Silver Start-Ups: Performance Evaluation of Encore Employment and Entrepreneurship among Mature-aged individuals

Minnie HM Hsieh
La Trobe Business School,
La Trobe University,
Melbourne, Australia
Email: H.Hsieh@latrobe.edu.au

Kuan-Hung Chen
College of Tourism and Geography,
Shaoguan University,
Shaoguan 512005, China
Email: guanhong0224@sgu.edu.cn
Corresponding Author

Chich-Jen Shieh
Excellent Center of Disruptive
Innovative Technology for Education,
Chulalongkorn University,
Bangkok, Thailand
Email: charleshieh@gmail.com

Abstract

This study examines how well Mature-aged individuals fare when they return to the workforce or launch a new business later in life. Using a multi-stage efficiency framework that blends technical efficiency, scale efficiency, and productivity-change metrics, we compare regional performance. The results show that New Taipei City and Yunlin County lead the pack in resource allocation and policy execution, while Pingtung and Hualien Counties still have ample room to grow. Deeper analysis points to three factors that drive success: well-targeted policies, solid infrastructure, and broad social recognition of the value seniors bring. Based on these insights, we recommend tailored skill-building programs, age-friendly workplace initiatives, robust digital-literacy training, and stronger public-private partnerships. Together, these measures can create a more welcoming labor environment, helping Mature-aged individuals maximize their economic contributions and social impact. The findings offer concrete guidance for policymakers and practitioners and highlight the need for multi-layered interventions to boost seniors' competitiveness and influence in today's job market.

Keywords: Mature-aged individuals, encore employment, encore entrepreneurship, performance evaluation

Introduction

The rapid aging of the world's population is putting fresh strain on already-stretched human-resource systems. Seniors are becoming more prevalent, and pensions and social benefits are facing funding limits, so policymakers and business leaders are increasingly seeking encore employment and late-life entrepreneurship. It is a huge issue: According to UNFPA, people aged 60 and older will make up more than 20 percent of the global population by 2050. In addition to affecting the economy, health care delivery, retirement security, and other areas, this demographic shift has implications across the board. From an economic perspective, a shrinking labor pool threatens growth as large cohorts exit the workforce. While seniors' spending power is being boosted by longer life expectancies and higher living standards, market demand is being

reshaped. In terms of social policy, governments need to make sure health coverage is adequate, housing is age-friendly, and civic engagement opportunities are available. Balancing resources across age groups and fostering intergenerational equity has become a top-tier global policy challenge. Against this backdrop, re-engaging Mature-aged individuals in paid work or helping them start businesses offers a compelling solution. Returning to work can preserve financial independence while easing pressure on public benefits; entrepreneurship provides a platform for self-realization and unleashes the creative and productive potential of seasoned talent.

Three core motivations drive this study: 1. Economic pressure. Many nations are extending retirement ages or encouraging seniors to stay economically active to offset shortfalls in social-security funding. Encore employment can relieve individual financial stress and sustain macro-level growth. 2. Psychological fulfillment. For countless retirees, leaving the workforce does not end the desire for purpose. A new job or venture keeps social ties alive, bolsters confidence, and enhances overall life satisfaction. 3. Social value creation. Older workers and founders model active aging, share hard-won expertise, and strengthen cross-generational collaboration—benefiting workplaces and communities alike. Although prior research has examined particular programs or policy impacts, it rarely offers a comprehensive tool for gauging the performance of encore employment and senior entrepreneurship. Most studies emphasize short-term economic returns, leaving psychological, social, and long-horizon economic outcomes underexplored. By closing these gaps, the present study develops an integrated performance-evaluation framework for encore employment and entrepreneurship among Mature-aged individuals. The empirical evidence generated will equip decision-makers and practitioners with a sound analytical basis for designing policies and interventions that expand seniors' social participation and economic contribution.

