Analysis of the Migration Impact on International Trade in Singapore since 1960

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Abstract: Both net migration and the volume of international trade in Singapore had a substantial increase during a certain era, suggesting a potential correlation between the two. This research seeks to investigate and assess the correlation between foreign commerce and migration in Singapore from 1960 onwards. The study used a mixed-method approach, integrating correlation analysis and an extensive document review to obtain significant insights into this intricate relationship. The study has identified a significant positive association between various crucial parameters in Singapore, such as the value of international commerce, the proportion of GDP derived from trade, the adoption of favorable policies, and migration trends. The research highlights the significant relationship between the value of international trade and migration, emphasizing the role of global economic integration in influencing migration flows and patterns. The statement underscores the importance of implementing advantageous policies to attract talented persons and investors, hence fostering Singapore's economic progress and advancement. The findings also emphasize the role of international trade in promoting economic growth and creating favorable conditions for immigration, which in turn affects the demographic composition of the nation.

Keywords: Singapore, International trade, migration, correlation

1. Introduction

The authors, Peter H. Egger, Maximilian von Ehrlich, and Douglas R. Nelson, in their collective book "Migration and Trade," intelligently revealed the complex interactions between migration and international trade [1]. Using a quasi-experimental setup, their analysis revealed a significant finding—a nonlinear correlation existed between migration and those four parameters.

In the article "International Migration And Trade Agreements: The New Role Of PTAs" written by Gianluca Orefice [1], a gravity model was used to analyze the impact of Preferential Trade Agreements (PTAs) on bilateral migration flows. Orefice conducted a thorough and precise investigation, revealing a strong beneficial impact and providing new insights into the previously unexamined influence that trade agreements can have on the patterns of international migration.

This research seeks to investigate and assess the correlation between foreign commerce and migration in Singapore from 1960 onwards. The study used a mixed-method approach, integrating correlation analysis and an extensive document review to obtain significant insights into this intricate relationship. This research aims to elucidate the impact of foreign commercial activities on migration

patterns in Singapore during recent decades. The study utilizes both quantitative and qualitative methods to gain a thorough understanding of how trade dynamics and migration patterns interact. This contributes to a more detailed view on the social and economic effects of globalization on the movement of people in Singapore.

2. The progress of migration and goods and services exports in Singapore

2.1. The Migration progress of Singapore

Migration patterns in Singapore have seen substantial transformations between 1960 and 2020. In recent years, Singapore has seen a significant shift from being a nation with a high rate of emigration to becoming an appealing destination for immigrants.

During the 1960s and 1970s, Singapore experienced significant emigration as numerous Singaporeans pursued more favorable prospects elsewhere. Official data indicates that in 1970, the population of Singaporeans residing overseas reached a zenith of approximately 336,000. Singapore saw a period of transition in migration patterns during the 1990s. The government took efforts to enhance economic conditions and entice Singaporeans who had repatriated to the country. Consequently, there was a decline in the number of Singaporeans living abroad. Unfortunately, there is a lack of freely accessible data for this particular time frame. Since the late 1990s, Singapore experienced a substantial surge in immigration. Official statistics indicates that the population of permanent residents (excluding Singapore citizens) in Singapore increased from approximately 80,000 in 1990 to more than 540,000 in 2020. This signifies a significant surge of foreign individuals opting to establish permanent residence in Singapore.

Singapore has experienced a rise in the number of foreign workers to cater to the needs of different sectors. According to the Ministry of Manpower, as of June 2020, Singapore had approximately 1.4 million foreign workers. These individuals provide valuable contributions to Singapore's economy and help address shortages in areas such as construction, manufacturing, healthcare, and services. Singapore employs a discerning method when it comes to bestowing permanent residency and citizenship. The number of individuals who have been given permanent residency has fluctuated over the years. According to the Immigration and Checkpoints Authority (ICA), almost 27,000 persons were granted permanent residency (PR) in 2019. The number of individuals obtaining Singapore citizenship has been pretty constant, with an average of approximately 18,000 people each year in recent times.

2.2. Goods and services export in Singapore

From 1960 to 2020, Singapore's export of products and services has been crucial in driving the country's economic expansion and transition from a developing nation to a dominant force in the global economy.

