# Announcement of Northern Metropolis Plan Raises Housing Prices, Consumption, and Changes Demographics, though Inconclusive on Regional Inequality

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**Abstract**

Early-stage evaluation of mega projects is essential for policymaking and follow-up policy revisions. Using the announcement of the Northern Metropolis Plan in Hong Kong in October 2021 as a quasi-natural experiment, we discern its immediate impact on housing price, consumption, and demographic changes. Drawing from a rich dataset spanning 100,576 housing transaction records, 4.7 million consumption records, and demographic data across 18 districts, our difference-in-differences analysis indicates a marked 3.9% rise in housing prices in the Northern Metropolis region one year after the announcement, with a profound 6.9% surge in the initial 4 months. Additionally, we discover a swift 4.1% uptick in consumption for residents in the treated region in the same initial 4 months, predominantly within the private housing market possibly with expected housing wealth realization. Last, we observe a notable inflow of higher-educated individuals, higher-income households, households with children, and increased school enrollment in the Northern Metropolis. Furthermore, we observe a regional spillover effect by rising housing prices and increased transactions in Shenzhen housing market. This trend may reflect the growing attractiveness of the Northern Metropolis as a hub for education and economic opportunities. While our short-term findings hint at narrowing cross-region inequality in the global superstar city, they also suggest burgeoning within-region inequality—particularly challenging to estimate over the long term—as benefits seem skewed towards individuals with higher socioeconomic profiles. We thus call for policy attention on the affordability and welfare of individuals with lower socioeconomic status in the Northern Metropolis region.

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Housing affordability remains a pressing concern in many of the world's leading cities, such as London, New York, Los Angeles, Melbourne, Shanghai, and Mumbai. Notably, Hong Kong has championed the world's least affordable housing market for an unprecedented 13th year. Providing affordable public housing to vulnerable residents is a remedy to cure the unrest. On 6 October 2021, Carrie Lam, the Chief Executive of Hong Kong, unveiled an ambitious plan to transform two remote districts, North and Yuen Long—accounting for 27% of Hong Kong's total area and bordering Shenzhen, China's third-largest city after Shanghai and Beijing—into a Northern Metropolis. The long-term aspirations are to alleviate the city's notorious housing affordability crisis and foster a new high-tech hub. It is projected to build an additional 500,000 housing units to accommodate 1.5 million more residents (i.e., 1/5 of the total population) and create 500,000 new jobs, including 150,000 positions in the IT sector (Bloomberg, 2021) (policy details in Appendix Table A1). The enactment of the Northern Metropolis policy provides a valuable policy arena to estimate how a massive urban development plan can alter human behaviors and affect regional economic development, both in the short term and over the long haul.

We examine whether the policy effectively aids vulnerable residents, such as tenants, or if it unintentionally leads to further increases in already exorbitant housing prices, thereby worsening affordability and inequality issues. Moreover, we evaluate how such perceived change in housing wealth shift households' consumption behavior, whether such policy announcement affects migration and demographic shifts, and its possible spillover effect to adjacent city of Shenzhen in the Greater Bay Area (GBA) in China.

To start, we delve into the repercussions of the policy on the economic conditions manifested in local house price fluctuations, household consumption, and demographic change in a difference-in-differences (DID) setting, using the announcement of this place-based policy as an exogenous shock. We designate the North and Yuen Long districts—two of Hong Kong's eighteen districts—as our treatment group. The remaining districts of Hong Kong constitute the control group. First, we quantify

the magnitude of housing price fluctuations attributable to the policy, using 100,576 housing transaction records spanning October 2020 to October 2022. We discerned a significant increase of 3.9% in the average transaction prices of housing units within the treatment group (i.e., North and Yuen Long districts) one year after the policy was enacted in October 2021, with the most pronounced rise of 6.9% observed in the fourth month after the announcement. Note that the average annualized return on private residential property in Hong Kong in 2015-2025 is 1.96%.

Subsequently, we explore household consumption behavior following the unveiling of the Northern Metropolis policy. Literature shows that household consumption exhibits excess sensitivity to macroeconomic news (Garmaise et al., 2024). Drawing from a rich dataset of approximately 4.7 million transaction records from Hong Kong's leading online shopping platform, we observe that the total amount of orders placed by customers within the Northern Metropolis areas surged by nearly 4.1% after the policy was enacted. The rate is almost the same as the estimated increase in housing values, which echoes the Permanent Income Hypothesis (PIH). Intriguingly, while house price movements are positively associated with online consumption, this consumption buoyancy seemed to predominantly uplift private estate occupants, who seemingly refined their consumption preferences in the policy's wake.

We further delve into the policy's impact on demographic changes. We observed that higher-educated residents (defined as university level or above) within the Northern Metropolis surged by over 5.58% after the policy, the number of households with higher income (monthly income more than 30,000 HKD) increased by 9.04% and the number of families with children (proxy as households with more than 2 family members) increased by 5.22%. The education effects reveal deeper societal impacts: the 8.07% enrollment surge reflects local household decisions, offering insights into intergenerational inequality (Black et al., 2020; Agarwal et al., 2023; Daysal et al., 2023; Yu et al., 2023). Such

disparities, we note, diverge from conventional cross-sectional contrasts (e.g., inter- and intraregional inequality).[1]

As Hong Kong is located within the Guangdong-Hong Kong-Macao GBA, which is China's booming Southern mega region and 10th largest economy in the world, we further estimate the spillover effect of such announcement in Hong Kong to its adjacent Shenzhen City. Notably, we observe regional spillover effects manifesting in Shenzhen's housing market, where prices and transactions rose modestly after the announcement, with several months' lags. This spillover effect suggests the policy is reshaping economic geography across the Hong Kong-Shenzhen border.

Our study is inconclusive on inequality. Hong Kong is formidable in its rising inequality. With 125,100 millionaires, the city has 1.6 million people living in poverty (Bloomberg, 2022). The recent unveiling of the Northern Metropolis Plan has yielded significant uplifts in housing prices especially for homeowners, household consumption, and demographic changes—foreshadowing enduring regional prosperity through rising inequality. Yet, as the disparity between the Northern Metropolis and city centers wanes, the inequality within the Northern Metropolis might amplify. Spiraling housing prices could exacerbate wealth gaps, particularly dichotomies between private and public housing occupants. The unaffordability within the region may deteriorate, pushing the vulnerable at the city border, geographically or economically, to become even more vulnerable. Nevertheless, fueled by the large-scale public housing construction and an influx of higher-educated and higher-income skilled labor in the high-tech sector, the housing unaffordability is likely to be mitigated and a potent multiplier effect could emerge, promising ripple benefits in the non-traded sectors, welfare benefits to

[1] Black et al. (2020) find that environmental factors, such as parental wealth and education, are more important than genetic ones in explaining the transmission of wealth between generations. Therefore, policies aiming at equalizing opportunities for children from different socio-economic backgrounds may be effective in reconciling intergenerational disparities (Daysal et al., 2023).

the locals and migrants, intra- and inter-generationally.[2] Future studies are warranted along this line with the progress of the Northern Metropolis redevelopment.

Burgeoning articles investigate the socioeconomic consequences of mega projects or place-based policies. For instance, a vast literature has scrutinized the ramifications of large infrastructural undertakings, such as hydropower dams on the environment, population displacement, human livelihoods, economic benefits, and resilience (Moran et al., 2018; Basheer et al., 2021; Holtgrieve and Arias, 2022; Galelli et al., 2022), or the environmental, social and economic consequences of expanded network of roads (Vilela et al., 2020; Diao et al., 2021; Lin et al., 2021). We align with this set of growing literature to advance understanding of the socioeconomic consequences of mega projects. Specifically, we investigate the announcement effect of a very recent government-led mega project, which is poised to reshape the lives of more than 1 million present inhabitants and to draw 1/3 population from congested city centers in two decades. To the best of our knowledge, we are the first to provide a holistic view of the effect of the Northern Metropolis plan on housing, consumption, demographic changes, and regional spillovers. Different from literature focusing on post-implementation policy impacts, our analysis of the announcement effect offers a forward-looking lens for policy implementation and adjustment, fostering a future-proof city.

In essence, the Northern Metropolis plan is parallel to the Economic Zone Program in P.R. China (Lu et al., 2019), the Opportunity Zones in the U.S. (Chen et al., 2023), the Enterprise Zone policies in France (Neumark and Simpson, 2015), Urban Revitalization Program in the Netherlands (Koster and Ommeren, 2019), Initiative for the Integration of Regional Infrastructure in South America (Vilela et al., 2020), and megaprojects such as building large dams and oil sands mining (Rooney et al., 2015; Moran et al., 2018). Additionally, in recent years, the adoption of industrial policies—a set of specific

[2] Notably, the multiplier effect of high-tech employment is three times larger than that in traditional manufacturing industries (Moretti and Thulin, 2013). Additionally, skilled workers are more innovative and react more quickly to economic shocks, and thus are expected to contribute to the reinvention of cities (Glaeser et al., 2004).

policy tools designed to bolster sectors deemed strategically important—has become common as means to tackle market failures and promote rapid, broadly shared economic growth. This raises the pertinent question: Why do certain sectors warrant government backing? Our findings suggest that the Northern Metropolis policy, particularly the contents favoring the high-tech industry like the San Tin Technopole, have the potential to attract skilled labor but come at the expense of exacerbating inequalities.

Hong Kong provides a valuable social laboratory to test the impact of government-led megaprojects on socioeconomic changes. Our findings can guide the development of place-based policies for other cities seeking to address regional inequality and boost economic opportunities. Our results are specifically insightful for cities situated within larger geographic/economic zones (e.g., European Union, San Francisco Bay Area, Greater Bay Area) or those undergoing structural evolution by embracing IT innovations and drawing in skilled labor (e.g., Mumbai, Kigali, Dublin).

## Results

### Short-term impact on housing price, consumption, and demographic change

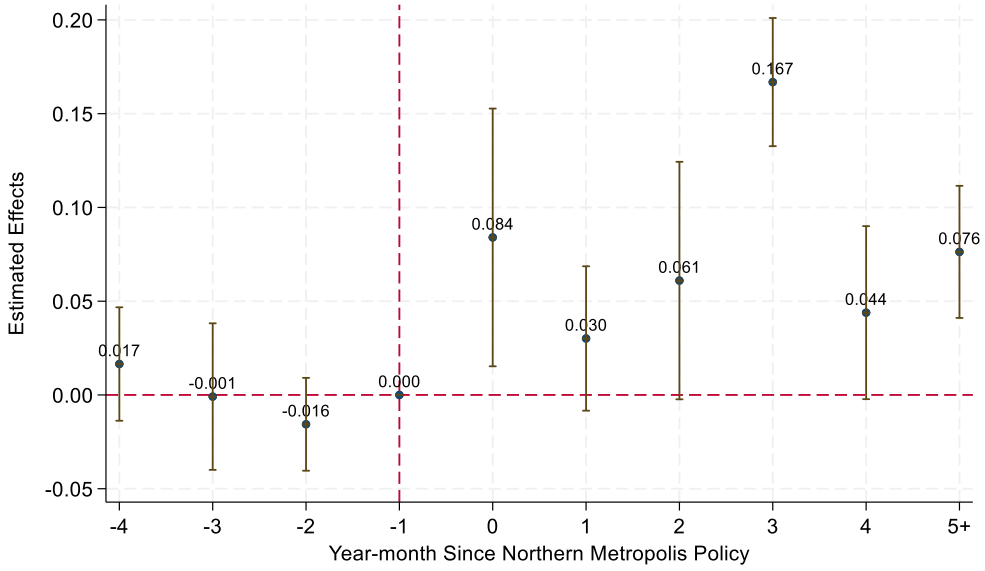
**Housing price.** First, we predict the short-term impact on housing prices, online consumption, and demographic changes in the Northern Metropolis area post the policy announcement.[3] To achieve this, we first delve into the housing price fluctuations attributable to the policy, using DID specifications and controlling for housing hedonics such as building age, floor levels, and property size to isolate the impact of the policy. The Methods Section details data sources and estimation strategy, with variable definitions and summary statistics presented in Appendix Tables A2 and A3, respectively.