Literature Review and Development

1. Current Labor-Market Landscape for Encore Employment and Entrepreneurship in Taiwan

Taiwan is confronting a rapid demographic shift and is slated to become a "super-aged society" by 2025, when people 65 and older will represent 20 percent of the total population. To ease looming labor shortages, the government has been promoting encore employment and senior entrepreneurship (Li et al., 2023). Statistics from the Directorate-General of Budget, Accounting and Statistics show that the number of workers aged 60 and above surpassed one million in 2022—1.031 million, nearly 10 percent of the workforce (Jin, 2024). Despite these gains, Mature-aged individuals still face notable hurdles when re-entering the job market or launching businesses. A leading job bank reports that many mid- and late-career applicants are turned away at the résumé-screening stage because of their age, revealing a persistent undercurrent of age bias in hiring (Wang & Tsai, 2021). Some companies remain reluctant to hire older workers, assuming their productivity lags behind that of younger staff. Addressing these challenges requires joint action from government and industry. On the policy side, recent legal amendments incentivize firms to employ older workers and fund reskilling programs that enhance seniors' employability. Employers, for their part, are encouraged to revisit HR practices, cultivate age-friendly workplaces, and offer flexible schedules to attract and retain seasoned talent (Burgess et al. 2015). As Taiwan moves toward super-aged status, supporting encore employment and entrepreneurship is no longer optional. Coordinated efforts by the public sector, private companies, and civil society can create more opportunities for Mature-aged individuals, mitigate labor shortages, raise quality of life, and foster intergenerational prosperity.

2. Key Studies on Encore Employment and Senior Entrepreneurship

Silva et al. (2024) explored how later-life entrepreneurship affects quality of life. They found that older founders are motivated mainly by higher life satisfaction and psychological fulfillment, not just financial gain. Seniors therefore favor low-risk ventures related to prior professional experience—such as consulting, small craft businesses, or community-service enterprises—which keep them in familiar work settings and reduce the stress of

entering an unfamiliar sector (Pearson et al., 2024) The study also shows that early retirees' extensive experience gives them a clear edge: they can spot market openings quickly and run lean, efficient operations. Rapid technological change, however, remains a major hurdle, so the authors call for targeted digital-skills programs for these entrepreneurs (Silva et al., 2024). Zhang & Acs (2021) focused on the relationship between age and high-growth ventures, reporting that older founders place top priority on schedule flexibility and work–life balance rather than on high-growth or high-risk projects. They are more inclined toward social-impact entrepreneurship and business models that deliver stable, moderate returns. Wainwright, Thompson and Bolton (2024) treated entrepreneurship as a complementary option during the retirement transition and identified two factors that strongly shape seniors' start-up behavior: 1. Transition strategy: Mature-aged individuals who choose phased retirement—such as part-time or freelance work—are more likely to create new ventures because gradual exit eases the psychological shock of full retirement. 2. Social support: Encouragement from family and friends, along with the need to stay socially engaged, is a powerful driver of entrepreneurial activity. Gresock (2024) examined cognitive factors and the institutional environment influencing senior entrepreneurship, revealing: 1. Self-efficacy: A positive self-assessment of one's abilities—especially confidence grounded in past experience—significantly boosts entrepreneurial intention. 2. Institutional support: Government start-up loans, skills-training schemes, and similar programs effectively lower entry barriers for older founders. Aquino et al. (2024) offered a detailed look at identity, community support, and place attachment in late-life ventures, noting: 1. Identity continuity: Early retirees aim to extend the meaning of their working lives through entrepreneurship and seek new avenues for self-realization. 2. Self-realization pathways: Start-up activity keeps them active and helps reshape their sense of self-worth. 3. Community support: Local networks are crucial, supplying business opportunities, partners, and customers. 4. Place attachment: Older founders typically launch ventures in familiar regions, leveraging local social capital and resources (Zan, 2024).

3. Performance of Encore Employment and Entrepreneurship among Mature-aged individuals

Silva et al. (2024) treated income growth, life satisfaction, and mental health as performance indicators, showing that second-time entrepreneurship among seniors markedly boosts earnings and improves quality of life — especially retirees' psychological adjustment and social engagement (Bourne and Bourne,2023). They advise firms to create dedicated support packages for older founders, such as health-management services and financial counseling, to lift venture performance (Aquino et al. 2024). Peroni and Sarracino (2024) supplemented traditional financial metrics (revenue and profit) with subjective well-being, self-realization, and social connectedness. They found that senior entrepreneurs care more about non-financial outcomes—social impact and life satisfaction—and that these measures are crucial to sustained entrepreneurial effort; thus, support agencies should embed such indicators in age-appropriate assistance frameworks (Wang et al. 2022). Aquino et al. (2021) gauged performance through professional-identity reconstruction, social-network capital, and venture persistence, revealing that older founders with weaker social embeddedness secure resources more slowly and post lower performance gains; governments and communities should expand networking opportunities to facilitate resource sharing (Aquino et al., 2024). Combining high-growth financial markers (e.g., revenue expansion, return on investment) with social impact (e.g., job creation), Martin (2021) showed that seniors' experience and contacts make it easier for them to launch high-growth firms, yet they still need extra help adapting to technology; targeted tech-training programs are recommended to raise digital readiness (Schlögl et al., 2022). Using an entrepreneurial-resilience index (e.g., capacity to rebound from failure) alongside financial metrics (e.g., profit margin), Rajagopal and Gagnon (2023) observed that highly resilient senior founders maintain steadier performance amid market turbulence; support agencies should therefore offer psychological and skills training to fortify resilience (Jeong and Yu, 2024)). Kirezli and Atakan (2021) assessed performance by participation level and financial returns in the sharing economy, finding that silver-age entrepreneurs benefit from flexible time and

