

Article

Urban Ageing Welfare Leaking and Remedy Strategies in Macau

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Abstract: The world is experiencing population ageing, which will extend to the future across the world. The ageing population is sure to impact a country's welfare policy and economy. Macau is a special administrative region (SAR) of China with a long-life expectancy and a decreasing reproduction rate, making the population ageing particularly obvious. This study adopts a mixed methods approach to analyze the relationship between the ageing population, pension recipients, and pension payments to suggest the pension system and welfare leaking strategies of Macau SAR. The Granger causality test and focus group were conducted to test and discuss the ageing population, pension recipients, and pension payments. Results show that the ageing population positively affects pension payments. The ageing recipients are not corresponding to the ageing population and payments show welfare leakage. Suggestions are offered accordingly for a welfare policy to offer remedy strategies and reform the pension system.

Keywords: older adults; urban ageing population; pension security system; Macau

1. Introduction

Population ageing has become a primary issue in almost all countries. The Macau Special Administrative Region (Macau SAR) has a small land area but the population has a long life expectancy and a low fertility rate, which gives it a firm ageing profile [1] with adverse social and economic effects. According to statistics, the population of this region has increased by 23.5% in 2021 compared with 2011, and the elderly population aged 65 and above has increased by 107.2% compared with 15% by 2011 [2]. Population ageing has become a serious social problem in this region that needs to be solved urgently. Although almost all countries in the world have taken various measures to solve the problems caused by population ageing, such as issuing pensions and building nursing homes, we do not know the ageing welfare leaking and policy to deal with the ageing society. Therefore, it is necessary to take a region as an example to examine the deficiencies of pension policies from the perspective of the historical development of the pension system, and suggestions for resolutions are put forward on this basis to deal with the social and economic problems associated with an ageing population.

According to data from the Statistics and Census Bureau (Direcção dos Serviços de Estatística e Censos, DSEC), the overall population of Macau has been ageing since the 1990s. Older adults have made up an ever-growing proportion of the population, remaining above 7% for a long time (see Figure 1) [3]. In detail, DSEC's demographic data (as shown in Table 1) shows that Macau's total population in the third quarter of 2020 was 682,800. Of these, 81,200 people were defined as older adults (≥ 65 years old), accounting for 11.9% of the total population and thus reaching the standard for an ageing society (in which the older adult population accounts for 7% or more of the total population). The dependency ratio of the older adult population was 15.8%, meaning that there were 15.8 older adults needing support for every 100 adults. There is increasing pressure on the older adults' welfare system [3]. The demographic data show that the number of older adults in Macau



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and the proportion of the older adult population are increasing, as indicated in Figure 1. Lifespans are more prolonged than before, placing a heavier burden on social support.

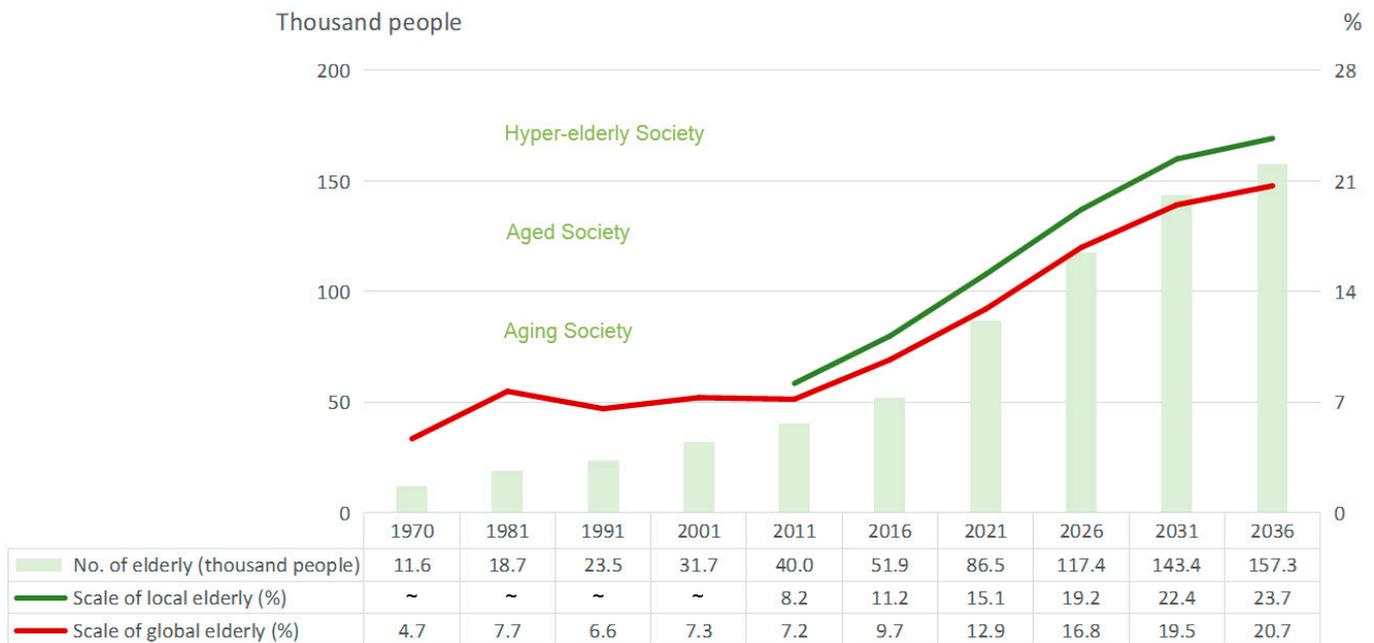


Figure 1. Trend and forecast of population ageing in Macau (1970–2036).

