

Population Transformation in Hong Kong and Shanghai, 1996–2025: A Comparative Event-Based Analysis of Global Shocks and Macroeconomic Context

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Abstract

While many of Asia's major urban centers face global economic shock waves; international trade disputes; public health emergencies; or significant political transitions in addition to each city having a large population and economy, each city can respond differently to these types of events. The purpose of this paper is to compare how two of Asia's largest urban areas - Hong Kong and Shanghai - responded from 1996 through 2025. To complete this analysis, we used the Asian Urban Transformation Matrix (AUTM) which is an AI-based research tool that provides access to UN data on world population trends and World Bank data for macroeconomic indicators. Because Shanghai was assigned to China for World Bank economic indicators on this platform, these indicators were treated as national macroeconomic context instead of values from Shanghai municipal levels; no false comparison by city-to-city GDP was made. Verified population endpoints show that Hong Kong population grew from 6.838 million in 2006 to 7.674 million in 2025 (+12.2%) while Shanghai population growth occurred from 16.675 million to 29.939 million (+79.5%). Shanghai's population compound annual growth rate declined by 2.27 percentage points (from 3.97 percent from 2006–2018) to 1.70 percent from 2018–2025, while it was less than 0.7 percent for Hong Kong during the two timeframes. In terms of event-based analysis, the research examined the effects of such key events as the 1997 transfer of sovereignty over Hong Kong, the Asian financial crisis in 1997–1998, China's accession to the WTO in 2001, the global financial crisis in 2007–2009, the Sino-US trade conflict commencing in 2018 and the COVID-19 pandemic. The results indicate that international events have differential impacts on various national/local structural forms: Hong Kong has an older and migration sensitive service economy with its population being exposed to greater external shocks compared to Shanghai, which experienced significant growth in its population due to long term urbanization and migration-based development factors; even though there were many disruptions to Shanghai's economic environment.

Keywords: Hong Kong, Shanghai, urban population, economic shocks, migration, globalization.

1. Introduction

1.1. Urban Population Change and External Shocks

Population change within large metropolitan areas is complex. All these factors (employment opportunities, housing prices, immigration policies, birth rates, aging populations, international trade, capital flows, and public trust) have a potential impact on the decision to move into, live in or migrate from an area. Therefore, the way in which population responds to external shocks will be dependent upon how each specific metropolitan area has developed its economic base. For example; a global financial crisis would likely travel very quickly to a financial center of commerce such as Hong Kong. On the other hand; a trade shock could potentially travel much faster through manufacturing networks and export markets. In addition, a public health disaster may travel differently than both the above examples due to restrictions placed on people's ability to move about and changes to people's migration patterns. This research takes Hong Kong and Shanghai as its two main locations for comparison purposes. The two cities are located relatively close to one another geographically and they also share many common economic ties. However, at the time this research began neither city had been developed in the same manner. Additionally; Hong Kong was also beginning the study period

in a position where it was much closer to achieving self-determination whereas China controlled all aspects of government in Shanghai.

The transfer of Hong Kong's sovereignty to China in 1997 coincided with the onset of the Asian Financial Crisis. The IMF (1998) [1] identified several reasons for the decline in the economy resulting from the regional financial crisis including; eroding investor confidence which created speculation against the Hong Kong dollar, higher interest rates, weaker demand at home, and an unstable housing market. Real GDP declined by 7 percent compared to one year ago as of Q3 1998 and the price of both residential real estate and stocks fell by over 50 percent relative to their peak values in 1997 [2]. Therefore, simply stating that the transfer of sovereignty led to the subsequent contraction in economic activity is appropriate because it would be impossible to isolate the political transition from the impact of the regional financial shock.

1.2. Shanghai, Globalization, and Migration

Shanghai took a distinct route. By becoming the 143rd member of the WTO on December 11th, 2001 [3] China furthered its ties into global trade and investment. In addition to being a leading port, manufacturing location, financial hub, and

internal migrant destination, Shanghai was uniquely situated to take advantage of this structural opening. Studies have found that in peri-urban Shanghai, manufacturing expansion and job creation drew migrants from other regions, while local housing and institutional arrangements were influential factors shaping the spatial distribution of migrants [4]. Therefore, rather than simply viewing population growth in Shanghai as an automatic result of increases in Gross Domestic Product, the research suggests that there is value in examining how migration opportunities and urban planning policy influence such changes.