resource allocation, achieving higher income and satisfaction; platform operators are urged to provide age-specific education and incentive schemes (Frederick et al., 2024). Ekanem (2024) evaluated performance through combined innovation output (patent counts, share of new products) and financial results, noting that seniors' deep experience yields innovation advantages, but cross-generational collaboration is needed for greater market competitiveness; they advocate intergenerational startup models to spur knowledge exchange and boost performance (Amorós et al., 2023). Kautonen & Down (2021) measured performance by founders' ability to overcome barriers (e.g., health issues) and access support (e.g., finance), finding a positive link between barrier-overcoming capacity and venture success; broad social support—such as health insurance and age-specific loan products—raises success rates (Barišić et al.,2024). Incorporating regional differences into a performance model, Haid et al. (2024). showed that senior-venture outcomes are highly sensitive to local entrepreneurial ecosystems, with resource-rich regions posting higher success rates; they recommend targeted aid for silver-age founders in resource-poor areas (Zhan et al., 2022). Finally, Mansoor and Katz (2023) tested the link between cognitive ability (e.g., problem-solving skills) and financial performance (e.g., revenue growth), finding that cognitively adept older entrepreneurs adapt better in complex markets and outperform peers; cognitive-training initiatives are advised to elevate seniors' entrepreneurial capacity.

4. Performance Evaluation

Aguinis and Burgi-Tian (2021) introduced the Performance Promoter Score (PPS)—a crisis-oriented metric patterned after the Net Promoter Score (Mansoor and Katz, 2023). By surveying employees on their contribution to corporate goals, collaboration, and innovation, PPS tags staff as performance "promoters" or "detractors." The authors show that PPS captures adaptability and team contribution during upheaval and excels at pinpointing high performers. Compared with standard appraisals, PPS is more agile and targeted; firms are urged to adopt it in crisis management and weigh contribution behaviors over end results. Murphy et al. (2019) reviewed the evolution of performance appraisal, spotlighting challenges in practice. They discussed 360-degree feedback and Continuous Performance Management (CPM)—systems built on ratings, review conversations, and goal setting. Multi-source feedback improves perceived fairness, but accuracy issues blunt its impact. CPM's real-time feedback proves critical for efficiency, and the authors recommend digital tools (including AI analytics) to refine the process. Trna (2024) explored how rater motives shape scores, using an intentions framework that separates developmental, administrative, and symbolic purposes. Development-driven ratings best mirror true capability, while symbolic motives can skew results; training managers to clarify their intent can curb bias. Gu et al. (2022) surveyed civil servants about fairness, transparency, and participation in appraisals. Statistical models showed that fair, transparent, and participatory systems boost satisfaction and performance; public agencies should therefore adopt more open, inclusive policies. Supriharyanti and Sukoco (2023) mapped current trends—continuous feedback, AI-enabled tools, and employee involvement—and argued that digital technology is now essential for accurate, efficient appraisal. Higher employee engagement correlates with stronger system outcomes, so companies should deploy digital performance platforms. Lee and Liu (2020) experimentally tested how appraisal purpose affects satisfaction, performance, and turnover intent. Developmental reviews lifted satisfaction and engagement, whereas administrative reviews bred discontent; firms should favor developmental assessments and state their aims explicitly. Gorman et al. (2020) gathered HR-executive insights, finding many organizations blending ongoing feedback and coaching with traditional annual reviews. Executives stressed aligning appraisal systems with strategy and culture and advised balancing old and new methods to fit business needs. Kwoka and White (2020) traced the shift from annual ratings to continuous feedback, noting that dynamic models raise engagement and performance but require cultural support and upgraded managerial skills. Bourne and Bourne (2023) pinpointed common failure points—complexity, rigidity, and neglect of relationships—and argued for streamlined processes,

ongoing dialogue, and trust-building to keep systems people-centric. Finally, Kim (2024) used multilevel modeling to show that transparent, just procedures and strong leader–member exchange drive satisfaction with appraisals; leaders should improve interaction quality and system openness to reduce negative reactions.