The unexpected timing of the announcement, which occurred during the transition period of chief executives, supports the exogeneity assumption. We tested and confirmed the parallel trends

[3] While analyzing short-term impacts, we also explore the policy's long-term economic implications using an extended Cobb-Douglas production function and a gravity model focusing on four key dimensions: economic development, income growth, housing affordability, and migration, as presented in the Discussion Section.

assumption—in the absence of the policy, the Northern Metropolis area and the rest of Hong Kong would have followed the same trends in housing prices. Figure 1 visually supports this assumption, demonstrating that, holding all other factors constant, the differences in housing price changes between the Northern Metropolis area and other districts were statistically indistinguishable from zero before the policy announcement. However, following the policy announcement, we observed a marked divergence in housing prices, most notably in the fourth month post-enactment.

**Figure 1: The Impact of Northern Metropolis Policy on Housing Price**




Note: This figure depicts event time coefficients, showcasing the differential impacts of the policy on residential properties. The coefficient for the month immediately before the policy implementation is normalized to zero. Year-month and district fixed effects are included. Standard errors are adjusted for clustering at the year-month and district levels.

After validating the assumptions underlying our empirical strategy, we proceed by examining the housing price reactions to the policy, within and outside the Northern Metropolis area. We find that the average housing price in the Northern Metropolis area increased by 7.6% (equivalent to 733,780 HKD or 93,475 USD) and 5.0% (equivalent to 482,750 HKD or 61,497 USD) respectively, in 4-month and 12-month windows after the policy announcement, controlling housing features, year-month, and district fixed effects (Columns (1)-(2) in Table 1). Taking potentially time-varying unobserved factors

into account, we include additional year-month by region fixed effects in Columns (3)-(4). The corresponding estimates shrink to 6.9% and 3.9% (equivalent to 666,195 HKD/84,866 USD and 376,545 HKD/47,968 USD for an average home), with statistical significance at a high 1 % level. We consider estimates in Columns (3)-(4) as our preferred ones, because of the inclusion of time-invariant and time-varying unobservables at granular levels. Our estimates remain robust when keeping samples within the New Territories to neutralize potential regional biases and winsorizing the 1% outliers. (Appendix Table A4).

**Table 1: Policy Impact on Increasing Housing Prices in Northern Metropolis Area**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Y: Log(Housing Price) | | | |
| Variable | [-4, +4] Months | [-12 +12] Months | [-4, +4] Months | [-12 +12] Months |
| Policy*North | 0.0764*** | 0.0495*** | 0.0686*** | 0.0393*** |
| | (0.0225) | (0.0143) | (0.0242) | (0.0148) |
| Log(Building Age) | -0.1512*** | -0.1352*** | -0.1516*** | -0.1362*** |
| | (0.0051) | (0.0037) | (0.0050) | (0.0037) |
| Log(Floor) | 0.0740*** | 0.0749*** | 0.0748*** | 0.0754*** |
| | (0.0048) | (0.0029) | (0.0047) | (0.0028) |
| Log(Size) | 0.9994*** | 0.9803*** | 1.0001*** | 0.9798*** |
| | (0.0146) | (0.0094) | (0.0144) | (0.0093) |
| Year-month FE | YES | YES | YES | YES |
| District FE | YES | YES | YES | YES |
| Year-month*Region FE | NO | NO | YES | YES |
| Observations | 38,214 | 100,576 | 38,214 | 100,576 |
| R-squared | 0.7164 | 0.7145 | 0.7168 | 0.7153 |

Note: This table presents the policy impact on housing prices in the Northern Metropolis area. $Log(HomePrice)_{it}$ is defined as the logarithm of the housing transaction price in million HKD. $Policy_t$ indicates transactions post-October 2021 (i.e., after the announcement). $North_i$ is also a dichotomous variable that equals 1 if the property is located within the Northern Metropolis area and 0 otherwise. We also control property characteristics: building age, floor, and property size. In Columns (1) and (2), results include year-month and district fixed effects. In Columns (3) and (4), we also include year-

month*region fixed effects. Standard errors are adjusted for clustering at year-month and district levels, are included in parentheses, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

We find a similar result when using the month-building level aggregated transaction amount as the outcome variable, as shown in Appendix Figure A1 and Table 2. These results indicate that the announcement of Northern Metropolis policy led to an increase in both housing prices and transaction volumes in the area.

**Table 2: Policy Impact on Increasing Housing Transaction Amount in Northern Metropolis Area**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Y: Log(Aggregated Transaction Amount) | | | |
| Variable | [-4, +4] Months | [-12 +12] Months | [-4, +4] Months | [-12 +12] Months |
| Policy*North | 0.0464* | 0.0794*** | 0.0822*** | 0.1164*** |
| | (0.0271) | (0.0222) | (0.0273) | (0.0211) |
| Year-month FE | YES | YES | YES | YES |
| District FE | YES | YES | YES | YES |
| Year-month*Region FE | NO | NO | YES | YES |
| Observations | 20,366 | 52,704 | 20,366 | 52,704 |
| R-squared | 0.1582 | 0.1496 | 0.1589 | 0.1507 |

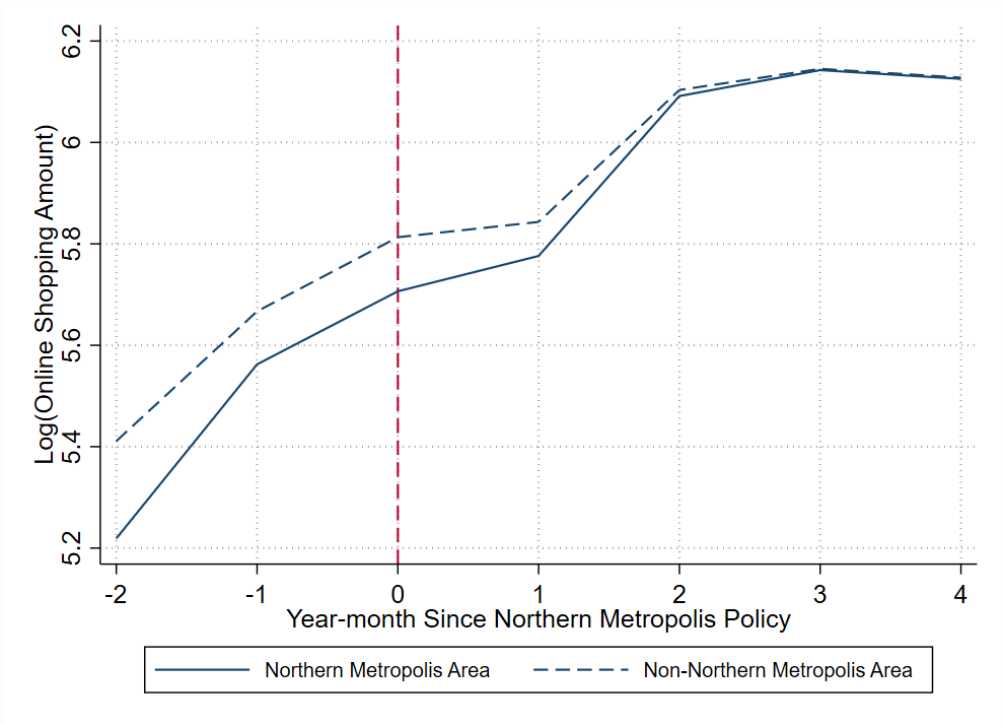
Note: This table presents the policy impact on aggregated transaction amount in the Northern Metropolis area. $Log(Aggregated\ Transaction\ Amount)_{it}$ is defined as the logarithm of the month-building level transaction amount. $Policy_t$ indicates transactions post-October 2021 (i.e., after the announcement). $North_i$ is also a dichotomous variable that equals 1 if the property is located within the Northern Metropolis area and 0 otherwise. In Columns (1) and (2), results include year-month and district fixed effects. In Columns (3) and (4), we also include year-month*region fixed effect. Standard errors are adjusted for clustering at year-month and district levels, are included in parentheses, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

**Consumption.** As discussed, the Northern Metropolis policy is expected to lead to a short-term increase in housing prices and transactions in that area, resulting in a run-up in housing wealth that primarily benefits private housing occupants. However, it is crucial to assess the policy impact on all

households, including those living in public housing where property sales are constrained in Hong Kong. Concurrently, in line with the findings by Garmaise et al. (2024), household consumption displays heightened sensitivity to macroeconomic news. To achieve this, we analyze the policy impact on online consumption for all households, including those living in private and public housing separately.

Our study utilizes online consumption data from the largest platform in Hong Kong (details in Methods Section). It provides high-frequency online consumption data on the order basis, thereby mitigating the drawbacks of aggregated level consumption data, which are typically reported with lags and are low frequency. Using the same DID model, we examine the policy impact on online consumption. Intriguingly, our results presented in Figure 2 and Table 3 indicate a significant surge in online shopping in the Northern Metropolis area four months post-policy announcement. A discernible spike in online consumption spending is displayed in the treatment group (Northern Metropolis area) compared to the control group (non-northern Metropolis area) after the announcement, despite a parallel trend before the announcement.

**Figure 2: The Impact of Northern Metropolis Policy on Average Amount of Online Shopping**




Note: This figure shows the average online shopping order amounts placed by buyers residing within the Northern Metropolis area (treatment group) and the non-northern Metropolis area (control group). The solid line represents the values for the Northern Metropolis area, while the dashed line represents the values for the non-northern Metropolis area.

Table 3 presents DID estimates using our full sample and subsets of order volume for private and public housing, respectively. In addition to the fixed effects included in Table 1, we also control fixed effects pertaining to each customer to control unobserved factors at the customer level in the consumption specification. Focusing on column (4) of Table 3, we find that, on top of the average for the rest of Hong Kong, the overall online order volume rose by 4.1% within the Northern Metropolis post-announcement. This consumption effect is particularly pronounced for private housing occupants (column (5)), who placed 4.7% higher in consumption post the policy announcement, and is modest for the public housing segment (column (6)). The difference between the coefficients on the DID estimator reported in columns (5) and (6) is significant at the 1% level. Our findings remain robust

after using a refined counterfactual that largely resembles the Northern Metropolis (i.e., New Territories) and winsorizing key control variables (Appendix Table A5).

**Table 3: Policy Impact on Increasing Order-level Online Shopping Amount in Northern Metropolis Area**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Y: Log(Order-level Online Shopping Amount) | | | | | |
| Variable | [-4, +4] Months | [-4, +4] Months | [-4, +4] Months | [-4, +4] Months | [-4, +4] Months | [-4, +4] Months |
| | Full samples | Private housing | Public housing | Full samples | Private housing | Public housing |
| Policy*North | 0.0678*** | 0.0788*** | 0.0331*** | 0.0412*** | 0.0469*** | 0.0260*** |
| | (0.0033) | (0.0040) | (0.0057) | (0.0034) | (0.0043) | (0.0061) |
| Year-month FE | YES | YES | YES | YES | YES | YES |
| District FE | YES | YES | YES | YES | YES | YES |
| Customer FE | YES | YES | YES | YES | YES | YES |
| Year-month*Region FE | NO | NO | NO | YES | YES | YES |
| Observations | 4,686,504 | 3,276,863 | 1,409,641 | 4,686,504 | 3,276,863 | 1,409,641 |
| R-squared | 0.4097 | 0.3963 | 0.4535 | 0.4100 | 0.3967 | 0.4536 |