1.3. Later Global Events

The 2007–2009 Global Financial Crisis, the trade conflict initiated in 2018 between the United States and China, and the COVID-19 Pandemic were all added opportunities to evaluate how cities responded differently. China's national economy grew at 9.0% in 2008 during the International Financial Crisis [5] indicated that a global shock can be cushioned domestically through policy and demand. The IMF noted trade tensions and tighter global financial conditions as significant risks for Hong Kong in 2018 [6], while tariffs and trade uncertainty directly impacted the macroeconomic environment of Shanghai in 2018. Mobility restrictions during COVID-19 made the changes in the population especially important. Hong Kong's official end-of-year population declined in 2020 from natural decrease and net population out-migration when combined with travel restrictions [7], and it decreased again in 2022 [8].

1.4. Objectives

The study had a few goals. The first goal was to quantify and compare the verified changes in urban agglomerations populations in Hong Kong and Shanghai using AUTM derived data. The second goal was to examine if the rate of growth for urban agglomerations population increased/decreased prior to/after the 2018 Trade Conflict Period and during the COVID-19 Era. The third goal was to interpret the population trends considering the two most significant International Events with an explicit separation of City Level Population Data from Country Level Macro Economic Indicators.

2. Materials and Methods

2.1. Research Platform and Data Source

The Asian Urban Transformation Matrix (AUTM) is an open access study data collection and comparison tool that was created to provide researchers, practitioners, and students a single location where they could retrieve data to compare cities across Asia. It has a React / Next.js frontend and a FastAPI backend using PostgreSQL and Redis. In addition to retrieving city linked table data on demographics, housing stock, economics and migration patterns, it pulls additional data from the World Bank and the UN's urban series. Additionally, it will create AI generated narrative insights. While AI generated text was used in this manuscript it was considered secondary empirical data. All numerical information came from either data display within the AUTM or exportable data within the AUTM. All these numbers were manually checked against the source labels in the AUTM documentation [9].

One of the most important validations for geography was that it used the World Bank's economic unit codes [10]. AUTM assigned a World Bank economy code of HKG to Hong Kong and CHN to Shanghai. For example, when viewing data from

the World Bank (such as NY.GDP.MKTP.CD) from Shanghai, it is using China-wide data and not GDP data for the City of Shanghai. Consequently, the manuscript treats this data as background national macro-economic information rather than as local economic data. That said, there is an additional, independent verification: According to the Shanghai Municipal People's Government (2026) [11], in 2025, Shanghai had a city gross domestic product of approximately RMB 5.67 trillion (which equates to about \$814 billion USD). On the other hand, AUTM displays a value of approximately \$19.50 trillion for "CHN" (i.e., China), which would indicate the total national Gross Domestic Product for China (not just for the City of Shanghai). Thus, if we were treating "the latter as city GDP for Shanghai", it would be incorrect.

2.2. Study Period and Event Framework

The time of conceptualization was from 1996 to 2025 (a time before hand over and after the pandemic) to provide an initial start year prior to hand-over and extend into the post-pandemic period. Only exact numeric results have been reported for those years that were directly available within the provided AUTM data; no 1996 missing values were created or interpolated. Validated population end points were available for 2006, 2018, and 2025. A full year by year Shanghai population dataset is also available for 2011 – 2025. Rather than experimental treatments, events served as temporal reference points: The 1997 Hand Over and Asian Financial Crisis, China's WTO membership in 2001, the 2007 – 2009 Global Financial Crisis, the 2018 United States-China Trade War, COVID-19 outbreak in 2020, and the 2022 Shanghai Lock Down Period.

