

Charitable Healthcare's Impact in Macao: Two Convergence Models and Outpatient Data from Kiang Wu Hospital

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Abstract. This research article examines the role of charitable healthcare facilities in shaping Macao's society, utilizing two convergence models (σ -convergence and β -convergence) and outpatient data from Kiang Wu Hospital, a notable charitable medical institution. The key findings reveal that the self-paying outpatient (SPO) numbers witnessed a steady increase. Conversely, the outpatient receiving free medical care (ORFMC) trend experienced a general decline over the entire period. This, in turn, influenced the ratio of ORFMC to SPO (ROS), reflecting a downward trajectory over the study period. Furthermore, the analysis of convergence indicated the changes of ORFMC and ROS gradually decreased throughout the sample period. This research highlights the evolving landscape of charitable healthcare contributions to Macao's society during the specified timeframe.

Keywords: Charitable Healthcare, Kiang Wu Hospital, outpatient receiving free medical care.

1. Introduction

Against the backdrop of these challenges, various medical institutions in Macao are struggling to meet the growing demand for medical services. Health facilities are often inadequate to meet the population's medical needs, yet lack of funding further hinders their ability to expand (Liu et al., 2018; Cernuda et al., 2021). In this context, the gap in access to health services between different social groups is further widened. Especially for those who cannot afford private medical expenses and are not adequately served by public medical institutions, it is difficult for them to obtain medical services (Xu et al., 2019).

In order to cope with these challenges, charitable medical care has become an essential part of the main medical supply in Macao. Religious organizations, local philanthropists and international partnerships have played a key role in establishing these charitable services. These services aim to provide health care, health education and disease prevention to underserved and vulnerable communities. Many charitable medical facilities were established and developed during this time, often associated with religious institutions or supported by international medical missions. Understanding the historical context and contributions of these charitable medical services is crucial to analyzing the evolution of Macao's healthcare system and its impact on society. These services provide basic healthcare services and play a key role in promoting health awareness, disease prevention and social integration. The legacy of these initiatives continues to influence Macao's modern healthcare landscape, making this period an important subject of study.

Through the outpatient data of Kiang Wu Hospital, the largest charitable hospital in Macao, this paper analyzes the contribution of charitable medical institutions to Macao society during the period from 1950 to 1980. This is because the Macao government did not have systematic statistics on charitable organizations during that period, and could only analyze Kiang Wu Hospital as a case. The marginal contribution of this paper is to fill the gap of the lack of contribution of Macao charitable organizations to Macao society during 1951-1980. Overall, this study sheds light on the importance of charitable medical services as agents of positive societal change. It underscores how these initiatives can address healthcare disparities, promote health awareness, and foster a sense of belonging and unity within diverse communities. The study's findings may provide insights for modern healthcare policy and practice, emphasizing the enduring value of community-centred healthcare approaches.

2. Material and method

2.1 Material

Kiang Wu Hospital, founded in 1871, is prominent in Macao's healthcare history. As one of the oldest medical institutions, it has been a vital healthcare provider and community pillar for over a century. Established as a charitable institution, Kiang Wu Hospital was created to address the healthcare needs of Macao's residents. It offers various medical services, ranging from general care to specialized treatments, surgery, and emergency services. Beyond medical care, Kiang Wu Hospital actively engages with the community. It conducts health campaigns, seminars, and collaborations to promote health awareness and disease prevention, contributing to a healthier Macao. Kiang Wu Hospital has modernized its facilities and integrated advanced technologies while preserving its cultural significance. It embodies compassion and community support, reflecting its historical role in Macao's societal fabric.

This paper utilizes outpatient data from Kiang Wu Hospital in Macao spanning the years 1951 to 1980. This timeframe predates the establishment of a public medical service system in Macao, during which private medical institutions predominantly catered to the population's healthcare needs. The specific data pertinent to this research have not been systematically presented in any prior publication. Consequently, the data utilized in this study are sourced from historical records found in the Kiang Wu Hospital Administration reports. The dataset primarily encompasses two key indicators: the count of self-paying outpatients (SPOs) and the count of outpatients receiving free medical care (ORFMC). Additionally, a third indicator is formulated, representing the ratio between these two indicators, ratio of ORFMC to SPO (ROS).