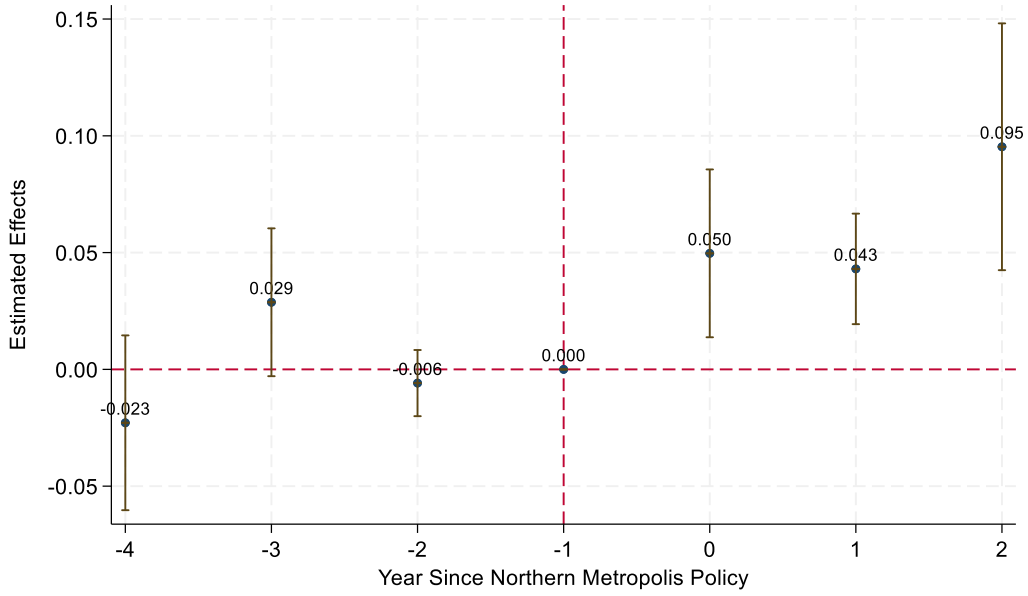
Note: This table presents the policy impact on order-level online shopping amount. $Log(Order-level\ Online\ Shopping\ Amount)_{it}$ is defined as the logarithm of the order-level total shopping amount in HKD. $Policy_t$ is a dummy variable that equals one if the date of purchase is after October 2021 (i.e., after the announcement), and 0 otherwise. $North_i$ is also a dummy variable that equals one if the buyer is in the Northern Metropolis area and 0 otherwise. In addition to using full samples, we also use private housing and public housing samples separately. In Columns (1), (2), and (3), results include year-month, district, and customer fixed effects. In Columns (4), (5), and (6), we add the year-month*region fixed effect. Standard errors are adjusted for clustering at year-month, district, and customer levels, are included in parentheses, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

We further investigate the heterogeneous impact of the policy on private and public housing occupants by decomposing online order volume into three categories, including necessities, non-necessities, and entertainment. We found that private estate occupants in the Northern Metropolis area increase their spending across all three categories ex-post (Columns (1), (3), and (5) in Appendix Table A6), while public housing occupants only spend more on necessities (column (2)). This disparity is likely attributed to the sale constraint of public housing—while private estate occupants can benefit

from surging housing prices by selling their homes and materializing capital gains, public housing occupants are almost entirely shunned from reselling their homes. Our results remain consistent when using a refined counterfactual and winsorizing our key variables (Appendix Table A7).

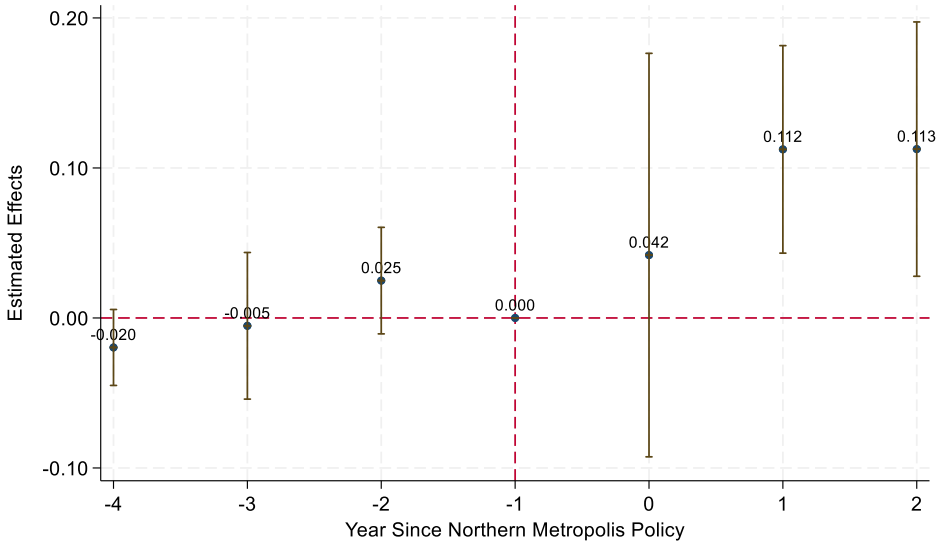
**Demographic Changes.** Our last set of analyses in this section anchors on shifts in the demographic and family composition of residents following the policy announcement. As the Northern Metropolis Plan aims to attract skilled labor in the high-tech sector, we observed a notable inflow of higher-educated individuals, higher-income households, households with children, and increased school enrollment in the Northern Metropolis under the event-study method. These patterns are illustrated in Figures 4 through 7, which depict diverging post-announcement trends compared to other districts.

**Figure 4: The Impact of Northern Metropolis Policy on Higher-Educated Residents**



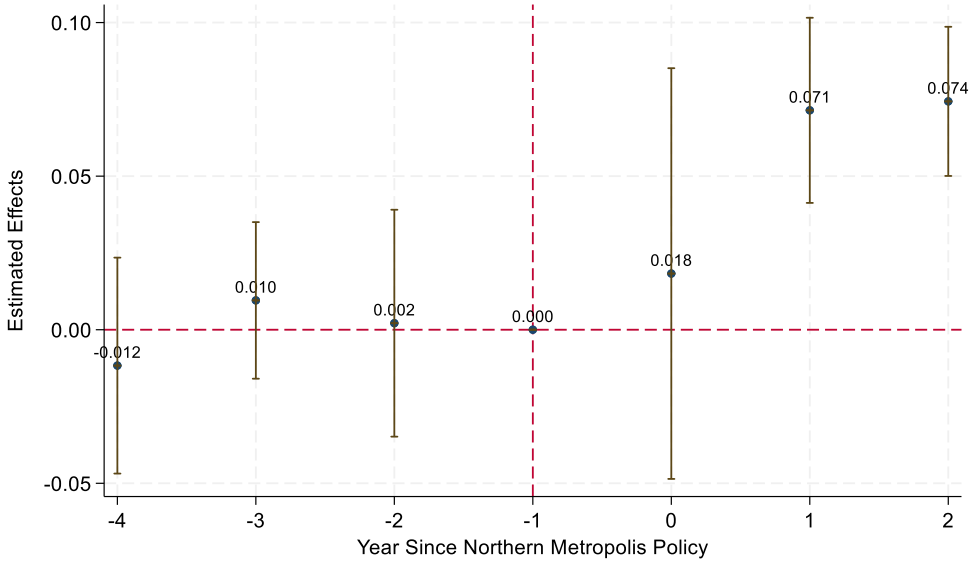

Note: This figure depicts event time coefficients, showcasing the differential impacts of the policy impact on residential properties. The coefficient for the year immediately before the policy implementation is normalized to zero. Year and district fixed effects are included. Standard errors are adjusted for clustering at the district levels.

**Figure 5: The Impact of Northern Metropolis Policy on Higher-income Households**



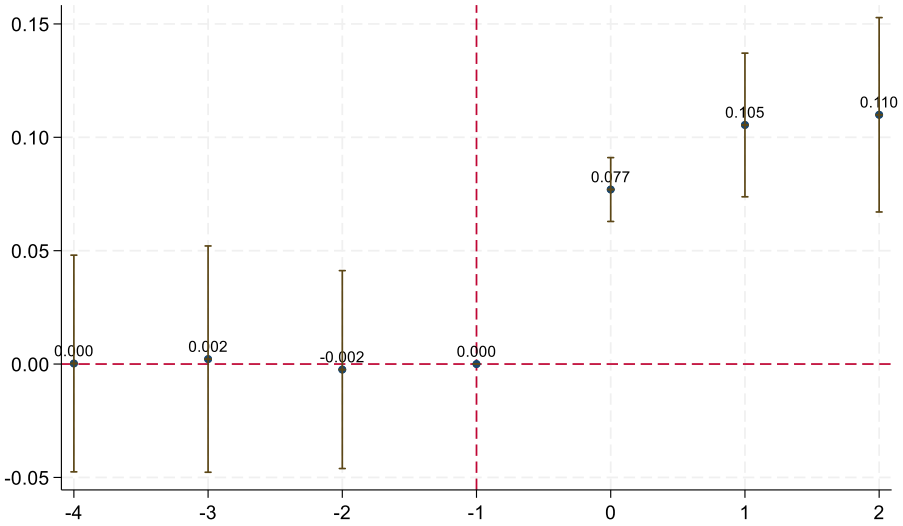

Note: This figure depicts event time coefficients, showcasing the differential impacts of the policy impact on residential properties. The coefficient for the year immediately before the policy implementation is normalized to zero. Year and district fixed effects are included. Standard errors are adjusted for clustering at the district levels.

**Figure 6: The Impact of Northern Metropolis Policy on Households with Children**




Note: This figure depicts event time coefficients, showcasing the differential impacts of the policy impact on residential properties. The coefficient for the year immediately before the policy implementation is normalized to zero. Year and district fixed effects are included. Standard errors are adjusted for clustering at the district levels.

**Figure 7: The Impact of Northern Metropolis Policy on School Enrolment**




Note: This figure depicts event time coefficients, showcasing the differential impacts of the policy impact on residential properties. The coefficient for the year immediately before the policy implementation is normalized to zero. Year and district fixed effects are included. Standard errors are adjusted for clustering at the district levels.

Utilizing the same DID model, we find that the Northern Metropolis area witnessed increases in higher-educated residents by 5.58%, higher-income households by 9.04% and households with larger family sizes by 5.22% separately in Table 4. These shifts indicate that the policy may have attracted relatively affluent and family-oriented households into the region.

**Table 4: Policy Impact on Demographic Structure Changes in Northern Metropolis Area**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Y: Log(Ratio_University) | | Y: Log(Higher-income households) | | Y: Log(Households with Larger Family Sizes) | |
| Policy*North | 0.0558*** | 0.0647*** | 0.0904** | 0.1301*** | 0.0522*** | 0.0796*** |
| | (0.0077) | (0.0077) | (0.0357) | (0.0383) | (0.0136) | (0.0151) |
| Policy*Outskirt | | 0.0206** | | 0.0907*** | | 0.0636*** |
| | | (0.0089) | | (0.0276) | | (0.0196) |
| HHIncome | YES | YES | NO | NO | YES | YES |
| Year FE | YES | YES | YES | YES | YES | YES |
| District FE | YES | YES | YES | YES | YES | YES |
| Observations | 126 | 126 | 126 | 126 | 126 | 126 |
| R-squared | 0.9931 | 0.9936 | 0.9860 | 0.9897 | 0.9956 | 0.9967 |

Note: This table presents the policy impact on demographic structure changes in Northern Metropolis area. The dependent variable is defined as the logarithm of annual district-level ratio of university, higher-income households and households with larger family sizes separately. $Policy_t$ is a dummy variable that equals one for all observations in the post-policy period (2021 and later), and 0 otherwise. $North_i$ is also a dummy variable that equals one if the data is of the Northern Metropolis area and 0 otherwise. $Outskirt_i$ is a dummy variable that equals one if the data is of the New Territories but not within the Northern Metropolis area and 0 otherwise. We also control district-level median monthly household income as macroeconomic controls. Results include year and district fixed effects. Standard errors are adjusted for clustering at the district level, are included in parentheses, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

We also documented significant increases in school enrolment, which provide further evidence of family relocation and longer-term settlement intentions. Specifically, as shown in Columns (1), (3), and (5) of Table 5, total school enrollment rose by 8.1% in the Northern Metropolis, with primary and secondary enrollment increasing by 5.5% and 12.0%, respectively. These effects are not observed vice versa in other parts of the New Territories, as highlighted in Columns (2), (4), and (6) of Table 5 and visualized in Appendix Figure A2.

Taking together, these findings are consistent with the interpretation that the Northern Metropolis is becoming increasingly attractive to well-educated, higher-income households with children. This early demographic transformation may have important long-term implications for the

area's social infrastructure, school systems, and local economic base, particularly if reinforced by complementary investments in housing, education, and transit.

