Foregone fiscal revenues are also significant cost drivers.
2. **Benefit Quantification Challenges:** While benefits were quantified, the total PV of Benefits (driven largely by employment projections based on specific assumptions) was insufficient to offset the high estimated costs. Proxies used for innovation and economic contribution also carry uncertainty.
3. **Time Horizon and Discounting:** The 11-year timeframe may not fully capture long-term benefits accruing beyond 2030, and the 7% discount rate gives less weight to future benefits.
4. **Exclusion of Qualitative Factors:** Important qualitative benefits (ecosystem maturity, diversification signals, cultural shifts) and potential financial returns from equity are not reflected in the NPV calculation.

It is crucial to interpret this deterministic result within the context of its underlying assumptions and limitations. The negative NPV signals potential concerns about cost-effectiveness under these specific conditions but does not definitively prove the policy is without merit, especially when considering strategic goals and unquantified benefits. It strongly underscores the importance of the probabilistic analysis to explore the impact of uncertainty across parameters and provide a more robust assessment of the policy's likely range of outcomes and risk profile.

Conclusion

This study presented a deterministic Cost-Benefit Analysis of Algeria's post-2020 startup support policies, focusing on a Moderate Scenario for the 2020-2030 period. The analysis indicates that under these central assumptions, the quantifiable economic costs (PV approx. 54.8 B DZD) exceed the quantifiable economic benefits (PV approx. 38.1 B DZD), resulting in a negative Net Present Value (NPV) of -16.7 B DZD and a Benefit-Cost Ratio (BCR) of 0.70.

This unfavorable baseline economic assessment is significantly influenced by high estimated administrative costs and the reliance on uncertain projections for employment benefits. While positive ecosystem activity is acknowledged, this deterministic evaluation raises questions about the cost-effectiveness of the current policy configuration within the analyzed timeframe. The findings highlight the need for careful consideration of policy design, implementation efficiency, and the assumptions underpinning benefit estimations. This deterministic result serves as a crucial point but must be interpreted cautiously due to inherent limitations and the exclusion of uncertainty. A comprehensive evaluation requires incorporating probabilistic analysis to assess the range of potential outcomes and associated risks, which could be the focus of subsequent research.

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