# Straw Purchase or Safe Haven? The Hidden Perils of Illicit Wealth in Property Markets[1]

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17 May 2020

**Abstract**

Real estate markets are highly vulnerable to inflows of illicit wealth, given the clandestine nature of dark money, making these activities difficult to detect and estimate. We exploit one of the largest offshore data leaks – the Panama Papers – to study how the associated individuals behave in housing transactions and quantify the effects of their housing market participation. We find that buyers linked to offshore secrecy purchase properties at a premium of 3.8%. Additional robustness and heterogeneity tests evidence that this premium is driven by these individuals' secret funding and agenda to park money in properties as a safe haven. We further explore two policy shocks: the 2007 introduction of a cross-border cash movement policy and the 2010 implementation of the Estate Agents Regulations (EAW). After the former, the property selling prices of these individuals decreased by 5.5%, while their property purchase prices decreased by 2.7% after EAW. In addition, we document a short-term negative externality of Panama-linked purchases on properties in the same blocks, projects and neighborhoods, revealing price increases of 1.3%, 2.0% and 3.4%, respectively.

**Keywords**: Money Laundering; Illicit Wealth; Offshore Secrecy; Housing Market; Safe Haven; Straw Purchase

[1] We benefited from the comments of Brent Ambrose, Gene Amromin, Souphala Chomsisengphet, Pulak Ghosh, Wenlan Qian, Changcheng Song, Qin Yu, Fan Yi and seminar participants at NUS, ISB, and HKBU. We would also like to thank the Monetary Authority of Singapore (MAS), Council for Estate Agencies (CEA) and Urban Redevelopment Authority (URA) for valuable comments. Research supports from Wang Long are also appreciated.

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## 1. Introduction

The real estate market has long been a prime destination for individuals seeking to launder illicit wealth, in part due to its ability to not only retain value but also provide predictable returns. According to the Financial Action Task Force (FATF), real estate accounted for up to 30% of confiscated criminal assets between 2011 and 2013. In British Columbia, between $800 million and $5.3 billion were laundered through the real estate market in 2018, raising housing prices by approximately 5%[3]. In London, approximately £4.2 billion worth of properties sold in 2017 were bought by high-corruption-risk individuals, including some who have been charged with and convicted of corruption offences[4]. The situation is similar in Australia and the United States, where all-cash deals are prevalent, especially in real estate purchases made by foreign nationals[5]. Understanding the use of illegitimate financial flows in the real estate market is crucial, given the significant role played by real estate in economic and social development. This paper focuses on illicit wealth in the real estate market. We aim to identify real estate transactions connected to suspicious financial flows, examine the outcome of these transactions, and quantify their potential impact on the overall real estate market.

Real estate is typically involved in the last phase – known as the integration phase – of the money-laundering scheme. At this stage, illicit wealth is reinjected into the legal economy after going through the layering process, whereby complex financial transfers are created to disguise the origins of financial assets and beneficial owners. These intricate financial transfers are usually made through corporate structures in offshore jurisdictions with strict bank secrecy, which are favored destinations for illegitimate wealth associated with fraud, embezzlement, bribery, tax evasion and money laundering. The involvement of offshore vehicles in property purchases is not uncommon; 91% of London properties owned by overseas companies were registered in secrecy havens, according to research conducted by Thomson Reuters and Transparency International UK[6]. Other hallmarks of illicit money being channeled through real estate include the use of complex loan structures and the use of nonfinancial professionals such as lawyers and real estate agents[7].

The key challenge to the empirical study of such questions lies in identifying illegal components of real estate transactions, given the unobservable and clandestine nature of illicit wealth. According to the UN, less than 1% of illicit wealth is ever detected, with this figure possibly being as low as 0.2%. In this paper, we exploit the Panama Papers data leaks to capture real estate transactions associated with offshore secrecy. In April 2016, the news media reported 40 years' worth of confidential information related to the business activities of Mossack Fonseca, a Panama-based provider of offshore financial services. The data leaks revealed 214,000 offshore shell companies linked to people – among them world political leaders and business figures – in more than 200 countries. Using information on the individuals

[3] Combatting Money Laundering in BC Real Estate. Expert Panel on Money Laundering in BC Real Estate, 2019.
[4] Faulty Towers: Understanding the impact of overseas corruption on the London property market. Transparency International UK, 2017.
[5] Doors Wide Open: Corruption and Real Estate in Four Key Markets. Transparency International, 2017.
[6] A Top Destination for Money Launderers. Thomson Reuters and Transparency International UK, 2016.
[7] Money Laundering & Terrorist Financing Through the Real Estate Sector. Financial Action Task Force, 2007.

responsible for the operation of offshore vehicles implicated in the Panama Papers, we merge the names of these individuals with our proprietary property transactions data, which contain the names and nationalities of property buyers. In light of the fact that offshore corporate secrecy is frequently exploited to conceal illicit wealth, we should expect these individuals to behave differently, perhaps more aggressively, than the average housing market participant, given their prodigious real estate budgets backed by offshore funding as well as their potential motive to park money in properties as a safe haven.

We use data on over 440,000 private property transactions in Singapore from 1995 to 2018. Of the 100,081 transactions that contain the buyer's details, we identify 2,331 transactions whose buyers are individuals implicated by name in the Panama Papers. These properties tend to be at the higher end of the property market: they fetch a higher transacted price, are more strategically located and are more highly valued in terms of property characteristics such as floor level, property size and tenure. To examine whether operators of offshore secrets (hereafter Panama-linked individuals) behave differently in the housing market, we compare the property purchase prices of these individuals with those of other individuals and find that Panama-linked individuals purchase property at a 3.8% premium, that is, approximately SGD$ 50,000 more for a property valued at SGD$ 1.3 million. Note that this "Panama premium" may be an underestimation, considering that we likely misclassify some individuals who are connected to illicit activities, but not captured in the Panama Papers into our control group. Varying across developments and locations, the Panama premium is found to be higher in the luxury property market.

Why does the Panama premium exist? It may be the result of the wealth effect associated with suspicious offshore funding, which is derived from large sums of illegitimate money laundered through offshore vehicles. Consistent with this possibility, we find, using information on the Panama-linked individuals' dates of employment in the offshore corporations, that the Panama premium appears only after an officer becomes employed at the corporation. The premium is found to be larger for properties purchased by Panama-linked individuals whose home countries are more corrupt and laxer in their enforcement of regulations related to anti-money laundering/countering the financing of terrorism (AML/CFT), suggesting the existence of a safe-haven effect for properties in Singapore. For locals, the Panama premium is partly attributable to their cherry-picking of superior units and colluding with other Panama-linked sellers. Further evidence suggests that locals are exploited as straw buyers to purchase properties on behalf of third parties. In addition, we provide evidence that Panama-linked individuals manipulate property values by not only buying but also selling properties at a premium. We examine a policy change in November 2007 that introduced controls on cross-border cash movements and find a significant reduction of 5.5% in the prices of properties sold by Panama-linked individuals. Our results provide support for the anecdotal evidence suggesting that illegitimate cash may be used to manipulate property values before properties are resold.

In view of their central role in facilitating real estate transactions, nonfinancial professionals, including lawyers and real estate agents, may be used by suspected criminals. In this paper, we

study the implementation on 15 November 2010 of the Estate Agents (Estate Agency Work) Regulations (EAW), which strengthened AML/CFT monitoring and the regulatory regime applicable to real estate agents. If the Panama premium is indeed associated with illegitimate financial flows from offshore vehicles, we expect this policy shock to have reduced the premium for transactions involving Panama-linked individuals and even more so for those involving individuals and markets characterized by higher risk. Figure 1 illustrates the distribution of Panama-linked transactions and their overpayment status, as represented by positive residuals derived from hedonic regressions, during the two-year period before and after the EAW policy shock. We observe a significant decline in the number of Panama-linked transactions and the proportion of overpayments after the policy shock. Empirically, we find that the purchase prices of Panama-linked buyers decreased by 2.7% after the introduction of the EAW. Notably, this estimate provides a lower bound of the policy effect since any effects that operate on the extensive margin (through purchase withdrawal or denial of purchase) are not captured. More specifically, the policy effect is found to be stronger for transactions involving foreign nationals and for resale transactions.

A key descriptive statistic from our analysis is that real estate market overheating is spatially correlated with Panama-linked transactions. Figure 2 offers five-year snapshots of the distribution of overpayments and Panama-linked transactions from 1995 to 2010. Overpayments seem to be more prevalent in the Central Region of Singapore, where Panama-linked transactions concentrate. To more formally analyze this pattern, we examine the dynamic change in the prices of properties in the focal blocks and projects where Panama-linked transactions occur as well as those of neighboring projects. In our baseline specification, we regress the transacted price on a set of indicators reflecting whether a property is located in the same block (project/neighborhood) as a Panama-linked transaction and how proximate the two transactions are in time. Our findings confirm the spatial correlation demonstrated in Figure 2: the transacted prices of properties in the same block, same project and same neighborhood as a Panama-linked property increase by 1.3%, 2.0% and 3.4%, respectively, in the year after the Panama-linked transaction occurs, highlighting the short-term spillover effects of Panama-linked buyers' participation in local housing markets. Further investigation using a subsample of transactions occurred after the implementation of EAW regulation confirms the effectiveness of policy in curbing the consequential spillover effects.

This study makes several contributions to the literature. First, to the best of our knowledge, this is the first attempt to quantify illicit wealth and its impact on the real estate market. Several research pieces have revealed the prevalence of suspicious activity in the real estate market, but direct evidence on problematic real estate purchases remains scarce due to the unobserved nature of illicit wealth. For example, Badarinza and Ramadorai (2018), in their study connecting political shocks to foreign demand in the housing market, document a large proportion of real estate transactions made by offshore vehicles incorporated in secrecy jurisdictions where the origins of capital are untraceable. Similarly, research by Deutsche Bank reveals a strong correlation between London house prices and hidden capital inflows through

secrecy havens[8]. Our paper confirms the use of illicit funds in the real estate market, providing evidence for a novel channel through which a buyer's profile can affect housing prices[9].

Second, our investigation into price premium spillovers links our study to a stream of literature that examines the spatial dimension of housing prices. DeFusco et al. (2018) document the spread of housing market booms via spatial spillovers that may be a result of non-rational factors, consistent with Shiller's (2005) irrational exuberance story, whereby price increases spur investor enthusiasm, which in turn spreads through psychological contagion[10]. Similarly, Bailey et al. (2017) document that housing experiences within an individual's social network play a role in her expectations and behaviors in the housing market, while Costello, Fraser and Groenewold (2011) discover a non-fundamental component of spillover effects in housing prices across regions. Our findings coincide with these stories and bring to light additional circumstances in which price increases spill over from one property to another.

Our paper is also closely related to the literature that analyses the role of offshore vehicles in facilitating illegitimate activities. Our use of the Panama Papers data leaks connects our paper to the work of O'Donovan, Wagner and Zeume (2018), who study the effects of offshore secrecy on shareholder value. Related to this is a growing strand of literature that examines the use of offshore vehicles for business activities, such as the studies by Bennedsen and Zeume (2018), Desai, Foley and Hines (2006), Dyreng and Lindsey (2009), and Hines and Rice (1994)[11], and research papers that investigate the association between illegitimate activities and corporate value, including those of Cheung, Rau, and Stouraitis (2012), Giannetti et al. (2019), Karpoff, Lee and Martin (2017), Liu (2016) and Mauro (1995). Our study highlights a channel for the funneling of offshore funding into the legal economy through real estate investment as well as the consequences associated with these activities.

Finally, our work is directly related to the literature on corruption, money laundering and tax evasion. Despite the challenges in detecting illicit activities due to their clandestine nature, significant progress has been made in measuring these activities using observational evidence (e.g., Agarwal et al. 2020a; Bertrand, Mehta and Mullainathan, 2002; McMillan and Zoido, 2004; Desai and Dharmapala, 2006; Desai, Dyck and Zingales, 2007; Fisman and Miguel, 2007; Desai and Dharmapala, 2009; Olken and Barron, 2009; Jiang, Lee and Yue, 2010; Cai et al., 2011; Sequeira and Djankov, 2014). For example, Agarwal et al. (2020b) uncover corruption in credit provision by showing that bureaucrats enjoy higher credit line premiums despite their lower creditworthiness. Fang, Gu and Zhou (2019) argue that price discounts in bureaucrats' housing purchases are evidence of rent-seeking and corruption. Our study contributes to the

[8] Dark matter: the hidden capital flows that drive g10 exchange rates. Deutsche Bank, 2015.
[9] See, for example, Chinco and Mayer (2016); Cvijanovic and Spaenjers (2018); Guerrieri, Hartley and Hurst (2013); Harding, Rosenthal and Sirmans (2003); Kurlat and Stroebel (2015); Landvoigt, Piazzesi and Schneider (2015); Nieuwerburgh and Veldkamp (2009); Sa (2015, 2016).
[10] See, for example, Bayer, Geissler and Roberts (2011), Fu and Qian (2014), and Fu, Qian and Yeung (2016), who document momentum trading by speculators in the housing market.
[11] For detailed reviews on this topic, see Bailey and Liu (2019); Chernykh and Mityakov (2014); Durnev, Li and Magnan (2016); Hanlon, Maydew & Thornock (2015); and Johannesen and Zucman (2014).

literature by providing new evidence on the financial use of criminal proceeds for property purchases and its consequences for the housing market.

The remainder of the paper is organized as follows. Section 2 provides background information on the Singapore property market and the anti-money-laundering/counter-terrorist-financing environment in Singapore. Section 3 discusses the data that we employ. Section 4 presents the empirical methodology and results, and Section 5 concludes.

## 2. Background

### *2.1 Singapore Property Market*

The Singapore residential property market can be divided into two categories: the public housing resale market and the private residential property market. Public housing units, commonly known as HDB flats, are subsidized units that are home to approximately 80% of Singapore's resident population, with approximately 90% of these households owning their homes[12]. Public housing is built, sold and managed by Singapore's public housing authority, the Housing & Development Board (HDB)[13], and transactions are tightly controlled by the government through ownership and occupancy restrictions. As of 2018, there were more than 1.06 million HDB flats (73.96% of the total housing stock) in Singapore[14].

Unlike public housing units, sales and purchases of private residential properties are not bound by requirements related to income thresholds, occupancy, property ownership or residency status[15]. The empirical analyses in this paper focus on the private residential market, using private housing transactions. As of the fourth quarter of 2019, the total number of private residential properties was estimated at 373,561 (26.04% of the total housing stock), of which 73,402 (19.65%) were landed properties and 300,159 (80.35%) were nonlanded properties comprising condominiums and apartments. Figure 3 depicts the total number and value of private property transactions from 1995 to 2018. The private residential market experienced a boom from 2005 to 2008, the year before the global financial crisis; after the crisis, both transaction volume and transaction value plunged to their levels prior to the boom. However, the market recovered rapidly from this slump and reached its peak in 2010, when the transaction volume exceeded 35,000 units in a single year. The market became more subdued in subsequent years before recovering slowly from 2015 onwards.

Singapore, as a regional center, is an attractive investment destination for many foreign investors, especially high-net-worth foreigners seeking luxury homes. The proportion of foreigners investing in luxury properties exhibits an increasing trend over the years (Figure 4). In 2016, close to 35% of foreign transactions involved properties priced in the top 10th percentile. Figure 5 shows that in general, the foreign participation rate in the private property

[12] Singapore Population Trends, Department of Statistics, Ministry of Trade & Industry, Singapore, 2019.
[13] See www.hdb.gov.sg for more information about public housing.
[14] Yearbook of Statistics Singapore 2019, Department of Statistics, Ministry of Trade & Industry, Singapore, 2019.
[15] Under the Residential Property Act, foreigners are not allowed to purchase landed residential property. Landed residential property includes vacant land, detached houses, semi-detached houses, bungalows, terraced houses, apartments of less than 6 stories and any other land gazetted for residential purposes.

market has remained consistently below 10% throughout the years, with the exception of 2004, when the number of transactions made by foreigners constituted 11.27% of the total transaction volume. Chinese, Indonesian and Malaysian are the top three nationalities among foreign buyers of private properties in Singapore (see Figure 6).

*2.2 Singapore's AML/CFT Environment and the Function of the Council for Estate Agencies*

Singapore is an international business, transport and financial hub. Given the large presence of foreign residents, coupled with lenient immigration rules as well as business-friendly policies, Singapore is exposed to the risks of being exploited for money-laundering and terrorist-financing purposes.

There are three stages in the money-laundering process: placement, layering and integration. In the first stage, funds directly associated with crimes are placed in the financial system in different forms[16]. The second stage involves the concealment of the criminal origin of proceeds, with offshore vehicles and their opaque ownership structures commonly exploited for the purposes of such layering. Real estate often plays a role in the final stage, in which laundered criminal proceeds are integrated into the legal economy through investments. Real estate is an appealing sector in which park illicit funds given the high monetary value of real estate, the potential for house price appreciation, and the regulatory loopholes available for concealing ownership (OECD, 2019)[17]. According to the Financial Action Task Force (FATF), real estate accounted for almost one-third of confiscated criminal assets between 2011 and 2013[18].

The Corruption, Drug Trafficking and Other Serious Crimes (Confiscation of Benefits) Act (CDSA) and Terrorism (Suppression of Financing) Act (TSOFA) are two main pieces of legislation enacted to combat money laundering and terrorist financing in Singapore[19]. Over the years, existing laws and regulations have been regularly reviewed; supervisory and enforcement frameworks continue to be put in place across various sectors to ensure that the measures are effective and in line with international standards. To address the high risk of money laundering (ML) and terrorism financing (TF) in the financial sector, the Monetary Authority of Singapore (MAS) has adopted tough licensing requirements, strict regulations on anti-money laundering (AML) and combatting the financing of terrorism (CFT), and rigorous supervision[20]. Compared to the AML/CFT measures in force in financial sectors, the control

[16] Cash can be converted into other valuables such as trade goods, jewelry, gold bars or cheques. Cash can also be exchanged into other currencies or larger denominations or split up into smaller sums to allow easy transportation by cash couriers or the underground banking system.

[17] Money Laundering and Terrorist Financing Awareness Handbook for Tax Examines and Tax Auditors, OECD, 2019.

[18] Money Laundering and Terrorist Financing Vulnerabilities of Legal Professionals. Financial Action Task Force, 2013.

[19] Enacted in 1992, the CDSA criminalizes the laundering of benefits proceeding from serious criminal offences and provides powers to investigate and confiscate benefits from money laundering offences; the TSOFA, enacted in 2002, criminalizes the provision of property and services for terrorist purposes and provides powers to seize and confiscate terrorist property.

[20] For instance, MAS Notice 626, MAS Notice 824 and MAS Notice 3001 on the Prevention of Money Laundering and Countering the Financing of Terrorism sets out the obligations of banks, financial companies and money-changers to take measures to mitigate the risk of the Singapore financial system being used for ML/TF.

measures in the real estate sector have been less robust, especially during the period prior to the implementation of the Estate Agents Act in 2010.

The Council for Estate Agencies (CEA) was established in October 2010 under the Estate Agents Act 2010 with a primary objective of strengthening regulatory oversight of the real estate brokerage sector. As of 1 January 2019, there were 1,229 property agencies and 29,146 property agents in Singapore [21]. As a statutory board under the Ministry of National Development, the CEA has primary functions involving the licensing of real estate agencies and registration of salespersons, regulating the conduct of real estate agency work, promoting the integrity and competence of salespersons, and engaging in public education efforts to raise awareness about consumers' rights and responsibilities in property transactions.