**Table 5: Policy Impact on Increasing School Enrolment in Northern Metropolis Area**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Y: Log(Total enrolment) | | Y: Log(Primary School enrolment) | | Y: Log(Secondary School enrolment) | |
| Policy*North | 0.0807*** | 0.1225*** | 0.0548* | 0.1218*** | 0.1195*** | 0.1373*** |
| | (0.0221) | (0.0247) | (0.0287) | (0.0341) | (0.0385) | (0.0398) |
| Policy*Outskirt | | 0.0973*** | | 0.1557*** | | 0.0413 |
| | | (0.0248) | | (0.0375) | | (0.0315) |
| HHIncome | YES | YES | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES | YES | YES |
| District FE | YES | YES | YES | YES | YES | YES |
| Observations | 126 | 126 | 126 | 126 | 126 | 126 |
| R-squared | 0.9912 | 0.9936 | 0.9786 | 0.9846 | 0.9934 | 0.9938 |

Note: This table presents the policy impact on the number of school students in the Northern Metropolis area. The dependent variable is defined as the logarithm of annual district-level school enrolments in one of the following categories: total, primary schools, and secondary schools. $Policy_t$ is a dummy variable that equals one for all observations in the post-policy period (2021 and later), and 0 otherwise. $North_i$ is also a dummy variable that equals one if the data is of the Northern Metropolis area and 0 otherwise. $Outskirt_i$ is a dummy variable that equals one if the data is of the New Territories but not within the Northern Metropolis area and 0 otherwise. We also control district-level median monthly household income as macroeconomic controls. Results include year and district fixed effects. Standard errors are adjusted for clustering at the district level, are included in parentheses, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

**Regional Spillover.** The Northern Metropolis plan represents a significant policy shift with the potential to reshape not only the targeted region in Hong Kong but also its neighbouring areas across the boundary, leading to interregional spillovers. Specifically, the economic impacts of a policy extend beyond the directly affected area into adjacent regions.

Focusing on Shenzhen, particularly the sub-districts bordering the Northern Metropolis (i.e., Shahe, Shekou, Yuehai, Shatou, Fubao, Futian, Nanyuan, Liantang, Huangbei, Nanhu and Guiyuan), we examine how housing prices and transactions in these areas responded to the policy announcement.

While the immediate effect of the Northern Metropolis plan was most pronounced within the targeted Hong Kong districts, we find that housing prices in the adjacent Shenzhen districts also exhibited a notable increase after five months. This delayed response contrasts with the more immediate price adjustments observed within the Northern Metropolis itself.

Following the same logic, we first tested and confirmed the parallel trends assumption for housing prices and transactions in Shenzhen housing market, as illustrated in Appendix Figure A3 and Appendix Figure A4. After validating the assumptions underlying our empirical strategy, we proceed by examining the housing price reactions to the policy, within and outside the bordering area. We find that the average housing price in the bordering area increased by 3.18% in 12-month windows after the policy announcement, controlling housing features, year-month, and district fixed effects (Columns (2) in Table 6). Taking potentially time-varying unobserved factors into account, we include additional year-month by region fixed effects in Columns (4). The corresponding estimates shrink to 4.93%. We find a similar result when using the month-building level aggregated transaction amount as the outcome variable (Appendix Table A8).

Taken together, our findings suggest that the impact of the Northern Metropolis plan is not confined to the directly targeted areas in Hong Kong but also extends to closely linked regions in Shenzhen. This highlights the importance of considering interregional dynamics when evaluating the broader consequences of major urban development policies.

**Table 6: Policy Impact on Increasing Housing Prices in Bordering Area in Shenzhen Housing Market**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Y: Log(Housing Price) | | | |
| Variable | [-4, +4] Months | [-12 +12] Months | [-4, +4] Months | [-12 +12] Months |
| Policy*Border | 0.0173 | 0.0318* | 0.0270 | 0.0493** |
| | (0.0251) | (0.0166) | (0.0302) | (0.0192) |
| Log(Building Age) | 0.5544*** | 0.5554*** | 0.5541*** | 0.5558*** |
| | (0.0117) | (0.0063) | (0.0119) | (0.0063) |
| Log(Floor) | -0.2937*** | -0.2351*** | -0.2920*** | -0.2349*** |
| | (0.0168) | (0.0085) | (0.0169) | (0.0085) |
| Log(Size) | 0.0542*** | 0.0462*** | 0.0554*** | 0.0464*** |
| | (0.0123) | (0.0063) | (0.0124) | (0.0063) |
| Year-month FE | YES | YES | YES | YES |
| Estate FE | YES | YES | YES | YES |
| Year-month*District FE | NO | NO | YES | YES |
| Observations | 9,255 | 41,060 | 9,255 | 41,060 |
| R-squared | 0.3517 | 0.3807 | 0.3561 | 0.3859 |

Note: This table presents the policy impact on housing prices in the Northern Metropolis area. $Log(HomePrice)_{it}$ is defined as the logarithm of the housing transaction price in million HKD. $Policy_t$ indicates transactions post-October 2021 (i.e., after the announcement). $Border_i$ is also a dichotomous variable that equals 1 if the property is located within the bordering area in Shenzhen and 0 otherwise. We also control property characteristics: building age, floor, and property size. In Columns (1) and (2), results include year-month and estate fixed effects. In Columns (3) and (4), we also include year-month*district fixed effect. Standard errors are adjusted for clustering at year-month and street levels, are included in parentheses, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

## Discussion

This study offers a meticulous economic assessment of the Northern Metropolis policy, announced in October 2021. The Northern Metropolis policy aims to transform the North and Yuen Long districts of Hong Kong into integrated hubs for living, working, and commuting. Like other "Mega-projects," the Northern Metropolis policy seeks to catalyze economic development in underutilized areas by addressing a broad range of issues: tackling disparities pertaining to certain locations, increasing the supply of housing, strengthening transportation connections, fostering innovation hubs and clusters, preserving natural spaces, highlighting cultural heritage, and involving local communities in decision-making processes.

Our findings reveal rapid and significant market responses shortly after the policy's announcement. Within merely four months, we observe sharp increases in both housing prices and online consumption, well ahead of any physical changes that were in place. This pattern is consistent with PIH, which posits that households make decisions based not only on their current income level but also on their expectations of lifetime resources. In this context, households and investors appear to have updated their beliefs about the long-term growth potential associated with the Northern Metropolis and responded accordingly. Housing investment and consumption thus emerge as early indicators, often preceding tangible capital deployment and labor market changes. These findings also highlight the salience of policy narratives in shaping expectations and economic behavior well in advance of implementation.

Importantly, the effects of the policy are not uniformly distributed across the population. We document meaningful heterogeneity in responses across demographic groups. Specifically, individuals with college education and higher income, as well as households with children, were more likely to move into the Northern Metropolis area. These groups tend to have stronger labor market attachment and greater financial flexibility to purchase a home. Consistent with this interpretation, we observe a surge in primary and secondary school enrolment in the area, likely reflecting in-migration by younger, family-oriented households anticipating long-term community development. These groups appear to have internalized the prospective gains from increased spatial connectedness, particularly the planned integration of Shenzhen's high-tech sector with Hong Kong's financial and professional services (e.g., an "industry-led, infrastructure-first" development approach). In contrast, disadvantaged groups such as smaller households, low-income renters, and less-educated individuals may face rising housing and living costs without proportional improvements in access to jobs or social mobility. Without complementary housing affordability and labor market policy interventions, these potential disparities may exacerbate existing inequalities in opportunity over time.

More broadly, the Northern Metropolis initiative should be viewed not as a vacuum but as an integral component of the GBA development strategy. The GBA framework aims to strengthen functional complementarities between Hong Kong, Shenzhen, and other neighboring cities. For example, the Northern Metropolis is strategically located near Shenzhen and includes projects such as the San Tin Technopole, which is designed to align with Shenzhen's innovation economy through the Guangdong–Shenzhen–Hong Kong–Macao Innovation and Technology Corridor. These cross-border industrial and institutional linkages, if realized, are expected to enhance urban vibrancy by improving the flow of talent, capital, and ideas. Rising housing prices and increased consumption may serve as harbingers of the long-term reorganization of the region's economic geography. We also adopt the Cobb-Douglas production function to present a back-of-the-envelope calculation on the longer-term impact of the Northern Metropolis Plan upon completion on GDP growth, monthly wage increase, housing price escalation, and migrant flow, as detailed in Appendix Section and illustrated in Appendix Figure A5.

Nonetheless, implementing these policy goals also entails considerable risks. As articulated by Flyvbjerg (2017), global spending on mega-projects constitutes approximately 8 percent of the world's GDP, yet many of these projects fall short of their intended objectives. A key concern is that efforts to reduce economic disparities between regions (inter-regional inequality) may unintentionally increase intra-regional disparities. For instance, investments in high-skilled sectors may raise the skill premium, resulting in wage and housing gaps between skilled and unskilled workers within the same region (Lopez and Morita, 2023). Additionally, the impact of new constructions on the value of existing housing stock remains a topic of discussion.[4] These challenges call for targeted interventions that strike a balance between economic efficiency and social equity.

[4] Homeowners, wary of the potential declines in home values, may resist public policies aimed at increasing housing supply (Glaeser et al., 2005). Evidence, however, suggested that Mega-projects like the Northern Metropolis policy are much needed because "society has reached a consensus on speeding up quality land supply for housing, social, and economic development." Our findings help shed light on this controversial issue by ascertaining economic gains in the Northern Metropolis. This uplift likely stems from expectations of future building upgrades, skilled labor influxes, and increased amenity levels (Hornbeck and Keniston, 2017).

Looking forward, our analysis opens several venues for future research. First, while our findings orbit around immediate household responses, it remains important to assess how the policy impacts firm behavior, particularly through channels such as increased collateral values and relaxed borrowing constraints (LaPoint and Sakabe, 2021). Second, the role of human capital in shaping regional development merits further attention. Skilled workers are often the first to migrate in response to new opportunities, and their presence can generate broader spillovers, either by stimulating employment growth in the non-traded sector through the "human capital multiplier" (Moretti and Thulin, 2013), or by exacerbating intra-regional inequality if skill-based gains are unevenly distributed. Third, beyond the economic well-being of households, future studies could consider the policy's implications for non-pecuniary aspects of welfare such as health, well-being, and community cohesion.

Taken together, our findings highlight the importance of recognizing both the intended and unintended consequences of large-scale regional development initiatives. They indicate the need for coordinated, inclusive policies that leverage the benefits of spatial transformation while mitigating its distributional risks. The Northern Metropolis policy presents a rare opportunity to reimagine the role of Hong Kong within the GBA, but its success will ultimately hinge on how well these trade-offs are understood and managed.

## Methods

### Data Sources

Our data come from four primary sources. First, the housing transaction data is obtained from EPRC Ltd., an esteemed reservoir of housing transaction data in Hong Kong. It contains detailed information on housing characteristics and transaction details, such as transaction date, transaction price, buyers' and sellers' names, property address, building age, floor level, salable floor area, and the number of rooms. We define the Northern Metropolis area as the North and Yuen Long districts, two of Hong Kong's eighteen districts. In Figure 8, the Northern Metropolis is distinctly marked in red.

Second, the online consumption dataset is obtained from the HKTV Mall platform, the leading online shopping platform in Hong Kong. This dataset covers comprehensive deal-level records spanning June 2021 to February 2022, encompassing 4,686,504 observations.[5] Previous studies examining household consumption patterns mainly rely on Census data, which are typically conducted at lower frequency (e.g., every 10 years) and are not viable for evaluating the policy impact in the near term. In contrast to conventional Census data, our dataset offers a high-frequency, granular perspective of online shopping, encompassing deal-level information such as buyers' ID, order date, delivery area, building name, housing type, and the amount of orders. Importantly, HKTV Mall catalogs the type of housing associated with each transaction, enabling us to examine the relationship between housing status and consumption even for public housing units, whose prices might not be available due to resale restrictions.

Third, demographic variables including household size, household income and education level are sourced from the Hong Kong Census database. School enrolment data is obtained from the Hong Kong Education Bureau. This dataset provides comprehensive coverage of local school enrolment,

[5] According to an online retail survey from Frost & Sullivan in 2021, the HKTV Mall leads the online retail landscape in Hong Kong with a commanding 13.9 percent market share. Its closest competitor, PARKnSHOP, lags significantly, holding a market share of merely 2.4 percent of the market, showcasing HKTV Mall's dominance.

cataloging annual school enrolment statistics for each grade across primary schools and secondary schools at the district level. Lastly, Shenzhen housing transaction data, acquired from proprietary source, includes detailed information on housing characteristics and transaction details.

