Proposal to introduce the concept of passports into a model for forecasting international tourist numbers using Japanese passport statistics

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Abstract

Global tourism has recently gained momentum alongside the expansion of the global economy. Japan is increasingly focusing on tourism as a valuable boost to its economy. This study investigates the trends of outbound tourists to gain insight into inbound tourism. We selected passport statistics as a novel data source for inclusion in our analytical model. Logarithmic multiple regression analysis was conducted using the number of Japanese nationals departing Japan and the number of newly issued general passports as the objective variables. We included the size of the working-age population and the exchange rate, or the working-age population and the productivity index, as parameters, respectively. In both cases, the logarithmic model displayed a good fit. We demonstrate the effectiveness of introducing a previously unexplored 'passport' factor into models when forecasting international tourist numbers.

Keywords

outbound tourist, passport, econometric models, Japanese tourist, departing traveller

1. Introduction

Several tourism studies have focused on the number of tourists; however, few analytical models have included the factor of passport statistics. For example, Abedtalas [2015] and Imamboccus et al. [2024] identified the impact of foreign exchange on the number of outbound tourists in countries where tourism is the main industry but did not include passport statistics. Models estimating the number of departures are simpler than those estimating the number of arrivals, given that the nationality of incoming travellers varies greatly. This study formulates a logarithmic multiple regression analysis based on the number of Japanese departures and newly issued passports.

2. About Japanese passports

There are two types of passports in Japan: round-trip and one-time valid passports. The validity period of round-trip passports was previously five years, but in 1995, it became possible to choose between five and ten years (not available for those under 18 years of age).

3. Data and analysis
3.1 Data

The study covered the period from 1960 to 2022. The data used included the number of Japanese departures [Immigration Services Agency, 2023], the number of new passports issued [Ministry of Foreign Affairs of Japan, 2023], exchange rates, and labour projections, and working-age population size [OECD, 2024a; 2024b; 2024c; 2024d].

3.2 Estimated model

In this study, log multiple regression analysis was conducted on four models using R software. The objective variables were the number of Japanese departures (Models 1 and 2) and the number of new passports issued (Models 3 and 4). Multicollinearity was considered for the explanatory variables of each model: Model 1 (working-age population size and exchange rate), Model 2 (working-age population size and productivity), Model 3 (working-age population size and exchange rate) and Model 4 (working-age population size and productivity). The model equation is shown in (1), where the objective variable is y, the explanatory variables are x_1 and x_2 and the error term is ε.

$$\ln(y) = \alpha \ln(x_1) + \beta \ln(x_2) + \varepsilon \qquad (1)$$

The calculated model formulas are presented in Figures 1 and 2, with the detailed analysis in Table1.

3.3 Calculating the number of valid passports

Number of valid passports: $P_{valid(year\ of\ acquisition)}$ was calculated using equations (2), (3) and (4).

The years 1960 and 1961 were set to 0 as they are unknown.

1962.
$$P_{valid(1962)} = P_{1962(5year)} \qquad (2)$$

1963.
$$P_{valid(1963)} = P_{1962(5year)} + P_{1963(5year)} \qquad (3)$$

Since 1964.
$$P_{valid(year\ of\ acquisition)}$$
$$= \sum_{n = year\ of\ acquisition-4}^{year\ of\ acquisition} P_{n(5year)}$$
$$+ \sum_{n = year\ of\ acquisition-9}^{year\ of\ acquisition} P_{n(10year)} \qquad (4)$$