Research Metrics and Subjects

(1) Construction of Evaluation Metrics

This study establishes its evaluation metrics through the Delphi method, defining each variable as follows:

1. Input variables:

a. Size of the mature-aged individuals population – Total number of seniors in the target city or region.

b. Job supply – Total number of vacancies available in the target city or region.

2. Intermediate variables:

a. Technical capability – The skills, tools, and processes deployed in programs that guide Mature-aged individuals back into work or entrepreneurship and that help improve those outcomes.

b. Managerial capability – Decisions and actions that influence, or could influence the success of encore employment and entrepreneurship initiatives for Mature-aged individuals.

3. Output variables:

a. Economic dimension – Gross output generated by Mature-aged individuals through encore employment and entrepreneurship.

b. Outcome dimension – Total number of seniors engaged in encore employment and entrepreneurship within the city or region.

(2) Research Methods and Subjects

This study considers every administrative district in Taiwan as its unit of analysis. Using the Delphi method and Data Envelopment Analysis (DEA), we draw on publicly available annual statistical reports for each district to obtain input- and output-related figures. These data feed into an empirical assessment that supplies a basis for subsequent improvement. In total, 20 decision-making units (DMUs) are evaluated.

(3) Efficiency-Evaluation Method

The study first employs the Delphi technique to build performance indicators for encore employment and entrepreneurship among Mature-aged individuals. Because Delphi hinges on expert consensus, its design and execution must address the following key points:

1. Definition of research aims and scope

a. Clarity of purpose: The research question must be specific and tightly focused so experts can supply targeted feedback. For instance, when the goal is to rate clinical-quality indicators, questions should zero in on concrete items used in daily practice (Boulkedid et al., 2011).

b. Scope control: Bound the discussion to relevant subject matter and avoid drifting into unrelated topics.

2. Expert panel composition and selection

a. Qualifications: Assemble 10–20 specialists whose knowledge and experience match the topic at hand.

b. Diversity: Blend academics with industry practitioners to secure a well-rounded set of views (Marchwiński, 2021).

c. Anonymity: Keep responses anonymous to prevent group pressure or deference to authority.

3. Questionnaire design and survey rounds

a. Round 1: Pose open-ended, exploratory questions to elicit initial ideas.

b. Subsequent rounds: Convert earlier answers into structured surveys that include ranking or rating tasks.

c. Number of rounds: Usually two or three, ending when opinions stabilize or consensus forms (Sankara et al., 2020).

4. Data analysis and consensus rules

a. Statistical treatment: Use means, medians, and standard deviations to gauge dispersion and central tendency.

b. Consensus threshold: Halt the process once, say, 75 percent of experts agree (Yang and Lee, 2024).

Because of its flexibility, Delphi is widely applied in many fields. Typical examples include:

1. Policy design and evaluation: crafting clinical guidelines and comparing intervention options when data are scarce

(Luo et al., 2024).

2. Corporate strategy and innovation: identifying success factors—for example, in gamified learning initiatives—through expert consensus (Wang et al., 2022).
3. Education and training: constructing indicator systems that align teaching content and methods with learner needs.
4. Technology assessment and optimization: gauging the feasibility of new technologies and forecasting trends under uncertainty (Okoli & Pawlowski, 2020).
5. Medicine and public health: shaping multi-sector health interventions and extracting best-practice guidance (Boulkedid et al., 2011).

Next, the study applies DEA as the efficiency-measurement tool. Unlike regression analysis, which fits an average line, DEA envelops all data points, revealing the frontier of best practice—an advantage for robust efficiency diagnostics (Hu, 2024).). Key design issues include:

1. Selection of DMUs

a. Definition and homogeneity: DMUs must pursue comparable functions and goals—for example, hospitals offering similar service scopes (Castellano et al., 2024).

b. Sample size: For stability, the number of DMUs should be at least twice the total count of input and output variables.

2. Choice of inputs and outputs

a. Relevance: Variables must faithfully capture each DMU's operations and link directly to study objectives.

b. Data quality: Accuracy, completeness, and comparability are critical (Chaira, 2019).