2.3. Variables and Calculations

The primary population metrics used in this analysis included Total Urban-Agglomerations Population and Population Density. Both cities' population data was labeled by AUTM as "UN.WUP.URBAN.AGGL" and density as "UN.WUP.DENSITY." It is important to note that because the geographic area analyzed is a single urban agglomeration, it would be incorrect to equate the values of these two metrics to those of resident-counts provided by municipalities. Population Percent Change was calculated using the formula $[(P2-P1)/P1]*100$. The compound Annual Growth Rate (CAGR) was calculated using the formula $(P2/P1)^{(1/n)}-1$. These calculations were completed for each period of 2006-2018, 2018-2025 and 2006-2025.

2.4. Verification Procedure

Two rounds of validation occurred to ensure data quality. The first round verified each piece of data that is presented in a table, figure, or within the Results section against an AUTM provided PDF document or the live platform's labels. A second round was completed where all percentage calculations (and associated CAGR) calculated from raw endpoints were redone using independent methods as well as verifying all statements related to economics are valid at their respective geographic levels. Sources referenced include: IMF; WTO; Hong Kong Census and Statistics Department; National Bureau of Statistics of China; and Shanghai Municipal Government were used to validate history, definitions, etc., but did not replace the actual observations by the AUTM.

Table 1: Verified AUTM urban-agglomeration population and density endpoints.

Year	Hong Kong population	Hong Kong density (/km ²)	Shanghai population	Shanghai density (/km ²)
2006	6.8382 M	6,182.8	16.6748 M	2,629.7
2018	7.4170 M	6,706.1	26.6066 M	4,196.0
2025	7.6740 M	6,938.5	29.9390 M	4,721.5

3. Results

3.1. Long-Run Population Divergence

The verified AUTM endpoint for Hong Kong has shown a significant divergence in population size. From 2006 with a population size of approximately 6.8382 million, to 2018 with a population size of approximately 7.4170 million, to 2025 with a population size of approximately 7.6740 million. The percentages of increase between these years are as follows; 8.46% (from 2006 to 2018), and then 3.47% (from 2018 to 2025) and overall percentage increase was 12.22%. Corresponding Compound Annual Growth Rates (CAGR) of .68%, .49%, and .61% respectively for the time frames mentioned. Population density increased from 6,182.8 to 6,938.5 persons per km² over the same endpoint span.

The number of people living in the urban area of Shanghai (AUTM) has increased significantly since 2006. In 2006 there were 16.6748 million people; by 2018 this had risen to 26.6066 million; while by 2025 there are now 29.9390 million. As such, 2006–2018 saw a 59.56% increase in the population; with an additional 12.52% over the years 2018–2025. Overall, there is an almost 80% increase for the period 2006 – 2025. Using compound annual growth rates (CAGR), the population of the urban agglomeration of Shanghai grew at a rate of 3.97 % during 2006 – 2018; 1.70% during 2018 – 2025; and a CAGR of 3.13% for the entire period of 2006 – 2025. With regards to density of population, in 2006 there were approximately 2629.7 persons/km². By 2025 however, there will have been a considerable increase to 4721.5 persons/km².