**Models**

We first investigate the policy's footprint on housing prices within the Northern Metropolis area in the short term. To implement the DID strategy, we designate the North and Yuen Long districts—two of Hong Kong's eighteen districts—as our treatment group. The remaining districts of Hong Kong constitute the control group. We anchor our analysis with a window spanning four months before and after the announcement (i.e., [-4 months, +4 months]). We further extend the window to a span of twelve months on either side of the announcement (i.e., [-12 months, +12 months]), aiming to estimate the longer-term effect. Our regression is specified as below:

$$Log(HomePrice)_{it} = \alpha + \beta_1 Policy_t * North_i + \gamma H_{it} + \varphi_t + \omega_i + \theta_{it} + \varepsilon_{it} \quad \text{---(1)}$$

where the dependent variable, $Log(HomePrice)_{it}$, represents the logarithm of the housing transaction price in million HKD. The independent variable of interest, $Policy_t$, indicates transactions post-October 2021 (i.e., after the announcement). $North_i$ is a dichotomous variable that equals 1 if the property is located within the Northern Metropolis area and 0 otherwise. The coefficient $\beta_1$ thus gauges the nuanced differential in housing prices within the Northern Metropolis post-announcement. $H_{it}$ encompasses a set of control variables, accounting for housing characteristics, such as building age, floor, and property size. $\varphi_t$ is the year-month fixed effect, $\omega_i$ represents the district fixed effect, and $\theta_{it}$ is the year-month*region fixed effect. $\varepsilon_{it}$ denotes the error term. Standard errors are clustered at the year-month and district levels.

Next, we delve into the policy's impact on online consumption within the Northern Metropolis area using the HKTV Mall dataset. In contrast to the previous housing prices analysis focusing solely on private housing transaction data, the HKTV Mall dataset provides insights into the consumption

behavior associated with all housing types. We categorize private houses, private apartments, and private village houses as private housing. Furthermore, we group housing under the Home Ownership Scheme and public rental housing as public housing. This allows for a nuanced examination of the policy's impact on various types of residences. Our empirical model can be expressed as follows:

$$Log(Order-level\ Online\ Shopping\ Amount)_{it} = \alpha + \beta_1 Policy_t * North_i + \varphi_t + \omega_i + \theta_{it} + \mu_i + \varepsilon_{it} \quad \text{---(2)}$$

where the dependent variable, $Log(Order-level\ Online\ Shopping\ Amount)_{it}$, is the logarithm of order-level total shopping amount in HKD. The coefficient $\beta_1$ captures the consumption changes in the Northern Metropolis area post-announcement. We also add customers' id fixed effect to control unobserved factors at customer level ($\mu_i$). Other variables and parameters are the same as in Equation (1). Standard errors are clustered at the year-month, district, and customer levels.

We then segment online consumptions into distinct categories post-announcement, including necessities (encompassing spending on housewares, gadgets, and supermarket goods) and non-necessities (encompassing spending on clothes, makeup, skincare, travel, sports, toys, and pets). We further subdivide non-necessities into entertainment items (encompassing spending on travel, sports, toys, and pets) versus other spending. These distinctions facilitate precise empirical analysis of the mechanisms underlying the policy's impact on consumption. We use the following empirical specifications:

$$Log(Categorized\ Shopping\ Amount)_{it} = \alpha + \beta_1 Policy_t * North_i + \varphi_t + \omega_i + \theta_{it} + \mu_i + \varepsilon_{it} \quad \text{---(3)}$$

where dependent variable $Log(Categorized\ Shopping\ Amount)_{it}$ is defined as the logarithm of necessity shopping amount, non-necessity shopping amount and entertainment shopping amount separately. The coefficient $\beta_1$ indicates the variations in categorized spending within the Northern Metropolis post-announcement. The definitions of other variables remain unchanged. Standard errors

are clustered at the year-month, district, and customer levels.

Lastly, we explored the policy's impact on demographic shifts within the Northern Metropolis area post-announcement. Specifically, we scrutinize the demographic trends from 2017 to 2023 spanning education level, household income, household size and school enrolment. The empirical model is expressed as follows:

$$Log(Demographic)_{it} = \alpha + \beta_1 Policy_t * North_i + \beta_2 Policy_t * Outskirt_i + \beta_3 Log(HHincome)_{it} + \varphi_t + \omega_i + \varepsilon_{it} \text{ ---(4)}$$

where the dependent variable $Log(Demographic)_{it}$ is defined as the logarithm of the following annual district-level demographic variables: the ratio of the population with a university education, the number of households with more than 2 members, the number of households with a monthly income exceeding 30,000 HKD, school enrolment. The independent variable of interest, $Policy_t$, is a dichotomous variable that equals one for all observations in the post-policy period (2021 and later), and 0 otherwise. $North_i$ is also a dummy variable that equals one if the data is of the Northern Metropolis area and 0 otherwise. $Outskirt_i$ is a dummy variable that equals one if it is within the New Territories but not within the Northern Metropolis area and 0 otherwise. $Log(HHincome)_{it}$ is the logarithm of median monthly household income of economically active households (excluding foreign domestic helpers) in Hong Kong Dollar. The coefficient $\beta_1$ gauges the variations in demographic changes within the Northern Metropolis area after the policy's introduction. Fixed effects pertaining to year and district are included. Standard errors are clustered at the year and district levels.

Last, we investigate the policy's footprint on housing prices within the bordering area in Shenzhen housing market. We designate the sub-districts near the bordering area in Shenzhen—Shahe, Shekou, Yuehai, Shatou, Fubao, Futian, Nanyuan, Liantang, Huangbei, Nanhu and Guiyuan—eleven of Shenzhen's seventy-four sub-districts—as our treatment group. The remaining districts of Shenzhen constitute the control group. We anchor our analysis with a window spanning four months before and

after the announcement. We further extend the window to a span of twelve months on either side of the announcement, aiming to estimate the longer-term effect. Our regression is specified as below:

$$Log(HomePrice)_{it} = \alpha + \beta_1 Policy_t * Border_i + \gamma H_{it} + \varphi_t + \omega_i + \theta_{it} + \varepsilon_{it} \quad \text{---(5)}$$

where the dependent variable, $Log(HomePrice)_{it}$, represents the logarithm of the housing transaction price in million CNY. The independent variable of interest, $Policy_t$, indicates transactions post-October 2021 (i.e., after the announcement). $Border_i$ is a dichotomous variable that equals 1 if the property is located within the bordering area and 0 otherwise. The coefficient $\beta_1$ thus gauges the nuanced differential in housing prices within the bordering area post-announcement. $H_{it}$ encompasses a set of control variables, accounting for housing characteristics, such as building age, floor, and property size. $\varphi_t$ is the year-month fixed effect, $\omega_i$ represents the estate fixed effect, and $\theta_{it}$ is the year-month*district fixed effect. $\varepsilon_{it}$ denotes the error term. Standard errors are clustered at the year-month and estate levels.

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# Announcement of Northern Metropolis Plan Raises Housing Prices, Consumption, and Changes Demographics, though Inconclusive on Regional Inequality

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July 2025

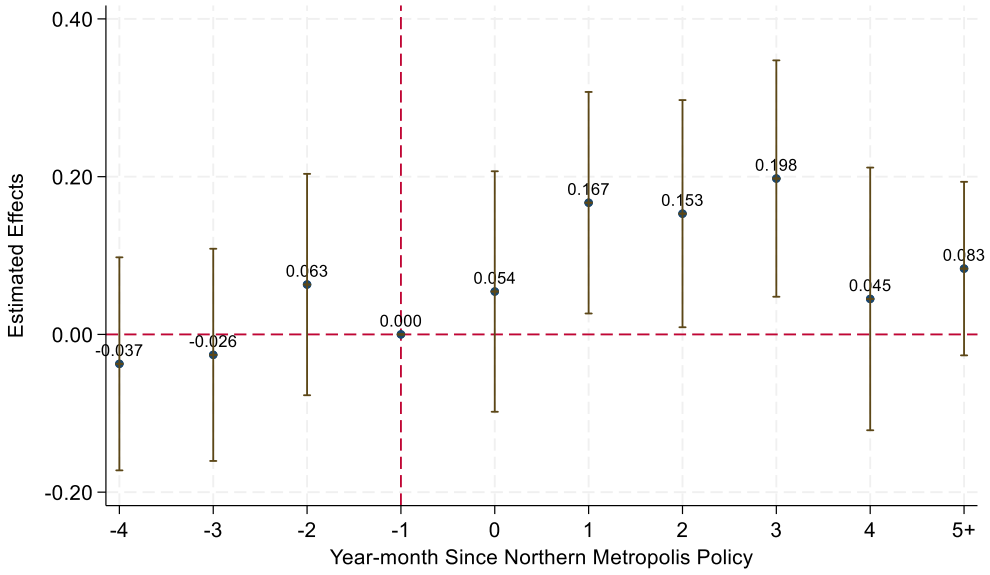
## Supplementary Information

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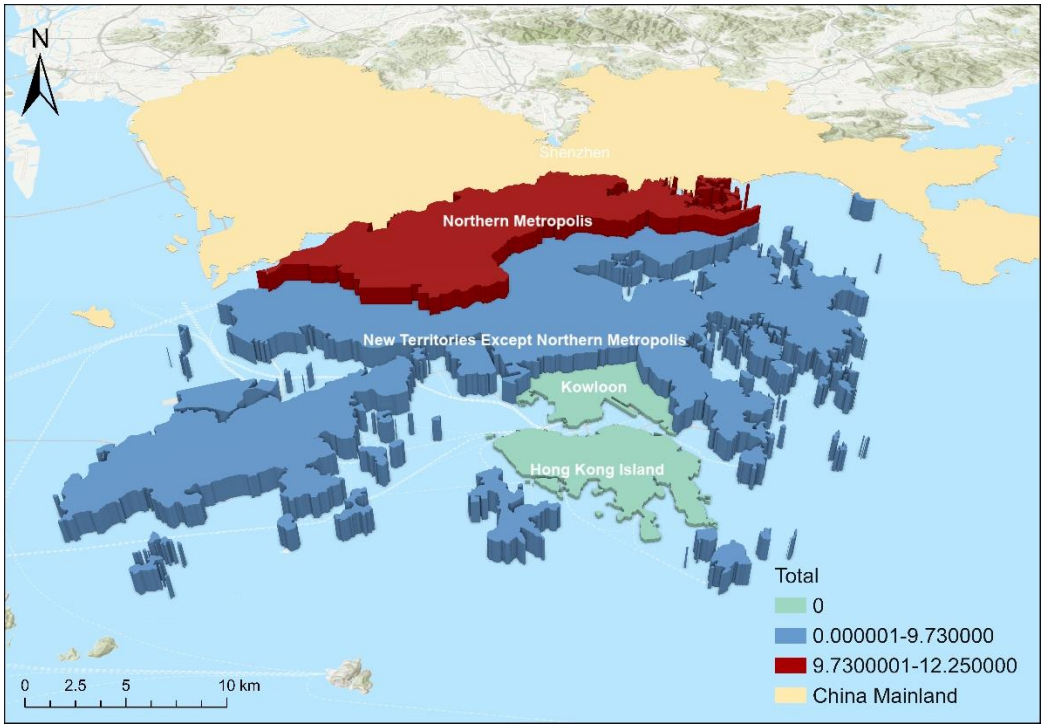
[‡] The University of Hong Kong. xkelly103@connect.hku.hk

**Appendix Figure A1: The Impact of Northern Metropolis Policy on Aggregated Transaction Amount**



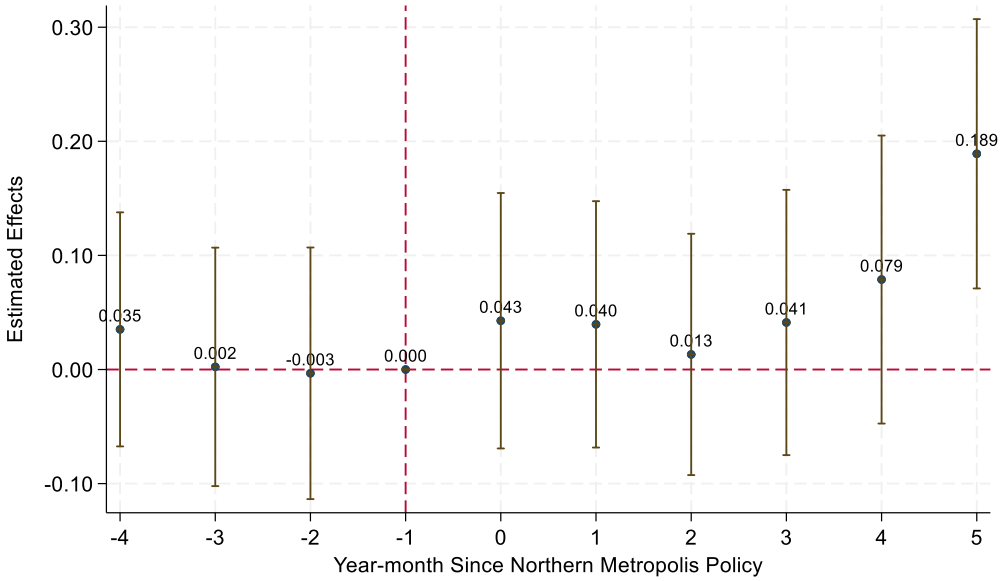

Note: This figure depicts event time coefficients, showcasing the differential impacts of the policy impact on residential properties. The coefficient for the month immediately before the policy implementation is normalized to zero. Year-month and district fixed effects are included. Standard errors are adjusted for clustering at the year-month and district levels.