First, early years and industrialization (1960s-1970s). In the early 1960s, Singapore's export sector primarily focused on traditional goods such as rubber, tin, and textiles. However, with limited natural resources, the government recognized the need for industrialization and economic diversification. During this period, the country made significant strides in developing its manufacturing sector, which included electronics, garments, and processed food products. Exports of these manufactured goods began to contribute significantly to Singapore's economic growth.

Second, export-oriented development (1980s-1990s). In the 1980s and 1990s, Singapore adopted an export-oriented strategy, capitalizing on its strategic location and business-friendly environment. The government actively courted foreign investments and multinational corporations to set up production facilities in the country. This led to a surge in exports of electronics, electrical machinery,

chemicals, and refined petroleum products. Singapore also became a hub for re-export, benefiting from its efficient port and logistics infrastructure.

Third, financial and business services exports (1990s-2000s). In addition to goods, Singapore started to export more services, particularly financial and business services. The country's well-regulated and stable financial sector attracted global banks, insurers, and asset managers. As a result, exports of financial services, including banking, insurance, and wealth management, became a significant contributor to Singapore's export revenue.

Fourth, knowledge-intensive services and high-tech goods (2000s-2010s). In the 2000s and 2010s, Singapore experienced a shift towards becoming a knowledge-based economy. The export orientation broadened to encompass knowledge-intensive services, such as information technology, research and development, and consulting services. Exports of advanced technological products, including semiconductors, medicines, and aerospace equipment, experienced an increase due to the country's investments in innovation and research and development (R&D).

Fifth, services-led economy and digital exports (2010s-2020s): In recent years, Singapore has continued to emphasize services-led growth, with a particular focus on digital exports. The country's digital economy has seen rapid growth, with exports of digital services, software, and data management services becoming increasingly prominent. Singapore's position as a regional hub for tech startups and e-commerce platforms has further boosted its digital exports.

During this time, Singapore's export industry has profited from a trade policy that is open and competitive, as well as from broad regional and international trade agreements. Additionally, the presence of a highly skilled workforce and a regulatory environment that is favorable to businesses has contributed to this success. There appears to be a little association between the growth of Singapore's exports of products and services and the increase in migration to Singapore. However, the author has identified some connection between these two factors.

3. Correlation analysis

3.1. Correlation Method

It pertains to the procedure of measuring and quantifying the extent of correlation or connection between two or more variables. It entails the utilization of statistical methodologies to evaluate the correlation between changes in one variable and changes in another variable. The primary goal of the correlation method is to ascertain the magnitude and direction of the association between the variables. Pearson correlation, sometimes referred to as Pearson's correlation coefficient, is the most frequently used method for measuring correlation.

The Pearson correlation coefficient, also referred to as Pearson's r or simply Pearson's correlation, is a statistical metric that precisely measures the magnitude and direction of a linear association between two continuous variables. The correlation coefficient is a commonly used statistical measure that quantifies the linear relationship between two variables.

The Pearson correlation coefficient is calculated using the following formula:

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

Where x_i and y_i are the individual data points of the two variables (x and y, respectively). X bar and y bar are the means of the two variables (x and y, respectively). n is the number of data points.

The Pearson correlation coefficient ranges from -1 to 1:

$r = 1$ indicates a perfect positive linear relationship, meaning that as one variable increases, the other increases proportionally.

$r = -1$ indicates a perfect negative linear relationship, meaning that as one variable increases, the other decreases proportionally.

$r = 0$ indicates no linear relationship between the variables.

A positive value of r indicates a positive correlation, and a negative value indicates a negative correlation. The magnitude of r measures the strength of the correlation. The closer the absolute value of r is to 1, the stronger the linear relationship between the variables.

3.2. P-value

The p-value is a statistical metric used to evaluate the significance of the correlation coefficient. This measures the likelihood of receiving the observed correlation coefficient (or a number that is even more extreme) if the null hypothesis is accurate. The null hypothesis posits that there is no statistically significant link between the two variables within the entire population.

In the context of correlation analysis, a low p-value signifies that the observed connection is highly improbable to have arisen only due to random chance, hence indicating that the correlation holds statistical significance. On the other hand, a high p-value indicates that the observed correlation may have been caused by random sample variance, and there is no statistically significant association between the variables.