4. Considerations

The degree-of-freedom-adjusted coefficients of determination were found to be well modelled at more than 0.60 in all models. The working-age population made a positive contri-
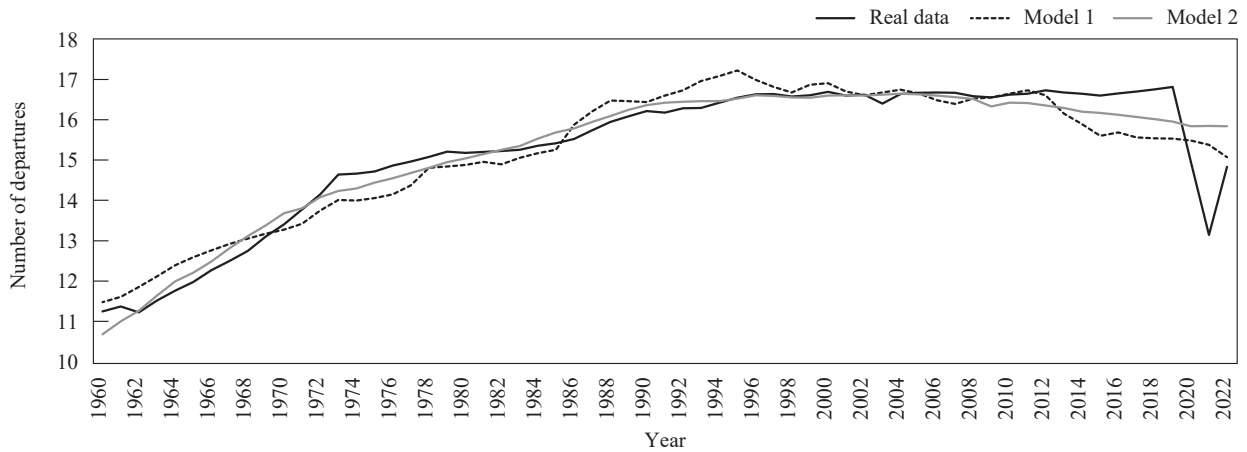
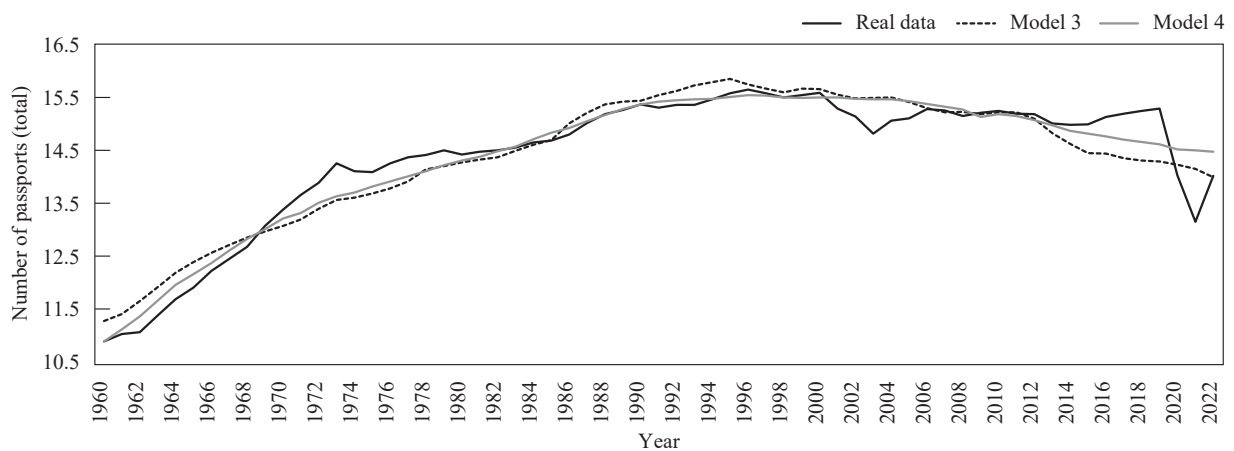Figure 1: Graphs of the formulae for Models 1 and 2

Figure 2 Graph of formulae for models 3 and 4

Table 1: Analysis results

	Number of Japanese departures		Number of new passports issued	
	Model 1	Model 2	Model 3	Model 4
Working age population (20-60)	10.180 ** (1.147)	6.257 ** (1.170)	10.146 ** (0.792)	7.423 ** (0.778)
National currency units/US dollar	−1.493 ** (0.213)		−0.626 ** (0.147)	
Labor productivity (Japan)		2.307 ** (0.230)		1.222 ** (0.153)
Intercept	−21.496 ** (5.842)	−11.036 * (5.187)	−26.661 ** (4.032)	−17.456 ** (3.449)
Num. Obs.	63	63	63	63
R^2	0.885	0.922	0.902	0.938
R^2 Adj.	0.881	0.919	0.899	0.936