Under the 2010 Estate Agents (Estate Agency Work) Regulations (EAW), the CEA is empowered to take enforcement actions against errant real estate agents and salespersons; this regulatory empowerment was absent before 2010[22]. The EAW took effect on 15 November 2010 and contains two regulatory codes, namely, the Code of Ethics and Professional Client Care and the Code of Practice for Estate Agents, which provide benchmarks for ethical behavior and professional standards for real estate agents and salespersons. Under the Code of Ethics and Professional Client Care, estate agents and salespersons are required to comply with all laws, including statutory and regulatory requirements as well as the practice circulars and guidelines issued by the CEA. For instance, it is mandatory for real estate agents to adhere to the suspicious transactions reporting requirements under Section 39 of the CDSA [23]. Any contravention of the requirements or guidelines make the agent subject to disciplinary action. Considering the high involvement of property agents in property transactions in Singapore, the EAW plays a central role in mitigating the risks of the real estate market being abused for ML/TF as well as in screening out dubious transactions linked to possible ML/TF schemes.

## *3.* Data Sources and Descriptive Statistics

### *3.1 Panama Papers*

On 3 April 2016, the news media released investigative reports on the Panama Papers, which provide insights into offshore shell companies linked to world political leaders, business figures, celebrities and even scammers, drug dealers and arms traffickers. The data leak revealed 40 years' worth of confidential information related to the business activities of the Panama-based law firm Mossack Fonseca, one of the world's largest providers of offshore financial services. The information includes 11.5 million documents – or 2.6 terabytes of data – from 214,000 offshore companies connected to people in more than 200 countries. On 9 May 2016, the International Consortium of Investigative Journalists (ICIJ) made public a searchable database

[21] Annual Report 2018/19, Council for Estate Agencies Singapore, 2019.

[22] Prior to the establishment of the CEA, real estate agents were informally regulated by two professional bodies – the Institute of Estate Agents and Singapore Accredited Estate Agencies Limited. These two professional bodies did not have statutory power to bar unethical agents from practicing in Singapore.

[23] Under Section 39(1) of the CSDA, it is mandatory that any person who, in the course of her business or employment, discovers or has reason to suspect that a property may be connected to a criminal activity lodge a Suspicious Transaction Report.

of the leaked data on its own website, including information such as the names of offshore vehicles, individuals and intermediaries responsible for the vehicles' operation.

ML/FT by its nature is anonymous, unobservable and unquantifiable. By uncovering corporate secrecy in various offshore tax havens and the true owners behind these secret structures, the data leaks provide a rare opportunity for us to examine the investment activities and purchase decisions of implicated individuals in other markets. After removing unidentified names, duplicate names and missing country information from the data, we observe that individuals from Taiwan (25.79%) constitute the largest proportion of individuals linked to the Panama Papers, followed by persons from Hong Kong (19.66%) and China (14.14%) (see Appendix A1).

### *3.2 Housing Transaction Data*

We collect transaction information on private property sales from the Urban Redevelopment Authority's (URA's) Real Estate Information System (REALIS). The transaction data include details on transaction occurring from January 1995 to August 2018, covering information such as the property address, unit size, floor level, transaction date and price, and the purchaser's existing dwelling type at the time of transaction. The data also indicate the type of transaction: new sales by developers or resales and subsales by unit owners in the open market. Several important locational characteristics are available after geocoding is performed on both datasets. We measure the property's distance to the nearest Mass Rapid Transit (MRT) station and primary school in straight-line kilometers to control for proximity effects on the property value.

In addition to this transaction-level data, we collect further data from three different sources. The first proprietary dataset contains property transactions made by foreign nationals in the Singapore private property market from 1995 to 2018. In addition to transaction details, these data also include foreign buyers' names, identification numbers and nationalities. Based on the transaction information, we match the foreigner dataset to our primary dataset to identify purchases made by foreigners and Singaporean citizens.

The second proprietary dataset contains records of private property transactions made by Singaporean citizens from January 1995 to December 2012 and includes buyer profiles, including their names and identification numbers. Using property addresses, transaction dates and transaction prices in the data, we are able to make exact matches with our primary transaction dataset. In addition, we exploit the names of buyers to merge these datasets with a full list of licensed real estate agents (salespersons) published in a public register on the Council for Estate Agencies (CEA) website in May 2014.

The master transaction data contain Singaporean buyers' names from 1995 to 2012 as well as foreign buyers' names and nationalities from 1995 to 2018. To examine the features of investments made by secretive funds in the housing market, we perform an exact-matching procedure based on the names of buyers in the master transaction data and the names of individuals in the Panama Papers to identify Panama-linked buyers (the treatment group) and non-Panama-linked buyers (the control group). Out of the 444,384 transaction observations,

the number of transactions with buyers linked to the Panama Papers stands at 2,331, which is approximately 0.5% of the total transactions. Figure 7 shows the frequency of Panama-linked transactions by year and buyer nationality[24]. Singaporeans constitute the largest proportion of Panama-linked transactions, but their numbers decrease drastically from 2010. In 2011, the number of Panama-linked Chinese buyers surpassed the numbers of Singaporean and Indonesian buyers for the first time. Since then, the number of Panama-linked transactions, regardless of buyer nationality, has been on a declining trend, pointing towards a potential effect of the establishment of the CEA in safeguarding the local real estate market from being exploited for shady ends.

Table 1 presents summary statistics on transaction and project characteristics based on the buyer's connection to the Panama Papers. We observe that Panama-linked individuals purchase more expensive units in terms of both price per square foot and absolute transacted price. Panama-linked transactions have an average transacted price of S$1,801,210, which is approximately S$500,000 higher than the average transacted price of the control group. Furthermore, these individuals purchase larger, newer properties located at a higher floor level. In terms of project-level characteristics, they purchase houses located at more strategic locations: the properties are located closer, on average, to the railway station and the Central Business District, at 1.06 km and 6.53 km, respectively. In addition, over 56% of the Panama-linked transactions involve freehold properties, a proportion larger than the corresponding figure (49%) for the control group. Panama-linked individuals are also observed to purchase properties of higher exclusivity, as proxied by the smaller project size in combination with the larger proportion of nonlanded transactions. We further exploit repeated-sales transactions to trace the characteristics of their selling behavior. On average, Panama-linked individuals have a shorter holding period and higher selling price per square foot.

### *3.3 Cross-Country Transparency Indicators*

Countries vary in the coverage of their regulations related to anti-money laundering/countering the financing of terrorism (AML/CFT), in their vulnerability to money-laundering activities and government effectiveness and in their commitment to combatting economic crime. We construct indicators of individuals' exposure to illicit activities and their potential access to illegitimate financial flows based on the nationality information in the housing transaction data. We hypothesize that individuals' connection to illicit funding is related to the robustness of the AML/CFT environment in their home country.

Our first indicator is the Corruption Perception Index (CPI) from Transparency International[25]. We collect the CPI for 180 countries and territories and take the average index value from 2012 to 2018. The CPI ranks countries by their perceived levels of public-sector corruption determined by expert assessments and opinion surveys, with a lower index value reflecting a higher level of corruption. Our second indicator, also collected from Transparency International, is the bribery rate published in the Global Corruption Barometer, the only

[24] Appendix A2 presents the number and frequency of transactions made by Panama-linked buyers by nationality.
[25] The CPI draws on 13 surveys and expert assessments to measure public sector corruption across countries, giving each a score from zero (highly corrupt) to 100 (very clean).

worldwide public opinion survey on corruption. The rate indicates the percentage of people who reported paying a bribe in their dealings with a public service provider in the past twelve months. We collect bribery rates from 2004 to 2018 and create a variable that contains the 15-year average bribery rate. The last two indicators are obtained from the ICIJ Offshore Leaks Database. On its website, the ICIJ has a list of "power players" who are world leaders, politicians and their close associates implicated by name in the Panama Papers. We collect the information and construct a variable quantifying countries' political exposure using the number of power players connected to the Panama Papers. The last indicator includes, in addition to those named in the Panama Papers, power players identified in the Paradise Papers, another leaked offshore database made public in 2017.

Appendix A3 summarizes the transparency indicators sorted by Panama-linked buyers (treatment group) and non-Panama-linked buyers (control group)[26]. The average CPI of the treatment group stands at 67.84, approximately one-fifth lower than the average CPI of the control group (83.28). In addition, we observe that the home countries of Panama-linked buyers, on average, report a higher bribery rate of 11.4% as well as a larger number of power players linked to the leaked offshore database. Taken together, these statistics point to a possible association between individuals' involvement in questionable transactions and the ML/FT situation in their home countries.

## 4. Empirical Methodology and Results

### *4.1 Do Panama-linked Buyers Purchase at Higher Prices?*

#### 4.1.1 Baseline Results

We examine whether price differences in housing transactions exist between Panama-linked buyers (treatment group) and non-Panama-linked buyers (control group). Our baseline specification is given by:

$$\ln(P_{ijt}) = \alpha + \beta_1 Panama_{it} + \beta_2 X_i + \theta_t + \lambda_j + u_{ijt} \quad (1)$$

where the dependent variable $\ln(P_{ijt})$ represents the natural logarithm of the transacted price (S$psf) for property $i$ located in postal sector $j$ at time $t$. $Panama_{it}$ takes a binary value of 1 if the buyer of the property is linked to the Panama Papers and 0 otherwise. $X_i$ is a vector of transaction and property attributes, which include floor level, unit size, property age at time of purchase, sale type, number of property units per transaction, tenure, property type and proximity measures such as the distances to the nearest railway station and primary school. We also include a binary variable equal to 1 (0) if the property buyer is a foreigner (Singaporean citizen) at the time of purchase. Heterogeneities across year-months and postal sectors are held constant with purchase year-month fixed effects and postal sector fixed effects, which are denoted by $\theta_t$ and $\lambda_j$, respectively. Standard errors in all regression analyses are clustered at the project level.

[26] Appendix A4 provides descriptive statistics of transparency indicators by country/region.

Table 2 presents the baseline results. The key explanatory variable is $Panama$, which measures the transacted price difference between treated and control buyers after the inclusion of controls for transaction and property characteristics. As shown in Column 1, the positive and significant estimate of 0.038 suggests that Panama-linked buyers purchase properties at a 3.8% premium. The coefficients on all control variables display signs that are consistent with theoretical predictions and expectations. Property size and property age (at the time of the transaction) are negatively correlated with property price, while floor level, number of units purchased per transaction, freehold tenure and distance to the nearest primary school are positively correlated with property price. Additionally, foreigners are found to purchase properties at a 3.4% higher price, a finding that is consistent with those of many existing papers focusing on the foreigner premium (Cvijanovic and Spaenjers, 2018; Chinco and Mayer, 2016)[27]. In Column 2, we replace the foreigner dummy with a fixed effect for the purchaser's nationality to fully capture the foreigner premium and to account for differences in the foreigner premium across nationalities. The coefficient on $Panama$ remains significant and positive, and the coefficients on all control variables are found to be identical to those in Column 1.

4.1.2 Robustness Checks

Overestimation may arise if Panama-linked buyers selectively enter the market at a particular time and favor a specific location. In Columns 3 and 4 of Table 2, we include fixed effects for the postal sector by purchase year-month to eliminate this concern, and the results are consistent with those of the baseline specification. Another concern is that the Panama premium may be attributable to incomparability between properties purchased by Panama-linked buyers and those purchased by buyers in the control group, with wealthier Panama-linked buyers potentially purchasing properties that are more expensive. If so, the positive coefficient on $Panama$ would be biased by omitted variables as a result of inadequate controls for property attributes. We perform 1:1 Propensity Score Matching to construct a comparable control group of properties based on property characteristics including project size, distance measures (distance to Central Business District, distance to nearest MRT station, distance to nearest primary school), project age, project tenure, property type and postal sector, using matching caliper of 0.01[28]. This matching process reduces our sample size by almost two-third; nonetheless, the Panama premium is still found to be positive and statistically significant, as presented in Columns 5 and 6.

In Column 7, we substitute the postal sector fixed effects in the baseline regression with project fixed effects, a more stringent specification that captures heterogeneity across developments and explores variations within a development. This change in specification reduces the Panama premium. It is now estimated at 0.9% but remains significantly different from zero. Similar to

[27] See, for example, Agarwal, Sing and Wang (2018); Badarinza, Ramadorai and Shimizu (2019); Chinloy, Hardin and Wu (2013); Garmaise and Moskowitz (2004); Kurlat and Stroebel (2015); and Liu, Gallimore and Wiley (2015).
[28] Appendix A5 presents the comparison of covariate baseline of pre- and post-propensity matched sample.

the specification in Column 2, we include the purchaser nationality fixed effect in Column 8, and the estimates do not change.

To measure the average Panama premium, we can also perform a two-step procedure. The first step entails the estimation of the price premium paid in every transaction based on the difference between the actual log transacted price and the predicted log transacted price measured using Equation (1), with the variable $Panama_{it}$ being excluded from the model. In the second stage, we regress the estimated price premium on the $Panama$ dummy to compute the difference in price premiums between Panama-linked buyers and other buyers. The estimation procedure is summarized in the following equation:

$$\ln(P_{ijt}) - \hat{E}\left[\ln(\mathrm{P_{ijt}}) \,|\mathrm{X_i}\right] = \alpha + \beta_1 Panama_{it} + \theta_t + \lambda_j + u_{ijt} \quad (2)$$

As shown in Columns 9 and 10 of Table 2, the coefficients on the Panama premium are highly consistent with those in the baseline results: compared to non-Panama-linked buyers, Panama-linked buyers pay a price premium of 3.7% of the underlying house price. Substituting postal sector fixed effects with project fixed effects reduces the difference in the price premium to 0.9%, which is in line with the results in Column 2.

We conduct further robustness checks on the results. Columns 1 and 2 of Table 3 present results estimated using a subsample that contains only houses sold more than once. Under the assumption that the underlying property characteristics are time-invariant, the repeated-sales specification serves as a robust way of controlling for unobserved property characteristics. Using a smaller sample, we further include house fixed effects in the estimation to control for the unobserved quality of houses. The positive and significant coefficient on our variable of interest rules out the possibility that the Panama premium is driven by unobserved property attributes: for an identical house, a Panama-linked buyer overpays by 1.6%.

One important concern arises surrounding the possibility that Panama-linked buyers (non-Panama-linked buyers) are misclassified into the control (treatment) group. For instance, corporations with names implicated in the Panama Papers may be miscategorized into the control group, as we do not have data on the corporate ownership of a property. In Columns 3 and 4, we remove transactions for which buyer details are missing, which reduces the sample size by three-quarters. Using a sample that contains only property transactions made by individual rather than corporate buyers, we find that the Panama premium remains positive and significant, and the estimates are found to be slightly larger at 0.039. In addition, some Panama-linked transactions may be underidentified due to the stringent exact-matching procedure performed when we merged the Panama Papers data with our master transaction dataset. Similarly, some buyers in the control group may be involved in unobserved illicit activities and remain unidentified. It is difficult to quantify the number and impact of false nonmatches and false controls. Nonetheless, their presence will bias our estimates towards zero, and in any case, the true Panama premium will be larger than what we find in this paper.

In addition, we are aware that our data on Singaporean buyers' names cut off at 2012. Thus, Panama-linked Singaporean buyers who purchased properties from 2013 onwards, if any, are misclassified into the control group, again resulting in downward bias. We rerun the baseline estimation using a restricted sample that excludes transactions occurring after 2012 and find that the Panama premium is consistent and robust at 3.1% (Columns 5 and 6). In Columns 7 and 8, we test robustness by merging the Panama Papers with the master transaction data with a sample generated after performing exact matches on both names and nationality, instead of just on names, and the results are robust and consistent.

4.1.3 Heterogeneity Tests

The luxury home market has long been a prime target for launderers seeking to integrate large sums of illicit funds into the legitimate economy, given the high aggregate value per transaction and the social status that luxury homes confer. In cities such as New York, London and Toronto, the news media have reported cases of secret owners behind multimillion-dollar property transactions and crime-related confiscations of luxury real estate[29]. We perform heterogeneity analyses to test whether the Panama premium varies across developments and locations by augmenting Equation (1) with additional variables and their interactions with the $Panama$ dummy.

Based on developments' average transacted price in developer sales, we categorize developments into 5 quartiles, with higher quartiles representing developments in the higher-end property segment. As shown in Columns 1 and 2 of Table 4, the $Panama$ dummy becomes negative and significant, while the interaction between the price quartile and the $Panama$ dummy is positive and significant. These results suggest that Panama premium is driven by overpayments by Panama-linked buyers for higher-end properties. The Panama premium increases by 6.1% for properties one quartile higher and is estimated to be 16.1% (0.061*5-0.144=0.161) for properties in the top quartile – a piece of evidence affirming anecdotes about "black money" in the luxury real estate market. In Columns 3 and 4, we explore cross-sectional variations in property locations by creating a binary variable equal to 1 if the property is located in the Central Region of Singapore[30]. We expect to see a positive estimate on the interaction term, as properties located in the Central Region are more strategically located and more highly valued than those in other regions. The findings are in line with the earlier results: we do not find a significant estimate on the $Panama$ dummy, but properties located in the Central Region are found to attract a higher Panama premium of 11.7%.

We further analyze heterogeneities based on the concentration of foreign buyers in a development. Panama-linked buyers may self-select into developments with a large number of foreign buyers for various reasons. First, buyers may be drawn to these developments either because of the stronger social network embedded in the neighborhood or because of the

[29] See, for example, "Towers of Secrecy: Stream of foreign wealth flows to elite New York real estate," The New York Times, 7 February 2015.
[30] The planning regions are large urban planning areas in Singapore and are five in number: Central Region, West Region, East Region, North-East Region and North Region.

stronger sense of social status implied by a higher concentration of foreigners in the neighborhood. Second, a large number of foreign buyers in a development may help to conceal suspicious overpayments in transactions due to the higher appreciation rate of property values resulting from the foreigner premium. Alternatively, as pointed out in the previous paragraph, Panama-linked buyers may self-sort into luxury properties, and in most cases, such properties have higher concentrations of foreign owners. The results are shown in Columns 5 and 6 of Table 4. The Panama premium is found to be insignificant, and properties with a larger presence of foreign buyers in the development command a higher purchase price. If we focus on the interaction term, the positive and significant coefficient of 0.552 suggests that Panama-linked buyers pay a 0.55% premium for a one-percentage-point larger presence of foreign buyers in the development. Overall, the results in Table 4 document the geographic concentration of Panama-linked transactions by property and location and Panama-linked buyers' higher purchase prices in these locations.

### *4.2 Channels of the Panama Premium*

#### 4.2.1 Safe-Haven Channel

Thus far, we have not discussed the channel of operation of the Panama premium documented empirically in the previous section. Why do Panama-linked buyers pay higher property prices than buyers in the control group? The Panama premium could be the product of large sums of illegitimate proceeds being layered and laundered through offshore vehicles. Given Singapore's political and economic stability, many regard its property market as a safe-haven investment destination, and this may drive the premium seen in transactions involving Panama-linked buyers; we call this the safe-haven channel (Badarinza and Ramadorai, 2018). Alternatively, the Panama premium could be solely the outcome of Panama-linked buyers' high net worth and strong economic positions, which are unrelated to their connections to offshore corporations or illicit financial flows; we call this the wealth channel. As proposed by Harding et al. (2003), wealthy individuals bargain less intensely than other people, as they have a lower marginal utility of wealth and higher opportunity costs of time. In Column 5 of Table 2, the positive Panama premium found even after the inclusion of project fixed effects could serve to rule out the wealth channel, under the assumption that the wealth of buyers is correlated with the properties that they purchase.