Researchers frequently establish a significance level, referred to as "alpha," which is typically selected as either 0.05 (5%) or 0.01 (1%). If the p-value is less than or equal to the significance level, the outcome is deemed statistically significant. Consequently, the null hypothesis is rejected in favor of the alternative hypothesis, indicating a substantial connection between the variables.

3.3. Inferential Analysis

Figure 1: Exports of Goods and Services (Current US$) [3]

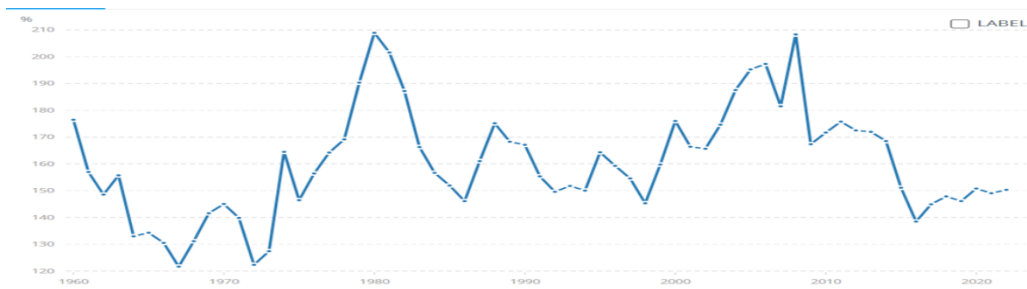Figure 2: Imports of Goods and Services (Current $) [3]

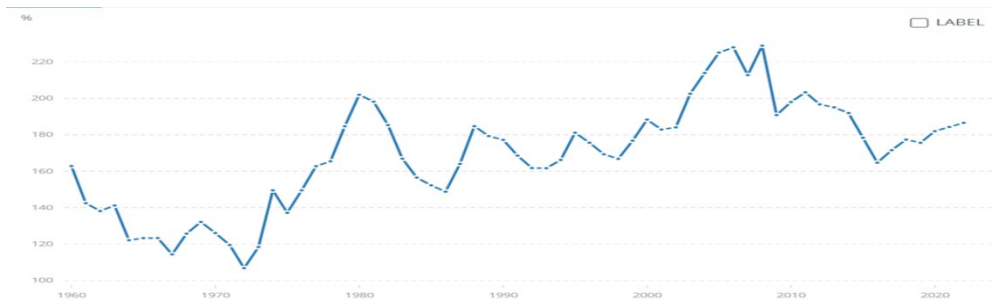Figure 3: Imports of Goods and Services (% of GDP) [3]

Figure 4: Exports of Goods and Services (% of GDP) [3]

Figure 5: Net Migration [4]

The author computed the correlation coefficient (r value) and the significance level (p value) using five groups of data (Figure 1-5) and obtained these indices.

Table 1: Relation between Migration and import and export value (dollar) and import and export GDP percentage

	R value	P value
Exports of Goods and Services (Current US$)	0.4732575500	0.0001024787
Imports of Goods and Services (Current US$)	0.4938775186	4.5184831454
Imports Of Goods and Services (%Of GDP)	0.6772355908	1.5024073934
Exports of Goodsa and Services (%of GDP)	0.4407711174	0.0003364949

The correlation coefficient (r) between migration and the other four groups of statistics is around 0.5, indicating a significant relationship between migration and the dollar value of imports and exports, as well as the proportion of imports and exports in GDP (as shown in table 1). However, only two of them, specifically the export of goods and services measured in US dollars and the import of goods and services as a percentage of GDP, have a significantly small p-value. The p-values for these

variables are roughly 0.0001 and 0.0003, respectively.

There seems to be a significant positive correlation (with a r value of around 0.5) between migration and four categories of data: the monetary value of imports and exports, as well as the percentage of GDP represented by imports and exports. This suggests that as these trade factors rise, there is a correlation with an increase in net migration.

Furthermore, the low p-values (around 0.0001 and 0.0003) for the export of goods and services (measured in US dollars) and the import of goods and services (as a percentage of GDP) suggest that these connections have strong statistical significance. Put simply, the likelihood of randomly achieving such significant correlations between migration and certain trade variables is exceedingly small.