Table 1. Macau’s population in 2020.

Year	Total Population (People)	Elderly People (≥65 Years Old)	Elderly Dependency Ratio (%) *	Dependency Ratio (%)	Ageing Index (%) **	Ageing Ratio (%)
2020/Q3	682,800	81,200	15.8	33.4	90.15	90.3

* Elderly dependency ratio: ratio of the population aged 65 and above to the population aged from 15 to 64, ** ageing index: ratio of the population aged 65 and above to the population aged 14 and below.

The research question is whether the ageing welfare in Macau is sufficient or not; in particular, there is a consensus that Confucianism exercises, which is that extending the care of the aged in one’s family to that of other families is a great virtue in East Asia [4]. Public finance is an essential guarantee for the ageing social security system [4]. The impact of an increasingly ageing population on the social security system is getting severe [5]. Macau’s Social Security Fund served as the main support of the pension system, which has varied in different periods. The pension is the main item of welfare expenditure, accounting for more than 80% of the Fund’s total payments. Pensions are the most reliable source of income for older adults in Macau [6]. With the intensification of the ageing of Macau’s population over recent years, it is now of great significance to study the impact on pension benefits and other policy remedies to support the ageing society [7]. This localized ageing case could offer global reference when dealing with ageing rectification.

This study takes the Macau SAR as a case to discuss the ageing welfare leaking and policy to deal with the ageing society. The study aims to analyze the relationship between the ageing population, pensioners, and pension payments, and to propose a pension system and benefit leakage strategies in Macau SAR. As population ageing is a serious issue facing the world, especially for developed regions, this study will make some contributions. First, there are specific reasons for the ageing population of Macao. The government should fundamentally understand and solve the problem of population ageing, and formulate a comprehensive and sustainable population development strategy. This study provides a new and unique perspective for exploring the social issues of population ageing from the

perspective of typology. Second, the study investigates welfare leakage remedial strategies, such as the government should establish a reasonable and scientific pension adjustment mechanism and a central provident fund system, otherwise the elevated population ageing will put a huge pressure on government financial expenditures. Third, while previous research has pointed to delayed retirement pension strategies to alleviate the pressures of population ageing on society [8], the current study provides a broad range of ageing strategies that urban planners in government departments can implement for older people. The application prospect is more extensive.

2. Literature Review

Protecting residents' lives lies at the foundation of social harmony and development, and building a relatively complete social security and pension security system is the cornerstone of social protection [9]. The Social Security Fund provides eligible beneficiaries with pensions, disability benefits, unemployment benefits, sickness benefits, funeral allowances, birth allowances, marriage allowances, and respiratory system occupational disease compensation. Pensions, disability benefits, medical allowances, and funeral allowances provide basic living security for Macau residents, especially older adults.

There are supplemental supports for Macau's ageing. The Social Security Fund initially funded the Macau Social Relief Fund, mainly for people over 65 years old who are not entitled to a disability allowance or pension, cannot work or engage in any paid activities, and cannot support their basic needs. The old-age pension is a subsidy paid annually by the Social Work Bureau to permanent residents of Macau aged 65 years or older. No contribution or interest review is required. The nature of the subsidies and benefits has been established to reflect the government's spirit of respect for the older adults as a reward, rather than to make up for the lack of pensions. Since 2005, the Macau SAR government has granted annual pensions to permanent citizens who have reached 65. The amount has gradually increased, from MOP 1200 in 2005 to MOP 7000 in 2014 and MOP 9000 in 2019 [10].

2.1. Ageing Population, Pension Recipients, and Pension Payment

As the ageing of the population accelerates, the size of the older adults population and its proportion of the total population continues to increase [11]. The direct impact of the ageing population on the social security system is an increase in pension recipients [12]. The overall pension benefits payment increases with the ageing population's growth [13]. The imbalanced relationship between the ageing population, pension recipients, and pension payment will cause the risk of the pension Fund [14]. The investigation has shown the issues of the ageing population, recipients, and pension benefits. As the ageing of Macau's population has accelerated and the number of pension recipients thereby increased, the overall amount of pension payments has also increased rapidly, which has affected the income and expenditure of the Macau Social Security Fund. It shows that as ageing has continued to accelerate, the amount of pension benefits paid in Macau has also increased rapidly and has become the most crucial component of the payment of Social Security Funds in Macau [15].

The social contradiction is happening from the increasing ageing population and pension recipients. The insufficient ageing benefits cannot meet the requirements [16]. Five factors have caused contradictions between the ageing population, pension recipients, and the older adults benefit system: (1) the inconsistencies between demand and supply during the development of an ageing benefit system; (2) The contradictions between different regions of rural and urban areas in the development of a pension benefit system. Deficits in pension funds in the northeastern provinces, for example, have been extensively reported, and a portion of Guangdong's pension fund has been taken to build a national cross-subsidization fund to help the northeastern provinces bail out their deficits [17]; (3) the contradiction between shifting demographic structures and intergenerational relationships [18]; (4) the contradiction between increasing family support needs and declining

family support capacity; and (5) the contradiction between the functional needs of the older adults group and insufficient government support. [19] provide Korea's experience for other countries in Asia. Primary care is a major element of universal health coverage, and it is becoming even more so because of the ageing population. The primary care system's limited function has contributed to Korea's inefficient health system and lack of cooperation between the health and long-term care systems. Primary care professionals should play an essential part in health prevention and promotion, along with overcoming the inefficiencies of hospital-centric care. The contradictions of this study are the relationships between the proportion of ageing population, pension recipients, and pension benefit amount which will be discussed in the following sections.