**Appendix Figure A2: Spatial Distribution of School Enrolment Changes after Northern Metropolis Policy**



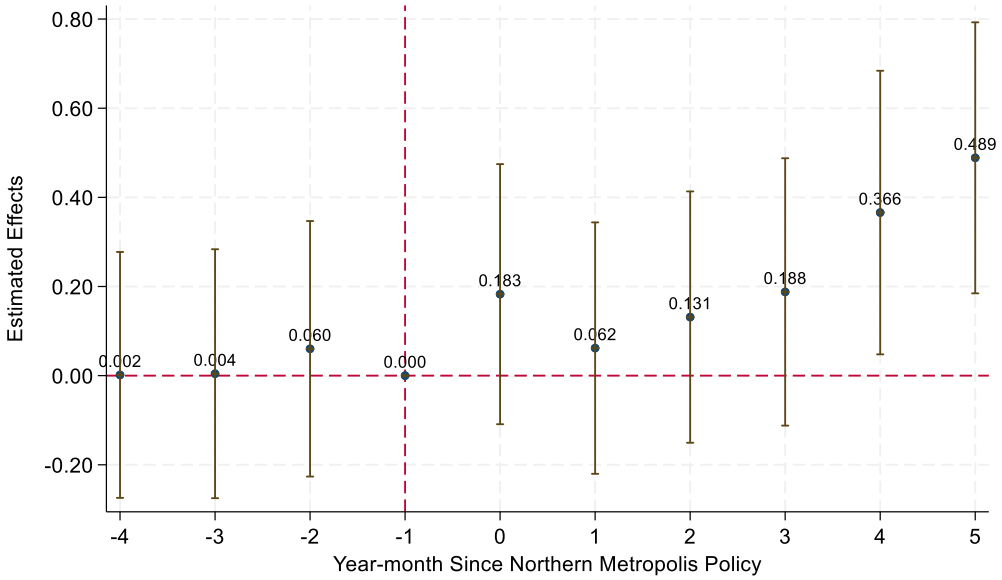

Note: These figures visualize the impact of the policy on total school enrolment in primary school and secondary school within the Northern Metropolis area (in red), in adjacent regions (in blue), and in regions further away from the Northern Metropolis area (in green), respectively. The height of the blocks represents the magnitude of the differential impacts of the policy on school enrolment across different areas. Year and district fixed effects are included. Standard errors are adjusted for clustering at the district level.

**Appendix Figure A3: The Impact of Northern Metropolis Policy on Housing Price in Bordering Area in Shenzhen Housing Market**




Note: This figure depicts event time coefficients, showcasing the differential impacts of the policy impact on residential properties. The coefficient for the month immediately before the policy implementation is normalized to zero. Year-month and district fixed effects are included. Standard errors are adjusted for clustering at the year-month and district levels.

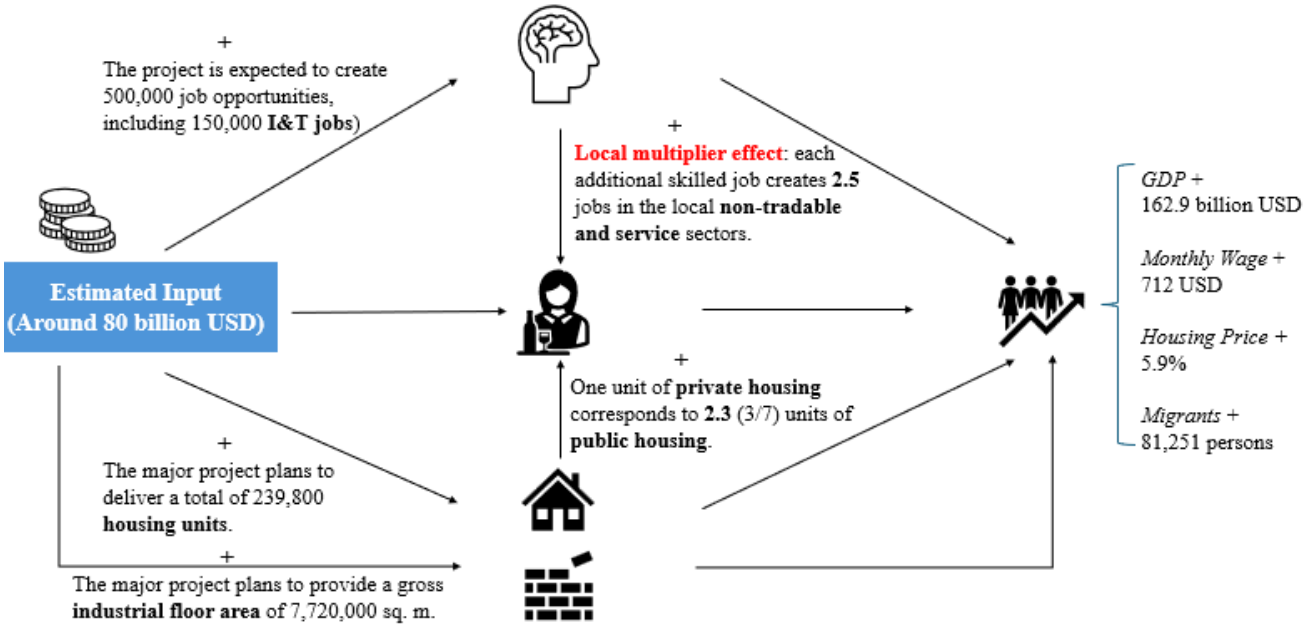
**Appendix Figure A4: The Impact of Northern Metropolis Policy on Aggregated Transaction Amount in Bordering Area in Shenzhen Housing Market**




Note: This figure depicts event time coefficients, showcasing the differential impacts of the policy impact on residential properties. The coefficient for the month immediately before the policy implementation is normalized to zero. Year-month and district fixed effects are included. Standard errors are adjusted for clustering at the year-month and district levels.

**Appendix Figure A5: The Long-term Impact of Northern Metropolis Policy**

These figures visualize the long-term impact of the policy on four dimensions: economic development, income growth, housing wealth, and migration.



**Appendix Table A1: Details of the Northern Metropolis Policy**

The chart below summarizes the details of the Northern Metropolis policy.

| | Northern Metropolis Policy |
|---|---|
| Purpose of the Policies | Promote economic development in the northern part of Hong Kong and strengthen the integration of the Greater Bay area. |
| Implementation Date | October 6th, 2021 |
| Scope of the Policies | North district and Yuen Long district |
| Measures | 1) Transportation Development: The Hong Kong government will construct five new railways, including three cross-border railways and two local railways. The three cross-border railways include the Hong Kong-Shenzhen western rail to upgrade the transport linkage with the Qianhai area in Shenzhen, the northern link spur line to link the San Tin/Lok Ma Chau area in Hong Kong and the Shenzhen I&T Zone and the east rail line to Luohu in Shenzhen. The two local railways include an automated people mover system from Tsim Bei Tsui to Pak Nai and the northern link eastward extension.<br>2) Innovation and Technology Development: The Hong Kong government will increase land supply for innovation and technology uses in the Northern Metropolis and build the San Tin Technopole. The San Tin Technopole has an estimated area of about 1,100 hectares and can provide a total of 45,500 to 47,500 residential units. Some of the units can be used as talent apartments for I&T enterprises and research institutes.<br>3) New comprehensive development node: The Hong Kong government will increase the housing supply in the Northern Metropolis area to mitigate the housing affordability issue in Hong Kong. In the western part of the Northern Metropolis, the Hong Kong government will develop the Lau Fau Shan and Tsim Bei Tsui area, providing 47,000 to 52,500 additional residential units in the Hung Shui Kiu/Ha Tsuen New development area. In the east part of the Northern Metropolis, the Hong Kong government will develop the Lo Wu/Man Kam To, providing around 75,000 to 85,000 residential units in total, and develop the Ma Tso Lung area, providing an additional 12,000 to 13,500 residential units.<br>4) Increased environmental capacity: The Hong Kong government will resume a lot of private wetlands and fishponds in the Northern Metropolis to increase environmental capacity. In addition, the Hong Kong government will build new wetland conservation parks and expand the old wetland park in the Northern Metropolis. Hong Kong government will also develop the urban-rural greenway in the New Territories North. |

**Appendix Table A2: Variable Definitions**

**Panel A: Housing Transaction Data**

| Variable Name | Definition |
|---|---|
| Aggregated Transaction Amount | The month-building level transaction amount. |
| Border | A dichotomous variable that equals 1 if the property is located within the bordering area in Shenzhen and 0 otherwise. |
| Building Age | Building age in years. |
| Floor | Floor in EPRC dataset. |
| Housing Price | CONSIDER in EPRC dataset. Property transaction price in million HKD. We adjust the transaction price using the published monthly Consumer Price Index (CPI) to remove the effect of inflation (the base is from October 2019 to September 2020). |
| North | A dichotomous variable that equals 1 if the property is located within the Northern Metropolis area and 0 otherwise. |
| Policy | A dummy variable that indicates transactions post-October 2021 (i.e., after the announcement). |
| Size | USIZES in EPRC dataset. Property saleable area in square feet. |
| Urban | A dummy variable that equals one if the property is in Hong Kong Island or Kowloon and equals 0 if the property is in New Territory. |

**Panel B: Order-level Online Consumption Data**

| Variable Name | Definition |
|---|---|
| Entertainment Shopping Amount | Customers' entertainment shopping amount in HKD per order. |
| Necessity Shopping Amount | Customers' necessity shopping amount in HKD per order. |
| Non-necessity Shopping Amount | Customers' non-necessity shopping amount in HKD per order. |
| North | A dummy variable that equals one if the buyer is within the Northern Metropolis area and 0 otherwise. |
| Order-level Online Shopping Amount | Customers' total shopping amount in HKD per order. |
| Policy | A dummy variable that equals one if the date of purchase is after October 2021 (i.e., after the announcement), and 0 otherwise. |
| Private | A dummy variable that equals one if the delivery address is private housing and 0 otherwise. Private residential properties include houses, apartments, villages, villas, and tenement houses. |
| Urban | A dummy variable that equals one if the property is in Hong Kong Island or Kowloon and equals 0 if the property is in New Territory. |

**Panel C: Demographic Structure Data**

| Variable Name | Definition |
|---|---|
| North | A dummy variable that equals one if the data is of the Northern Metropolis area and 0 otherwise. |
| Outskirt | A dummy variable that equals one if the data is of the New Territories but not within the Northern Metropolis area and 0 otherwise. |
| Policy | A dummy variable that equals one if all observations in the post-policy period (2021 and later), and 0 otherwise. |
| Ratio_University | Annual district-level ratio of the population with a university education. |
| Higher-income households | Annual district-level number of households with a monthly income exceeding 30,000 HKD |
| Households with Larger Family Sizes | Annual district-level number of households with more than 2 members. |
| Primary School Enrolment | Annual district-level primary school enrolments. |
| Secondary School Enrolment | Annual district-level secondary school enrolments. |
| Total School Enrolment | Annual district-level school enrolments in primary schools and secondary schools. |

**Appendix Table A3: Summary Statistics**

This table provides summary statistics for key variables used in this study. *Urban* is a dummy variable that equals one if the property is in Hong Kong Island or Kowloon and equals 0 if the property is in New Territory. *North* is a dummy variable that equals one if the property is in the Northern Metropolis area and 0 otherwise. *Private* is a dummy variable that equals one if the delivery address is a private residential property and 0 otherwise.