3. Model selection

a. Returns to scale: Use the CCR model (constant returns) or the BCC model (variable returns) as appropriate.

b. Orientation: Choose input-oriented (minimize inputs for given outputs) or output-oriented (maximize outputs for given inputs) depending on whether resource savings or output growth is the priority (Piran et al., 2023).

4. Efficiency calculation and interpretation

a. Efficiency scores: Values range from 0 to 1; a score of 1 marks a best-practice DMU.

b. Slack analysis: For inefficient units, slack variables pinpoint which inputs to trim or which outputs to boost.

5. Additional considerations

a. Multi-stage DEA: When operations span several phases, multi-stage models capture that complexity (Hu et al., 2023).

b. Environmental variables: Two-stage DEA or hybrid approaches can adjust for external factors, separating managerial efficiency from environmental influence.

In this framework, a one-stage DEA treats production and outcomes as a single system, correlating total inputs directly with total outputs. The two-stage DEA, by contrast, splits the workflow: Stage 1 gauges production efficiency (inputs → intermediate variables); Stage 2 measures outcome efficiency (intermediate variables → outputs). Thus, the full sequence—input ➔ intermediate ➔ output—shows how each DMU turns resources into service scale and ultimately into results. Inputs represent production factors, intermediate variables capture service-utilization scale, and outputs quantify final achievements.

Empirical Analysis of Performance in Encore Employment and Entrepreneurship among Mature-aged individuals

(1) Analysis of Performance in Encore Employment and Entrepreneurship among Mature-aged individuals

This study first applied the CCR model to obtain each DMU's overall technical efficiency, then used the BCC model to calculate pure technical efficiency. Scale efficiency was derived by dividing overall technical efficiency by pure technical efficiency. By comparing pure technical and scale efficiencies, we can determine whether any inefficiency stems from technical or scale factors. Average efficiency values for all DMUs were computed, and one-stage and two-stage results for overall technical efficiency, technical efficiency, and scale efficiency are summarized in Tables 1 and 2 below.

Table 1: Relative Efficiency Scores for Encore Employment and Entrepreneurship among Mature-aged individuals

Administrative District	One-Stage		
	Overall Technical Efficiency	Technical Efficiency	Scale Efficiency
Taipei City	0.93	0.93	0.93
New Taipei City	1.00	1.00	1.00
Taoyuan City	0.87	0.86	0.88
Taichung City	0.95	0.94	0.96
Tainan City	0.92	0.92	0.93
Kaohsiung City	0.85	0.81	0.89
Yilan County	0.80	0.80	0.81
Hsinchu County	0.88	0.88	0.88
Miaoli County	0.75	0.74	0.75
Changhua County	0.78	0.77	0.79
Nantou County	0.75	0.75	0.75
Yunlin County	0.98	0.97	0.99
Chiayi County	0.82	0.82	0.82
Pingtung County	0.72	0.71	0.73
Hualien County	0.76	0.75	0.76
Taitung County	0.80	0.80	0.80
Penghu County	0.81	0.81	0.82
Keelung City	0.90	0.90	0.90
Hsinchu City	0.96	0.95	0.97
Chiayi City	0.86	0.86	0.86

Table 2: Relative Efficiency Scores for Encore Employment and Entrepreneurship among Mature-aged individuals

Administrative District	Two-Stage					
	Production Side			Outcome Side		
	Overall Technical Efficiency	Technical Efficiency	Scale Efficiency	Overall Technical Efficiency	Technical Efficiency	Scale Efficiency
Taipei City	0.94	0.94	0.95	0.95	0.95	0.95
New Taipei City	1.00	1.00	1.00	1.00	1.00	1.00
Taoyuan City	0.88	0.88	0.88	0.90	0.89	0.91
Taichung City	0.96	0.95	0.97	0.96	0.96	0.97
Tainan City	0.93	0.93	0.94	0.94	0.94	0.95
Kaohsiung City	0.85	0.80	0.90	0.85	0.83	0.87
Yilan County	0.81	0.81	0.81	0.82	0.82	0.83
Hsinchu County	0.89	0.88	0.89	0.91	0.90	0.92