2.2 Method

This study undertakes a comprehensive descriptive analysis of the data from various angles, illuminating the contribution of Macao's private medical institutions to the local society within the specified timeframe. Additionally, the research assesses both σ -convergence and β -convergence to this contribution over the given sample period. Equation (1) delineates the methodology for calculating σ -convergence. Evidently, the coefficient of variation is derived by dividing the standard deviation by the mean, offering a measure of the extent of disparity within observed values. In this equation, the subscript j designates the period ($j = 1, 2, 3, \dots$), while the subscript i corresponds to the specific year encompassed within the period. N_j represents the count of years within period j , and $\bar{V}_{ij}$ denotes the mean of the observed values within period j .

The concept of β -convergence suggests that years with lower initial values tend to catch up with those starting with higher values over time, as the former experience higher growth rates, eventually leading to convergence. β -convergence encompasses two variations: conditional β -convergence and absolute β -convergence. In this study, our focus centers solely on testing the concept of absolute convergence, as outlined in equation (2). In this equation, the subscript t signifies time. V_t and V_{t+1} represent the observed values in years t and $t + 1$, respectively. The coefficient β reflects the degree of convergence. A negative value of β , validated through significance testing, indicates the presence of β -convergence. Conversely, a positive value of β , supported by statistical significance, suggests divergence. The variables ε_{it} and α denote the time effect and the interference term, respectively

$$\sigma = \frac{\sqrt{\frac{\sum_i^{N_j} (V_{ij} - \bar{V}_{ij})^2}{N_j}}}{\bar{V}_{ij}} \quad (1)$$

$$\ln\left(\frac{V_{i,t+1}}{V_{i,t}}\right) = \alpha + \beta \ln(V_{i,t}) + \varepsilon_t \quad (2)$$

3. Results and discussion

Figure 1 shows the annual number of SPOs in Kiang Wu Hospital from 1951-1980. Table 1 shows the coefficient, standard deviation, and mean of SPOs, ORFMC, and ROS. Due to the extended sample period, this study divides it into two distinct sub-periods: 1951-1965 and 1966-1980 for analytical convenience. As for the first period, the highest number of SPOs occurred in 1961, with a substantial count of 273,226 self-paying patients seeking medical care at Kiang Wu Hospital. This peak suggests a remarkable surge in demand for the hospital's services during that year. The lowest number of SPOs was recorded in the initial year, 1951, with 30,062 self-paying patients. This minimum value signifies the baseline utilization of the hospital's medical services at the beginning of the observed period. From 1951 to 1960, the number of SPOs experienced gradual growth. The counts increased relatively consistently, with each year exhibiting a higher value than its predecessor. This steady rise indicates a consistent demand for Kiang Wu Hospital's healthcare services. 1961 witnessed an unprecedented exponential surge in SPOs, jumping from 96,474 in 1960 to 273,226. The armed struggle between the Portuguese government and the Chinese government near the gates of Macao happened in 1952, so most of outpatients hospitalized in Kiang Wu Hospital may be injured soldiers (Luo et al., 1988). This remarkable increase suggests the presence of a significant triggering factor, which could be attributed to various factors such as healthcare policies, awareness campaigns, or shifts in healthcare preferences. Following the exceptional growth in 1961, the subsequent years saw a gradual decline in SPOs. While there was a decrease from the peak in 1961, the values remained considerably higher than in the earlier years. By 1965, the number of SPOs stabilized at 121,784. The analysis of SPOs at Kiang Wu Hospital from 1951 to 1965 reveals a distinct pattern of growth and fluctuation. The exponential surge in 1961, followed by a moderate decline and stabilization, suggests that the hospital's services experienced dynamic shifts in demand. Factors contributing to these fluctuations could include changes in healthcare policies, public awareness campaigns, and societal influences.