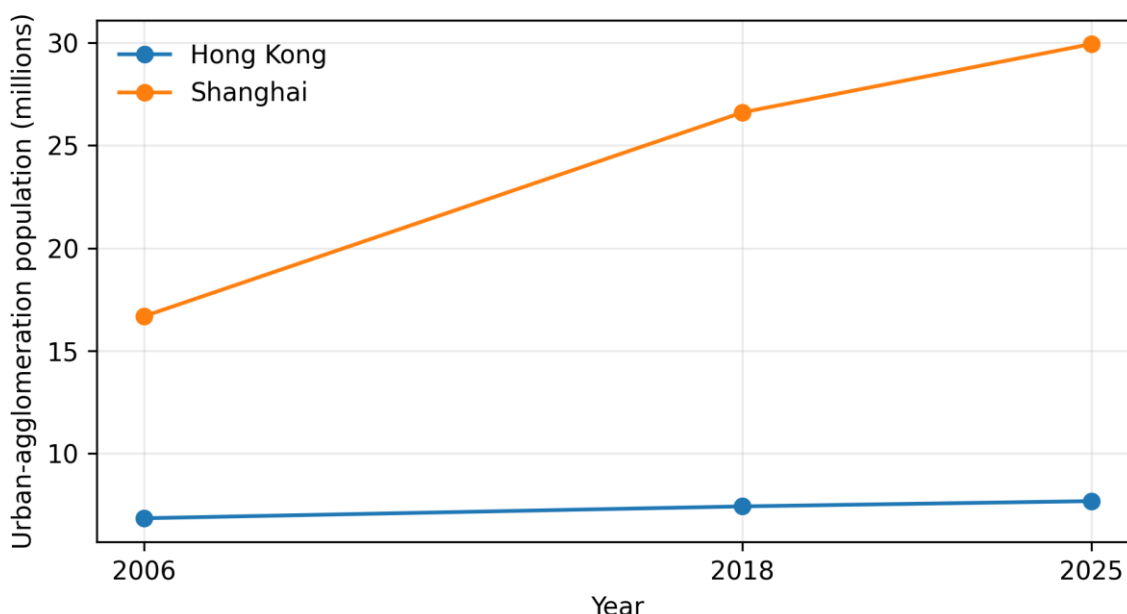


Figure 1: Verified AUTM urban-agglomeration population endpoints for Hong Kong and Shanghai. Values are from supplied platform exports; lines connect verified endpoints and do not imply unobserved annual values.

3.2. Comparative Change in Growth Rates

The relative differences in rates of increase during these time frames are almost as important as the absolute rates themselves. Between 2006–2018, Shanghai's annual population compound average growth rate (CAGR) of 3.97%, or roughly 5.8 times that of Hong Kong's (0.68%), provided evidence of a significant gap between the population dynamics of the two cities. Over the next interval (2018–2025), although the population growth rates for both cities decreased, the difference remained very large;

Shanghai experienced an average annual population growth rate of 1.70%, whereas Hong Kong averaged just 0.49%. Therefore, over the two-time frames, the decline in CAGR for Shanghai was around 2.27 percentage points, whereas the corresponding decrease for Hong Kong was roughly 0.19 percentage points. These qualitative trends reflect a shift toward slower urban growth for Shanghai and toward lower-population-growth maturity for Hong Kong.

Table 2: Population change derived from verified AUTM endpoints.

City	Interval	Start (M)	End (M)	Change / CAGR
Hong Kong	2006–2018	6.8382	7.4170	+8.46% / 0.68% yr ⁻¹
Hong Kong	2018–2025	7.4170	7.6740	+3.47% / 0.49% yr ⁻¹
Hong Kong	2006–2025	6.8382	7.6740	+12.22% / 0.61% yr ⁻¹
Shanghai	2006–2018	16.6748	26.6066	+59.56% / 3.97% yr ⁻¹
Shanghai	2018–2025	26.6066	29.9390	+12.52% / 1.70% yr ⁻¹
Shanghai	2006–2025	16.6748	29.9390	+79.55% / 3.13% yr ⁻¹

3.3. Shanghai Annual Population Pattern, 2011–2025

The Shanghai Series (annual) provides higher detail about the area of time that is closer to both the trade conflict and the COVID-19 Pandemic. In 2011, according to AUTM, there were 20.9 million. Then, the number increased steadily through 2018 (26.6 million), 2019 (27.6 million), and 2020 (28.5 million). Growth was slower after this: 28.8 million in 2021, 29.1 million in 2022, 29.4 million in 2023, 29.7 million in 2024, and 29.9 million in 2025.

million in 2025. Therefore, the data provided by the Shanghai Series do not show a drop in total population in the AUTM urban-agglomerations during the COVID-19 pandemic; rather they indicate a sharp reduction in growth rate. It grew to a total of 5.7 million people over the course of the seven years from 2011 to 2018. It also grew to a total of 3.3 million people over the course of the next seven years from 2018 to 2025.