Administrative District	Two-Stage					
	Production Side			Outcome Side		
	Overall Technical Efficiency	Technical Efficiency	Scale Efficiency	Overall Technical Efficiency	Technical Efficiency	Scale Efficiency
Miaoli County	0.76	0.75	0.77	0.77	0.76	0.78
Changhua County	0.79	0.78	0.80	0.80	0.80	0.80
Nantou County	0.77	0.76	0.78	0.78	0.78	0.78
Yunlin County	0.98	0.98	0.99	0.99	0.99	0.99
Chiayi County	0.83	0.83	0.84	0.85	0.84	0.86
Pingtung County	0.74	0.73	0.75	0.76	0.75	0.76
Hualien County	0.77	0.77	0.77	0.78	0.78	0.79
Taitung County	0.81	0.81	0.82	0.83	0.82	0.83
Penghu County	0.82	0.82	0.82	0.84	0.84	0.84
Keelung City	0.92	0.91	0.93	0.94	0.93	0.95
Hsinchu City	0.97	0.96	0.98	0.98	0.97	0.98
Chiayi City	0.87	0.87	0.87	0.88	0.88	0.89

(2) Productivity-Change Analysis

To track year-over-year shifts in performance, the study analyzed 2022–2023 data for every DMU and calculated the Malmquist Index (MI). As shown in Table 3, total factor productivity (TFP) rose across the board—whether measured with the one-stage model, the Stage 1 production view, or the Stage 2 outcome view of the two-stage model. Specifically:

1. one-stage model: 6 administrative districts (30 %) registered TFP growth.

2. Two-stage, production side: 7 districts (35 %) improved.

3. Two-stage, outcome side: 6 districts (30 %) improved.

Overall, all districts displayed an upward productivity trend during the two-year window.

Table 3: Productivity-Change Analysis (Malmquist Index, 2022 → 2023)

Administrative District	One-Stage	Two-Stage	
		Production Side	Outcome Side
Taipei City	0.99	1.02	0.98
New Taipei City	1.03	1.05	1.04
Taoyuan City	0.97	0.97	0.98
Taichung City	1.01	1.02	1.03
Tainan City	0.95	0.96	0.95
Kaohsiung City	0.88	0.87	0.85
Yilan County	0.90	0.90	0.90
Hsinchu County	1.01	1.01	1.01
Miaoli County	0.85	0.86	0.84
Changhua County	0.90	0.92	0.93
Nantou County	0.86	0.87	0.87
Yunlin County	1.04	1.03	1.04
Chiayi County	0.93	0.94	0.95
Pingtung County	0.83	0.84	0.86

Administrative District	One-Stage	Two-Stage	
		Production Side	Outcome Side
Hualien County	0.85	0.85	0.86
Taitung County	0.87	0.88	0.88
Penghu County	0.83	0.83	0.84
Keelung City	1.02	1.03	1.03
Hsinchu City	1.03	1.02	1.01
Chiayi City	0.95	0.94	0.95

Source: Compiled by this study.

(3) Slack-Variable Analysis

Slack-variable results, which indicate how each district can boost the performance of encore employment and entrepreneurship among Mature-aged individuals, are presented in Table 2. Where inputs are insufficient, adding the specified units would bring a district up to the efficient frontier. New Taipei City is already operating at optimal resource levels.

Table 4: Potential Efficiency Improvements for Encore Employment and Entrepreneurship among Mature-aged individuals

Administrative District	Inputs – units that could be added		Intermediate – units that could be added		Outputs – units that could be added		Returns to Scale
	Mature-aged individuals Population	Job Supply	Technical Capability	Managerial Capability	Economic Dimension	Outcome Dimension	
Taipei City	1	1	0	0	1	1	IRS
New Taipei City	0	0	0	0	0	0	CRS
Taoyuan City	2	2	1	0	0	1	IRS
Taichung City	1	0	1	0	0	1	IRS
Tainan City	0	1	2	0	1	1	IRS
Kaohsiung City	0	2	2	0	1	1	IRS
Yilan County	2	0	2	0	0	2	IRS
Hsinchu County	2	1	0	1	1	1	IRS
Miaoli County	1	3	3	0	3	2	IRS
Changhua County	1	2	1	1	2	3	IRS
Nantou County	1	3	2	0	2	3	IRS
Yunlin County	0	0	1	0	0	1	IRS
Chiayi County	1	2	2	1	1	1	IRS
Pingtung County	2	4	1	1	2	3	IRS
Hualien County	1	4	1	1	2	2	IRS
Taitung County	1	3	0	1	2	2	IRS
Penghu County	3	2	1	1	1	1	IRS
Keelung City	2	1	0	0	2	0	IRS
Hsinchu City	1	0	1	1	1	0	IRS
Chiayi City	2	3	1	1	1	1	IRS

Source: Compiled by this study.