Numerous experts believe that long-term demographic trends pose a threat to the budgetary sustainability of wealthy nations. Tax revenues are anticipated to suffer and pension costs to rise as a result of the ageing population and a decline in the labor force. The ability of governments to finance social welfare systems and the provision of other public goods may be threatened by this. As a result, recent improvements to pension systems have been implemented in almost all developed countries [20]. In Europe, [21] address broader general equilibrium effects by considering the role of technological change and associated changes in labor productivity and returns to education. It could be useful that a more comprehensive concept of fiscal balance is taken into account, such as indirect taxes.

Huge sums in benefits are paid out of retirement accounts that are not so applied. The solutions are that pension finance has taken a significant role in the funding, management, and allocation of pension funds in China since integrating China's financial industry and pension industry. The integration of the financial and pension industries also plays an essential role in supporting the transformation and development of the pension benefit and insurance systems in China throughout the "Silver Wave" [22]. The ageing benefit policy should be elevated to a national strategic level, and guiding standards for taking action are necessary. To address the problems of the older adults, short-term strategies are not effectively responding to the ageing population; instead, a mid- to long-term visionary plan should be more effective to deal with the growth of the aged community. We need to determine critical areas and prioritize tasks based on the mechanism, patterns, and characteristics to develop a long-term management framework and program in line with an increasingly ageing population, the recipients for a better pension benefit system. We need to adjust the mindset and develop the existing ageing policy and social service programs from a comprehensive and systematic perspective to achieve a top-level framework and strategic approach to handle the ageing population, recipients, and pension benefits.

2.2. Ageing Welfare Leaking

The challenges of ageing welfare leaking have been stated: (1) social support: [23] emphasized that population ageing and its consequences pose challenges and concerns for society, families, and older adults. Ageing has evolved into the new population issue of our time. Numerous demographers, social and political commentators, and economists have pointed to an increase in the number of older adults and warned of the world's dangers in general. (2) Fiscal expenditure: Pension spending is anticipated to more than quadruple over the next three decades, reaching 13.5 percent of GDP by 2050. Unlike healthcare costs, population ageing will be the major factor in pension spending, accounting for 72 percent of the rise between 2015 and 2050. (3) Public medical resources: Long-term care is required due to chronic diseases and issues. In hospitals, rehabilitation following acute sickness to assist in restoring the older patient to premorbid function is frequently absent. As a result, the current healthcare system is inadequate, if not unsuitable, for serving older adults with chronic illnesses and impairments. As the expense of hospital-based care rises, the emphasis shifts to prevention and primary health care. Although many localities provide comprehensive medical and health care services to the general population, special programs for older adults are absent. This is due, in part, to a dearth of qualified workers in geriatric health care, as well as a lesser emphasis assigned to geriatric

care [24]. (4) Human Resources: There is no scarcity of studies on geriatric care. Few studies, however, explore the topic from the standpoint of governmental and structural factors. Research on working conditions in senior care is critical to comprehending the highlighted dilemma that recruiting issues are causing within older adults' care at the moment. Based on [25], the main cause of staff shortages is not an inverted population pyramid but a decrease in the number of persons who prefer to work in aged care. The aged care working industry has few certifications and accreditations, and the staff have little or no professional education. Workplaces also have a very high personnel turnover, particularly in metropolitan regions where short-term employment and temporary contracts are standard. This leads to insecurity in the workplace. Therefore, staff turnover is high, and it appears difficult to attract young people interested in completing the nursing training programs associated with the profession. Furthermore, smaller private enterprises may find it challenging to provide full-time employment for individuals and become reliant on temporary workers. Employees suffer from poor working conditions due to short-term employment with low wages and inconsistent working hours [25]. (5) Living conditions: For older adults, the built and living environment is where outdoor mobility occurs; thus, the environment plays a significant role in their mobility. The decline in older adults' health and physical functioning as they age can result in more difficulty in moving around in living environments [26]. This kind of limitation can negatively influence older adults directly or indirectly, thus leading to an increased social burden. (6) Older adults' rights: From another perspective, China's population is developing towards the ageing trend. Although China's economic strength is continuously enhanced, the legitimate rights and interests of older adults have not been guaranteed, and the relevant laws and regulations are not perfect [27].

2.3. Remedy Strategies

The remedial strategy is a long-term strategy implemented by the region to deal with urban ageing, while "Urban Ageing Welfare" is a specific measure to care for the elderly population, and a tactic of remedial strategies. Before remedial strategies and pension benefits are implemented, to deal with ageing population issues, pension recipients, and pension benefits, challenges must be clarified in five areas: regulatory preparation, institutional arrangement, policy system, environmental construction, and ageing education. To actively respond to the issues and challenges, remedy strategies are developing a mid- to long-term strategic approach, strengthening multi-stakeholder social management, creating an age-friendly society and policy framework, and conducting training on the nationwide circumstance to conquer ageing challenges [28].