Table 1. s coefficient, standard deviation and mean of SPO, ORFMC, and ROS

Period	Variable	SPO	ORFMC	ROS
1951-1965	σ	0.610827	0.387886	0.492333
	Standard deviation	58371	62410	1.03
	Mean	95561	160898	2.09
1966-1980	σ	0.312158	0.351971	0.782496
	Standard deviation	88871	33583	0.324
	Mean	284700	95414	0.414
1951-1980	σ	0.637891	0.463856	0.906877
	Standard deviation	121283	59446	1.14
	Mean	190131	128156	1.25

As for the second period, the highest tally of SPOs during this specific interval was noted in 1979, reaching a substantial figure of 472,145. This pinnacle indicates a significant surge in the hospital's medical services demand during that particular year. The lowest count of SPOs was registered in 1966, with a value of 117,686. This minimal value underscores the foundational utilization of the hospital's services at the initiation of this sub-period. The SPO counts between 1966 and 1970 showcase a moderate growth trajectory with intermittent fluctuations. Despite these variations, a consistent upward trend persists in utilizing Kiang Wu Hospital's medical services during this timeframe. Starting from 1971, a consistent escalation in SPOs is observed. The counts progressively escalate yearly, signifying a sustained demand for the hospital's healthcare services. The analysis of SPOs at Kiang Wu Hospital from 1966 to 1980 reveals a continuous upward trend in the utilization of medical services by self-paying patients. The striking upsurge in 1979, followed by a continual rise in subsequent years, reflects the lasting popularity of the hospital and its services. For the period spanning 1951 to 1965, the mean and standard deviation stand at 95,561 and 58,371, respectively. During the subsequent period from 1966 to 1980, the mean and standard deviation are

284,700 and 88,871, respectively. The increase of mean value and the decrease of coefficient of variation indicate that Kiang Wu Hospital has been recognized by more and more people, and its contribution to society has increased.