Nonetheless, we further test these opposing mechanisms by exploiting information on individuals' date of employment in offshore entities. We create a binary indicator equal to 1 if a property transaction occurs after the buyer becomes employed in an offshore entity implicated by name in the Panama Papers. If the Panama premium is indeed associated with offshore financial flows, we should find this premium only in transactions occurring after the individuals become employed in offshore entities. In Columns 1 and 2 of Table 5, the Panama premium is estimated at 2.9%, and the premium increases by 2.7% after the buyer becomes employed in an offshore entity. Substituting spatial fixed effects for project fixed effects in Columns 3 and 4 eliminates the statistical significance of the Panama premium, and more importantly, the employment dummy remains positive and significant. These results uphold our conjecture on

the safe-haven channel and provide strong support for the association found in this paper between the Panama premium and offshore secrecy.

Next, we test for heterogeneous effects of the Panama premium by country-based transparency indicators. Certain countries are considered attractive for criminal activities or money laundering. Based on our hypothesis that individuals' associations with illegal financial flows correspond to the regulations related to anti-money laundering/countering the financing of terrorism (AML/CFT) in their home countries, we expect a higher Panama premium for buyers whose home country is more corrupt or more easily exploited for criminal activities due to a weaker regulatory environment. In addition, these buyers' higher willingness to pay for properties in Singapore may reflect a stronger desire to park money in safe-haven assets.

Table 6 presents the results of interactions between the $Panama$ dummy and five transparency indicators. In Column 1, we find that a one-point lower average CPI value is associated with a 0.2% higher Panama premium. As an illustration, an Indonesian buyer, who has an average CPI of 35, pays a 10% higher Panama premium than a Singaporean buyer, who has an average CPI of 85. Column 2 studies the heterogeneous effect using the second indicator: we find that a 1% higher bribery rate in the home country translates to a 0.39% higher Panama premium on the property purchase. Countries' bribery rates vary across years as the regulatory environment improves or deteriorates. We subsequently substitute the average bribery rate with the yearly bribery rate based on the buyer's nationality and the year of property purchase. The change in variable reduces the sample size by over two-quarters; nonetheless, the coefficient on the interaction is still significantly positive at 0.29%.

Finally, we analyze heterogeneity in the Panama premium based on the existence of grand corruption[31] in the home country. We expect that money-laundering activities or related criminal practices are more widespread in more corrupt nations, which, as in the analysis based on countries' CPI and bribery rates, we can infer from the degree of corruption at the country's highest levels of power. We create a dummy that equals one if the current or former heads of government or their close associates are implicated by name in the Panama Papers. Contrary to our expectation, we do not find a significant estimate on the interaction term, as shown in Column 4, possibly due to underidentified corruption across countries. In Column 5, we consider the power players information from the Paradise Papers in addition to that from the Panama Papers and find meaningful results: buyers whose home countries are corrupt at the top levels purchase properties at a premium of 6.8%. Taken together, the results in Table 6 document a strong association between the premiums buyers pay for a property and the level of corruption/money laundering in their home country, providing additional evidence supporting the safe-haven channel of the Panama premium[32].

[31] According to Transparency International, grand corruption is abuse of high-level power that benefits the few at the expense of the many and causes serious and widespread harm to individuals and society.

[32] The results remain consistent when the postal sector fixed effects are replaced by project fixed effects. Due to space constraints, the results are not reported here.

4.2.2 Local Buyers and the Panama Premium

Are there differences in the Panama premium between foreigners and locals? We perform additional analyses on the subsamples of locals and foreigners. The Panama premium is found to be 3.7% for foreigners, while that of locals is 3.4%; when additional buyer attribute controls are included in the estimation, the local Panama premium stands at 3.6% (Appendix A6).

Figure 8 depicts the geographical distribution of Panama buyers' overpayment status by nationality. The proportion of overpayment in Panama-linked transactions is larger among Indonesian buyers than among Chinese and Malaysian buyers, and transactions with a Panama premium are concentrated in the Central Region, where Indonesian buyers cluster. Turning to Singaporean buyers, we see a large proportion of overpayments among these Panama-linked local buyers. Panama-linked foreign buyers' higher premium on property purchases is suggestive of their higher willingness to pay for the safe-haven status of the Singaporean property market. What, then, is the role of the safe-haven channel in explaining the Panama premium paid by local buyers? Why does Panama premium exist in local property purchases, despite the informational advantage Singaporean buyers possess when investing in their home country (Chinco and Mayer, 2016; Ivković and Weisbenner, 2005; Kurlat and Stroebel, 2015; Van Nieuwerburgh and Veldkamp, 2009)?

One possible explanation could be that Panama-linked local buyers cherry-pick superior units (i.e., units with a better view, penthouses, etc.) when purchasing properties. We classify a property as a superior unit if its new sale price is larger than the average new sale price of all units within the same project. We find that Panama-linked locals are 3.9% more likely than other locals to purchase superior units, which can partly explain the Panama premium found among local buyers (Column 4 of **A6**); however, this cherry-picking behavior does not occur among Panama-linked foreign buyers. Moreover, Panama-linked locals are 10% more likely to purchase properties from sellers who are also connected to the Panama Papers. Their purchase premium, relative to that of non-Panama-linked buyer-seller pairs, is 28.6% higher. This exceptionally large premium points towards possible collusion among Panama-linked local individuals to manipulate property prices through such transactions. Next, we delve into the profile of these local Panama-linked buyers to examine the premium on their property purchases.

Interestingly, we notice two puzzling features of Panama-linked housing transactions that bring to light locals' questionable agenda behind such purchases. First, the proportion of HDB upgraders among Panama-linked local buyers is exceptionally high. Over one-third (35.4%) of these buyers are HDB upgraders, that is, first-time buyers of private property who previously lived in subsidized public housing and thus have lower purchasing power and higher price sensitivity. Compared to other HDB upgraders, those who are connected to the Panama Papers purchase properties at a 1.5% higher price, which is $11,775 higher based on the average transacted price of $785,000 (Appendix A7). Despite this purchase premium, this group of buyers is 4.9% less likely to obtain a mortgage and 6.6% less likely to use their Central

Provident Fund (CPF)[33] savings for the property purchase, after we control for property transacted price and buyer attributes (Columns 2 and 3 of A7).

Considering their middle-class background, which casts doubt on their purchasing capability, coupled with the premium paid on their property purchases, the large presence of Panama-linked HDB upgraders raises questions about the true agenda behind these property purchases. This evidence is indicative of the possibility that some Panama-linked local buyers may be straw buyers who purchase properties on behalf of third parties for various reasons. For instance, a straw buyer may be employed if there are certain legal or financing restrictions preventing the real buyer from making a property purchase in the local property market. This overpayment in transactions may thus reflect the disguised buyers' willingness to pay for the property.

Second, real estate agents constitute a large share of buyers in Panama-linked property transactions, providing additional support for our earlier proposition that straw buyers exist among Panama-linked local buyers. An overview of the descriptive statistics reveals that approximately 17% of the Panama-linked transactions involve real estate agent buyers, more than twice the figure of 7.5% of agent buyers in non-Panama-linked transactions. Agent discounts, as argued in Agarwal et al. (2019), continue to apply in property transactions that involve Panama-linked real estate agents. Real estate agents connected to the Panama Papers purchase properties at a 5.1% lower price than Panama-linked nonagents; this discount not only neutralizes the Panama premium but also brings down the purchase price further by 0.9% (Appendix A8). In addition, Panama-linked agent buyers are 8.3% more likely to hold their properties and obtain 5.9% higher gain when they decide to sell relative to non-Panama-linked agent buyers. The results suggest that real estate agents, as important gatekeepers of real estate transactions, are likely to be employed as straw buyers in property purchases. Their knowledge and experience in the local property market could help facilitate the circumvention of legislation and obtain larger returns through both purchases at discounted prices and resales at higher prices. Taken together, the pieces of evidence provided above cannot rule out the possibility that locals are exploited by third parties to purchase properties in the local market for illicit reasons – which would explain the existence of the premium on their property purchases.

#### 4.2.3 Manipulation of Property Value

According to the Financial Action Task Force (FATF), manipulation of property valuations is one technique commonly used to launder money in the real estate sector. In the earlier part of this paper, we empirically documented overpayment by Panama-linked individuals in property purchases, the association of this trend with offshore secrecy, and the premium found in transactions that involved Panama-linked buyer-seller pairs. Here, we further examine whether overvaluation persists in successive sales using the subsample of repeated-sales transactions.

[33] The Central Provident Fund is a mandatory social security savings scheme for working Singaporeans and permanent residents to fund their retirement, housing and healthcare needs. CPF members can use their CPF savings to buy private properties, subject to eligibility criteria.

Our dependent variable is the natural logarithm of the selling price (psf), and we include the purchase price in addition to property attributes and the foreigner dummy as control variables in the estimation. The results are reported in Table 7. We find a positive relationship between the $Panama$ dummy and the selling price: Panama-linked individuals sell properties at a 4.2% higher price than non-Panama-linked individuals; when project fixed effects are included, the price premium is reduced to 1.3% but remains highly significant.

Why do Panama-linked buyers sell properties at a premium, and how do they achieve this? Several reports reveal that real estate money laundering can be carried out through property renovations using illicit funds. Renovation increases the value of a property, which is then sold at a higher price, creating a seemingly legitimate capital gain that is difficult to connect to a specific criminal activity[34]. Alternatively, collusions among the rich, as discussed in the previous section, could also explain the higher selling price attained by Panama-linked sellers.

In an attempt to test the use of illicit cash to manipulate property values, we exploit a policy change that introduced controls on cross-border cash movements. Under the Cross-Border Currency/Bearer Negotiable Instruments Reporting Regime (CBCRR) that took effect on 1 November 2007, all persons carrying or posting cash or negotiable instruments of more than S$30,000 or the equivalent in foreign currency into or out of Singapore are required to report to the Suspicious Transaction Reporting Office (STRO). The policy change aimed to deter cross-border movements of currency by cash couriers linked to money-laundering and terrorism-financing activities. If the story of manipulating property values through renovations or collusions funded with illegal cash is correct, we should expect the policy change to have a negative effect on the selling prices of properties sold by Panama-linked individuals. Using a difference-in-differences model, we estimate:

$$\ln(S_{ijt}) = \alpha + \beta_1 Panama_{it} + \beta_2 Panama_{it} \times Aft\ CBCRR_t + \beta_3 X_i + \theta_t + \lambda_j + u_{ijt} \quad (3)$$

where $S_{ijt}$ is the selling price for property $i$ located in project $j$ at time $t$; $Aft\ CBCRR$ equals 1 if the property sale occurs after November 2007; $X_i$ is a vector of control variables that include property attributes, the natural logarithm of the purchase price and the foreigner dummy; and $\theta_t$ and $\lambda_j$ represent sale year-month and project fixed effects, respectively.

Figure 9 shows the parallel trends of the treatment and control groups in the pretreatment period in the analysis[35]. The results of the DID regressions are reported in Table 8. Prior to November 2007, Panama-linked individuals sold properties at a price that was 2.4% higher, consistent with our previous findings. After the implementation of the CBCRR, the transacted price of properties sold by Panama-linked individuals decreased by 5.5% compared to that of properties sold by sellers in the control group. The results are robust to the inclusion of seller nationality fixed effects (Column 2). To avoid concerns over confounders due to the global financial crisis

[34] Money Laundering and Terrorist Financing Awareness Handbook for Tax Examiners and Tax Auditors. OECD, 2019; Money Laundering & Terrorist Financing Through the Real Estate Sector, FATF, 2007.
[35] The wide confidence interval in *Event Month*$_{+4}$ is the result of small sample size during that month.

from the end of 2008, we shorten the sample period to 6 months before and after the introduction of the policy. As presented in Columns 3 and 4, the DID estimate remains robust[36].

The negative policy effect on selling price may be a result of seller's loss of access to illicit cash that was previously available for use in renovations; it could also be due to prospective buyer's lack of funding to purchase property at inflated prices. We perform additional analyses to further pin down the mechanisms. Specifically, we rerun the DID regression using a transaction subsample of uncompleted units[37], in which renovations cannot be carried out before the development is completed. As shown in Columns 1 and 2 of Table 9, the DID estimators are found to be negative and significant. Columns 3 and 4 repeat the same procedure using the subsample of completed units instead. DID estimators are smaller in magnitude and their statistical significance disappears, though the direction of the effect remains negative.

Next, we turn to investigating transaction volume of high-end properties. The underlying argument is that the volume of transactions, especially those of properties in the high-end segment where illicit wealth proliferates, should not be affected by the policy unless purchases funded with illegal cash do exist in the market. Figure 10 depicts the proportion of property transaction volume by property segments around the period when CBCRR policy was introduced. Transaction volume of properties in the top quartile classified based on launching price (per square foot) started to decline since the policy implementation, and the shrinking trend continued even in the subsequent quarters. [38] In the bottom panel where properties are categorized into quartiles based on absolute transaction price, the declining trend is clearly discernible. By simple calculation, compared to the quarter before the policy implementation, proportion of transaction of properties in the top quartile declined by nearly 41.3% in the 1st quarter after the policy event.[39]

The drop in transaction volume of both high-end properties and Panama-linked properties reveals some clues that point to the involvement of illicit cash in property purchase before the policy was introduced. In Table 10, we examine the intensive margin of policy effects on property purchase by replacing the dependent variable with natural logarithm of purchase price and performing a dynamic DID estimation. We find that Panama-linked buyers purchased properties at lower price after CBCRR policy; in particular, purchase prices were 3.9% lower three months after the policy introduction. Using a wider sample period of twelve months pre-

[36] The policy may also affect property selling prices from the demand side, with buyers linked to money-laundering activities becoming cash-constrained after the policy change and thereby affecting the transacted price. In Appendix A9, we remove transactions that involve Panama-linked buyers, and the results remain robust.

[37] The transaction of uncompleted unit is referred to as a sub-sale. The URA defines a sub-sale as "the sale of a unit by one who has signed an agreement to purchase the unit from a developer or a subsequent purchaser before the issuance of the Certificate of Statutory Completion and the Subsidiary Strata Certificates of Title or the Certificates of Title for all the units in the development".

[38] Event quarters subsequent to Event $\text{Quarter}_1$ seem to coincide with Global Financial Crisis. To avoid concerns over cofounders, one could focus on the immediate quarters after the policy event where the declining pattern is still salient.

[39] In Appendix A10, we plot the volume and value of Panama transactions pre- and post-CBCRR event. Both Panama-linked buyers and Panama-linked sellers decrease after the policy shock. Specifically, the volume of Panama-linked purchases in Event $\text{Quarter}_1$ dropped by more than two-third compared to the transaction volume in Event $\text{Quarter}_{-1}$, which is the period before the policy introduction.

and post-policy, we find continued negative effects on purchase prices seven, nine and twelve months after the policy event.

Together, these results evince that buyer-seller collusions were at play in causing high selling price in transactions involving Panama-linked sellers. While our findings appear to steer towards the channel of buyer-seller collusions, we remain cautious about ruling out the use of illicit money in property value manipulation through renovations due to our lack of renovation data. Nonetheless, our findings offer evidence for the use of illicit cash to increase property values in an unlawful way and further provide insights into the mechanisms through which black money can be exploited in the real estate market.

### *4.3 Effects of the Monitoring Regime – the 2010 Estate Agents Regulations*

#### 4.3.1 Policy Effects on Panama Premium

What are the effects of regulatory interventions on the use of illegal proceeds in the real estate sector? On 15 November 2010, the Estate Agents (Estate Agency Work) Regulations (EAW) were implemented to strengthen AML/CFT monitoring and regulatory oversight in the real estate market. Under the EAW, the Council for Estate Agencies (CEA) has the statutory power to regulate the behavior and conduct of all real estate agents in Singapore. It is also empowered to monitor and oversee agents' compliance with all regulations and guidelines, including the AML/CFT reporting requirement under the CDSA. In short, the introduction of the regulation strengthened the gatekeeping role of real estate agents in real estate transactions.

If the intervention was effective, we should expect the Panama premium to have diminished after the policy shock. Indeed, on the intensive margin, buyers stopped overpaying to avoid triggering a reporting threshold. On the extensive margin, straw purchasing or other illegal purchases ceased as a result of the tighter regulation, as demonstrated by the declining number of Panama-linked transactions presented in Figure 1 and Figure **7**. Specifically, the year-over-year number of Panama-linked transactions decreased by 35.62% after the policy shock and by 72.10% in the second year following the shock. We test the effect of the policy on the Panama premium using a difference-in-differences regression given by:

$$\ln(P_{ijt}) = \alpha + \beta_1 Panama_{it} + \beta_2 Panama_{it} \times AftEAW_t + \beta_3 X_i + \theta_t + \lambda_j + u_{ijt} \quad (4)$$

where $AftEAW$ is a binary indicator that has a value of 1 if the purchase occurs after the EAW took effect. Project and purchase year-month fixed effects are included in the estimation, denoted by $\lambda_j$ and $\theta_t$, respectively. The sample period of our main analysis spans from 2009:11 to 2011:11, which is one year before and after the treatment. We also perform the analysis on larger samples by using a two-year window before and after the treatment event as well as the full sample.

Table 11 shows the results of our difference-in-differences analysis. The Panama premium is found to be positive at 0.3% to 1.3% in the pre-intervention phase. The estimates, however, are insignificant in models 1 to 4 when samples of smaller size are used; this may be due to the

short duration of the pretreatment window in these models. Our main variable of interest is the DID estimate, $Panama \times AftEAW$, which captures the change in the purchase price of Panama-linked buyers relative to that of buyers in the control group due to the policy shock. The negative and significant estimate in Column 1 suggests that Panama-linked buyers reduced their purchase price by 2.7% after the introduction of the EAW. The inclusion of purchaser nationality fixed effects in Column 2 does not affect the findings. Similarly, our DID estimate remains consistent when the analysis is performed on a sample with a four-year rolling window (Columns 3 and 4) as well as on the full sample (Columns 5 and 6)[40]. The negative effect on the purchase price may be attributable to a change in buyers' overpayment behavior to avoid raising suspicion among third parties, including agents and sellers. Alternatively, real estate agents may have played a key role in cautioning their clients against overpaying in property purchases. Either way, our results provide evidence that the EAW regulations have been effective in putting in place monitoring and regulatory controls on real estate agents, helping curb the unlawful manipulation of property values through overpayments on property purchases.

#### 4.3.2 DID Robustness Checks

According to Agarwal et al. (2019), the EAW policy change reduced price discounts for agent buyers[41]. Thus, our estimates may be biased downwards (upwards) by the presence of agent buyers in the control (treatment) group. To alleviate this potential confounder, we re-estimate the DID specification using a subsample that excludes agent-buyer transactions. The policy effects remain consistent and robust, and the slightly larger estimates suggest an underestimation bias due to the presence of agent buyers (Appendix A12). Additionally, we test the identifying assumption of common pre-trends by including pretreatment indicators in the regression. As shown in Table 12, the differences in the pre-treatment indicators are statistically indistinguishable from zero, validating the parallel trends assumption underlying the DID design. Taking a closer look at the dynamic response, the muted response in the first two periods indicates delayed policy effect on purchase price, substantiating our earlier proposition about the policy effects on the extensive margin. We further perform falsification tests using different placebo treatment year-months, and the interaction terms are not statistically significantly different from zero (Appendix A13). On the extensive margin, straw purchasing or other illegal purchases ceased as a result of the tighter regulation, as demonstrated by the declining number of Panama-linked transactions presented in Figure 1 and Figure **7**.