Remedy strategies for ageing welfare lacking have been proposed: (1) social security system: [7] found that retirement is a major problem for vulnerable families in Macau. Thus, improving the social security system to society's future retirement security needs is important. In the meantime, [29] showed that adjusting the pension security mechanism is the policy direction to adapt to the ageing of populations, especially in the pension and healthcare fields. (2) Family support: The primary source of social life for older people in China is family. Because of traditional Chinese filial piety, middle-aged adults are pivotal in providing support to parents, and they also play the most critical role to their children [30]. Thus, it is necessary to focus on the older adults group from the perspective of middle-aged adults. (3) Pension security system: [29] suggested that it is necessary to adjust pension security systems to the ageing. The pension security systems have to include as many people for as long as possible. For older adults, the benefits of the pension system should be high enough to cover their living of minimum cost level. (4) Cross-border supporting system: the construction of the Guangdong-Hong Kong-Macao Greater Bay Area presents a new era opportunity for the united front work of SARs [31], including the cross-border ageing communities with a social security system [32]. (5) Life-long contribution opportunity: empowering older adults to promote active ageing in the labor market is a new strategic scheme to improve ageing human resources and solve a labor

force shortage for ageing services. (6) Lifelong learning: Continuous participation in non-formal lifelong learning may help sustain older adults' psychological wellbeing. It provides older learners, even those most vulnerable, with a compensatory strategy to strengthen their reserve capacities, allowing them to be autonomous and fulfilled in their everyday lives. The goal is to create community-based non-formal lifelong learning opportunities for developing inclusive, equitable, and caring active ageing societies. (7) Legal system: the law provides a benchmark to protect and promote an age-friendly environment [33]. (8) Population policy: China has announced a new population policy for encouraging reproduction and having multiple children in the family to solve the foreseeable economic development and ageing welfare issues [34].

3. Methodology

Literature shows the relationship between the ageing population, the number of pension recipients, and the amount of pension payments can detect the trend of ageing society to plan the coping strategies for ageing welfare [35]. This section adopts a mixed methods approach to explore the conditions and solutions of Macau's ageing issues, as indicated in Table 2.

Table 2. Research methods.

Process	Method	Techniques and Tactics
Stage 1	Quantitative analysis	Granger causality test
Stage 2	Qualitative phenomenological approach	Semi-structured focus group technique

3.1. Research Design

First, we quantify the relationship of the three constructs using a measurement model, as shown in Figure 2. Second, given the exploratory nature of pension policy making and welfare leakage solutions in Macau, it relies on a qualitative phenomenological approach to capture the elaboration of industry stakeholders in detail. Therefore, this study uses a semi-structured focus group technique to discuss the challenges and solutions of Macau's welfare leaking issues. On 1 July 2021 and 10 August 2021, a total of 30 elderly people participated in this study. The researchers conducted 2 batches of 15 face-to-face focus interviews each. Participants were recruited by snowballing and theoretical sampling using newsletters, word of mouth, and leaflets. Each time, two staff members of the Macau government pension institution, three Macau elders over 65 years old and two experts in sociology participated, and one researcher took notes. The interview program was constructed based on the existing literature related to ageing and social welfare, as well as the problems existing in Macao's current pension policy and social welfare. The two focus interviews discussed several questions, including "What kind of pension system is being implemented in Macau?", "Which pension systems are the elderly satisfied with and why?", "Which pension systems are the elderly dissatisfied with and the reasons?", "What pension problems do you suggest the government solve for the elderly?", "Whether the government encounters welfare leaking when implementing the pension system", "What methods are used internationally to solve the welfare loopholes in the pension system?", and "These methods is it applicable in Macau?". Each interview lasted from 90 min to 2 h. The staff of the government's pension department, the elderly, and experts had heated discussions and exchanges.

The entire interview process was recorded, and then transcribed and coded immediately after conclusion to ensure accuracy. The corresponding information was imported into Nvivo 12.0 for further analysis after the interview was recorded and transcribed. Content analysis is used to analyze qualitative data collected from interviews, which enables the researcher to investigate the text without being influenced by any theory or concept [36]. During the coding process, meaningful units in respondents' records were captured and used to extract information related to pension and social welfare leaking issues.

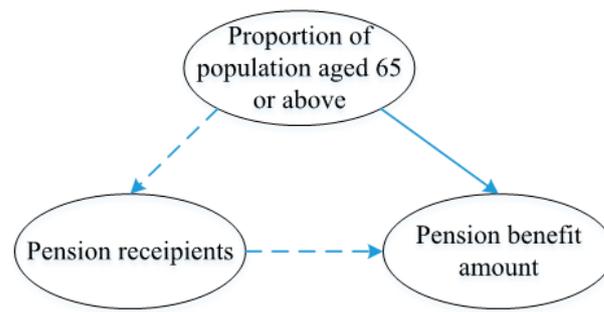


Figure 2. Granger causality test results for the three time series. Note: 1. Drawn according to Granger causality test results. 2. The solid line represents significance at the 5% level; the dotted line represents insignificance at the 5% level.

3.2. Quantitative Research

To quantitatively analyze the impact of an ageing population on Macau’s social security (especially pension security) system, the proportion of Macau’s population aged 65 and above (Old_t) was selected as an index of the level of population ageing. Pension recipients ($Receiver_t$) and pension payment amounts ($Pension_t$) were used as pension payment indicators.