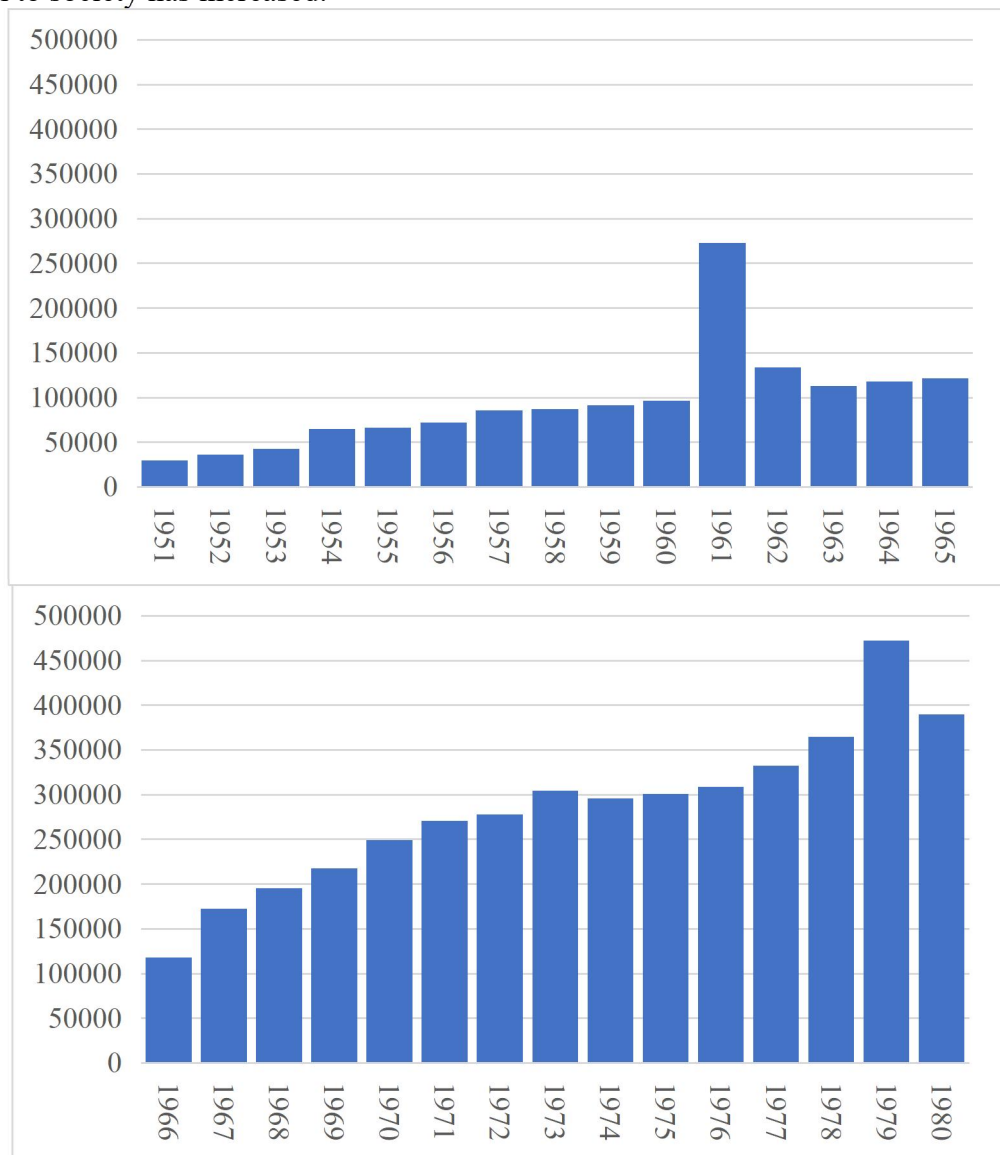


Fig. 1 The number of self-paying outpatients in Kiang Wu Hospital during 1951-1980

SPO can only reflect the size of Kiang Wu Hospital or the patient's recognition. This paper focuses on the charitable behavior of Kiang Wu Hospital. The above first analysis of the change of SPO is to pave the way for the next two core index analysis. Figure 2 shows ORFMC in Kiang Wu Hospital during 1951-1980. We also divide it into two sub-periods. During 1951-1965, the peak count of ORFMC occurred in 1958, reaching 302,819 cases, signifying substantial utilization of free medical care services. Conversely, the lowest count of ORFMC was documented in 1959, registering 18,101 cases. This minimal value sets the foundational utilization at the period's outset. The mean in this period is 160898. A prevalent upward trajectory in ORFMC counts is evident from 1951 to 1958, underscoring a rising demand for free medical care services during this interval. After 1958, fluctuations in ORFMC counts emerge, with select years exhibiting variability.