Sample composition issues may arise if the group of individuals who made purchases before the implementation of the policy is different from those who made purchases after it, thereby confounding the estimation of the policy effect in question. With this in mind, we perform a subsample analysis on repeat buyers who made purchases both pre- and post-policy. The

[40] In Appendix A11, we reestimate the DID regressions using the subsample of transactions made by individual buyers. The results remain robust.

[41] The EAW prohibits dual representation by real estate agents (i.e., no salesperson is allowed to act for both buyer and seller or landlord and tenant in any property transaction).

sample size shrinks greatly, leaving us with insufficient statistical power. Nonetheless, the DID estimate is found to be negative, and the point estimate is 2.8% (Column 1 of Table 13), which is nearly identical to that in our DID baseline.

One may argue that the lower post-policy purchase price is the result of Panama-linked buyers' increased experience and thus their enhanced acquisition performance in the property market[42]. In Column 2, we compare the purchase prices of Panama-linked repeat buyers to those of non-Panama-linked buyers using a pre-policy transaction sample. The Panama premium is found to be significant at 2.9% in this specification. This result shows that the transaction experience of Panama-linked buyers does not reduce their tendency to overpay, and in any case, experienced Panama-linked buyers behave more aggressively in housing transactions given the higher point estimates relative to the baseline results in Table 2. In all, these findings rule out the alternative explanation that the policy effect is a result of changes in the sample composition[43].

Another concern is that the EAW regulation suppressed housing demand either because of the heavy compliance requirements on the part of real estate agents or because of the prohibition of dual representation by agents, which may have caused a general decline in housing prices. In Figure 11, we plot the housing price index from 2005 to 2013 and show that this is not the case. Housing prices have been on an upward trend since the second quarter of 2009; specifically, we do not observe any structural shifts in housing prices after the introduction of the EAW policy.

#### 4.3.3 Heterogeneity in the Policy Effects

Enhanced monitoring regimes may have a stronger effect on foreigners, given the disproportionately high perpetration rates of money laundering with foreign funding in the real estate sector worldwide. According to a report by Transparency International, over US$34 billion of foreign money of unclear origin was funneled into German real estate in 2017[44]. Similarly, approximately GBP$100 billion in hidden foreign inflows has reportedly entered the United Kingdom since 2006[45]. In Singapore, a client's nationality profile is specified as the first indicator that should trigger real estate agents to conduct due diligence measures on customers[46]. Against this backdrop, we employ a difference-in-difference-in-differences (DDD) approach to analyze heterogeneities in the policy effect between Panama-linked foreigners and Panama-linked locals. The results are reported in Table 14. As shown in Columns 1 and 2, we find that compared to Panama-linked locals, Panama-linked foreigners purchase properties at

[42] See, for example Agarwal, Sing and Wang (2018); Cuypers et al. (2017); and Nadler, Thompson and Boven (2003).
[43] As further robustness checks, we rerun the estimations with block-level fixed effects, which is a more stringent specification. Both the DID estimate and the Panama premium have the same direction and significance. The results are not reported due to space constraints.
[44] See, for example, "German real estate market a hotbed of money laundering, Transparency reports," Deutsche Welle News, 7 December 2018.
[45] Faulty Towers: Understanding the impact of overseas corruption on the London property market, Transparency International UK, 2017.
[46] Practice Circular on the Prevention of Money Laundering and Countering the Financing of Terrorism, CEA, 2015.

a larger premium of 2.1% to 2.7% prior to the treatment event. Our main variable of interest is the DDD estimate, $Panama \times Foreigner \times AftEAW$. The negative and significant coefficient indicates that compared to Panama-linked locals, Panama-linked foreigners reduced their purchase price by a larger percentage of 5.5%. The results are in line with our expectations and further highlight the effectiveness of the monitoring and regulatory regimes in alleviating the price externality brought about by the presence of illicit foreign wealth in the local real estate market.

The effect of the EAW policy on the Panama premium may also vary across different property submarkets. For uncompleted or newly built properties sold by developers (commonly referred to as new sale properties), the purchase price closely follows the launch price predetermined by the developers. Hence, manipulation of property valuations may be limited in the new sale market. In contrast, in the resale market, where the transacted price is determined through negotiation between the buyer and the seller, buyers who wish to exploit the real estate market using illegitimate money could manipulate the property price by simply entering the deal without negotiating. We test for heterogeneous effects of the policy shock on different submarkets; the results are reported in Columns 3 and 4 of Table 14. Focusing on the DDD estimate, we find that the resale market experienced a stronger policy effect: the purchase price of a Panama-linked buyer for a resale property is 4.2% lower than that for a new sale property. Overall, these heterogeneity analyses suggest that the policy effect is mostly driven by foreigners and resale transactions and further clarify our understanding of the mechanisms behind the Panama premium in real estate purchases.

Next, we examine whether the policy shock affected successive sales of a property, for which evidence of overvaluation in property sales involving Panama-linked sellers was found above. Given the strengthened monitoring regime in place, manipulation of property valuations through the raising of selling prices may have become risky. Thus, we expect the policy shock to have decreased, if not eliminated, overvaluations in the selling price of the affected treatment group. Table 15 reports the DID regressions using the selling price (psf) as the dependent variable. As shown in Columns 1 and 2, the DID estimates are found to be statistically insignificant when we use one-year post- and pre-policy windows. The insignificant results are likely due to the attrition in property sales, as some Panama-linked individuals may have refused to sell their properties in the near term either to prolong their holding period or to wait for better timing. In Columns 3 and 4, we expand our sample size to a longer rolling window, and we find a significant negative effect of the policy shock on the selling price of properties sold by Panama-linked individuals. Compared to the selling prices attained by sellers in the control group, the selling price of Panama-linked individuals dropped by 1.9% after the establishment of the CEA – a drop that not only eliminated overvaluation in the property price but also further drove the selling price below market value[47]. Given the possible attrition of property sales mentioned earlier, the DID estimates are likely to be a lower bound for the actual effect.

[47] We test the parallel pretrend for the DID specification. Regression results are presented in Appendix A14.

*4.4 Spillover Effect of Panama Premium*

Academics have shown evidence of geographic spillovers in housing markets. Shiller (2005) argues that irrational exuberance arising from psychological contagion may lead to spatial spillovers of house prices. Bailey et al. (2016) document a direct association between house price experiences within an individual's social network and the individual's expectations in the housing market. Similarly, DeFusco et al. (2018) reveal that housing booms in one market may have both extensive- and intensive-margin spillovers to neighboring markets. In this section, we test the spatial dimension of the Panama premium in property prices by investigating price spillovers within the block (the Panama block) and the focal project where Panama-linked transaction occurs (the Panama project) as well as spillovers to neighboring projects.

4.4.1 Within-block and Within-project Spillovers

We begin the analysis by first examining spillovers within the Panama block, which is the smallest locality where spillovers can happen[48]. Our sample is restricted to include only resale transactions of nonlanded multifamily residential units. We test for a change in the transacted prices of properties in the Panama block after a Panama-linked purchase based on the following equation:

$$\ln(P_{ijlt}) = \alpha + \beta_1 Panama\ Block_{ijl} + \sum_{t=-2}^{4} \beta_2 \left(Panama\ Block_{ijl} \times Relative\ Year_{it}\right) + \beta_3 X_i + u_{ijlt} \quad (5)$$

where $Panama\ Block$ is an indicator for whether property $i$ is located in block $j$ of project $l$, in which the block has at least one transaction linked to a Panama buyer, and $X$ is a set of controls including hedonic attributes and transaction characteristics. We also include project fixed effects and purchase year-month fixed effects. The third term contains our primary variables of interest. We construct a series of $Relative\ Year$ indicator variables that identify whether the transaction occurs $t$ years before or after the Panama-linked transaction. If there exists more than one Panama-linked transaction in the block, these indicators mark all transactions that occur $t$ years before or after any of the Panama-linked transactions. The baseline period is $Relative\ Year\ 0$, which includes property transactions that occur in the 4-quarter period prior to the Panama-linked transaction, while $Relative\ Year\ 1$ includes the quarter in which the Panama-linked transaction occurred as well as the subsequent three quarters. Panama-linked transactions are excluded from the estimations to avoid overestimation. In short, $\beta_2$ measures the Panama block's differential change in transacted price, where the change is measured with respect to the omitted category $Relative\ Year\ 0$. We report results for the three years before and after the Panama-linked transaction.

Results are presented in Table 16. As shown in Column 1, the coefficient on $Panama\ Block \times Relative\ Year\ 1$ is found to be positive but weakly significant. Clustering standard errors at the treatment level - the block level - brings the statistical significance level to less than 0.05. Translating these figures in layman's term, values of properties located in the

[48] In a typical nonlanded multifamily project, there exist more than one block of residential units.

same block as the Panama-linked transactions are 1.3% higher than neighboring blocks within the same project. These findings are striking, considering how perceptible the short-term price effects are as a result of these Panama-linked transactions.

To study spillovers within the Panama project, we create a comparable sample using propensity score matching as specified in section 4.1.2. The estimation equation follows equation (5), except that we replace the project fixed effect with matched-pair fixed effects and include additional property-level controls. Column 3 of Table 16 reports the results estimated on a sample constructed using a caliper width of 0.05 in the matching stage. The difference in the transacted price between the treatment group and the control group during the pretreatment period remains constant, as shown by the insignificant estimates for the interactions of $Panama\ Project$ and the pretreatment indicators, which confirms the underlying assumption of a parallel trend. Interestingly, we find that the coefficient on $Panama\ Project \times Relative\ Year\ 1$ is positive and significant at 0.02, implying that the transacted prices for properties in the Panama project increase by 2% in the year that a Panama-linked buyer purchases a property in the same project, compared to the transacted prices for properties in the control group. In Columns 4, we use tighter caliper width of 0.01 to construct the PSM sample. The point estimate for $Panama\ Project \times Relative\ Year\ 1$ increases to 3.1%, while the spillover effects in subsequent years remain statistically insignificant. Taken together, the results in Table 16 confirm the existence of short-term spatial spillovers of the Panama premium to properties within the same block and project. The price spillovers are large, considering the estimated Panama premium of 3.8% shown in Table 2.

4.4.2 Within-neighborhood Spillovers

The previous analyses documented within-project spillovers of the Panama premium. We now further investigate whether spatial spillovers take place beyond the Panama project and onto neighboring projects. We define a neighborhood based on the first four digits of the 6-digit postal code[49] and include resale transactions for all private residences, including landed properties, in our estimation. Our $Relative\ Year$ indicators closely follow those defined in the previous estimation: $Relative\ Year\ 1$ includes all transactions for properties located in the same neighborhood and occurring in the quarter or in the three subsequent quarters in which a Panama-linked transaction occurred. Simply put, the $Relative\ Year$ indicators capture the neighborhood spillover effects of the Panama premium, which is the effect of the Panama-linked transaction on the prices of properties in the same neighborhood over time.

We present our regression results in Table 17. In Column 1, we include purchase year-month fixed effects to control for neighborhood-invariant dynamic trends, as well as neighborhood fixed effects to eliminate any time-invariant neighborhood-specific variation. Note that the insignificant estimates for the pre-treatment period imply the absence of a pre-trend. Similar to the results on within-project spillover effects, we find short-term neighborhood spillover

[49] All private residences in Singapore are categorized into 72 postal sectors (based on the first two digits of the postal code), 241 localities (based on the first three digits of the postal code), and 1,465 neighborhoods (based on the first four digits of the postal code).

effects of the Panama premium. The estimate of 0.034 for $Relative\ Year\ 1$ suggests that the transacted prices of nearby properties increase by 3.4% after the Panama-linked transaction occurs. The results remain consistent in Column 2, which includes quarter-by-neighborhood fixed effects that absorb common aggregate trends across neighborhoods. The point estimates approximate the Panama premium at 3.8%, which represents an economically large effect.

As documented in the earlier results, overpayments by Panama-linked buyers are concentrated among transactions for high-end properties. In view of this, we examine whether spillovers of the Panama premium vary across neighborhoods, with higher-end neighborhoods experiencing stronger spillovers and vice versa. We categorize the neighborhoods into four segments based on the average new sale price of properties within the neighborhood and perform subsample analyses on higher-end neighborhoods (above the $50^{th}$ percentile) and lower-end neighborhoods (below the $50^{th}$ percentile) separately. In line with our expectations, the results in Columns 3 and 4 show that the spillover effects are negligible in lower-end neighborhoods and primarily appear in higher-end neighborhoods. In high-end neighborhoods, property prices increase by 3.5% after a Panama-linked transaction occurs. The percentage increase in the transacted price is equivalent to over S$65,000 (~USD$46,500), based on the average price of S$1,864,041 for properties in high-end neighborhoods.

In Columns 5 and 6, we recategorize neighborhoods into larger localities based on the first three digits of the 6-digit postal code, which gives rise to localities that are larger in terms of geographical coverage but smaller in terms of total number of localities. The spillover effects remain statistically significant but are found to be lower at 2.3%, suggesting that price spillovers diminish with geographic distance.

### 4.4.3 Spillovers After EAW Regulation

Previous analyses reveal significant spillover effects of the Panama premium within and beyond the Panama project in the first year in which a Panama-linked transaction occurs. Given that all estimations of spillover effects exclude Panama-linked transactions, the short-term price distortions reflect negative welfare effects for the housing market in general.

Could the imposition of regulatory and monitoring oversight in the real estate industry curb price distortions arisen from Panama premium spillovers? Considering the negative effect of EAW policy on Panama premium as estimated in Section 4.3, we should expect premium spillovers to diminish following the policy introduction. To test this proposition, we repeat the estimation using the sample of transactions from November 2010 onwards, which is the period after the introduction of EAW policy. Results are reported in Table 18. Short-term positive spillovers no longer exist within and across projects, as demonstrated by the small and insignificant coefficients on the Panama indicator interacted with $Relative\ Year\ 1$ across all columns. Transaction prices of properties within Panama project and neighborhood are also found to be either lower or indifferent compared to the non-treatment group in the $2^{nd}$ and $3^{rd}$ year after Panama-linked transactions.

Our findings shed light on the pivotal role of the enhanced monitoring and regulatory regime in the real estate industry. By closing the loopholes that facilitate illicit wealth in property purchase, the EAW policy is effective in impeding overpayments in property purchase and the consequential premium spillovers.

## 5. Conclusion

A large body of anecdotal evidence reveals that the real estate market is at high risk of being exploited as a target of illicit wealth associated with money-laundering/terrorist-financing activities, with far-reaching consequences for the real estate market as a whole. However, empirical studies in this area are limited, given the clandestine nature of illicit wealth, which makes flows of criminal money difficult to detect and quantify.

Using the information from the Panama Papers and buyers' details for a proprietary dataset on housing transactions, we identify 2,331 property buyers in the Singapore private residential market who are implicated by name in the leaked data. We document a significant positive premium in property transactions involving Panama-linked buyers. Our results across a variety of model specifications and sample selections consistently show that Panama-linked buyers purchase properties at a premium of approximately 3.8%. This Panama price premium is found to be larger for luxury properties, which are properties that are located in the Central Region, have a higher average transacted price and have a higher concentration of foreign buyers.

We delve into our findings to identify the channels through which the Panama premium operates. From the Panama Papers, we use information on individuals' date of employment in offshore entities. We document that the Panama premium appears only when a property transaction occurs after a Panama-linked buyer becomes employed in an offshore firm, providing evidence for the association between the Panama premium and offshore hidden wealth. We also show a clear connection between the Panama premium and buyer nationality, with the Panama premium found to be higher if the Panama-linked buyer's home country is more corrupt and has laxer anti-money laundering/countering the financing of terrorism (AML/CFT) regulations, as proxied by country-based transparency indicators. Panama-linked individuals not only purchase but also sell at a premium. By exploiting an AML policy that regulates cross-border movements of cash, we draw an association between the higher selling prices of Panama-linked individuals and the use of illegitimate cash to manipulate property values.

Further, we study the impact of policies to reinforce AML/CFT monitoring and regulations on illicit investments in the housing market. We show that the Panama premium diminished after the policy shock. Specifically, the policy effect was stronger for foreign Panama-linked individuals and resale transactions. Finally, we provide evidence of spillovers of the Panama premium to properties located in the same development as well as properties in other developments in the same neighborhood.

This paper provides direct evidence of the existence of black money in housing purchases and further quantifies its impacts on the housing market. Singapore, which ranks among the top 5

least-corrupt countries in the world according to Transparency International, has seen a penetration of illicit wealth into the housing market; this suggests that the role of illicit financial flows in the property market may be more pronounced in countries where financial crimes are more prevalent. Our findings bring to light the impact of illicit wealth on housing markets and highlight the importance of AML regulations and the monitoring function of real estate agents as gatekeepers. Our findings have considerable implications for policies related to illicit financial flows, money laundering and terrorist financing.