Data were collected from 1999 to 2019. The proportion of the population aged 65 and above (Old_t) was calculated based on the population of the older adults group and the total population, with the figures taken from the Macau Statistics’ Official Database and Census Bureau. The pension recipients and the overall payment amount were obtained from the annual reports published on the Macau Social Security Fund’s official database. The pension payment amount is calculated based on the current price level. To eliminate the impact of price factors on the quantitative analysis, each calendar year’s pension payment amount was processed based on 1999 prices. These secondary data are different from primary data where the measurement is being measured with reliability and validity [37].

Before conducting a Granger causality test to determine the relationships between Macau’s ageing population, the number of pension recipients, the amount of pension payments, and the correlation was calculated. The correlation coefficient matrix and significance test results are shown in Table 3.

Table 3. Correlation coefficient matrix for the number of elderly residents, number of pension recipients, and the total amount of pension payments in Macau, 1999–2019.

	Old	Pension	Receiver
Old	1.0000		
Pension	0.9199 ***	1.0000	
Receiver	0.8517 ***	0.9744 ***	1.0000

Note: 1. Compiled based on the output of EViews software. 2. *** = significant at the 0.1% level.

The results of the correlation testing show that the correlation coefficients between the proportion of the population aged 65 and over (Old_t), the number of pension recipients ($Receiver_t$), and the total amount of pension payments ($Pension_t$) were 0.8517 and 0.9199, respectively, and significant at the 1% level. This indicates that there were significant positive correlations between Macau’s ageing population, the number of pension recipients, and the total amount of pension payments over the 1999–2018 period. The correlation coefficient between the number of pension recipients and the total payment amount was 0.9744, significant at the 1% level, indicating that there was also a significant positive correlation between the number of pension recipients and the total pension payment amount over the same period.

To eliminate possible heteroscedasticity before the Granger causality test, a logarithmic transformation was applied to the three time series for the proportion of the population

aged 65 and over (Old_t), the number of pension recipients ($Receiver_t$), and the total pension payment amount ($Pension_t$).

We adopted [38] coding procedures to perform [39] six-step thematic analysis of focus group discussions at the second stage. These studies defined thematic analysis and placed it in context with other qualitative analytic methods that look for themes or patterns and various epistemological and ontological perspectives. According to [39], advantages of thematic analysis include but are not limited to: a useful method for dealing with participants as partners in the participatory research paradigm; can provide a ‘thick description’ of a data set or summarize essential elements of a big amount of data; and it can be used to create qualitative studies that can be used to inform policy development. Fifteen experts were invited to discuss the first stage’s analysis result. Open and axial coding that explored broad properties of experts’ discussions were structured and grounded into challenging issues and remedy strategies for welfare leaking of Macau’s pension system.

3.3. Data Stationarity Test

Time series often have the problem of “pseudo-regression” between variables. To eliminate this problem caused by data stationarity, it was necessary to first check the stability of the three-time series for basicity. This study conducted an augmented Dickey-Fuller (ADF) unit root test as the data stationarity test, with the results shown in Table 4.

Table 4. Results of the stationarity test of the three time series.

Sequence	Lag Order	Inspection Value	10% Critical Value	5% Critical Value	1% Critical Value
$LnOld$	1	−0.7008	−2.6735	−3.0656	−3.9204
$LnReceiver$	0	−2.1190	−3.2978	−3.7105	−4.6162
$LnPension$	0	−1.8244	−3.2978	−3.7105	−4.6162
$\Delta LnOld$	1	−3.6167 ***	−1.6050	−1.9663	−2.7283
$\Delta LnReceiver$	0	−4.2887 ***	−2.6735	−3.0656	−3.9204
$\Delta LnPension$	0	−4.5248 ***	−2.6735	−3.0656	−3.9204

Note: 1. Compiled based on the output of EViews software. 2. *** = significant at the 1% level.

This shows that the results of the log-series ADF unit root test for the three times series of the proportion of the population aged 65 and over (Old_t), the number of pension recipients ($Receiver_t$), and the total amount of pension payments ($Pension_t$) in Macau were −0.7008, −2.1190, and −1.8244, respectively. These values are all greater than the critical value at the 1% level, meaning that the original hypothesis of the unit root could not be rejected, and thus indicating that the logarithmic sequence of the three-time series was non-stationary.

Differentiation is a common processing method used to stabilize data. The ADF unit root test results for the three logarithmic time series of the proportion of the population aged 65 years and over (Old_t), the number of pension recipients ($Receiver_t$), and the total amount of pension payments ($Pension_t$) in Macau were −3.6167, −4.2887, and −4.5248, all of which are less than the critical value at the 1% level, meaning that the original hypothesis of the unit root test was rejected. The alternative hypothesis was accepted, indicating that the logarithmic sequences of the three time series were stable after the first-order difference.

4. Results and Discussions

4.1. Variable Granger Causality Test

With the logarithmic sequence of the three time series found to be stable after the first-order difference, to more accurately estimate the causal relationships among the three time series of the proportion of the population aged 65 and above in Macau, the number of pension recipients, and the total amount of pension payments, a Granger causality test was performed. The Granger causality test results are shown in Table 5 and displayed more intuitively in Figure 2.

Table 5. Results of Granger causality test for the three time series.