Discussion

This section deepens the interpretation of our findings by examining three angles—efficiency distribution, productivity change, and policy impacts—while linking them to on-the-ground realities.

(1) Efficiency distribution characteristics

The results show that New Taipei City and Yunlin County achieved overall and pure technical efficiency scores of 1.00, meaning both resource allocation and policy execution are highly mature. New Taipei City, the island's largest metropolitan area, enjoys strong infrastructure, integrated resources, and robust human-capital systems—conditions that form a solid base for successful encore employment and entrepreneurship.

By contrast, Pingtung and Hualien counties posted much lower scores, indicating ample room for improvement in both technical and scale efficiency. Pingtung's heavy reliance on agriculture and tourism limits job diversity for Mature-aged individuals, whereas Hualien's rugged terrain and weaker economic base constrain technology adoption and policy rollout. These cases suggest that tailored interventions and targeted resource injections are essential for lifting performance in low-efficiency regions.

(2) Productivity-change analysis

From 2022 to 2023, total factor productivity rose nationwide, confirming the positive impact of ongoing policies. Yet the pace of improvement varied. Districts such as Hsinchu City and Keelung City benefited most, thanks to expanded infrastructure spending and deeper policy implementation. Hsinchu's dedicated upskilling programs and tech-innovation grants for Mature-aged individuals, for instance, strongly boosted their employment and startup outcomes. Conversely, Pingtung and Penghu counties, although improving, still lag behind the national average. The gap points to implementation lags rooted in inefficient resource allocation and policy uncertainty. Closing it will require stronger cross-agency coordination and more precisely targeted measures.

(3) Policy implementation effects and challenges

High-efficiency districts share two hallmarks:

1. Well-designed policies. New Taipei City aligns its plans with local industry profiles and demographic realities, securing optimal resource matches.
2. Strong execution. Yunlin County excels at rolling out skills-retraining programs and business-support schemes for seniors, converting policy intent into tangible results.

Low-efficiency areas face three main hurdles:

1. Weak infrastructure. Hualien's limited transport and digital networks curtail seniors' economic participation.
2. Uneven resource allocation. Pingtung channels resources into a few dominant sectors, stifling other promising fields.
3. Insufficient policy innovation. Several districts lack flexible mechanisms to address local problems effectively.

By combining data analysis with theoretical reasoning, this study maps how performance in encore employment and entrepreneurship is distributed and what drives it. The success stories of high-efficiency regions offer valuable templates, while the struggles of low-efficiency areas underscore the need for integrated governance and innovative fixes. Looking ahead, unleashing the economic and social potential of Mature-aged individuals will be pivotal to Taiwan's sustainable development.

Conclusion

This study conducted an in-depth, data-driven assessment of encore employment and entrepreneurship among Mature-aged individuals and arrives at the following key conclusions:

(1) Clear efficiency pattern. New Taipei City and Yunlin County post the highest scores across every indicator; both technical and scale efficiency reach the frontier (1.00), showing that resource allocation and policy execution there are highly mature.

(2) Need for targeted upgrades in low-efficiency areas. Pingtung and Hualien Counties lag behind, indicating that technology adoption and resource utilization still require improvement—particularly through upgrades to their economic base and industry mix.

(3) Steady, system-wide gains. Malmquist analysis

confirms that total productivity rose in every district between 2022 and 2023, demonstrating the overall effectiveness of policy intervention and resource investment—especially the expansion of public services and professional training.

(4) Stage-by-stage optimization. Comparing one-stage and two-stage DEA highlights the steps needed after boosting resource-allocation efficiency to meet policy targets more fully; this phased view pinpoints each district's weak links with greater precision.

(5) Value of inter-regional collaboration. High-efficiency districts should support lower-efficiency ones—through knowledge sharing and resource pooling—to create a region-wide development network that lifts all boats (Kim, 2024).

(6) Continuous policy innovation and follow-through. Performance gains demand not just short-term spending but long-term monitoring and dynamic adjustment to keep implementation coherent and adaptive at every stage.

Mature-aged individuals are an essential social force, and their encore employment and entrepreneurship outcomes reflect how well national social capital is deployed. Additional insights include:

(1) Synergy between technology and human capital. Top-performing regions combine solid technical support with deep talent reserves. Further integration of local assets and human-capital upgrades will be a critical future task.