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**Tables and Figures**

Table 1: Summary Statistics of Transaction and Property Attributes by Purchaser's Connection to The Panama Papers

| | | | **Panama==0** | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| VARIABLES | N | mean | sd | min | max |
| Transacted Price (S$) | 442,056 | 1,312,714 | 1,258,024 | 107,000 | 201,339,353 |
| Unit Price (S$ psf) | 442,056 | 984.0 | 504.3 | 54 | 6,840 |
| Area (sqm) | 442,056 | 133.3 | 105.1 | 24 | 10,712 |
| Property Age as of Sale (yr) | 442,056 | 5.889 | 9.684 | 0 | 67 |
| Unit Storey | 442,056 | 8.116 | 7.672 | 1 | 71 |
| New Sale (1,0) | 442,056 | 0.479 | 0.500 | 0 | 1 |
| Dist. to MRT (km) | 442,056 | 1.080 | 0.816 | 0.0423 | 6.855 |
| Dist. to CBD (km) | 442,056 | 8.606 | 4.460 | 0.281 | 19.77 |
| Dist. to School (km) | 442,056 | 0.679 | 0.411 | 0.0387 | 3.999 |
| Freehold Tenure (1,0) | 442,056 | 0.488 | 0.500 | 0 | 1 |
| Non-Landed (1,0) | 442,056 | 0.919 | 0.272 | 0 | 1 |
| Project Size (No. of Units) | 411,918 | 398.1 | 311.9 | 1 | 1,715 |
| Holding Period (month) | 148,249 | 70.38 | 51.33 | 0 | 283 |
| Sell Unit Price (S$ psf) | 147,309 | 985.1 | 456.9 | 91 | 5,305 |
| Property Age as of Sell (yr) | 148,249 | 10.05 | 10.20 | -17 | 67 |
| | | | **Panama==1** | | |
| Transacted Price (S$) | 2,331 | 1,801,210 | 1,750,861 | 220,000 | 15,802,104 |
| Unit Price (S$ psf) | 2,331 | 1,081 | 636.8 | 190 | 5,262 |
| Area (sqm) | 2,331 | 147.1 | 77.48 | 32 | 1,376 |
| Property Age as of Sale (yr) | 2,331 | 4.124 | 6.989 | 0 | 49 |
| Unit Storey | 2,331 | 10.74 | 9.462 | 1 | 66 |
| New Sale (1,0) | 2,331 | 0.508 | 0.500 | 0 | 1 |
| Dist. to MRT (km) | 2,331 | 1.064 | 0.830 | 0.0615 | 5.685 |
| Dist. to CBD (km) | 2,331 | 6.526 | 4.229 | 0.289 | 17.95 |
| Dist. to School (km) | 2,331 | 0.808 | 0.599 | 0.0387 | 3.999 |
| Freehold Tenure (1,0) | 2,331 | 0.564 | 0.496 | 0 | 1 |
| Non-Landed (1,0) | 2,331 | 0.998 | 0.046 | 0 | 1 |
| Project Size (No. of Units) | 2,324 | 359.2 | 297.2 | 1 | 1,715 |
| Holding Period (month) | 884 | 65.62 | 49.10 | 0 | 265 |
| Sell Unit Price (S$ psf) | 881 | 1,243 | 560.4 | 246 | 3,800 |
| Property Age as of Sell (yr) | 884 | 7.334 | 8.214 | -4 | 48 |

Notes: The table presents summary statistics of project-level and transaction-level attributes identified by the *Panama buyer* status. *Transacted Price* is the aggregate transaction price in Singapore dollars. *Unit Price* is the unit sale price in Singapore dollars per square foot. *Area* is the transacted property size in square meters. *Property Age as of Sale* is the property age as at transaction in years. *Unit Storey* is the floor level of the property. *New Sale* represents properties sold in developer's sales. Distance measures such as *Dist. to MRT, Dist. to CBD* and *Dist. to School* are proximity measures measured in kilometres. *Freehold Tenure* has a value of 1 if the property has a freehold tenure. *Non-Landed* takes the value of 1 is the property is either a condominium or an apartment. *Project Size* is the total number of property units in the development. *Holding Period*, *Sell Unit Price*, and *Property Age as of Sell* are variables derived from repeated-sales transactions. *Holding Period* is the number of months between the purchase and sale of property; *Sell Unit Price* is the unit sell price in Singapore dollars per square foot; *Property Age as of Sell* is the age of the property when property is sold, measured in years.

Table 2: Baseline Regression – Estimating Panama Premiums in Housing Prices

| | Dependent Variable: Ln (Transacted Price S$ psf) | | | | | | | | Price Premium | |
|---|---|---|---|---|---|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Panama | 0.038*** | 0.037*** | 0.026*** | 0.026*** | 0.026*** | 0.025*** | 0.009*** | 0.009*** | 0.037*** | 0.009** |
| | (0.006) | (0.006) | (0.005) | (0.005) | (0.008) | (0.008) | (0.003) | (0.003) | (0.007) | (0.004) |
| Foreigner | 0.034*** | | 0.033*** | | 0.033*** | | 0.011*** | | | |
| | (0.003) | | (0.002) | | (0.004) | | (0.002) | | | |
| Unit Size | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | | |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | | |
| Property Age | -0.007*** | -0.007*** | -0.007*** | -0.007*** | -0.014*** | -0.014*** | 0.002 | 0.002 | | |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.003) | (0.003) | | |
| Floor level | 0.007*** | 0.007*** | 0.007*** | 0.007*** | 0.006*** | 0.006*** | 0.005*** | 0.005*** | | |
| | (0.001) | (0.001) | (0.000) | (0.000) | (0.001) | (0.001) | (0.000) | (0.000) | | |
| No. of Purchased Units | 0.168*** | 0.168*** | 0.156*** | 0.156*** | 0.186*** | 0.186*** | 0.159*** | 0.159*** | | |
| | (0.018) | (0.018) | (0.016) | (0.016) | (0.027) | (0.027) | (0.018) | (0.018) | | |
| Freehold Tenure | 0.154*** | 0.154*** | 0.160*** | 0.160*** | 0.164*** | 0.164*** | | | | |
| | (0.011) | (0.011) | (0.010) | (0.010) | (0.016) | (0.016) | | | | |
| Dist. to MRT | -0.008 | -0.008 | -0.024*** | -0.024*** | -0.014 | -0.013 | | | | |
| | (0.006) | (0.006) | (0.009) | (0.009) | (0.009) | (0.009) | | | | |
| Dist. to School | 0.111*** | 0.110*** | 0.116*** | 0.116*** | 0.138*** | 0.138*** | | | | |
| | (0.015) | (0.015) | (0.015) | (0.015) | (0.026) | (0.026) | | | | |
| Observations | 444,387 | 444,387 | 444,387 | 444,387 | 184,320 | 184,320 | 444,387 | 444,387 | 444,387 | 444,387 |
| R-squared | 0.849 | 0.849 | 0.891 | 0.891 | 0.877 | 0.877 | 0.937 | 0.937 | 0.615 | 0.875 |
| YearMonth FE | Y | Y | N | N | Y | Y | Y | Y | Y | Y |
| PostalSector FE | Y | Y | N | N | Y | Y | N | N | Y | N |
| YearMonth*PostalSector FE | N | N | Y | Y | N | N | N | N | N | N |
| Project FE | N | N | N | N | N | N | Y | Y | N | Y |
| BuyerCountry FE | N | Y | N | Y | N | Y | N | Y | N | N |

Notes: The table reports regression estimates for OLS regression, and the dependent variable is the natural logarithm of property transacted price. *Panama* is a binary variable equal to 1 if the buyer is implicated by name in the Panama Papers; *Foreigner* has a value of 1 if the buyer is not a Singapore citizen; *Unit Size* is the size of property measured in square metre; *Property Age* is the age of property as at purchase; *Floor Level* is the floor level of unit; *No. of Purchased Units* is the number of properties purchased in the transaction; *Freehold Tenure* is a dummy variable equal to 1 if the property has a freehold tenure; distance measures include distance to the nearest MRT Station and distance to the nearest primary school. Columns 5 and 6 are estimated using sample derived from Propensity Score Matching. Control variables not reported here include *property type* (i.e., condominium, apartment, terrace house, semi-detached house and detached house) and *type of sale* (i.e., new sale, resale, sub-sale). *Property type* is not included in estimations with Project FE. Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Table 3: Robustness Tests – Estimating Panama Premiums in Housing Prices

| | Dependent Variable: Ln (Transacted Price S$ psf) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Panama | 0.016** | 0.016** | 0.039*** | 0.039*** | 0.031*** | 0.031*** | 0.052*** | 0.052*** |
| | (0.008) | (0.008) | (0.005) | (0.005) | (0.006) | (0.006) | (0.009) | (0.009) |
| Foreigner | 0.021*** | | 0.047*** | | 0.031*** | | 0.034*** | |
| | (0.003) | | (0.004) | | (0.003) | | (0.003) | |
| Observations | 253,442 | 253,442 | 100,081 | 100,081 | 342,303 | 342,303 | 444,387 | 444,387 |
| R-squared | 0.957 | 0.957 | 0.877 | 0.877 | 0.827 | 0.827 | 0.849 | 0.849 |
| PropertyControls | Y | Y | Y | Y | Y | Y | Y | Y |
| YearMonth FE | Y | Y | Y | Y | Y | Y | Y | Y |
| PostalSector FE | N | N | Y | Y | Y | Y | Y | Y |
| House FE | Y | Y | N | N | N | N | N | N |
| BuyerCountry FE | N | Y | N | Y | N | Y | N | Y |
| Sample | Repeated Sales | Repeated Sales | W/ Buyers' Names | W/ Buyers' Names | 1995:2012 | 1995:2012 | Exact Match: Name & Country | Exact Match: Name & Country |

Notes: The table reports regression estimates for OLS regression, and the dependent variable is the natural logarithm of property transacted price. *Panama* is a binary variable equal to 1 if the buyer is implicated by name in the Panama Papers; *Foreigner* has a value of 1 if the buyer is not a Singapore citizen. Control variables not reported here include *Unit Size*, *Property Age*, *Floor Level*, *No. of Purchased Units*, *Freehold Tenure*, *distance measures*, *property type* (i.e., condominium, apartment, terrace house, semi-detached house and detached house) and *type of sale* (i.e., new sale, resale, sub-sale). Among the control variables, property-level controls are not included in estimations with House FE. Columns 1 and 2 are estimated using repeated-sales sample; Columns 3 and 4 exclude transactions with missing buyer's details; Columns 5 and 6 are estimated using sample of transactions from January 1995 to December 2012. For Columns 7 and 8, Panama-linked buyers are identified based on exact matches on name and country. Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Table 4: Heterogeneity Tests by Property Segment, Location and Concentration of Panama-linked Buyers

| | Dependent Variable: Ln (Transacted Price S$ psf) | | | | | |
|---|---|---|---|---|---|---|
| | Ave. Price Quantile | | Central Region | | % Foreign Buyers | |
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) |
| Panama | -0.144*** | -0.142*** | -0.014 | -0.008 | 0.005 | 0.005 |
| | (0.014) | (0.014) | (0.010) | (0.010) | (0.008) | (0.008) |
| Panama*Ave Price Q | 0.061*** | 0.060*** | | | | |
| | (0.005) | (0.005) | | | | |
| Panama*Central | | | 0.117*** | 0.107*** | | |
| | | | (0.017) | (0.017) | | |
| Panama*% Foreign | | | | | 0.552*** | 0.544*** |
| | | | | | (0.113) | (0.112) |
| Central | | | 0.084*** | 0.084*** | | |
| | | | (0.015) | (0.015) | | |
| Foreigner | 0.036*** | | 0.073*** | | 0.030*** | |
| | (0.003) | | (0.005) | | (0.003) | |
| Observations | 384,434 | 384,434 | 444,387 | 444,387 | 414,242 | 414,242 |
| R-squared | 0.860 | 0.861 | 0.771 | 0.772 | 0.864 | 0.864 |
| PropertyControls | Y | Y | Y | Y | Y | Y |
| YearMonth FE | Y | Y | Y | Y | Y | Y |
| PostalSector FE | Y | Y | N | N | Y | Y |
| BuyerCountry FE | N | Y | N | Y | N | Y |

Notes: The table reports regression estimates for OLS regression, and the dependent variable is the natural logarithm of property transacted price. *Panama* is a binary variable equal to 1 if the buyer is implicated by name in the Panama Papers. We categorize projects into 5 quartiles based on project's average transacted price in developer sales, denoted as *Ave Price Q. Central* takes a value of 1 if the property is located in the Central Region of Singapore; *% Foreigner* is the concentration of foreign buyers in the project as at transaction, which is calculated using the number of foreigner's transaction as at purchase divided by project size; *Foreigner* has a value of 1 if the buyer is not a Singapore citizen. Control variables not reported here include *Unit Size*, *Property Age*, *Floor Level*, *No. of Purchased Units*, *Freehold Tenure*, *distance measures (MRT and Primary School)*, *property type* (i.e., condominium, apartment, terrace house, semi-detached house and detached house) and *type of sale* (i.e., new sale, resale, sub-sale). In Column 3 and 4, *distance to Central Business District* is included as additional control variable. Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Table 5: The Relationship between Panama Premium and Offshore Employment Status

| | Dependent Variable: Ln (Purchase Price psf) | | | |
|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) |
| Panama | 0.029*** | 0.028*** | 0.003 | 0.003 |
| | (0.007) | (0.007) | (0.004) | (0.004) |
| After Emp. | 0.027*** | 0.028*** | 0.019*** | 0.020*** |
| | (0.010) | (0.010) | (0.006) | (0.006) |
| Foreigner | 0.034*** | | 0.011*** | |
| | (0.003) | | (0.002) | |
| Observations | 444,387 | 444,387 | 444,387 | 444,387 |
| R-squared | 0.849 | 0.849 | 0.937 | 0.937 |
| PropertyControls | Y | Y | Y | Y |
| YearMonth FE | Y | Y | Y | Y |
| PostalSector FE | Y | Y | N | N |
| Project FE | N | N | Y | Y |
| BuyerCountry FE | N | Y | N | Y |

Notes: The table reports regression estimates for OLS regression, and the dependent variable is the natural logarithm of property transacted price. *Panama* is a binary variable equal to 1 if the buyer is implicated by name in the Panama Papers; *After Emp.* takes a value of 1 if the transaction occurs after the buyer is employed in the firm linked to the Panama Papers; *Foreigner* has a value of 1 if the buyer is not a Singapore citizen. Control variables not reported here include *Unit Size*, *Property Age*, *Floor Level*, *No. of Purchased Units*, *Freehold Tenure*, *distance measures, property type* (i.e., condominium, apartment, terrace house, semi-detached house and detached house) and *type of sale* (i.e., new sale, resale, sub-sale). Among the control variables, project-level controls are not included in estimations with Project FE. Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Table 6: Heterogeneity Tests by Home Countries' Transparency Indicators

| | Dependent Variable: Ln (Purchase Price psf) | | | | |
|---|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) | (5) |
| Panama | 0.158*** | 0.004 | 0.009 | 0.046*** | 0.024*** |
| | (0.020) | (0.009) | (0.010) | (0.007) | (0.007) |
| Panama*CPI | -0.002*** | | | | |
| | (0.000) | | | | |
| Panama*Mean Bribery % | | 0.393*** | | | |
| | | (0.069) | | | |
| Panama*Yearly Bribery % | | | 0.290*** | | |
| | | | (0.073) | | |
| Panama*Politician $_{panama}$ | | | | 0.015 | |
| | | | | (0.015) | |
| Panama*Politician $_{both}$ | | | | | 0.068*** |
| | | | | | (0.012) |
| Observations | 444,193 | 444,139 | 146,676 | 444,387 | 444,387 |
| R-squared | 0.849 | 0.849 | 0.851 | 0.848 | 0.849 |
| PropertyControls | Y | Y | Y | Y | Y |
| YearMonth FE | Y | Y | Y | Y | Y |
| PostalSector FE | Y | Y | Y | Y | Y |

Notes: The table reports regression estimates for OLS regression, and the dependent variable is the natural logarithm of property transacted price. *Panama* is a binary variable equal to 1 if the buyer is implicated by name in the Panama Papers; *CPI* is the average of Corruption Perception Index (CPI) from 2012 to 2018 obtained from Transparency International; *Mean Bribery %* is the average bribery rate from 2004 to 2018 collected from Global Corruption Barometer; *Yearly Bribery %* is the yearly bribery rate across countries; $Politician_{panama}$ is a binary variable equal to 1 if the current and former heads of government and their close associates were implicated by name in the Panama Papers; while $Politician_{both}$ considers information from both the Panama Papers and Paradise Papers. *Foreigner* has a value of 1 if the buyer is not a Singapore citizen. Control variables not reported here include *Unit Size*, *Property Age*, *Floor Level*, *No. of Purchased Units*, *Freehold Tenure*, *distance measures*, *property type* (i.e., condominium, apartment, terrace house, semi-detached house and detached house) and *type of sale* (i.e., new sale, resale, sub-sale). Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Table 7: Estimating Panama Premiums in Selling Prices

| | Dependent Variable: Ln (Sell Price psf) | | | |
|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) |
| Panama | 0.042*** | 0.042*** | 0.013*** | 0.013*** |
| | (0.006) | (0.006) | (0.004) | (0.004) |
| Ln (Purchase Price) | 0.405*** | 0.406*** | 0.162*** | 0.163*** |
| | (0.012) | (0.012) | (0.009) | (0.009) |
| Foreigner | 0.011*** | | -0.004** | |
| | (0.004) | | (0.002) | |
| Observations | 148,168 | 148,168 | 148,168 | 148,168 |
| R-squared | 0.874 | 0.874 | 0.928 | 0.928 |
| PropertyControls | Y | Y | Y | Y |
| SellYearMonth FE | Y | Y | Y | Y |
| PostalSector FE | Y | Y | N | N |
| Project FE | N | N | Y | Y |
| SellerCountry FE | N | Y | N | Y |

Notes: The table reports regression estimates for OLS regression, and the dependent variable is the natural logarithm of property selling price. *Panama* is a binary variable equal to 1 if the seller is implicated by name in the Panama Papers; *Ln (Purchase Price)* is the natural logarithm of purchase price psf; *Foreigner* has a value of 1 if the buyer is not a Singapore citizen. Control variables not reported here include *Unit Size*, *Property Age (as at sell)*, *Floor Level*, *Freehold Tenure*, *distance measures and property type* (i.e., condominium, apartment, terrace house, semi-detached house and detached house). Among the control variables, project-level controls are not included in estimations with Project FE. Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Table 8: The Impact of CBCRR Regime on Selling Price

| | Dependent Variable: Ln (Sell Price psf) | | | |
|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) |
| Panama | 0.024** | 0.024** | 0.020 | 0.019 |
| | (0.011) | (0.011) | (0.013) | (0.013) |
| Panama*AftCBCRR | -0.055** | -0.055** | -0.058** | -0.055** |
| | (0.022) | (0.022) | (0.027) | (0.027) |
| Ln (Purchase Price) | 0.171*** | 0.171*** | 0.152*** | 0.152*** |
| | (0.011) | (0.010) | (0.012) | (0.011) |
| Foreigner | 0.005 | | 0.009 | |
| | (0.005) | | (0.005) | |
| Observations | 24,786 | 24,786 | 15,463 | 15,463 |
| R-squared | 0.951 | 0.951 | 0.957 | 0.958 |
| PropertyControls | Y | Y | Y | Y |
| SellYearMonth FE | Y | Y | Y | Y |
| Project FE | Y | Y | Y | Y |
| SellerCountry FE | N | Y | N | Y |
| SamplePeriod | +-1 year | +-1 year | +-6 months | +-6 months |

Notes: The table reports regression estimates for DID regression, and the dependent variable is the natural logarithm of property selling price. *Panama* is a binary variable equal to 1 if the seller is implicated by name in the Panama Papers; AftCBCRR takes the value of 1 if the transaction occurs after the implementation of Cross-Border Currency/ Bearer Negotiable Instruments Reporting Regime (CBCRR) on 1st November 2007. *Ln (Purchase Price)* is the natural logarithm of purchase price psf; *Foreigner* has a value of 1 if the buyer is not a Singapore citizen. Control variables not reported here include *Unit Size*, *Property Age (as at sell)* and *Floor Level*. Columns 1 and 2 are estimated based on two-year rolling window (1 year pre- and post-treatment); while Columns 3 and 4 are estimated based on 1-year rolling window (6 months pre- and post-treatment). Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Table 9: Subsample Analysis on the CBCRR Policy Effect

| | Dependent Variable: Ln (Sell Price psf) | | | |
|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) |
| Panama | 0.052** | 0.050** | 0.003 | 0.002 |
| | (0.026) | (0.025) | (0.013) | (0.013) |
| Panama*AftCBCRR | -0.083** | -0.074** | -0.032 | -0.029 |
| | (0.040) | (0.036) | (0.026) | (0.027) |
| Ln (Purchase Price) | 0.254*** | 0.249*** | 0.137*** | 0.138*** |
| | (0.020) | (0.021) | (0.010) | (0.010) |
| Foreigner | 0.013 | | 0.008 | |
| | (0.013) | | (0.006) | |
| Observations | 2,143 | 2,143 | 13,318 | 13,318 |
| R-squared | 0.954 | 0.955 | 0.952 | 0.952 |
| PropertyControls | Y | Y | Y | Y |
| SellYearMonth FE | Y | Y | Y | Y |
| Project FE | Y | Y | Y | Y |
| SellerCountry FE | N | Y | N | Y |
| SamplePeriod | +-6 months | +-6 months | +-6 months | +-6 months |
| Sample | Uncompleted Units | | Completed Units | |