*Null Hypothesis	Lag Order	F	p-Value
DLNPENSION does not Granger-cause DLNOLD	3	1.3521	0.3330
DLNOLD does not Granger-cause DLNPENSION	1	7.5320	0.0167
DLNRECEIVER does not Granger-cause DLNOLD	2	1.7758	0.2188
DLNOLD does not Granger-cause DLNRECEIVER	3	4.3119	0.0509
DLNRECEIVER does not Granger-cause DLNPENSION	1	3.7638	0.0744
DLNPENSION does not Granger-cause DLNRECEIVER	4	2.0305	0.2548

Data source: Output of EViews statistical software.

Table 5 and Figure 2 show that for the 1999–2019 period, the proportion of the Macau population aged 65 and above was not Granger-caused by the total amount of pension payments or the number of pension recipients, and the number of pension recipients was not Granger-caused by the total amount of pension payments. For the other three relationships, the F statistics of the test (7.5320, 4.3119, and 3.7638) and the corresponding *p*-values (0.0167, 0.0509, and 0.0744, respectively) led to the rejection of the null hypothesis only between the proportion of the population aged 65 and above and pension benefit amount at the levels of 5%. This indicates that the Granger cause for the total pension payments is the proportion of the population aged 65 or above in Macau over this period. The proportion of the population aged 65 or above was not the Granger cause for the number of pension recipients. The number of pension recipients was not the Granger cause for the change in the total amount of pension payments.

The Granger causality test results indicate that Macau’s ageing population is the Granger cause of the increasing amount of pension payments. Therefore, it can be forecast that a further acceleration of population ageing will lead to further increases in pension expenditure. Meanwhile, the two insignificant relationships represent the ageing population’s welfare leaking and pension recipients, which is discussed in the following section.

4.2. Qualitative Results

The qualitative analysis results were organized and summarized in the following context for further discussion. For example, one panel respondent of focus group indicated that “the ageing population recipients is not associated with the increased ageing population could be implied that the burden should depend on their own families. However, the pension benefit amount is still increasing because of ageing society with welfare leading”. The details with predations were shown as follows.

The pension recipients not corresponding to the ageing population has caused a heavy burden to society. The situation could be predicted, as in Table 6, that social dependency ratio increases with the increase in the older adults population and the pressure on working-age adults in Macau. Macau’s dependency ratio was 37.9% in 2021 and is expected to reach 51.2% in 2036. It means that 37.9 older adults and children were supported by every 100 adults (defined as persons aged 15–64) in 2021. However, it is estimated that in 2036, 100 adults will need to support 51.2 older adults and children. In 2021, the dependency ratio of the older adults population was 17.3%, and it is estimated that the dependency ratio of the older adults population will reach 30.0% in 2036. This means that 17.3 older adults were supported by every 100 adults in 2021, with the figure rising rapidly. However, an estimated 100 adults will need to support 30 older adults in 2036, increasing the figure gradually. In 2021, every six adults supported one older adult; in 2036, every three adults will support one older adults. The increase in the older adults population has increased the pressure on working-age adults to support the older adults. The burden of this support is expected to continue to increase in the future.

The social burden could cause pressure on government fiscal expenditure. To strengthen the Active Life Service Plan and Community Employment Assistance Plan and enhance vulnerable groups’ self-reliance, the government might need to subsidize eligible full-time low-income employees up to MOP 5000. It provides concessionary fares for senior citizens,

students, people with disabilities, and all citizens. The increase in the older adult population and the number of people receiving old-age benefits has placed significant pressure on the government's finances.

Table 6. Projected total population dependency ratio in Macau, 2021–2036.

Rate Year	2021	2026	2031	2036
Dependency ratio (%) *	37.9	47.6	51.3	51.2
Elderly dependency ratio (%) **	17.3	23.6	28.2	30.0

* Dependency ratio: the population aged 14 and under and the population aged 65 and above as a ratio of the population aged 15–64. ** Elderly dependency ratio: the population aged 65 and over as a ratio of the population aged 15–64.

The ageing of the population could also cause tremendous pressure on medical and health resources. The ageing population has increased the demand for medical services by the older adult population. Although the Macau government is working hard to increase its provision of medical resources, the increasing number of older people in Macau and the continuous expansion of demand mean that Macau's medical resources still fall short of the comparable international average. One of the panel members described as follows:

“With the increasing ageing population and lifespans, the sickness rate of older adults has increased, which has increased their dependence on medical assistance. The rapid growth of Macau's older adult population has dramatically added to the burden of medical care. Patients' general medical services and specialty services face long waiting periods to see a doctor. Furthermore, there are long waiting periods to receive the prescribed medicines after consultation. Many patients choose to leave without seeing a doctor or taking the prescribed medicine because they have waited too long, which is not conducive to preventing disease or recovery from illness in the older adults”.

4.3. Discussions

According to the quantitative analysis result, the analysis of the relationships between the ageing population and the number of pension recipients as well as pension payments in Macau lead to the following discussions.

Significant correlations existed between population ageing, the number of pension recipients, and the total pension payments over this period (Table 3). The correlation coefficients between the proportion of the population aged 65 years and above (Old_t), the number of pension recipients ($Receiver_t$), and the total amount of pension payments ($Pension_t$) were 0.8517 and 0.9199, respectively, and significant at the 1% level. This indicates that there were significant positive correlations between the ageing of the population of Macau, the number of pension recipients, and the total amount of pension benefits. However, when we conducted the Granger causality test, we found that only the ageing of the population was the Granger cause for the increase in the total amount of benefits paid in Macau over this period. The ageing welfare is leaking to be found that not all in the ageing population receive the pension. The significant Granger causality of the ageing population and the increased pension payment show increasing pressure on the Macau SAR government's fiscal expenditure. The sources of social security benefits, including pensions and the subsidy for senior citizens, are mainly government funds. There is no reasonable and scientific adjustment mechanism, and the Central Provident Fund system is not perfect. With the continuous increase in the older adult population, the number of pensioners and recipients of the subsidy for senior citizens has increased. The allowance base has become more prominent, which is undoubtedly placing tremendous pressure on government fiscal expenditure.