Note: + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$.

bution, with the coefficients also having a large impact. The exchange rate gave a negative contribution in Models 1 and 3, where the number of locals departing Japan and the number of new passports issued decreased with the weakening of the yen. Conversely, a stronger yen caused an increase in both figures. In Models 2 and 4, labour productivity made a positive con-

tribution, indicating that an increase in productivity increases the number of Japanese departures and the number of new passports issued. Productivity is also closely related to income and working hours and influenced by the 'money' and 'leisure time' required for tourism. There was a strong positive correlation (0.98) between the number of departures and the number
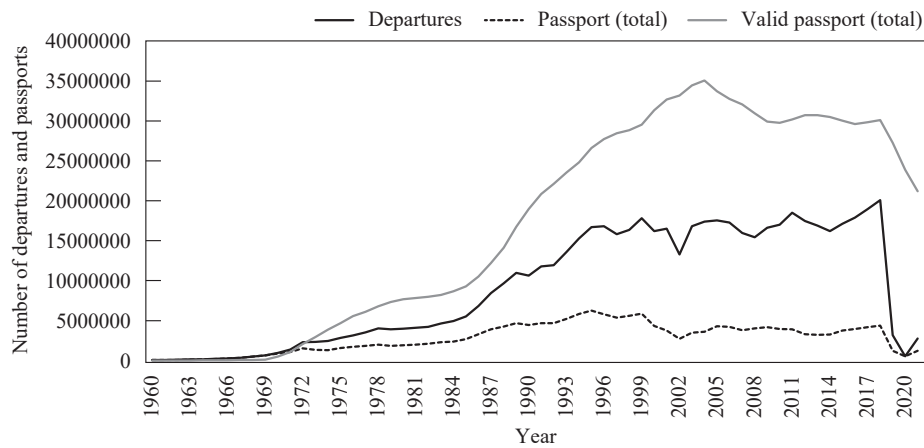
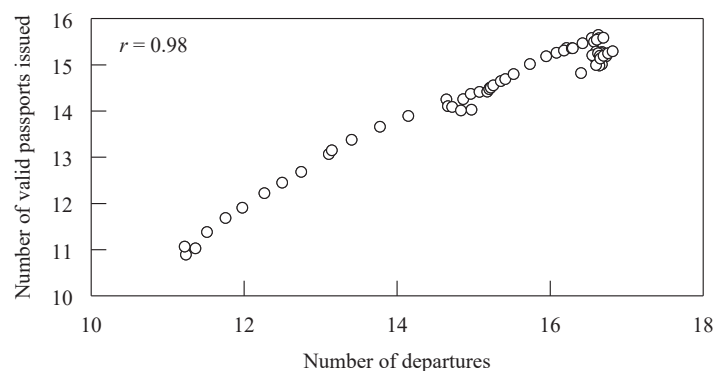Figure 3: Number of Japanese departures and passports

Figure 4: Correlation between the number of departures and the number of valid passports issued

of valid passports issued, but there was a clear difference in the total number of passports issued. This indicates that fewer people travelled abroad more than once. Some people did not travel abroad, despite possessing passports. This indicates the need for measures to increase the rate of repeat visitors to overseas tourist destinations.

5. Conclusion

We conclude that introducing the previously unexplored 'passport' factor into models is effective when forecasting the number of travellers depart from Japan. Our contribution to the literature lies in specifically including passport statistics and demonstrating how they relate to other factors. The number of Japanese nationals departing from Japan is evidenced by the size of the working-age population and the exchange rate, or the working-age population and productivity. The number of new passports issued can be explained similarly. Previous international tourist forecasting models assumed that exchange rate fluctuations affect the number of tourists, given the strong correlation between the number of departures and the number of passport-holders. However, considering the number of Japanese departures is the same as considering the number of new passports issued. Therefore, we propose including a 'passport' component in international tourist forecasting models. Future studies could also explore the impact of barriers to obtaining passports and visas.

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https://doi.org/10.37020/jgtr.9.2_141