Notes: The table reports regression estimates for DID regression, and the dependent variable is the natural logarithm of property selling price. *Panama* is a binary variable equal to 1 if the seller is implicated by name in the Panama Papers; AftCBCRR takes the value of 1 if the transaction occurs after the implementation of Cross-Border Currency/ Bearer Negotiable Instruments Reporting Regime (CBCRR) on 1st November 2007. *Ln (Purchase Price)* is the natural logarithm of purchase price psf; *Foreigner* has a value of 1 if the buyer is not a Singapore citizen. Control variables not reported here include *Unit Size*, *Property Age (as at sell)*, *and Floor Level*. Columns 1 and 2 are estimated using transactions of properties before completion; while Columns 3 and 4 are estimated using transactions of completed properties. Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Table 10: Dynamic Effects of CBCRR policy on Property Purchase Price

| | Dependent Variable: Ln (Purchase Price psf) | | | |
|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) |
| Panama | 0.020 | 0.023 | 0.007 | 0.008 |
| | (0.018) | (0.018) | (0.009) | (0.009) |
| Panama*Before$_{-5}$ | -0.015 | -0.018 | -0.036 | -0.038 |
| | (0.028) | (0.027) | (0.039) | (0.037) |
| Panama*Before$_{-4}$ | -0.015 | -0.017 | 0.006 | 0.008 |
| | (0.024) | (0.024) | (0.026) | (0.026) |
| Panama*Before$_{-3}$ | -0.019 | -0.019 | 0.001 | 0.004 |
| | (0.023) | (0.023) | (0.020) | (0.020) |
| Panama*Before$_{-2}$ | 0.017 | 0.017 | 0.037 | 0.039 |
| | (0.040) | (0.040) | (0.036) | (0.036) |
| Panama*Before$_{-1}$ | -0.013 | -0.014 | -0.006 | -0.004 |
| | (0.031) | (0.031) | (0.025) | (0.026) |
| Panama*After $_{0}$ | -0.006 | -0.000 | 0.017 | 0.019 |
| | (0.030) | (0.032) | (0.023) | (0.026) |
| Panama*After$_{+1}$ | -0.092* | -0.093* | -0.076* | -0.074 |
| | (0.050) | (0.049) | (0.046) | (0.045) |
| Panama*After$_{+2}$ | -0.037 | -0.037 | -0.021 | -0.021 |
| | (0.030) | (0.030) | (0.024) | (0.025) |
| Panama*After$_{+3}$ | -0.039* | -0.043** | -0.037*** | -0.038*** |
| | (0.020) | (0.020) | (0.011) | (0.011) |
| Panama*After$_{+4}$ | -0.011 | -0.022 | 0.017 | 0.008 |
| | (0.047) | (0.047) | (0.050) | (0.050) |
| Panama*After$_{+5}$ | 0.044 | 0.039 | 0.050 | 0.043 |
| | (0.040) | (0.041) | (0.034) | (0.035) |
| Panama*After$_{+6}$ | 0.043 | 0.025 | 0.050 | 0.038 |
| | (0.059) | (0.038) | (0.060) | (0.046) |
| Panama*After$_{+7}$ | | | -0.066** | -0.066** |
| | | | (0.032) | (0.032) |
| Panama*After$_{+8}$ | | | -0.023 | -0.023 |
| | | | (0.046) | (0.046) |
| Panama*After$_{+9}$ | | | 0.018 | 0.016 |
| | | | (0.026) | (0.026) |
| Panama*After$_{+10}$ | | | 0.054* | 0.052* |
| | | | (0.028) | (0.029) |
| Panama*After$_{+11}$ | | | -0.011 | -0.013 |
| | | | (0.037) | (0.037) |
| Panama*After$_{+12}$ | | | -0.053*** | -0.054*** |
| | | | (0.014) | (0.014) |
| Observations | 29,681 | 29,681 | 53,864 | 53,864 |
| R-squared | 0.958 | 0.958 | 0.952 | 0.953 |
| PropertyControls | Y | Y | Y | Y |
| YearMonth FE | Y | Y | Y | Y |
| Project FE | Y | Y | Y | Y |
| BuyerCountry FE | N | Y | N | Y |
| Sample Period | +-6 months | +-6 months | +-1 year | +-1 year |

Notes: The table reports dynamic treatment effects of Cross-Border Currency/ Bearer Negotiable Instruments Reporting Regime (CBCRR) implemented on 1st November 2007, and the dependent variable is the natural logarithm of property transacted price. *Panama* is a binary variable equal to 1 if the buyer is implicated by name in the Panama Papers. The *Before* dummies are monthly indicators that have values of 1 if the transaction occurs in the respective month before the policy implementation. For example, *Before$_{-1}$* equals to 1 if the transaction occurred in one month before the regulation takes effect. *After* has a value of 1 if the transaction occurs after the regulation implementation. Control variables not reported here include *No. of Purchased Units, Unit Size*, *Property Age (as at purchase)*, *Floor Level, and type of sale* (i.e., new sale, resale, sub-sale). Columns 1and 3 include additional *Foreigner* control, while Columns 2and 4 include buyer country fixed effect. Columns 1 and 2

are estimated based on one-year rolling window (6 months pre- and post-treatment), with the reference base period being *Before*$_{-6}$ (which is omitted here). Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Table 11: Effects of the EAW Regulation

| | Dependent Variable: Ln (Purchase Price psf) | | | | | |
|---|---|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) |
| Panama | 0.003 | 0.004 | 0.004 | 0.004 | 0.013*** | 0.013*** |
| | (0.006) | (0.006) | (0.004) | (0.004) | (0.004) | (0.004) |
| Panama*Aft EAW | -0.028*** | -0.027*** | -0.025*** | -0.025*** | -0.030*** | -0.031*** |
| | (0.010) | (0.010) | (0.009) | (0.008) | (0.008) | (0.008) |
| Foreigner | 0.008*** | | 0.009*** | | 0.011*** | |
| | (0.002) | | (0.001) | | (0.002) | |
| Observations | 65,967 | 65,967 | 129,904 | 129,904 | 444,387 | 444,387 |
| R-squared | 0.952 | 0.952 | 0.943 | 0.944 | 0.937 | 0.937 |
| PropertyControls | Y | Y | Y | Y | Y | Y |
| YearMonth FE | Y | Y | Y | Y | Y | Y |
| Project FE | Y | Y | Y | Y | Y | Y |
| BuyerCountry FE | N | Y | N | Y | N | Y |
| Sample Period | +-1 year | +-1 year | +-2 years | +-2 years | Full Sample | Full Sample |

Notes: The table reports regression estimates for DID regression, and the dependent variable is the natural logarithm of property transacted price. *Panama* is a binary variable equal to 1 if the buyer is implicated by name in the Panama Papers; *Aft EAW* has a value of 1 if the transaction occurs after the Estate Agents (Estate Agency Work) Regulations (EAW) takes effect. *Foreigner* has a value of 1 if the buyer is not a Singapore citizen. Control variables not reported here include *No. of Purchased Units, Unit Size, Property Age (as at purchase), Floor Level, and type of sale* (i.e., new sale, resale, sub-sale). Columns 1 and 2 are estimated based on two-year rolling window (1 year pre- and post-treatment); Columns 3 and 4 are estimated based on four-year rolling window (2 years pre- and post-treatment); Columns 5 and 6 are estimated using the full sample. Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Table 12: Pre-trend Tests on the EAW Policy Shock

| | Dependent Variable: Ln (Purchase Price psf) | |
|---|---|---|
| VARIABLES | (1) | (2) |
| Panama | 0.007 | 0.007 |
| | (0.015) | (0.015) |
| Panama*Before$_{-5}$ | -0.007 | -0.006 |
| | (0.017) | (0.017) |
| Panama*Before$_{-4}$ | 0.003 | 0.003 |
| | (0.019) | (0.018) |
| Panama*Before$_{-3}$ | 0.005 | 0.006 |
| | (0.021) | (0.020) |
| Panama*Before$_{-2}$ | -0.019 | -0.018 |
| | (0.020) | (0.020) |
| Panama*Before$_{-1}$ | -0.005 | -0.002 |
| | (0.036) | (0.035) |
| Panama*After $_{0}$ | -0.026 | -0.026 |
| | (0.021) | (0.021) |
| Panama*After$_{+1}$ | -0.052 | -0.053 |
| | (0.033) | (0.033) |
| Panama*After$_{+2}$ | 0.019 | 0.019 |
| | (0.023) | (0.022) |
| Panama*After$_{+3}$ | -0.018 | -0.016 |
| | (0.027) | (0.026) |
| Panama*After$_{+4}$ | -0.050** | -0.048** |
| | (0.021) | (0.021) |
| Panama*After$_{+5}$ | -0.099*** | -0.097*** |
| | (0.034) | (0.034) |
| Observations | 65,967 | 65,967 |
| R-squared | 0.952 | 0.952 |
| PropertyControls | Y | Y |
| YearMonth FE | Y | Y |
| Project FE | Y | Y |
| BuyerCountry FE | N | Y |
| Sample Period | +-1 year | +-1 year |

Notes: The table reports estimates for DID Pre-trend test, and the dependent variable is the natural logarithm of property transacted price. *Panama* is a binary variable equal to 1 if the buyer is implicated by name in the Panama Papers. The *Before* dummies are bi-monthly indicators that have values of 1 if the transaction occurs in the respective two-month period before the implementation of Estate Agents (Estate Agency Work) Regulations (EAW). For example, *Before$_{-1}$* equals to 1 if the transaction occurs within two months before the regulation takes effect. *After* has a value of 1 if the transaction occurs after the regulation implementation. Control variables not reported here include *No. of Purchased Units*, *Unit Size*, *Property Age (as at purchase)*, *Floor Level*, *and type of sale* (i.e., new sale, resale, sub-sale). Column 1 includes additional *Foreigner* control, while Column 2includes buyer country fixed effect. Columns 1 and 2 are estimated based on two-year rolling window (1 year pre- and post-treatment), with the reference base period being *Before$_{-6}$* (which is omitted here). Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Table 13: Subsample Analysis Based on Repeated Buyers

| | Dependent Variable: Ln (Purchase Price psf) | |
|---|---|---|
| VARIABLES | (1) | (2) |
| Panama | 0.022 | 0.029*** |
| | (0.017) | (0.008) |
| Panama*Aft EAW | -0.028 | |
| | (0.023) | |
| Observations | 4,210 | 84,306 |
| R-squared | 0.967 | 0.944 |
| PropertyControls | Y | Y |
| YearMonth FE | Y | Y |
| PostalSector FE | N | N |
| Project FE | Y | Y |
| BuyerCountry FE | Y | Y |

Notes: Column 1 reports regression estimates for DID regression and Column 2 reports regression estimates for OLS regression. The dependent variable is the natural logarithm of property transacted price. *Panama* is a binary variable equal to 1 if the buyer is implicated by name in the Panama Papers; *Aft EAW* has a value of 1 if the transaction occurs after the Estate Agents (Estate Agency Work) Regulations (EAW) takes effect. Control variables not reported here include *No. of Purchased Units, Unit Size, Property Age (as at purchase), Floor Level, and type of sale* (i.e., new sale, resale, sub-sale). In Column 1, the sample includes only repeated buyers with both transactions before and transactions after the EAW regulation. In Column 2, the treatment group (*Panama* equal to 1) excludes buyers' first-time purchases, and only transactions before regulation are included. Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Table 14: Cross Sectional Heterogeneity Effects of the EAW Regulation

| | Dependent Variable: Ln (Purchase Price psf) | | | |
|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) |
| Panama | -0.007 | -0.003 | -0.005 | -0.006 |
| | (0.007) | (0.004) | (0.007) | (0.005) |
| Foreigner | 0.008*** | 0.013*** | 0.008*** | 0.008*** |
| | (0.002) | (0.002) | (0.002) | (0.001) |
| Resale | | | -0.069** | -0.058*** |
| | | | (0.027) | (0.014) |
| Panama*AftEAW | -0.001 | -0.005 | -0.026* | -0.007 |
| | (0.011) | (0.010) | (0.014) | (0.011) |
| Panama*Foreigner | 0.027** | 0.021** | | |
| | (0.012) | (0.009) | | |
| Foreigner*AftEAW | 0.000 | -0.008** | | |
| | (0.003) | (0.003) | | |
| Panama*Foreigner*AftEAW | -0.055*** | -0.038** | | |
| | (0.020) | (0.016) | | |
| Panama*Resale | | | 0.022* | 0.025*** |
| | | | (0.011) | (0.008) |
| Resale*AftEAW | | | 0.020*** | 0.014* |
| | | | (0.006) | (0.007) |
| Panama*Resale*AftEAW | | | -0.013 | -0.042** |
| | | | (0.020) | (0.017) |
| Observations | 65,967 | 129,904 | 59,837 | 117,708 |
| R-squared | 0.952 | 0.944 | 0.952 | 0.944 |
| YearMonth FE | Y | Y | Y | Y |
| Project FE | Y | Y | Y | Y |
| PropertyControls | Y | Y | Y | Y |
| Sample Period | +-1 year | +-2 year | +-1 year | +-2 year |

Notes: The table reports regression estimates for DDD regression, and the dependent variable is the natural logarithm of property transacted price. *Panama* is a binary variable equal to 1 if the buyer is implicated by name in the Panama Papers; *Aft EAW* has a value of 1 if the transaction occurs after the Estate Agents (Estate Agency Work) Regulations (EAW) takes effect. *Foreigner* equals to 1 if the buyer is not a Singapore citizen; *Resale* takes the value of 1 if the transaction is a resale transaction. Control variables not reported here include *No. of Purchased Units*, *Unit Size*, *Property Age (as at purchase)*, *Floor Level*, *and type of sale* (i.e., new sale, resale, sub-sale). *Type of sale* is not included in the estimations of Columns 3 and 4. Columns 1 and 3 are estimated based on two-year rolling window (1 year pre- and post-treatment); Columns 2 and 4 are estimated based on four-year rolling window (2 years pre- and post-treatment). Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Table 15: Effects of the EAW Regulation on Selling Price

| | Dependent Variable: Ln (Sell Price psf) | | | | | |
|---|---|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) |
| Panama | 0.000 | -0.000 | 0.007 | 0.008 | 0.044*** | 0.045*** |
| | (0.008) | (0.008) | (0.007) | (0.007) | (0.007) | (0.007) |
| Panama*AftEAW | 0.000 | 0.001 | -0.019** | -0.020** | -0.069*** | -0.068*** |
| | (0.012) | (0.012) | (0.010) | (0.010) | (0.010) | (0.010) |
| Ln (Purchase Price) | 0.140*** | 0.140*** | 0.145*** | 0.145*** | 0.163*** | 0.163*** |
| | (0.008) | (0.008) | (0.009) | (0.009) | (0.009) | (0.009) |
| Foreigner | -0.005* | | -0.007*** | | -0.004** | |
| | (0.003) | | (0.002) | | (0.002) | |
| Observations | 30,864 | 30,864 | 55,778 | 55,778 | 148,160 | 148,160 |
| R-squared | 0.952 | 0.952 | 0.946 | 0.946 | 0.929 | 0.929 |
| PropertyControls | Y | Y | Y | Y | Y | Y |
| SellYearMonth FE | Y | Y | Y | Y | Y | Y |
| Project FE | Y | Y | Y | Y | Y | Y |
| BuyerCountry FE | N | Y | N | Y | N | Y |
| Sample Period | +-1 year | +-1 year | +-2 years | +-2 years | Full Sample | Full Sample |

Notes: The table reports regression estimates for DID regression, and the dependent variable is the natural logarithm of property selling price. *Panama* is a binary variable equal to 1 if the seller is implicated by name in the Panama Papers; *AftEAW* takes the value of 1 if the transaction occurs after the Estate Agents (Estate Agency Work) Regulations (EAW) takes effect. *Ln (Purchase Price)* is the natural logarithm of purchase price psf; *Foreigner* has a value of 1 if the buyer is not a Singapore citizen. Control variables not reported here include *Unit Size*, *Property Age (as at sell)*, and *Floor Level*. Columns 1 and 2 are estimated based on two-year rolling window (1 year pre- and post-treatment); Columns 3 and 4 are estimated based on four-year rolling window (2 years pre- and post-treatment); Columns 5 and 6 are estimated using the full sample. Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Table 16: The impact of Panama-linked Transaction on Transacted Prices of Properties Within Block and Within Project

| | Dependent Variable: Ln (Purchase Price psf) | | | |
|---|---|---|---|---|
| | Within Block | | Within Project | |
| VARIABLES | (1) | (2) | (3) | (4) |
| Panama Block | 0.005 | 0.005 | | |
| | (0.006) | (0.005) | | |
| Panama Block *Relative Year$_{-2}$ | 0.007 | 0.007 | | |
| | (0.011) | (0.008) | | |
| Panama Block *Relative Year$_{-1}$ | 0.003 | 0.003 | | |
| | (0.007) | (0.006) | | |
| Panama Block *Relative Year$_{+1}$ | 0.013* | 0.013** | | |
| | (0.007) | (0.006) | | |
| Panama Block *Relative Year$_{+2}$ | -0.004 | -0.004 | | |
| | (0.009) | (0.007) | | |
| Panama Block *Relative Year$_{+3}$ | -0.010 | -0.010 | | |
| | (0.009) | (0.007) | | |
| Panama Project | | | 0.023 | 0.102*** |
| | | | (0.033) | (0.036) |
| Panama Project*Relative Year$_{-2}$ | | | -0.017 | 0.001 |
| | | | (0.013) | (0.015) |
| Panama Project*Relative Year$_{-1}$ | | | 0.001 | -0.006 |
| | | | (0.008) | (0.010) |
| Panama Project*Relative Year$_{+1}$ | | | 0.020** | 0.031*** |
| | | | (0.008) | (0.010) |
| Panama Project*Relative Year$_{+2}$ | | | 0.010 | 0.018 |
| | | | (0.011) | (0.013) |
| Panama Project*Relative Year$_{+3}$ | | | (0.010 | 0.017 |
| | | | (0.012) | (0.015) |
| Observations | 46,710 | 46,710 | 27,648 | 24,349 |
| R-squared | 0.949 | 0.949 | 0.897 | 0.894 |
| PropertyControls | Y | Y | Y | Y |
| YearMonth FE | Y | Y | Y | Y |
| Project FE | Y | Y | N | N |
| Matching Pair FE | N | N | Y | Y |
| Matching Caliper | - | - | 0.05 | 0.01 |
| SE Cluster | Project | Block | Project | Project |