The qualitative analysis raised the challenges of and solutions to Macau's social welfare system as follows: Due to low salaries, intense workloads, long working hours, high levels of job pressure, and limited advancement opportunities, there is a high turnover rate among older adults care staff. It is, therefore, a significant challenge to find enough reliable

and long-term nurses for older adults. Older adults care nurses need regular professional training. The frequent flow of personnel and many new nursing staff requiring training have increased the cost of training for older adults care workers without improving nursing staff's service skills for older adults care accordingly. Thus, the Macau SAR government strengthens cooperation with non-profit organizations to assist the public hospital (Centro Hospitalar Conde de São Januário) in implementing its patient discharge plan. Special clinics for older adults, such as memory clinics and aged health care clinics, should be set up, and nursing and drug consultation services should be strengthened. The Macau government could rigorously train local physiotherapists and related specialists to develop local older adults care professionals and meet the growing need among the older adults of Macau for specialist medical assistance.

The increasing number of older adults in Macau face difficulties relating to poor living conditions and inconvenient travel. Most of the older adult population in Macau live in the old city, which is generally characterized by old buildings, a poor environment, and incomplete infrastructure. Sewage leaks from the canal due to a lack of repair and maintenance result in road sewage. The poor living environment causes significant problems for the older adults in getting around, and it is also detrimental to their physical and mental health. In the old city, many old buildings do not have elevators. Climbing up and downstairs is difficult for many older people and presents a threat to their safety, as climbing stairs can lead to accidents. A combination of a poor living environment and old buildings without elevators has reduced the frequency of outdoor activities among older adults, thus reducing opportunities for contact with the outside world and participation in social activities. Thus, the public sector could establish a set of appropriate policies for housing, including providing a sense of belonging as the prerequisite for all measures to improve the quality of life of older adults. Improving old buildings in the old city and making timely repairs to the street-level infrastructure could be of help. In addition, by applying proper planning to idle land, the number of public residential care homes and apartments for older adults can be increased. In the older adults' neighborhoods, the public sectors help carry out the Senior Mutual Volunteer Program. Such mutual aid groups can constitute an open old-age management model. For transportation environment, public sectors could promote the use of "rehabilitation vehicles" to ensure the safety of older adults' travel. To optimize the bus service for the older adults, the government should improve barrier-free facilities inside and outside transportation venues, improve the waiting environment and travel safety by increasing the number of the bus "love seats," conduct bus consultations with older adults, and optimize bus routes. For the rehabilitation vehicles, fixed-route services, electric calling services, combined services, and shuttle bus services can all be used.

The resulting lack of social contact is not conducive to the physical and mental health of older adults. Due to the low levels of social support for older adults, some older people with mental illnesses do not receive timely treatment and remain isolated in the community. If these older people are not identified, they live in seclusion in the community without receiving help and treatment, indirectly harming the physical and mental health of other older people and affecting the overall living environment of the older adults. The resolution that could be the most crucial support source for older adults in the Macau SAR remains their children. In the short term, adopting policy subsidies to reduce family support pressure would provide the most effective relief. In addition to implementing the caregiver allowance pilot program, parental allowances under the occupation tax could be considered to further alleviate the pressure on adults supporting their older adult parents. In the long run, the government should also continue to pay attention to social work and social services provided to youth to fundamentally solve population ageing while building a comprehensive population development strategy.

The Macau government has actively introduced some social care policies and laws to protect the rights and interests of older adults. However, these are scattered across various codes, laws, decrees, and administrative regulations. Retaining vital flexibility does not have the stability and authority of legal protection, making it difficult to protect and

maintain the legal status of older adults. In the relevant laws promulgated by the Macau government, such as the Macau Basic Law, Family Policy Outline Law, Macau Civil Code, and Macau Criminal Code, there are many references to the care and protection of older adults and the protection of their fundamental political and civil rights, but no detailed or specific instructions for providing this care and protection. The subjects covered by the Basic Law and Civil and Criminal Codes are broad and have substantial limitations in solving practical problems. They do not reflect the integrity and systematicity of the older adult rights protection system and do not play a major role in social security provision. Thus, the government should work to promote the relevant content of the Law on the Protection of the Rights and Interests of Elderly People and train relevant professionals in its application, to raise the awareness of social members of their legal obligations to protect the rights and interests of older adults.

The abovementioned discussions on the welfare leaking remedy could be summarized into the typology of governance strategies, as Figure 3. From the welfare focus and the relationship of Macau SAR and China, Macau’s ageing governance strategy can consider shifting from state governance to cross-state governance for welfare leaking based on mutual benefits.