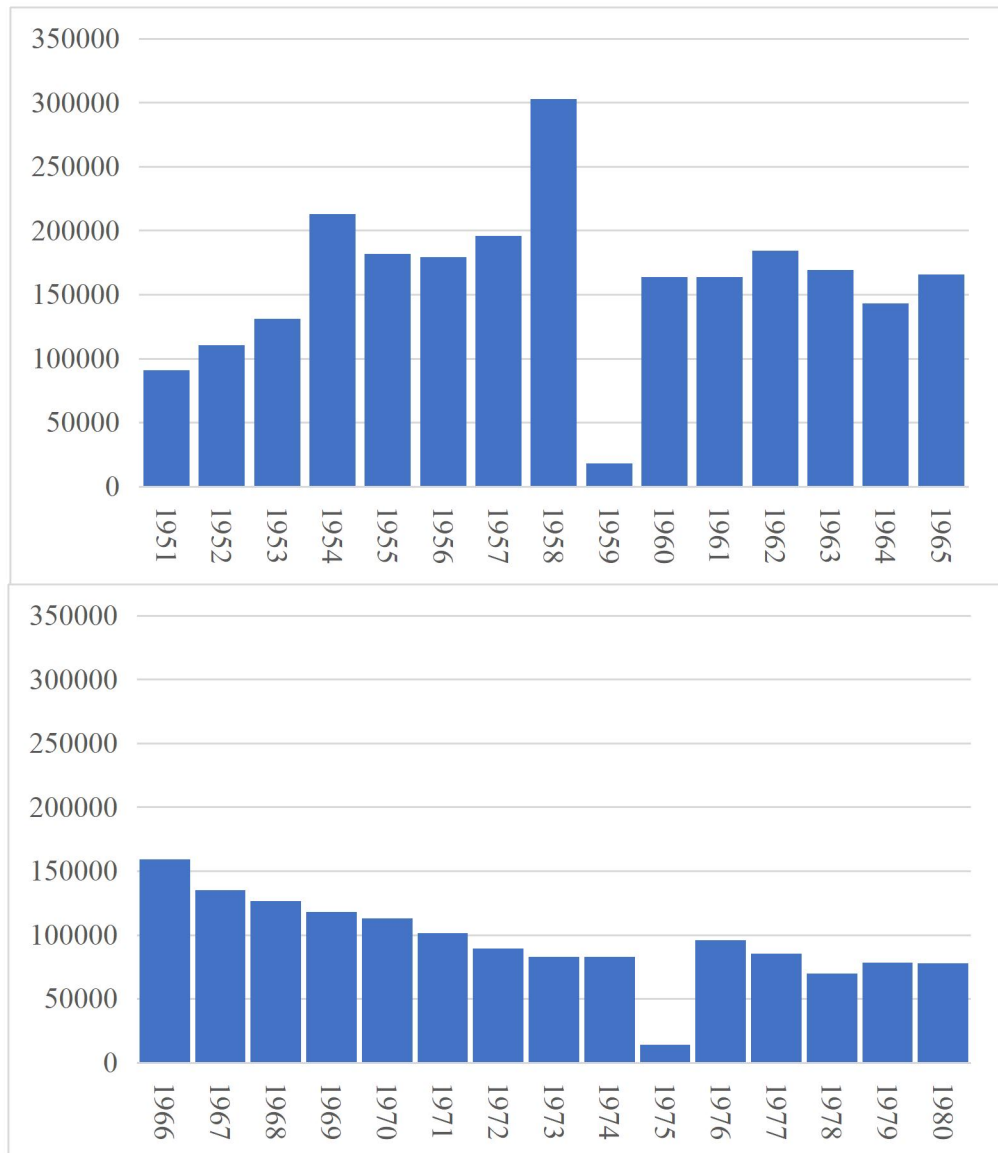


Fig. 2 The number of outpatients receiving free medical care in Kiang Wu Hospital during 1951-1980

Nevertheless, an overall stabilization of the trend materializes in later years, indicating a sustained albeit fluctuating demand for free medical care services. As for the period 1966-1980, the highest ORFMC was observed in 1966, reaching 159,310 cases. This indicates significant utilization of free medical care services during that year. In contrast, the lowest ORFMC was seen in 1975, with only 14,243 cases. This reflects the baseline utilization at the outset of this sub-period. There are varying ORFMC counts over these years, with certain periods showing fluctuations. However, an overall trend of stabilization emerges, suggesting a consistent albeit fluctuating demand for free medical care services. The mean in this period is 95414, much less than the number from 1951-1965. We can infer that the charity behavior of Kiang Wu Hospital decreased significantly in the latter period. However, the number of outpatients in this period was much higher than that in the earlier period. Note that Macao's population is growing during the sample period (Chen, 1999). During the period 1951-1980, the mean is 128156, which indicates that the charity medical services provided by Kiang Wu Hospital to Macao society are at a high level during the whole sample period.