**Panel A: Housing Transaction Data in Hong Kong**

| Variable | N | mean | SD | P25 | P50 | p75 |
|---|---|---|---|---|---|---|
| Home Price (in millions HKD) | 100,576 | 9.331 | 10.151 | 5.726 | 7.594 | 10.020 |
| Size | 100,576 | 545.083 | 268.586 | 379.000 | 492.000 | 645.000 |
| Floor | 100,576 | 17.786 | 12.988 | 8 | 15 | 25 |
| Building Age | 100,576 | 17.892 | 15.934 | 1 | 18 | 31 |
| Urban | 100,576 | 0.415 | 0.493 | 0 | 0 | 1 |
| North | 100,576 | 0.134 | 0.341 | 0 | 0 | 0 |

**Panel B: Online Consumption Data**

| Variable | N | mean | SD | P25 | P50 | p75 |
|---|---|---|---|---|---|---|
| Order-level Online Shopping Amount | 4,686,504 | 568.750 | 539.300 | 324.500 | 474.500 | 674.500 |
| Urban | 4,686,504 | 0.472 | 0.499 | 0 | 0 | 1 |
| North | 4,686,504 | 0.105 | 0.307 | 0 | 0 | 0 |
| Private | 4,686,504 | 0.699 | 0.459 | 0 | 1 | 1 |
| Necessity Shopping Amount | 4,686,504 | 453.644 | 474.060 | 124.500 | 374.500 | 574.500 |
| Non-necessity Shopping Amount | 4,686,504 | 115.106 | 281.919 | 0.000 | 0.000 | 107.693 |
| Entertainment Shopping Amount | 4,686,504 | 34.004 | 149.242 | 0 | 0 | 0 |

**Panel C: Demographic Data**

| Variable | N | mean | SD | P25 | P50 | p75 |
|---|---|---|---|---|---|---|
| Ratio_University | 126 | 35.538 | 8.229 | 27.900 | 35.950 | 40.100 |
| Higher-income households (000) | 126 | 70.027 | 23.846 | 53.500 | 64.000 | 90.600 |
| Households with Larger Family Sizes (000) | 126 | 118.033 | 46.617 | 86.800 | 118.050 | 147.700 |
| Total School Enrolment (000) | 126 | 34.356 | 14.283 | 23.058 | 34.004 | 44.728 |
| Primary School Enrolment (000) | 126 | 17.462 | 7.409 | 12.341 | 16.598 | 21.882 |
| Secondary School Enrolment (000) | 126 | 16.894 | 7.077 | 10.692 | 16.940 | 21.215 |

**Panel D: Housing Transaction Data in Shenzhen**

| Variable | N | mean | SD | P25 | P50 | p75 |
|---|---|---|---|---|---|---|
| Home Price (in millions CNY) | 41,060 | 1.509 | 0.555 | 1.204 | 1.548 | 1.892 |
| Size (in squared meters) | 41,060 | 87.262 | 50.312 | 57.695 | 79.430 | 101.410 |
| Floor | 41,060 | 11.239 | 8.421 | 5 | 9 | 17 |
| Building Age | 41,060 | 16.397 | 6.201 | 11.959 | 16.275 | 20.162 |
| Border | 41,060 | 0.211 | 0.408 | 0 | 0 | 0 |

**Appendix Table A4: Policy Impact on Increasing Housing Price in Northern Metropolis Area: Robustness Check with Samples within New Territories and Winsorized Home Price**

This table presents the policy impact on housing prices in the Northern Metropolis area. In this table, we only use samples within the New Territory area in Hong Kong. $Log(HomePrice)_{it}$ is defined as the logarithm of the housing transaction price in million HKD. $Policy_t$ indicates transactions post-October 2021 (i.e., after the announcement). $North_i$ is also a dichotomous variable that equals 1 if the property is located within the Northern Metropolis area and 0 otherwise. We also control property characteristics: building age, floor, and property size. In Column (3) and Column (4), we use winsorized home prices. We include year-month, district, and year-month*region fixed effects. Standard errors are adjusted for clustering at year-month and district levels, are included in parentheses, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Y: Log(Home Price) | | Y: Winsorized Log(Home Price) | |
| Variable | [-4, +4] Months | [-12 +12] Months | [-4, +4] Months | [-12 +12] Months |
| Policy*North | 0.0731*** | 0.0439*** | 0.0623*** | 0.0407*** |
| | (0.0246) | (0.0149) | (0.0189) | (0.0130) |
| Log(Building Age) | -0.1369*** | -0.1236*** | -0.1322*** | -0.1209*** |
| | (0.0054) | (0.0036) | (0.0048) | (0.0035) |
| Log(Floor) | 0.0530*** | 0.0534*** | 0.0581*** | 0.0545*** |
| | (0.0060) | (0.0033) | (0.0053) | (0.0030) |
| Log(Size) | 0.9096*** | 0.8780*** | 0.8703*** | 0.8580*** |
| | (0.0160) | (0.0090) | (0.0096) | (0.0070) |
| Year-month FE | YES | YES | YES | YES |
| District FE | YES | YES | YES | YES |
| Year-month*Region FE | YES | YES | YES | YES |
| Observations | 21,709 | 58,828 | 21,709 | 58,828 |
| R-squared | 0.6384 | 0.6502 | 0.7428 | 0.7436 |

**Appendix Table A5: Policy Impact on Increasing Order-level Online Shopping Amount in Northern Metropolis Area: Robustness Check with Samples within New Territories and Winsorized Shopping Amount**

This table presents the policy impact on order-level online shopping amount in the Northern Metropolis area. In this table, we only use samples within the New Territory area in Hong Kong. $Log(Order-level\ Online\ Shopping\ Amount)_{it}$ is defined as the logarithm of the order-level total shopping amount in HKD. $Policy_t$ is a dummy variable that equals one if the date of purchase is after October 2021 (i.e., after the announcement), and 0 otherwise. $North_i$ is also a dummy variable that equals one if the buyer is in the Northern Metropolis area and 0 otherwise. In Column (4), Column (5), and Column (6), we use the winsorized shopping amount. We include year-month, district, customer, and year-month*region fixed effects. Standard errors are adjusted for clustering at year-month, district, and customer levels, are included in parentheses, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Y: Log(Order-level Online Shopping Amount) | | | Y: Winsorized Log(Order-level Online Shopping Amount) | | |
| Variable | [-4, +4] Months | [-4, +4] Months | [-4, +4] Months | [-4, +4] Months | [-4, +4] Months | [-4, +4] Months |
| | Full samples | Private housing | Public housing | Full samples | Private housing | Public housing |
| Policy*North | 0.0415*** | 0.0471*** | 0.0264*** | 0.0412*** | 0.0468*** | 0.0263*** |
| | (0.0035) | (0.0043) | (0.0061) | (0.0035) | (0.0043) | (0.0061) |
| Year-month FE | YES | YES | YES | YES | YES | YES |
| District FE | YES | YES | YES | YES | YES | YES |
| Customer FE | YES | YES | YES | YES | YES | YES |
| Year-month*Region FE | YES | YES | YES | YES | YES | YES |
| Observations | 2,474,406 | 1,657,169 | 817,237 | 2,474,406 | 1,657,169 | 817,237 |
| R-squared | 0.4208 | 0.4068 | 0.4620 | 0.4204 | 0.4063 | 0.4616 |

**Appendix Table A6: Policy Impact on Increasing Online Shopping Amount by Consumption Category in Northern Metropolis Area**

This table presents the policy impact on online shopping amount by consumption category in the Northern Metropolis area. The dependent variable is defined as the logarithm of categorized spending. $Policy_t$ is a dummy variable that equals one if the date of purchase is after October 2021 (i.e., after the announcement), and 0 otherwise. $North_i$ is also a dummy variable that equals one if the buyer is in the Northern Metropolis area and 0 otherwise. We investigate the policy impact on necessities, non-necessities, and entertainment separately. In Column (1), Column (3), and Column (5), we use private housing samples. In Column (2), Column (4), and Column (6), we use public housing samples. Results include year-month, district, customer, and year-month*region fixed effects. Standard errors are adjusted for clustering at year-month, district, and customer levels, are included in parentheses, and ***, **, * indicate 1%, 5%, and 10% significance, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Y: Log(Necessity Shopping Amount) | | Y: Log(Non-necessity Shopping Amount) | | Y: Log(Entertainment Shopping Amount) | |
| Variable | [-4, +4] Months | [-4, +4] Months | [-4, +4] Months | [-4, +4] Months | [-4, +4] Months | [-4, +4] Months |
| | Private housing | Public housing | Private housing | Public housing | Private housing | Public housing |
| Policy*North | 0.0409*** | 0.0182** | 0.0453*** | 0.0113 | 0.0253*** | 0.0116 |
| | (0.0062) | (0.0089) | (0.0096) | (0.0135) | (0.0060) | (0.0082) |
| Year-month FE | YES | YES | YES | YES | YES | YES |
| District FE | YES | YES | YES | YES | YES | YES |
| Customer FE | YES | YES | YES | YES | YES | YES |
| Year-month*Region FE | YES | YES | YES | YES | YES | YES |
| Observations | 3,276,863 | 1,409,641 | 3,276,863 | 1,409,641 | 3,276,863 | 1,409,641 |
| R-squared | 0.3613 | 0.4519 | 0.3728 | 0.4497 | 0.4597 | 0.5558 |

**Appendix Table A7: Policy Impact on Increasing Online Shopping Amount by Consumption Category in Northern Metropolis Area: Robustness Check with Samples within New Territories and Winsorized Shopping Amount**

This table presents the policy impact on online shopping amount by consumption category in the Northern Metropolis area. In this table, we only use samples within the New Territory area in Hong Kong. The dependent variable is defined as the logarithm of categorized spending. The dependent variable is winsorized at 1% level. $Policy_t$ is a dummy variable that equals one if the date of purchase is after October 2021 (i.e., after the announcement), and 0 otherwise. $North_i$ is also a dummy variable that equals one if the buyer is in the Northern Metropolis area and 0 otherwise. Results include year-month, district, customer, and year-month*region fixed effects. Standard errors are adjusted for clustering at year-month, district, and customer levels, are included in parentheses, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Y: Winsorized Log(Necessity Shopping Amount) | | Y: Winsorized Log(Non-necessity Shopping Amount) | | Y: Winsorized Log(Entertainment Shopping Amount) | |
| Variable | [-4, +4] Months | [-4, +4] Months | [-4, +4] Months | [-4, +4] Months | [-4, +4] Months | [-4, +4] Months |
| | Private housing | Public housing | Private housing | Public housing | Private housing | Public housing |
| Policy*North | 0.0411*** | 0.0197** | 0.0427*** | 0.0096 | 0.0241*** | 0.0105 |
| | (0.0062) | (0.0089) | (0.0096) | (0.0136) | (0.0059) | (0.0082) |
| Year-month FE | YES | YES | YES | YES | YES | YES |
| District FE | YES | YES | YES | YES | YES | YES |
| Customer FE | YES | YES | YES | YES | YES | YES |
| Year-month*Region FE | YES | YES | YES | YES | YES | YES |
| Observations | 1,657,169 | 817,237 | 1,657,169 | 817,237 | 1,657,169 | 817,237 |
| R-squared | 0.3739 | 0.4598 | 0.3780 | 0.4544 | 0.4674 | 0.5593 |