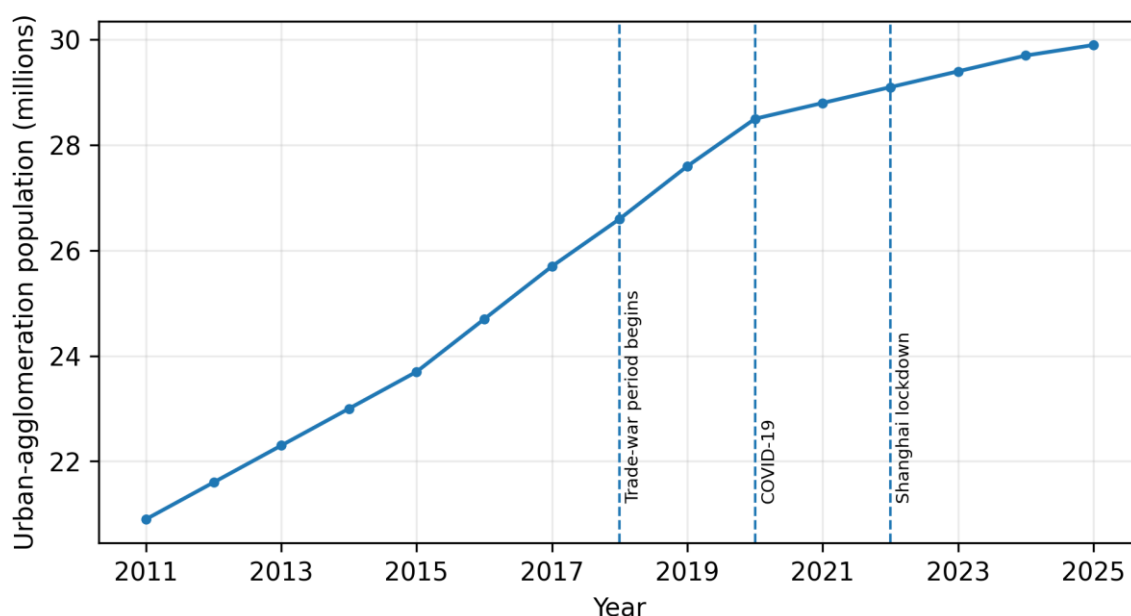


Figure 2: Shanghai AUTM urban-agglomeration population, 2011–2025, with selected event markers. Event lines indicate timing only and are not causal estimates.

3.4. Macroeconomic Context and the Geographic-Level Check

The Website's Macro-Economic Dashboard clearly depicts significant macro-economic differences in the countries represented; however, as all data is sourced from the AUTM's coded data for each country, it should be considered when interpreting these data. In 2025, AUTM presents the following values for Hong Kong (HKG): GDP = \$427.3 billion; GDP/capita = \$56,983; real GDP growth = 3.49%; Unemployment rate = 2.8%; and CPI inflation = 1.44%. On the Shanghai Page, the platform displays China (CHN) values for the following: GDP = \$19.50 Trillion; GDP/capita = \$13,862; Real GDP Growth = 4.96%; Unemployment Rate = 4.6%; and CPI inflation = .06% [12]. Although these represent valuable indicators of the National Macro-Economic Environment surrounding Shanghai, they do not represent the Municipal Economic Outcomes for Shanghai. The same problem exists regarding Geographic level for previous economic value exports presented on the platform.

The method of this validation dramatically alters how we interprets the data. We are justified in stating that the population of Shanghai's urban agglomeration increased at an incredibly fast rate while the Chinese national economy was expanding and experiencing subsequent shocks from both international trade and pandemics. However, it is not justifiable (with our current platform exports) to use this to determine whether there is a municipal GDP per capita for Shanghai using either the correlation between the municipal GDP and its population or comparing \$US 19.5 trillion to Hong Kong's \$US 427.3 billion, as if both represent city GDP. Therefore, The Results do not include these types of calculations.

4. Discussion

4.1. The 1997 Handover and Asian Financial Crisis

The initial large-scale event of the study period shows why there are special considerations for causal language when conducting historical urban analysis. As well as being a significant institutional change when Hong Kong returned to Chinese authority on July 1, 1997, the Asian Financial Crisis began at roughly the same time. A study by the International Monetary Fund (IMF) attributed the extreme decline in

economic performance from 1997-98 to regional financial transmission, speculative pressures, higher interest rates, the collapse in asset values, lower export volumes and less domestic consumption. Because the mechanisms identified by the IMF were operating during the same time frame as the transfer of power to China, no independent evidence exists of a post-transfer-of-power effect. Therefore, it would be reasonable to conclude that Hong Kong underwent a double transition – one political and the other financial – both of which were occurring at a particularly difficult moment.