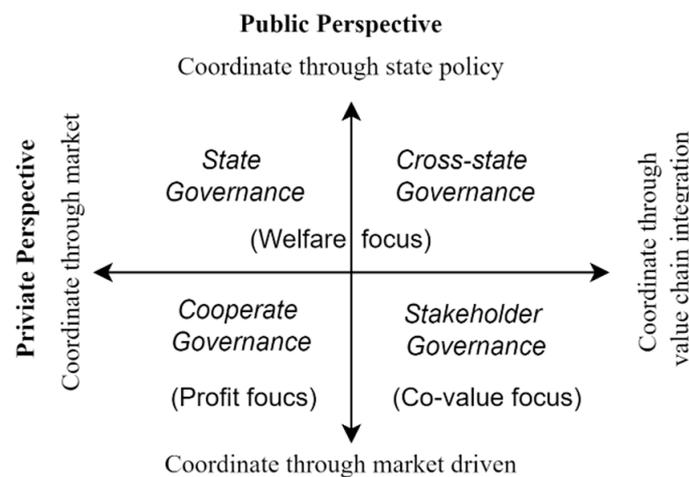


Figure 3. The typology of governance strategies.

5. Conclusions and Suggestions

5.1. Conclusions

Macau is now officially an ageing society, and pension security has become an important indicator of the completeness of its social security system. This study investigated the significant positive correlations between the ageing population of Macau, the number of pension recipients, and the total amount of pension benefits. However, by conducting the Granger causality test, we found that only population ageing was the cause of the increase in the total amount of benefits paid in Macau on the Granger cause over this period. The ageing welfare leaking found that not all in the ageing population receive the pension. The significant Granger causality of the ageing population and the increased pension payment show increasing pressure on Macau SAR government’s fiscal expenditure.

Faced with the great challenge of an increasingly ageing population in the future, the Macau SAR government has noted that the ageing population in Macau has its specific causes and reflects a common trend. The increasing number of older people is placing more pressure on young people to support older adults. Therefore, in addition to paying attention to older adults care, the Macau SAR government should pay more attention to social work and social services for young people, seek to fundamentally understand and solve the problem of an ageing population, and build a comprehensive and sustainable population development strategy.

5.2. Suggestions

The Macau government can organize employment training to increase the skills of older adults. The older adults should be supported and encouraged to continue learning to strengthen the social integration of elders, the middle-aged, and young people. To improve social development, older adults should be encouraged to continue studying and pursuing volunteer work, which can enrich their lives and help them become or remain integrated into social life through learning and work. Thus, elders can continue employment or volunteer to achieve prosperity for elders and develop the “silver hair” industry to meet their social needs. Rationally planning resources for the older adults and encouraging elders to remain in employment can effectively alleviate the labor shortage caused by the ageing of the population and effectively improve the operating efficiency of organizations and reduce their operating costs. It is recommended that the government encourage older adults to extend their retirement age voluntarily and continue to work, allowing them to maintain contact with society, enrich their lives, and increase their social value and contribution.

As population ageing continues, consideration needs to be given to improving Macau’s long-term social security mechanism. It is recommended to fully consider the sufficiency, robustness, and sustainability of the current first-tier social security system. Regarding sufficiency, Social Security Fund contributions need to reflect the principle of fairness in being shared by the government, enterprises, and individuals. The government should establish a complete fund contribution mechanism to complete the increase in Social Security Fund contributions. There is a need to establish an appropriation mechanism linked to the Social Security Fund and fiscal surplus concerning robustness. Sustainability strategies should be formulated to support the social security system as Macau’s economic situation fluctuates. It is recommended that the government continue to strengthen the relevant assessments and research necessary to promote the gradual transition of the Central Provident Fund from non-mandatory to mandatory. Hengqin’s New Neighborhood Project has long explored the “enclave” model of new community construction. Macau residents can enjoy the same pension, residence, education, and other services and benefits in Hengqin as in Macau. In the future, the Macau government could also gradually negotiate with Hengqin to rationally plan more land to construct Macau’s cross-border older adults care community and enrich the types and number of older adult care institutions.

Last but not least is to encourage reproduction and having multiple children in the family, increase maternity allowances, reduce child-rearing costs, and extend maternity leave to aid the recovery of new mothers. Increasing the fertility rate and changing the population structure can reduce the ageing of the population. First, the Macau SAR government could increase free education and education allowances for middle school, primary, and kindergarten children in terms of education. Second, in terms of medical care, pregnant women and new mothers should be assisted with improved care services, good beds, and reduced waiting times for prenatal and postnatal examinations. Last, extending the period of maternity leave for new mothers would help with their recovery and adjustment after delivery.

5.3. Implications, Limitations and Future Research

Based on the typology of welfare leaking remedy strategies, as indicated from this study, these strategies could not only rely on the public sector. The private sectors must come together with the public sector in order to relieve the burden of ageing society with a policy of encouraging families to take part in the social security system actively.

The research reflects global ageing issues; however, the results are a case study that can only be applied locally in Macau SAR because its local ageing funding, subsidy, and pension policies differ from China and other countries. Thus, the external validity of this case study is limited to Macau SAR locally. Population ageing is a worldwide problem; the research methodologies, recommendations, and theoretical and practical implications used in this study can serve as a point of reference for further research on population ageing.

Future research should seek to expand the area, collect more data, and conduct a broader range of analysis. Population ageing policies comparison in different regions also could provide more definitive evidence and different recommendations.

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Data Availability Statement: The data can be obtained from the Statistics and Census Service of Macau SAR: <https://www.dsec.gov.mo/en-US/>, accessed on 11 December 2022.

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