**Appendix Table A8: Policy Impact on Increasing Housing Transaction Amount in Bordering Area in Shenzhen Housing Market**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Y: Log(Aggregated Transaction Amount) | | | |
| Variable | [-4, +4] Months | [-12 +12] Months | [-4, +4] Months | [-12 +12] Months |
| Policy*Border | 0.1039 | 0.1625*** | 0.1429* | 0.1393*** |
| | (0.0767) | (0.0578) | (0.0753) | (0.0389) |
| Year-month FE | YES | YES | YES | YES |
| Estate FE | YES | YES | YES | YES |
| Year-month*District FE | NO | NO | YES | YES |
| Observations | 6,304 | 19,993 | 6,304 | 19,993 |
| R-squared | 0.2000 | 0.2519 | 0.2083 | 0.2622 |

Note: This table presents the policy impact on aggregated transaction amount in the Northern Metropolis area. $Log(Aggregated\ Transaction\ Amount)_{it}$ is defined as the logarithm of the month-building level transaction amount. $Policy_t$ indicates transactions post-October 2021 (i.e., after the announcement). $North_i$ is also a dichotomous variable that equals 1 if the property is located within the Northern Metropolis area and 0 otherwise. In Columns (1) and (2), results include year-month and street fixed effects. In Columns (3) and (4), we also include year-month*district fixed effect. Standard errors are adjusted for clustering at year-month and street levels, are included in parentheses, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

**Long Term Model Prediction of the Northern Metropolis Policy**

In this section, we predict the long-term impact of the Northern Metropolis policy, assuming all the planned establishments in the Northern Metropolis area will be implemented. The summarized outcomes are illustrated in Appendix Figure A1. We begin our prediction with the Cobb-Douglas production function. According to Cobb and Douglas (1928), the production function is specified as below:

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha} \quad \text{---(A1)}$$

To facilitate our estimation, we transform Equation (1) into logarithmic changes,

$$\Delta lnY_t = (1-\alpha)\Delta lnL_t + \alpha \Delta lnK_t + \Delta lnA_t \text{ ---(A1a)}$$

where $\Delta lnY_t$ denotes the changes in the year-level logarithm of Hong Kong's Gross Domestic Product (GDP) in chained (2022) dollars. $\Delta lnL_t$ represents the variations in the logarithm of the total number of employed persons in Hong Kong, measured in thousands. $\Delta lnK_t$ captures the changes in the year-level logarithm of Hong Kong's gross value on investment expenditure, also in million HKD. Lastly, $\Delta lnA_t$ represents the changes in amenities. To estimate the output elasticity of *K* (i.e., the coefficient $\alpha$), we rearrange Equation (A1a) as Equation (A1b) and regress $\Delta lnY_t$ on $\Delta lnK_t - \Delta lnL_t$.

$$\Delta lnY_t = \Delta lnL_t + \Delta lnA_t + \alpha(\Delta lnK_t - \Delta lnL_t) \text{ ---(A1b)}$$

Based on 25 years of sample predating the announcement of Northern Metropolis policy (i.e., from 1997 to 2021), the estimated value of $\alpha$ is 0.350, which is statistically significant at the 1% level. According to the action agenda of the Northern Metropolis policy, the Northern Metropolis area is expected to create about 500,000 job opportunities, which includes 150,000 positions in the Information & Technology (I&T) sector. In that case, once the Northern Metropolis is fully operational, given the existing level of employed persons (3,709.6 thousand people) in 2023, $lnL$ will increase to 8.345 (ln (3,709.6+500)) and, $\Delta lnL_t$ will be 0.126 (8.345-ln (3709.6)). We further assume that total factor productivity (TFP) remains constant during the process ($\Delta lnA_t = 0$) and assume that the fixed investment expenditure of the Northern Metropolis project will mirror that of the 'Lantau Tomorrow Vision' initiated in 2018, approximately 624 billion HKD (79.5 billion USD).[4] Given the existing level of investment expenditure 501,457 million HKD (63,879.9 million USD) in 2023, $lnK$ will increase to 13.934 (ln(501,457+624,000)), and $\Delta lnK_t$ will be 0.808 (13.934-ln (501,457)). Based on these

[4] https://www.devb.gov.hk/en/home/my_blog/index_id_330.html

estimates, the change in the natural log of GDP, or $\Delta lnY_t$ , will be 0.365 (0.65*0.126+0.35*0.808). Given the existing level of GDP 2,901 billion HKD (369.6 billion HKD) in 2023, we predict a projected increase in GDP to 4,180 billion HKD (532.5 billion HKD) ($e^{\ln (2,901,018)+0.365}$), marking an increment of approximately 1,279 (4,180-2,901) billion HKD (162.9 billion USD) attributable to the Northern Metropolis policy. This is roughly double the projected investment expenditure for the project (1,279 billion / 624 billion HKD), resulting in a 44.1% growth in GDP compared to the 2023 baseline of 2,901 billion HKD (369.6 billion USD).

By taking the derivative of GDP with respect to labor, we obtain the marginal productivity of labor, which serves as the theoretical foundation for wages. The expression for wages can be expressed as follows,

$$\frac{\partial Y_t}{\partial L_t} = (1-\alpha)A_t K_t^{\alpha} L_t^{-\alpha} = w_t \quad \text{---(A2)}$$

We then transform Equation (2) into logarithmic changes. The formula for wage changes thus becomes,

$$\Delta lnw_t = \alpha(\Delta lnK_t - \Delta lnL_t) + \Delta lnA_t \quad \text{---(A3)}$$

where $\Delta lnw_t$ represents the changes in the logarithm of the median monthly salary in Hong Kong, denoted in HKD. Under the assumption of constant TFP, we predict an increase in the logarithm of the average monthly salary ($\Delta lnw_t$=0.239, or 0.350 x (0.808-0.126)). Given the existing level of median monthly salary 20,700 HKD (2,636.9 USD) in 2023, we forecast a surge in the median monthly salary to reach 26,289 HKD ($e^{\ln (20,700)+0.239}$) (3,348.9 USD), amounting to an increase of 5,589 HKD (26,289-20,700) (712 USD) when the Northern Metropolis is fully operational.

Housing wealth represents an important source of wealth accumulation. Building upon Glaeser and Gottlieb's (2009) extension of the Cobb-Douglas model, which separates $K_t$ into tradable and non-tradable capital (with an emphasis on the housing sector), we forecast the changes on housing prices after the Northern Metropolis is fully established. The pivotal idea here is the competition for land use between the tradable and non-tradable sectors. Utilizing Glaeser and Gottlieb's (2009) framework, we express the changes in logarithm of housing prices as a function of the changes in logarithm of the land use in the industrial sector and the housing sector. The model could be expressed as follows,

$$\Delta lnP_t = \lambda_1 \Delta lnInd_t + \lambda_2 \Delta lnRes_t + \sigma_t \quad \text{---(A4)}$$

where $\Delta lnP_t$ represents the changes in logarithm of the Hong Kong housing price index. $\Delta lnInd_t$ measures the changes in logarithm of the annual industrial new completions, measured in square meters.[5] $\Delta lnRes_t$ denotes the changes in logarithm of the annual private residential new completions, measured in units. $\sigma_t$ denotes the changes in local amenities.

Consistent with the previous analysis, we use 25 years of sample predating the announcement of Northern Metropolis policy. The estimated coefficient $\lambda_1$ is 0.055. The coefficient $\lambda_2$ has a value of -0.138. The value of $\sigma_t$ is 0.052. All coefficient estimates are statistically significant at least at the 10% level. Conservatively speaking, according to the action agenda for the Northern Metropolis policy, we estimate the area will create 71,940 new private residential units in major development projects.[6] Meanwhile, we estimate the area will provide 7,720,000 square meters in new industrial completions.[7]

Compared to the new completions of industrial space (113,200 square meters) in 2023, we estimate that $\Delta lnInd_t$ will be 4.222 (ln(7,720,000)-ln(113,200)) after the establishment in Northern Metropolis policy. Similarly, compared to the new completions of private housing (13,852) units in 2023, we estimate that $\Delta lnRes_t$ will be 1.647 (ln(71,940)-ln(13,852)). Assuming the $\sigma_t$ as 0.052, the change in the logarithm form of price index, or $\Delta lnP_t$ will be 0.057. Given the existing level of housing price (337.400) in 2023, we predict an increase in housing price index to 357.152 ($e^{\ln(337.400)+0.057}$) and conjecture a long-term increase in housing price by approximately 5.9% (357.152 /337.400-1).

We also estimate the changes of housing price following a pre-policy increase (i.e. the Northern Metropolis policy had not been enacted). For residential sector, we first calculate the average year-level units of new completions using recent ten years data predating the Northern Metropolis policy, and the average number is 14,767 units. Assuming that new completions in the Northern Metropolis area account for 10% of total new completions, we thus predict a total of 29,535 units of new residential completions in that area over the next two decades (14,767*10*20). Similarly, for industrial sector, we first calculate the average year-level square

[5] The categories of industrial new completions include private flatted factories, private specialized factories, and private storage facilities.

[6] Despite an initial estimate of approximately 500,000 housing units to be delivered through this policy, we have taken a conservative approach and calculated a cumulative estimated supply of 239,800 units from the major development projects. In the meantime, the ratio of public and private residential supply in Hong Kong in the vast majority of cases will be seven to three. We thus estimate the new private housing supply will be 71,940 units (239,800*0.3) in that area.

[7] According to the action agenda, the San Tin Technopole and Industrial building near Hung Shui Kiu will provide a gross floor area of 7 million square meters and 720,000 square meters, respectively.

meters of new completions using recent ten years data predating the Northern Metropolis policy, and the average number is 125,120 square meters. Therefore, we estimate that the total new industrial completions in the Northern Metropolis area over the next two decades will amount to 2,502,400 square meters (125,120*20).

Considering the new completions of industrial space (113,200 square meters) in 2023, we estimate that $\Delta lnInd_t$ will be 3.096 (ln(2,502,400)-ln(113,200)). Similarly, comparing the new completions of private housing (13,852 units) in 2023, we estimate that $\Delta lnRes_t$ will be 0.757 (ln(29,535)-ln(13,852)). Assuming the $\sigma_t$ as 0.052, the change in the logarithm form of price index, or $\Delta lnP_t$ will be 0.118. Given the existing level of housing prices in 2023, which is 337.400, we predict that the housing price index will increase to 379.577 ($e^{\ln(337.400)+0.118}$) and conjecture a long-term increase in housing price by approximately 12.5% if the Northern Metropolis policy had not been enacted.

In contrast, our analysis predicts a more modest housing price increase of 5.9% following the implementation of the Northern Metropolis policy. This modest rise helps maintain housing affordability and mitigates potential adverse effects on the residential market. While our calculations do not indicate significant housing price increases/declines beyond fundamentals, it is important to acknowledge that housing prices may still fluctuate due to unforeseen changes in economic fundamentals. For instance, policy uncertainty and investor speculation could introduce variability and lead to realized price changes that diverge from our predictions.

Next, to estimate the expected influx of immigrants following the establishment of the Northern Metropolis, we employ the gravity law of population migration model (Anderson, 2011), expressed as follows:

$$lnM_{ijt} = \beta_1 lnPop_{it} + \beta_2 lnPop_{jt} - \gamma lnD_{ij} + \varepsilon_{ijt} \text{ ---(A5)}$$

where $M_{ijt}$ denotes the cumulative migration flow from area $i$ to area $j$ at year level. $Pop_{it}$ and $Pop_{jt}$ represent the populations (in thousands) of the originating area $i$ and the destination area $j$, respectively. $D_{ij}$ is the shortest flight distance in kilometers between areas $i$ and $j$. We utilize the OECD international migration database, which provides country-level migration data from 2000, and the Penn World Table, which provides country-level population data up until 2019. Therefore, we limit our analysis to the period between these two years. The estimated coefficient $\beta_1$ is 0.326. The coefficient $\beta_2$ is 0.428. The coefficient γ is 0.702. All coefficient estimates are statistically significant at least at the 1% level.

The coefficient $\beta_2$ indicates that a 1% increase in Hong Kong's population (destination area) is associated with a 0.428% increase in the cumulative migrants from other regions to Hong Kong. Given the current population level (7,490.336 thousand people) and the average annual growth rate of Hong Kong's population (0.60%) over the sample period, along with the projection of 500,000 new job opportunities from the Northern Metropolis initiative, we predict that Hong Kong's population will increase by 19.35% over the new two decades ((7,490.336*(1+0.60%)^20+500)/7,490.336-1). Therefore, we expect an 8.28% (19.35 x 0.428%) in the cumulative migrants from other regions to Hong Kong.