The distinctions are important for population study. While an economic crisis might decrease population in a way through indirect mechanisms such as reduced employment, wealth, construction or overall confidence, the same type of impact could be produced by a large number of political events in a mature high-cost city, to the extent that they produce similar impacts in these areas. In addition to Li et al.'s (2022) [13] research on Hong Kong residential mobility showing how housing conditionally and structurally affects mobility over many years, this makes it clear that the relationships between population and economy are affected indirectly by housing and migration and do not reflect a simple one-to-one response.

4.2. WTO Accession and Shanghai's Structural Expansion

The speed of Shanghai's growth from 2006 through 2018 is consistent with a long-term structural urbanization process rather than a short-lived response to an event. The strong support that China provided for its foreign trade position by acceding to the WTO in 2001, further improved the global trade environment within which Shanghai grew. Additionally, as new markets and manufacturing, logistics, service sectors and investments emerged, these new marketplaces created employment opportunities for people migrating into the region; thereby supporting greater numbers of people moving into the periphery of Shanghai. Zhu et al. (2019) [4] illustrated how the expansion of manufacturing industries facilitated the attraction of migrants from other regions to the periphery of Shanghai. In contrast, Yang et al. (2018) [14], noted that this has been just part of a larger issue: to integrate migrants into the economic mainstream of a large metropolis such as Shanghai. Thus, it can be seen why, despite both being internationally integrated; Shanghai was able to experience significantly higher rates of population increase than Hong Kong.

The differences in the numbers of new urban agglomeration residents in Shanghai (approximately 9.93 million) and Hong Kong (approximately 0.58 million) from 2006 to 2018 do not indicate that Shanghai was less affected than Hong Kong during each crisis. Instead, a strong migration/urbanization trend could mask the effects of crises over a longer time frame.

4.3. The Global Financial Crisis

The 2007-2009 crisis differed from the 1997-1998 Asian Financial Crisis in that the crisis in 2007-2009 began with the collapse of the global credit markets, as well as in housing markets and subsequently affected by both finance and trade. As an important international financial center, Hong Kong's exposure to the global capital market environment could also potentially lead to negative effects on its economy. In contrast, mainland China's relatively strong economic performance in 2008 allowed for continued rapid national growth; in fact, according to National Bureau of Statistics of China (2009) official estimates indicated a 9.0% increase in GDP during 2008. Although Shanghai may have been negatively impacted due to

lower levels of external demand during this time period than it would have experienced otherwise; however, when looking at the overall level of activity within the Chinese economy as well as the policy responses employed by the government domestically, there is a clearly identifiable difference in terms of the macro-economic environment that existed at the time.

4.4. Trade Conflict and the Post-2018 Slowdown

The beginning of the US-China trade war in 2018 presents another form of an external shock. Tariffs, as well as trade uncertainty, do not function like a banking crisis, where they work through export demand, supply chain functions, investment expectations, and business confidence. As Hong Kong acts both as a trade and financial middleman, it was therefore affected by tariffs and trade uncertainty. The IMF has also recognized trade tensions as one of Hong Kong's primary risks over the next year [6]. Shanghai was also affected through its exposure to China's manufacturing, trade and investment channel functions. According to the AUTM population data, Shanghai's CAGR decreased from 3.97% for the years 2006 – 2018 to 1.70% for the years 2018 - 2025. This period is similar to other areas of a global slowdown since 2018; however, the study does not believe that this decline can be attributed solely to tariffs due to all these factors being experienced at the same time (demographic aging, immigration policies, COVID-19, and changes in developmental conditions)