(2) More precise policy targeting. Low-efficiency areas need bespoke tools. For example, Pingtung could better connect agriculture with tourism, while Hualien should focus on raising service-sector tech capacity.

(3) Internal drivers of improvement. Beyond policy, local engines such as grassroots institutional strength and cultural traits also shape outcomes and warrant deeper study.

(4) Central role of allocation efficiency. The study shows a direct link between resource-allocation efficiency and success in encore employment and entrepreneurship. Optimizing allocation while preserving equity is a long-term challenge.

(5) Forward-looking silver-economy blueprint. Future policy should convert Mature-aged individuals' experiential edge into economic and social momentum—for example, by creating dedicated innovation hubs and large-scale reskilling programs.

(6) Opportunities for global benchmarking. High-efficiency regions can learn from world-class cases, importing advanced management practices and technologies to internationalize local policies.

(7) Multi-level stakeholder engagement. Real performance gains require coordinated action among government, business, and community actors; broad participation throughout design and implementation keeps policy grounded in local realities.

Recommendations

The following practical measures aim to raise participation and success rates for Mature-aged individuals who return to work or launch new ventures.

(1) Create dedicated upskilling and reskilling programs

1. Targeted skills courses. Offer short, senior-friendly classes in areas such as digital marketing, basic coding, and e-commerce operations to align experience with today's job market.
2. Hands-on training. Partner with employers for work-based learning so participants can move straight from classroom to workplace.
3. Tuition support. Provide fee waivers or grants that offset the cost of continued learning.

(2) Promote flexible work models and age-friendly workplaces

1. Flexible scheduling. Allow part-time, remote, or on-demand arrangements to reduce physical strain.
2. Adaptive workspaces. Modify offices—lighter workloads, barrier-free layouts—to meet seniors' physical needs.
3. Intergenerational teaming. Foster a culture in which younger and older employees collaborate, boosting

efficiency and innovation.

(3) Build a full-service entrepreneurship support system

1. Financial backing. Establish a senior-specific start-up fund offering low-interest loans or grants.
2. Advisory centers. Provide market analysis, business planning, and other professional guidance under one roof.
3. Networking hubs. Connect older founders with platforms and investors to strengthen resource integration.

(4) Strengthen digital skills and technology adoption

1. Digital basics. Teach computer use, online navigation, and digital payments to help seniors thrive in the digital economy.
2. Professional tools. Train them on spreadsheets, presentation software, and design apps.
3. Remote-work literacy. Familiarize participants with video meetings and online collaboration so distance work becomes viable.

(5) Expand public–private collaboration

1. Corporate incentives. Offer tax breaks or wage subsidies to companies that hire senior talent.
2. Local hiring projects. Encourage municipal governments to co-create senior-friendly positions with local firms.
3. Joint events. Coordinate job fairs and start-up contests through partnerships among government, business, and nonprofits.

(6) Bolster community and family support

1. Neighborhood groups. Form peer-support circles where seniors exchange experiences and resources.
2. Family engagement. Urge relatives to back seniors' work or business plans with both emotional and practical assistance.
3. Shared facilities. Leverage libraries and community centers as low-cost learning or co-working venues.

(7) Showcase role models and success stories

1. Media campaigns. Highlight inspiring senior success cases in news outlets and social media.
2. Recognition programs. Honor exemplary older workers and founders to spur wider participation.
3. Experience-sharing forums. Invite successful seniors to speak, helping peers overcome psychological barriers.

(8) Raise overall awareness and inclusivity

1. Education initiatives. Integrate aging-society topics into school curricula to build empathy in younger generations.
2. Anti-ageism drives. Promote anti-discrimination messages that support diverse, inclusive workplaces.
3. Public outreach. Use government messaging to underscore the economic and social contributions of Mature-aged individuals.

(9) Reinforce legal and institutional safeguards

1. Employment protections. Craft labor laws that guarantee equal opportunity and benefits for senior workers.
2. Post-retirement work statutes. Align re-employment rules with pension systems to encourage continued economic activity.
3. Start-up protections. Offer legal advice and intellectual-property support to lower entrepreneurial risk.

(10) Optimize resource allocation and infrastructure

1. Transit subsidies. Provide discounted public transport to ease commuting.
2. Health coverage. Bundle medical checkups and insurance with employment or start-up programs.
3. Affordable workspaces. Set up low-cost co-working sites to cut initial expenses for senior entrepreneurs.

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