The strong association shown between migration and trade variables, specifically in regard to the values of imports and exports, indicates that economic activities have a crucial influence on the formation of movement patterns in Singapore. With the expansion of the economy, Singapore has the potential to attract foreign investments and trade possibilities. This might lead to an influx of talented professionals, entrepreneurs, and investors who are seeking improved economic prospects.

These findings emphasize the significance of comprehending the interaction between trade dynamics and migration patterns, as well as the impact of economic considerations on migration choices. Nevertheless, it is crucial to bear in mind that correlation does not establish causation, and there may be additional factors influencing migratory patterns. The analysis may be constrained due to the small sample size and the scarcity of historical data.

Nevertheless, this research offers useful insights into the correlation between trade and migration in Singapore and can serve as a basis for additional investigation and policy deliberations in effectively regulating migrant flows while promoting economic growth and development.

4.   Results and analysis

The research findings suggest a direct relationship between trade variables, such as trade value and the percentage of GDP allocated to trade, and net migration in Singapore. This implies that when foreign trade activities expand, both in terms of value and their impact on the economy, there is a tendency for net migration to also rise.

The presence of a positive correlation emphasizes the interaction between the dynamics of trade and migration. The expansion of trade operations can generate additional economic opportunities, entice foreign investment, and cultivate a favorable climate for corporate growth. As a result, the economic growth and development in Singapore may entice highly trained professionals, entrepreneurs, and investors from other countries, resulting in a surge of immigrants who are looking for improved opportunities.

Nevertheless, it is crucial to acknowledge that migration is a complex phenomena impacted by numerous causes, and policy plays a significant role in shaping migration trends [5]. The establishment of favorable migration rules in Singapore can significantly contribute to the attraction and retention of international talent. The government can influence the migration decisions of potential immigrants by offering incentives and creating a hospitable atmosphere for highly competent persons [6].

The ease of individuals entering and residing in Singapore for employment or business purposes can be considerably affected by policies concerning permanent residency, work permits, and visa rules [7]. The government can achieve a harmonious balance between attracting foreign talent and protecting the interests of its citizens by formulating and implementing policies that are in line with economic objectives and social cohesion.

Furthermore, the implementation of policies that endorse social integration, cultural comprehension, and inclusiveness can actively enhance the overall migration experience for

immigrants. This, in turn, cultivates a feeling of belonging and stimulates a lasting dedication to the host country.

To summarize, the strong link between trade variables and net migration in Singapore highlights the significant impact of economic considerations on migration patterns. Moreover, it highlights the crucial significance of migration policies in determining the flow of individuals into and within the nation. Gaining comprehension and utilizing this connection can assist policymakers in making well-informed choices that advance sustainable economic expansion and social unity while efficiently handling migrant movements.

5.   Conclusion

To summarize, the strong connection between trade variables and net migration in Singapore highlights the significant impact of economic considerations on migration patterns. Moreover, it underscores the pivotal significance of migration policy in influencing the flow of individuals into and within the nation.

The investigation is significantly limited by the limited availability of data samples. The lack of data on several factors, such as the quantity of immigrants in Singapore, specific imports and exports of goods, and characteristics of immigrants, limits the extent of study and thorough comprehension of the correlation between international trade and migration. The limitations arising from the scarcity of data sources and the modest size of the database present difficulties in formulating reliable and widely applicable conclusions. In the absence of a substantial and varied dataset, the research might encounter difficulties in comprehensively capturing the intricate and subtle dynamics of the trade-migration link in Singapore throughout the previous decades. By obtaining a greater amount of comprehensive and specific data, the research has the ability to provide more substantial insights and attain a more thorough comprehension of the interplay between trade operations and migratory trends in Singapore since its inception in 1965. An expanded and more comprehensive dataset would facilitate the analysis of more intricate correlations, trends, and impacts, resulting in more assured and significant conclusions. Due to Singapore's recent independence in 1965, the historical data available may be restricted in capturing long-term patterns and variances. An extended historical timeframe could provide additional significant data points for a thorough examination of the shifts in trade and migration patterns across history.

Although the research provides valuable insights into the correlation between international trade and migration in Singapore, the limited data sample restricts the scope and applicability of its findings. By utilizing a wider range of extensive and varied data, future research has the capacity to make even more substantial contributions and provide additional insights into this intricate and ever-changing interaction.

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