4.5. COVID-19, Mobility, and Population Resilience

COVID-19 is an example of one such "shock" that affected Hong Kong's population and economic activities as it restricted individuals from moving around and engaging in economic activity. The Census and Statistics Department (2021) reported a year-end decline in the total number of people living in Hong Kong by the end of 2020. This was due to both natural decrease (the difference between deaths and births) and net out-migration (more people left Hong Kong than moved into it), as a result of travel restrictions imposed on residents. In addition, at the end of 2022, official statistics indicated that the total population had declined again; there were natural decreases, and more people had left the city than moved into it [8]. So et al. (2025) [15] have also demonstrated recently that immigration has become a very important factor in determining Hong Kong's population trend, because of low fertility rates. Thus, these studies indicate that external "shocks," like those caused by COVID-19, may be able to influence populations in terms of their mobility/migration patterns as well as through their effect on Gross Domestic Product (GDP).

In comparison to Shanghai's previous trend for an urban agglomeration (a) the AUTM numbers rose again until 2022 (b), however at a decelerating rate; from 28.5 million up to 29.1 million. However, it should be noted that there are differences between urban-agglomerations and municipal borders and as such should not be compared to the administrative resident population of Shanghai. The continued overall increase in the total number of residents along with the lower incremental increases in population size suggest an ability for the agglomeration to withstand disruptions to its economy and movement during the 2022 lockdown. Therefore, when comparing these two measures, (i.) changes in the levels of the two populations and (ii.) their respective rates of change, the difference between them will help us understand whether or not a city is growing at a declining rate.

4.6. Why Hong Kong and Shanghai Differ

The findings indicate that there were at least three different factors affecting the responses to global events. First, the stage of urbanization in each city influenced how they responded. In terms of size and density, Hong Kong had very little space to grow rapidly as an urban population. At this point, Shanghai was expanding as a metropolis and experiencing significant movement of people within it. Secondly, the way in which economies were exposed to financial market shocks affected their ability to respond. Financial market shocks have shown great speed in reaching Hong Kong. Trade, production, and domestic investments channels are important influences on the larger environment in which Shanghai's economy operates. Finally, migration, housing, fertility, and public policy influence how populations respond to external crises. Together these mechanisms explain why we cannot expect global events to cause the same demographic changes in all cities.

4.7. Limitations

This study also has some serious restrictions. First, this is a two-city comparison based on observations and does not allow us to determine whether events caused certain changes. Multiple shocks are occurring at the same time and there are no control cities without treatment. Second, due to incomplete annual data provided by AUTM related to the entire 1996 – 2025 timeframe regarding the total Hong Kong population, we were unable to calculate the exact number of people that changed prior to and after each event. Third, the site integrates geographic regions: Urban Agglomeration Population is centered around cities; whereas The Shanghai World Bank's Economic Series is centered around China. Due to this inconsistency, we cannot perform a valid Regression Model using Municipal GDP - Population from the current export. Fourth, Historical Events can have lagged effects on population (i.e., the population in a given area may change before the event occurs) therefore, linking a population change to the same Calendar Year as a Shock could potentially be misrepresentative.

5. Conclusion

Between the confirmed endpoints of 2006 and 2025 from AUTM, Hong Kong's urban agglomeration population grew by 12.22%, and Shanghai's grew by 79.55%. The difference was most pronounced during 2006-2018; whereas Shanghai's compound annual growth rate (CAGR) averaged 3.97% per year, Hong Kong's CAGR averaged .68% for those years. After 2018 both cities began to grow at slower rates however Shanghai continued to be the faster growing. This study does not provide an indication that a major international event will have a direct impact on the population of a given city. Rather, the results are much better explained as part of a mediating process where political transition, economic crisis, trade wars/pandemics can affect perceived opportunity, confidence, mobility and migration in addition to local development stage/availability of housing/fertility/policy affecting the extent to which populations respond.

The data visualization comparison shows how important data origin is when using artificial intelligence for conducting studies. The AUTM was able to collect and represent historical urban trend data; however, using an automated system to map countries created an error at a regional level with respect to Shanghai's economic data. By explicitly showing this error, it prevented a false GDP per capita city-to-city comparison and enhanced the overall integrity of the study. As additional harmonized municipal economic and migration datasets are

added, the platform has potential for supporting more robust causal event comparisons between larger sets of Asian cities.

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