Table 2. The absolute β convergence test results of SPO, ORFMC, and ROS

Period	Variable	SPO	ORFMC	ROS
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1951-1965	β	-0.7634	-0.5071***	-0.5094**
	t	-1.982	-4.357	-3.221
	Constant	11.3701***	11.8753***	0.5307**
	t	79.913	104.349	3.255
	R-squared	0.2465	0.6127	0.4637
1966-1980	β	-1.82708**	-0.5283**	-0.6402*
	t	-3.394	-3.144	-2.567
	Constant	12.63800***	11.3484 ***	-1.1938***
	t	153.392	96.254	-6.595
	R-squared	0.4898	0.4517	0.3544
1951-1980	β	-0.9249	-0.49783***	-0.506*
	t	-1.828	-4.543	-2.227
	Constant	11.9633***	11.62573***	-0.3006
	t	85.102	126.873	-1.511
	R-squared	0.1101	0.4333	0.1552

The changes of ROS during the sample period also verified this conclusion. During 1951-1965, ROS fluctuated significantly, but the overall level was high. Its mean, standard deviation and coefficient of variation are 2.09, 1.03 and 0.492, respectively. During the period from 1966 to 1980, ROS was in a steady downward trend with no obvious fluctuation. Its mean, standard deviation and coefficient of variation are 0.414, 0.324 and 0.782, respectively. This period is significantly lower than that during 1951-1965.

The difference in the number of ORFMC at Kiang Wu Hospital between the periods of 1951-1965 and 1966-1980 could be attributed to several factors. This difference may be due to a combination of factors. First, changes in healthcare policy may have played a role. The government may have adjusted the free medical care policy at a later stage, which may have led to a decrease in the use of free medical clinics by charities (Song et al., 2020). Changes in funding allocation, scope of services or eligibility requirements may have reduced patient demand for the charity's free medical services. Secondly, the limitation of medical resources may also be one of the influencing factors. Between 1966 and 1980, various factors, such as the limitation or uneven distribution of medical resources, may have led to a decrease in the number of free medical clinics (Wang et al., 2015). Social changes in the accessibility of medical services, changes in medical publicity and awareness, changes in medical needs and changes in sociocultural attitudes may have influenced the variation in the utilization of free medical clinics to varying degrees. These factors may explain why the number of free medical outpatients in Beijing and Shanghai hospitals in the two periods differed significantly. This study believes the most important reason is the change in the economy. From the 1950s to the early 1970s, Macao's economy was dominated by light industry, handicrafts and small-scale trade. Textile, shoe, sugar and other industries were the main industries at that time, but the overall scale was limited. At this time, Macao's economy was still supported by traditional handicrafts and small-scale commerce, and its level of development was lagging behind that of neighboring Hong Kong (Zheng et al., 1999). However, in the late 1960s and 1970s, with the introduction of the gambling industry, Macao began to gradually develop as a gambling tourism destination. The Portuguese government legalized gambling in 1962, which triggered the rise of Macao's gambling industry, attracting many domestic and foreign tourists. This had a positive impact on the economy of Macao, and the gambling industry became one of the economic pillars at that time and also laid the foundation for the economic development of the Special Economic Zone later.

Table 2 shows the absolute β convergence test results of SPO, ORFMC, and ROS. During 1951-1965, ORFMC and ROS are significant at the 1% and 5% level, respectively. That means the values of the two indicators are gradually gradually remain the same. In other words, their changes are gradual to 0. During 1966-1980, SPO, ORFMC, and ROS are significant at the 10%, 10% and

10% levels, respectively. Different from these during 1951-1965, SPO also is significant. During the entire sample period, the result is similar to that during 1951-1965, which means ORFMC and ROS are significant, but ROS is just significant at 10%.