Notes: The table reports regression estimates for OLS regression, and the dependent variable is the natural logarithm of property transacted price. *Panama Block (Project)* is a binary variable equal to 1 if there is at least one Panama-linked transaction occurs in the block (project); *Relative Year* indicators are a set of indicator variables which identify whether the transaction occurs *t* years before or after the Panama-linked transaction occurs. Control variables not reported here include *No. of Purchased Units*, *Foreigner*, *Unit Size*, *Property Age (as at purchase)*, *Floor Level*, and *Type of Sale* (i.e., new sale, resale, sub-sale). Additional control variables are included in Columns 3 and 4, they are *Freehold Tenure*, *Property Type* (i.e., condominium, apartment) and distance measures including distance to the nearest MRT Station and distance to the nearest primary school. All samples only include resale transactions of non-landed properties. Standard errors clustered at the project level (Columns 1,3,4) and block level (Column 2) are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Table 17: The impact of Panama-linked Transaction on Transacted Prices of Properties Within Neighborhood

| | Dependent Variable: Ln (Purchase Price psf) | | | | | |
|---|---|---|---|---|---|---|
| | Postal 4 | | Subsample Analyses | | Postal 3 | |
| | | | Bottom 50th | Top 50th | | |
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) |
| Relative Year$_{-2}$ | 0.006 | -0.000 | 0.005 | -0.001 | 0.010 | 0.008 |
| | (0.010) | (0.010) | (0.013) | (0.020) | 0.010 | 0.010 |
| Relative Year$_{-1}$ | 0.003 | 0.001 | -0.020 | 0.015 | -0.002 | -0.004 |
| | (0.008) | (0.009) | (0.012) | (0.015) | 0.008 | 0.008 |
| Relative Year$_{+1}$ | 0.034*** | 0.033*** | 0.021 | 0.035** | 0.023** | 0.022** |
| | (0.010) | (0.010) | (0.013) | (0.017) | 0.009 | 0.009 |
| Relative Year$_{+2}$ | 0.006 | 0.007 | 0.011 | -0.005 | -0.009 | -0.009 |
| | (0.010) | (0.010) | (0.014) | (0.017) | 0.008 | 0.008 |
| Relative Year$_{+3}$ | -0.006 | -0.004 | 0.000 | -0.013 | -0.019* | -0.019* |
| | (0.012) | (0.012) | (0.015) | (0.019) | 0.010 | 0.010 |
| Observations | 13,233 | 13,233 | 6,210 | 7,023 | 32,706 | 32,706 |
| R-squared | 0.893 | 0.904 | 0.890 | 0.868 | 0.843 | 0.847 |
| PropertyControls | Y | Y | Y | Y | Y | Y |
| YearMonth FE | Y | Y | Y | Y | Y | Y |
| Postal4 FE | Y | N | N | N | N | N |
| Postal3 FE | N | N | Y | Y | Y | N |
| QuarterPostal FE | N | Y | N | N | N | Y |

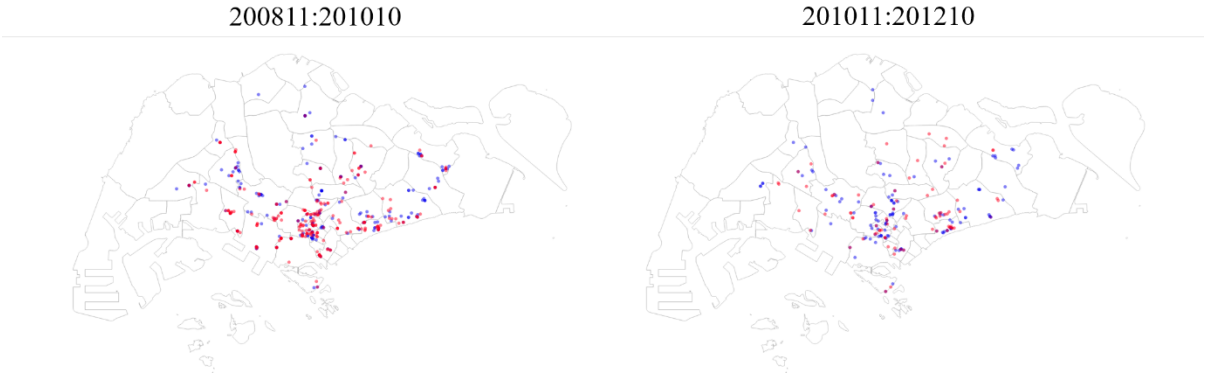
Notes: The table reports regression estimates for OLS regression, and the dependent variable is the natural logarithm of property transacted price. *Relative Year* indicators are a set of indicator variables which identify whether the transaction occurs *t* years before or after the Panama-linked transaction occurs. For example, $Relative\ Year_{+1}$ includes all transactions of properties located in the same neighbourhood that occur in the quarter or in subsequent three quarters in which the Panama-linked transaction occurred. For Columns 1 to 4, a neighborhood is defined based on the first four digits of the 6-digit postal code; for Columns 5 and 6, a neighborhood is defined based on the first three digits of the 6-digit postal code. Control variables not reported here include *Foreigner, Unit Size, Property Age (as at purchase), Floor Level, No. of Purchased Units, Freehold Tenure, distance measures, Property Type* (i.e., condominium, apartment, terrace house, semi-detached house and detached house), and *Type of Sale* (i.e., new sale, resale, sub-sale). All samples exclude Panama projects and only include resale transactions. Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Table 18 Subsample Analysis on the impact of Panama-linked Transaction on Transacted Prices of Properties Within Block, Project and Neighborhood After EAW Policy

| | Dependent Variable: Ln (Purchase Price psf) | | | | | |
|---|---|---|---|---|---|---|
| | Block | | Project | | Postal4 | |
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) |
| Panama Block | 0.009 | 0.009* | | | | |
| | (0.006) | (0.005) | | | | |
| Panama Project | | | 0.101** | 0.181*** | | |
| | | | (0.041) | (0.052) | | |
| Panama Block/Project*Relative Year$_{-2}$ | 0.000 | 0.000 | 0.031 | 0.032 | 0.002 | 0.020 |
| | (0.010) | (0.008) | (0.024) | (0.023) | (0.023) | (0.029) |
| Panama Block/Project*Relative Year$_{-1}$ | 0.003 | 0.003 | 0.026* | 0.021 | -0.001 | 0.007 |
| | (0.009) | (0.008) | (0.015) | (0.014) | (0.016) | (0.019) |
| Panama Block/Project*Relative Year$_{+1}$ | 0.001 | 0.001 | -0.005 | 0.004 | -0.016 | -0.013 |
| | (0.006) | (0.006) | (0.010) | (0.009) | (0.013) | (0.018) |
| Panama Block/Project*Relative Year$_{+2}$ | -0.011 | -0.011* | 0.003 | 0.021 | -0.034* | -0.041* |
| | (0.007) | (0.006) | (0.017) | (0.016) | (0.020) | (0.024) |
| Panama Block/Project*Relative Year$_{+3}$ | -0.016** | -0.016** | -0.004 | 0.025 | -0.043 | -0.045 |
| | (0.008) | (0.007) | (0.023) | (0.019) | (0.027) | (0.033) |
| Observations | 10,417 | 10,417 | 5,566 | 4,763 | 3,591 | 3,591 |
| R-squared | 0.958 | 0.958 | 0.912 | 0.919 | 0.871 | 0.885 |
| PropertyControls | Y | Y | Y | Y | Y | Y |
| YearMonth FE | Y | Y | Y | Y | Y | Y |
| Project FE | Y | Y | N | N | N | N |
| PSM Matching Pair FE | - | - | Y | Y | - | - |
| Postal4 FE | N | N | N | N | Y | N |
| Quarter Postal4 FE | N | N | N | N | N | Y |
| PSM Matching Caliper | - | - | 0.05 | 0.01 | - | - |
| SE Cluster | Project | Block | Project | Project | Project | Project |

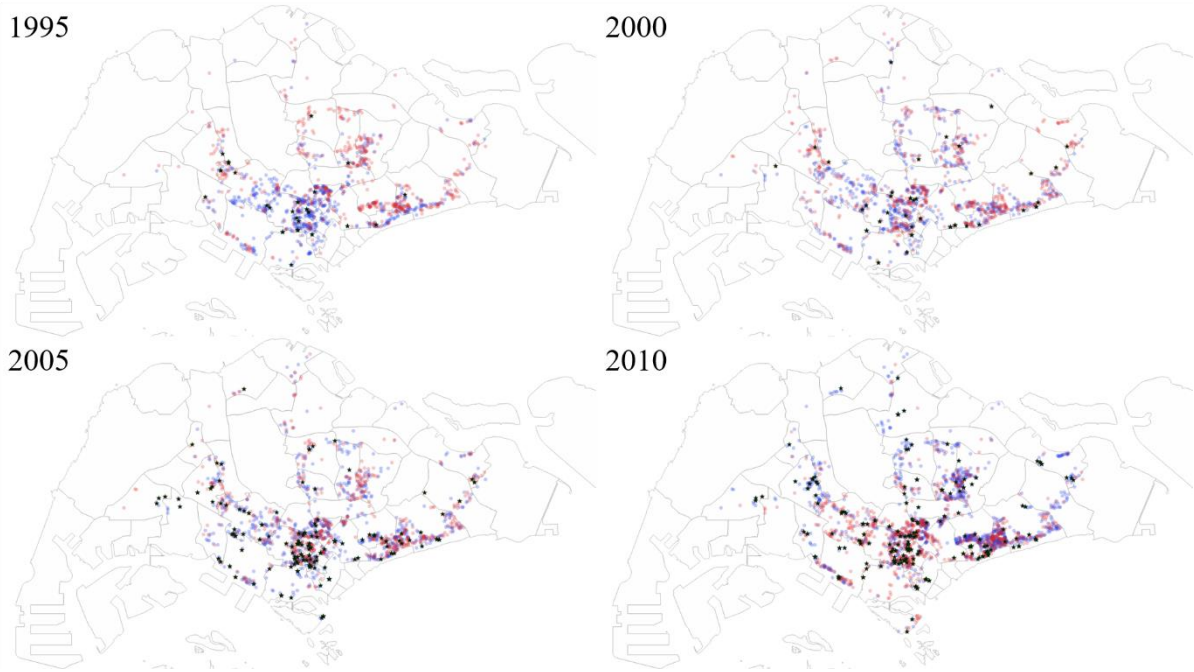
Notes: The table reports regression estimates for OLS regression, and the dependent variable is the natural logarithm of property transacted price. *Panama Block (Project)* is a binary variable equal to 1 if there is at least one Panama-linked transaction occurs in the block (project); *Relative Year* indicators are a set of indicator variables which identify whether the transaction occurs *t* years before or after the Panama-linked transaction occurs. Control variables not reported here include *No. of Purchased Units*, *Foreigner*, *Unit Size*, *Property Age (as at purchase)*, *Floor Level*, and *Type of Sale* (i.e., new sale, resale, sub-sale). Additional control variables are included in Columns 3 to 6, they are *Freehold Tenure*, *Property Type* (i.e., condominium, apartment) and distance measures including distance to the nearest MRT Station and distance to the nearest primary school. All samples only include resale transactions: transactions of non-landed properties and Panama-linked transactions are excluded from estimations in Columns 1 to 4, while Panama projects are excluded from estimations in Columns 5 and 6. Standard errors clustered at the project level (Columns 1,3-6) and block level (Column 2) are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Figure 1: Distribution of Panama-linked Transactions and Overpayment Pre- and Post- EAW Regulation



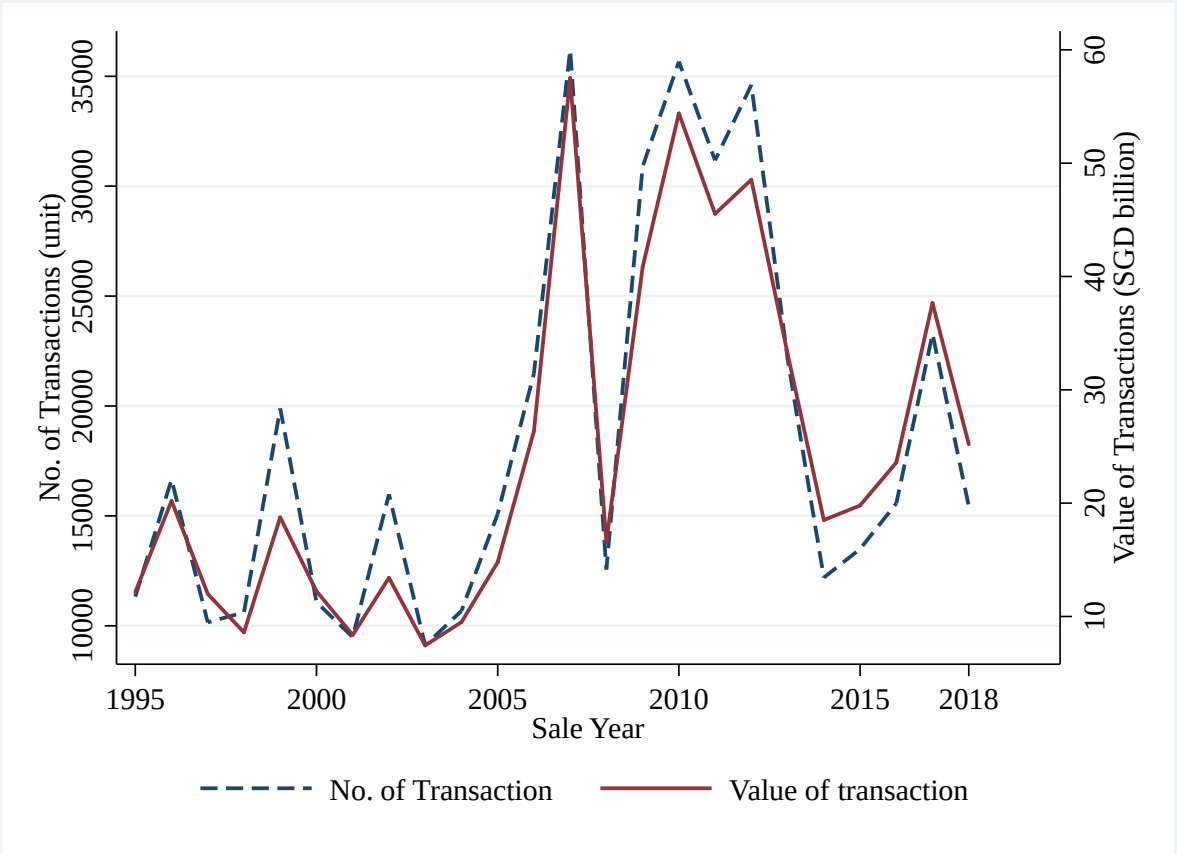

Notes: The figure plots the distribution of Panama-linked transactions and overpayment from November 2008 to October 2010 (left panel), and November 2010 to October 2012 (right panel). Red and blue dots represent overpayment and underpayment respectively. They are categorized based on the standard errors derived from hedonic regression that regresses natural logarithm of transacted price per square foot on a set of hedonic attributes, purchase year month fixed effect and project fixed effect.

Figure 2: Distribution of Overpayment and Panama-linked Transactions from 1995 to 2010



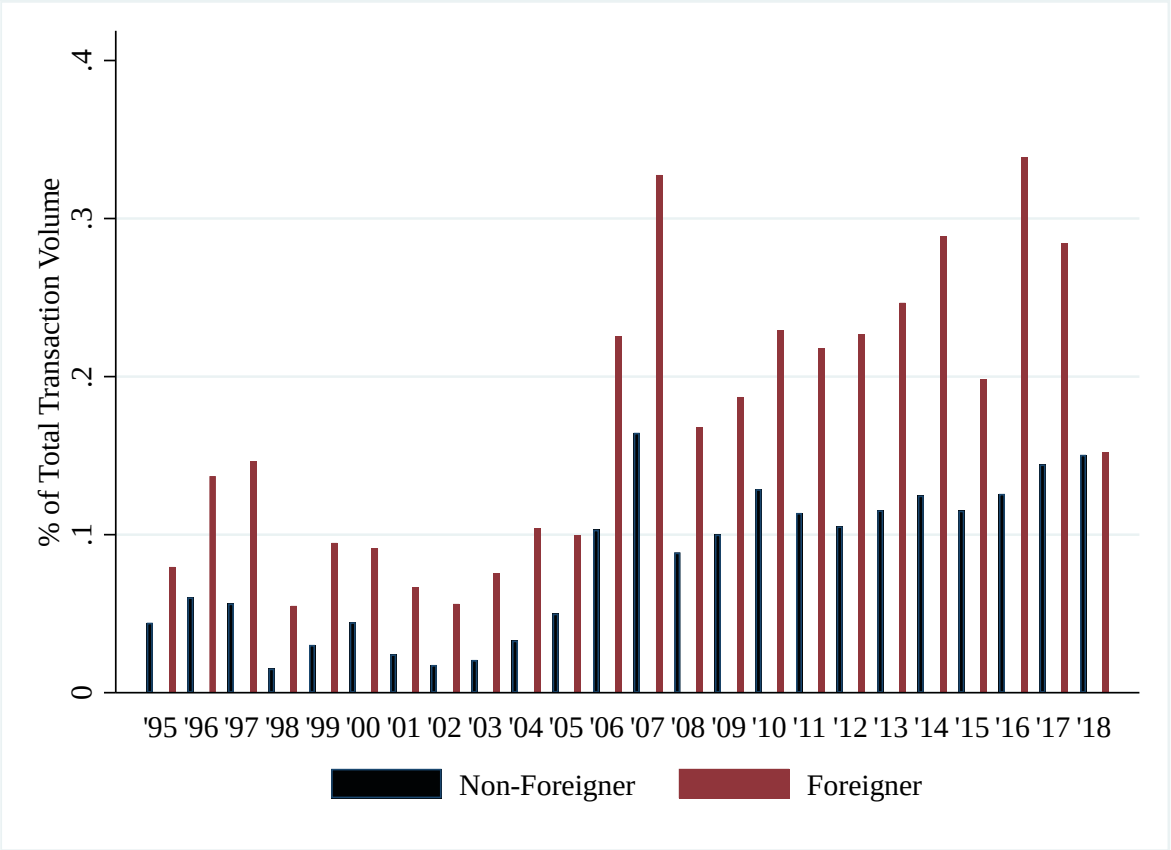

Notes: The figure plots the distribution of overpayment and Panama-linked transactions from 1995 to 2010. Black markers represent Panama-linked transactions, while red and blue dots represent overpayment and underpayment respectively. Transaction-level overpayment/underpayment is represented by the standard errors derived from hedonic regression that regresses natural logarithm of transacted price per square foot on a set of hedonic attributes, purchase year month fixed effect and project fixed effect. For non-landed properties, a project is classified as "overpayment" if more than 50% of the transactions are overpaid.