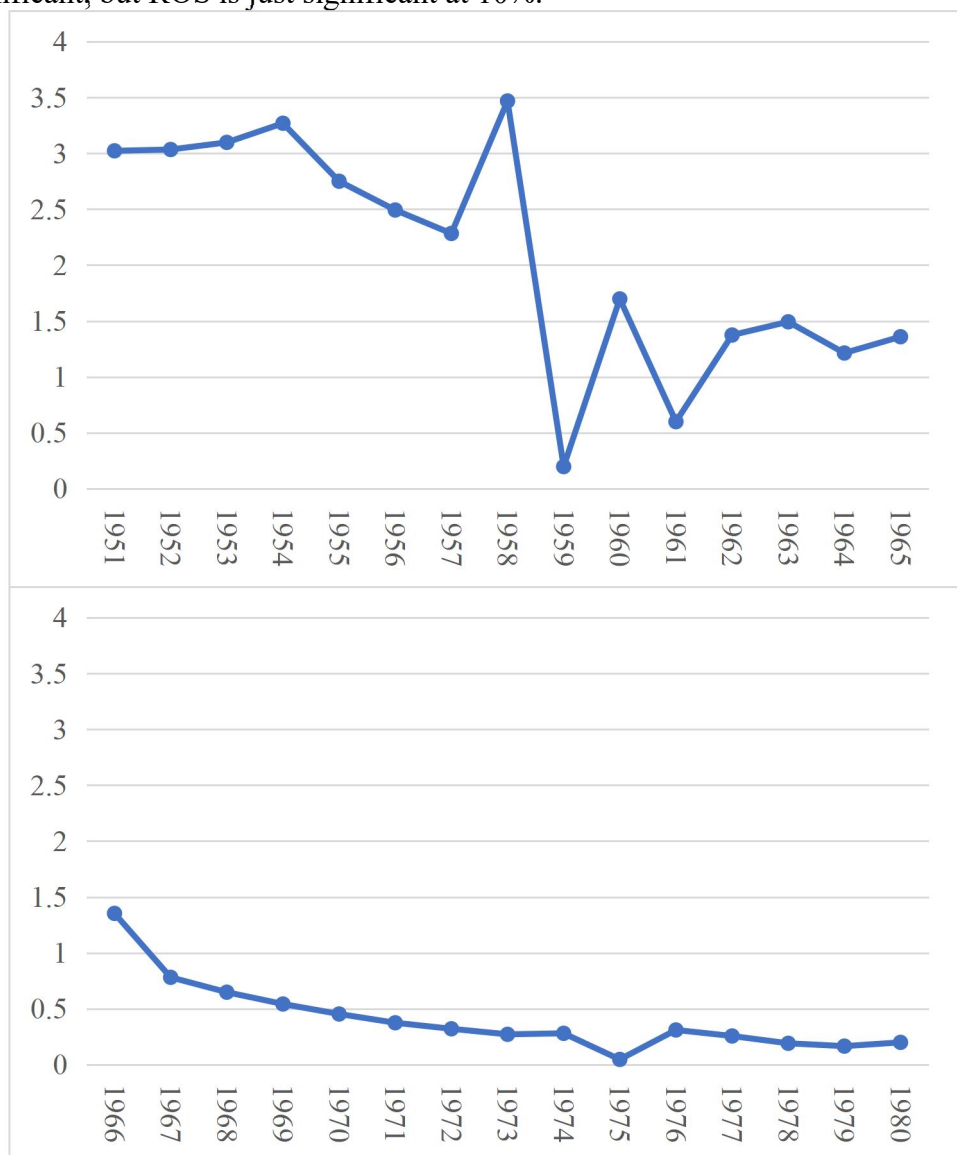


Fig. 3 The ratio of ORFMC to SPO in Kiang Wu Hospital during 1951-1980

4. Conclusion

By utilizing the two convergence models (σ -convergence and β -convergence) and outpatient data from Kiang Wu Hospital, the prominent charitable medical institution in Macao, this study delves into the role of charitable healthcare facilities in shaping Macao's society from 1950 to 1980. The main findings were as follows. Firstly, The SPO of Kiang Wu Hospital during sample period was generally increasing, especially the SPO during the second subperiod was much higher than that during 1951-1965. Secondly, in general, the ORFMC of Kiang Wu Hospital was decreasing, especially the SPO during the second subperiod was much lower than that during the first subperiod. Thirdly, Since ROS is composed of SPO and ORFMC, their changing trend determines that ROS is also declining. Fourthly, The results of absolute convergence analysis showed that the changes of ORFMC and ROS gradually decreased throughout the sample period.

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