Figure 3: Total Number and Value of Private Property Transactions by Year



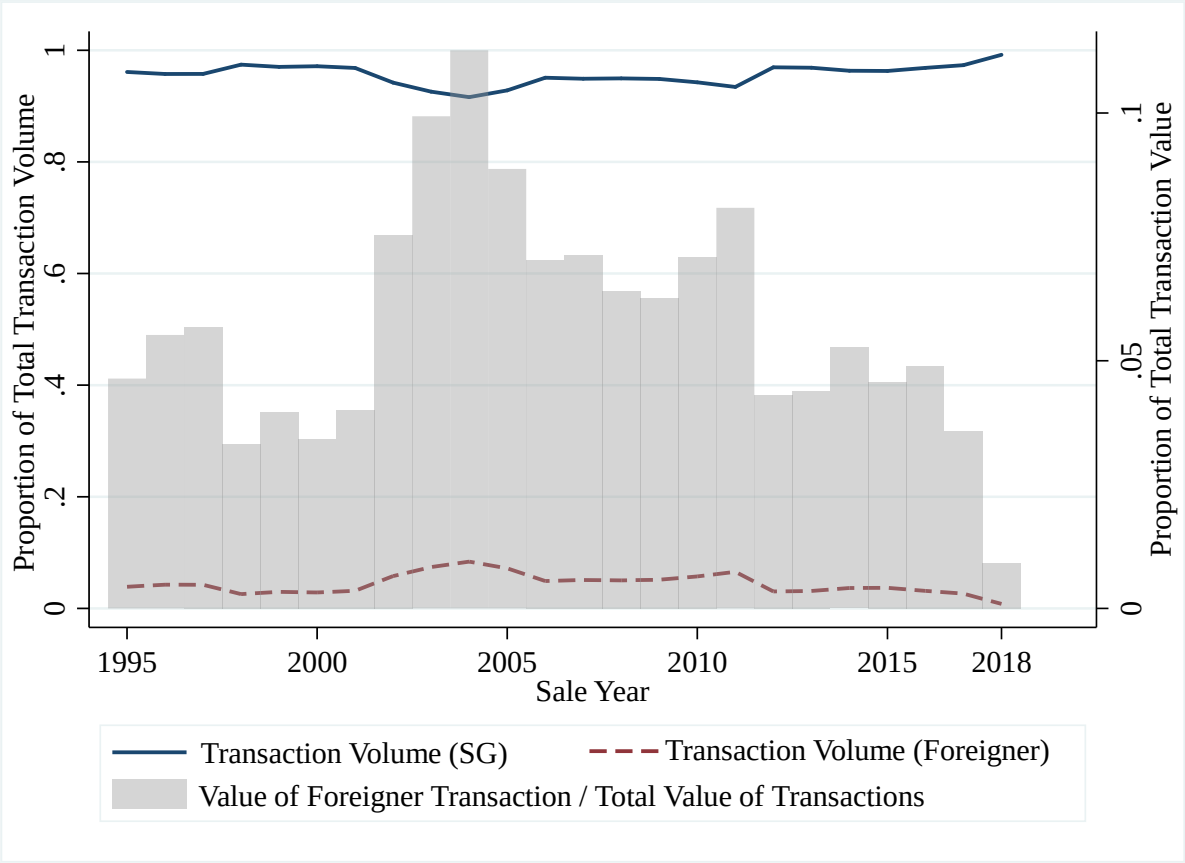

Notes: The figure shows the total number and value of transactions in Singapore property market over the years from 1995 to 2018.

Figure 4: Percentage of Top 10% luxurious Transaction Volume by Year and Foreigner Status



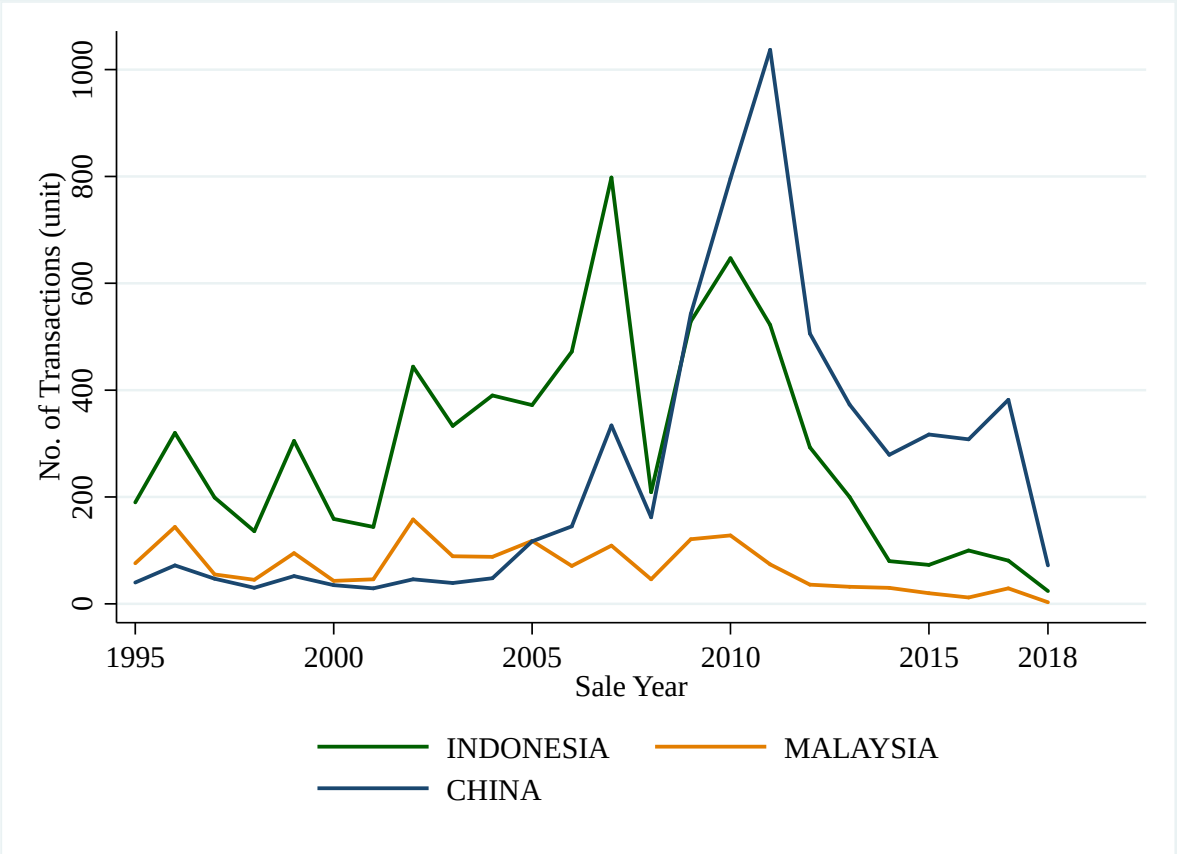

Notes: The figure shows the proportion of foreign purchases in top 10% luxurious property transactions.

Figure 5: Proportion of Private Property Transactions by Year and Foreigner Status



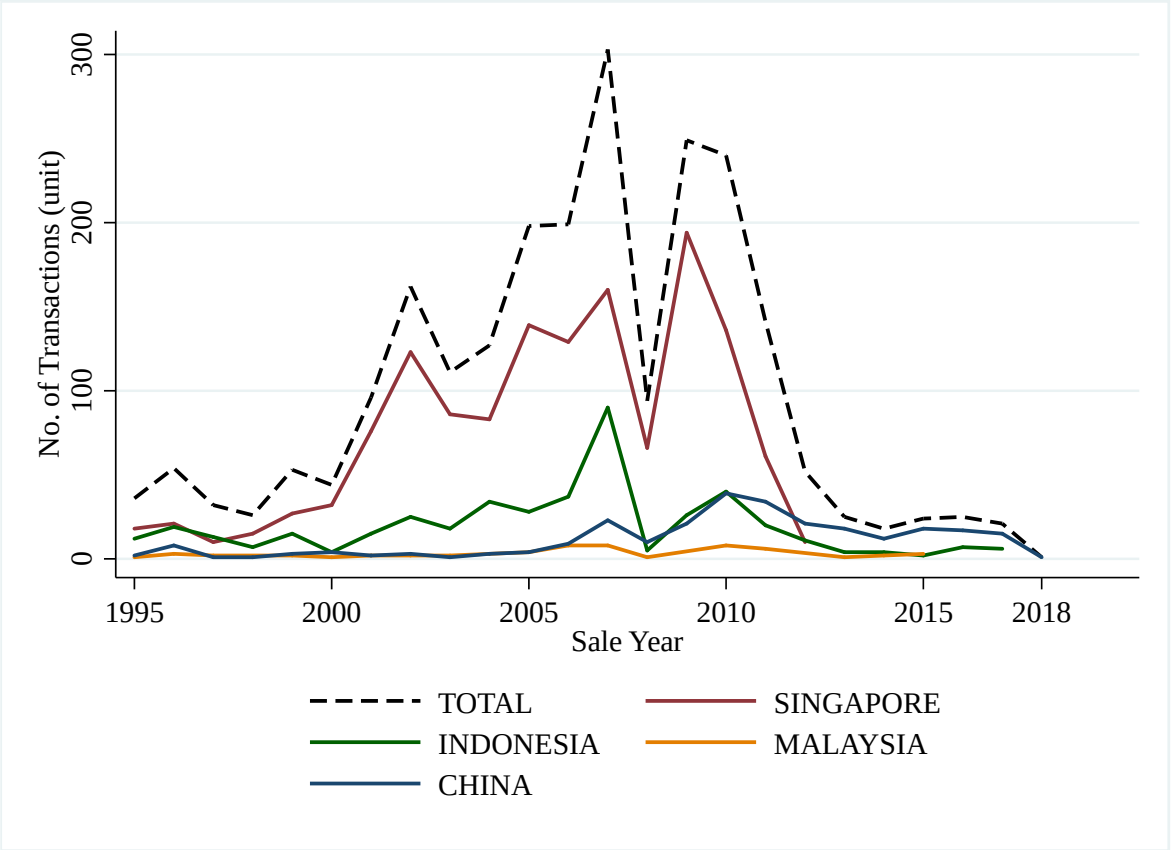

Notes: The figure shows the proportion of transaction volume by year and foreigner status.

Figure 6: Number of Foreign Property Purchase by Year and Nationality



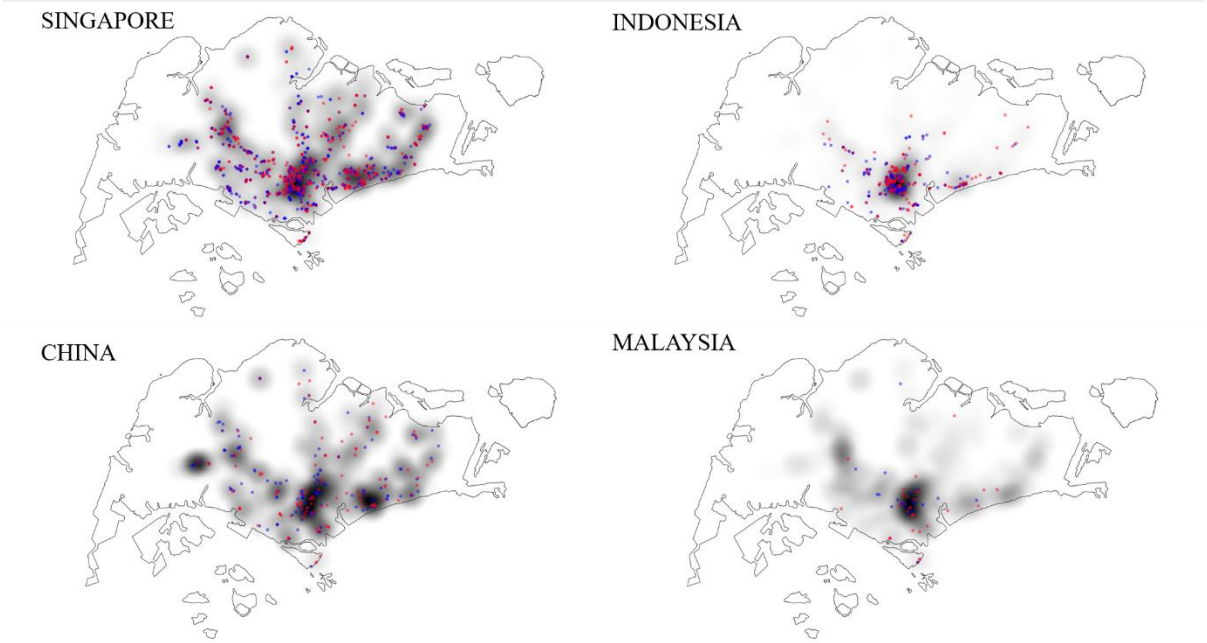

Notes: The figure shows the total number of foreign purchases by year and buyer's nationality.

Figure 7: Number of Panama Transactions by Year and Nationality



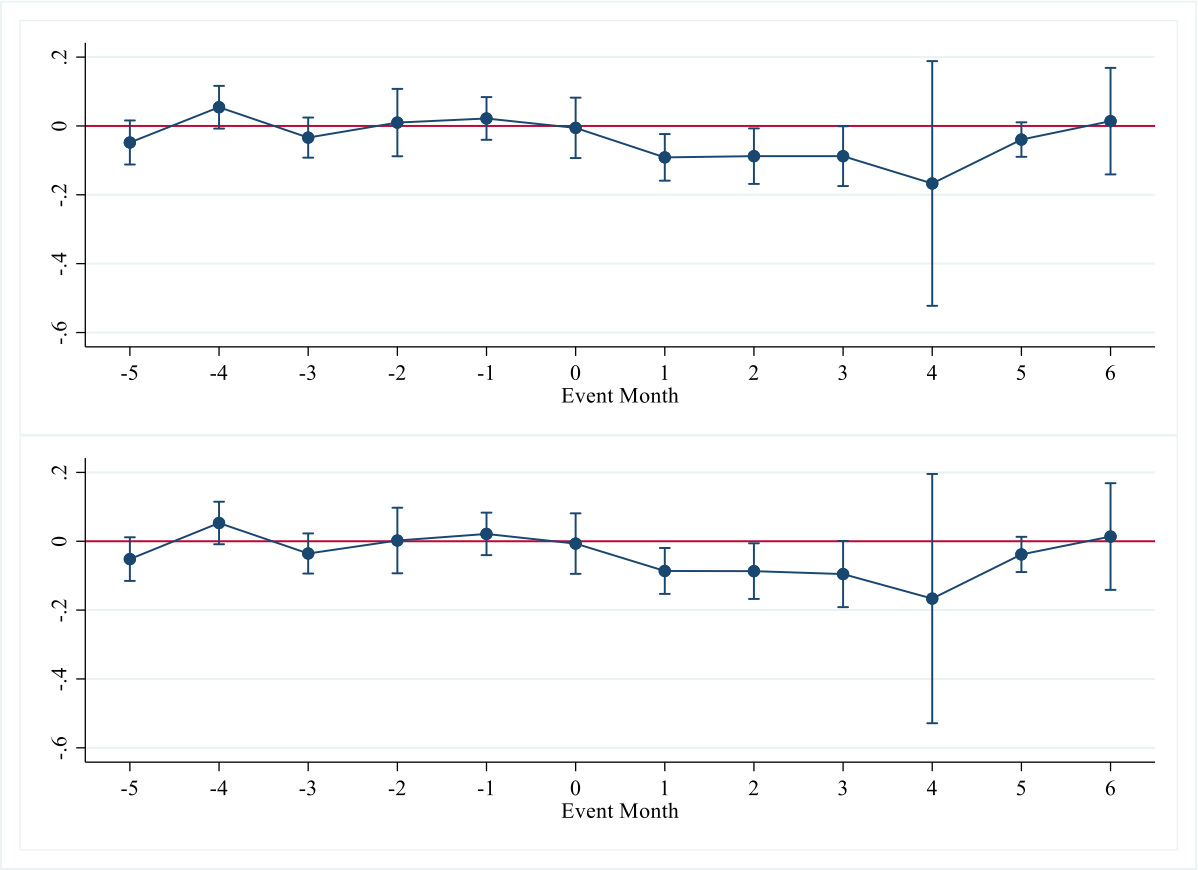

Notes: The figure shows the total number of Panama-linked transactions by year and buyer's nationality.

Figure 8: Distribution of Panama-linked Transactions by Overpayment status and Buyer's Nationality



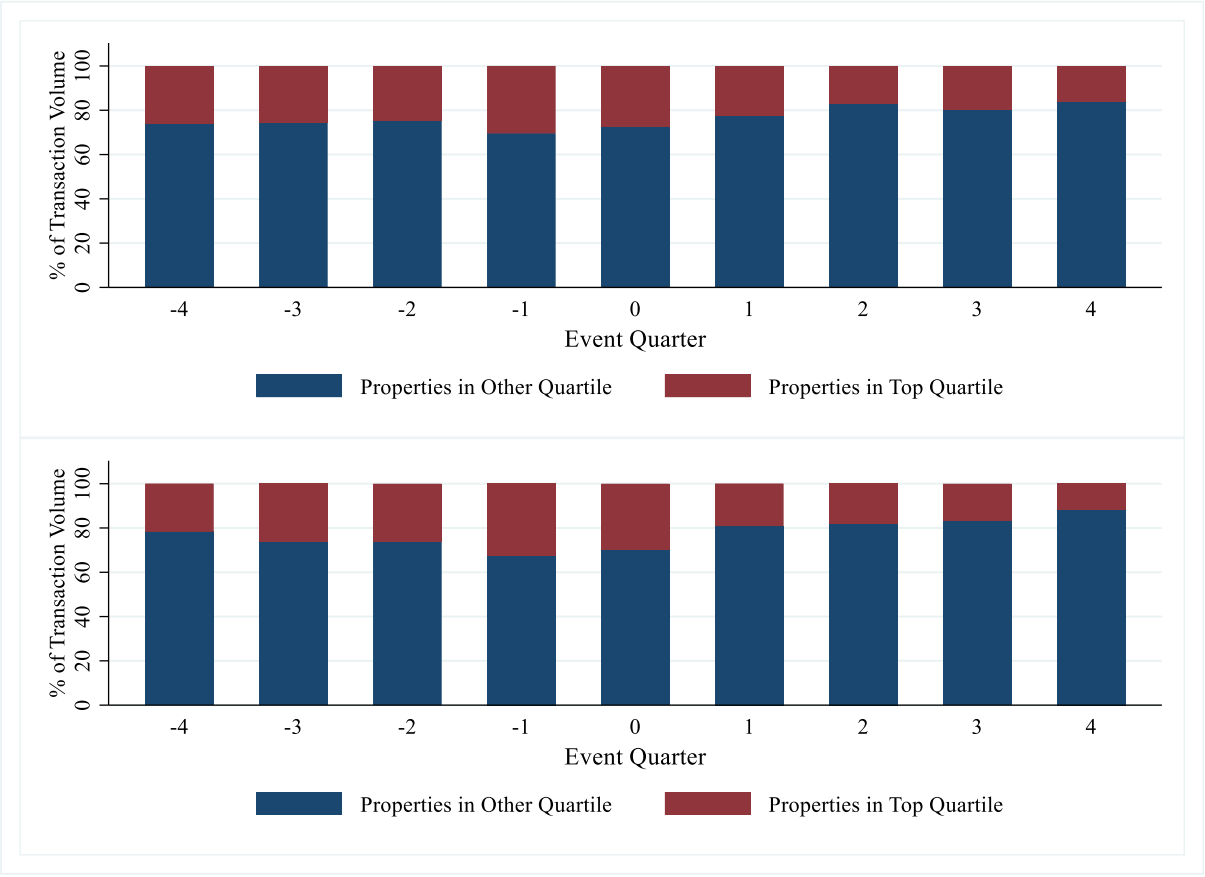

Notes: The figure plots the distribution of Panama-linked transactions by overpayment status and buyer's nationality from 1995 to 2018. The Panama-linked transactions, indicated by the red and blue dots, are overlaid on the black-white gradient heatmap that illustrates the concentration of non-Panama-linked transactions made by the buyers of the same nationality. Red and blue dots represent Panama-linked transactions that are overpaid and underpaid respectively. The categorization of transaction overpayment and underpayment is based on the standard errors derived from hedonic regression that regresses natural logarithm of transacted price per square foot on a set of hedonic attributes, purchase year month fixed effect and project fixed effect.

Figure 9: Estimated Selling Price Response to CBCRR Policy Shock



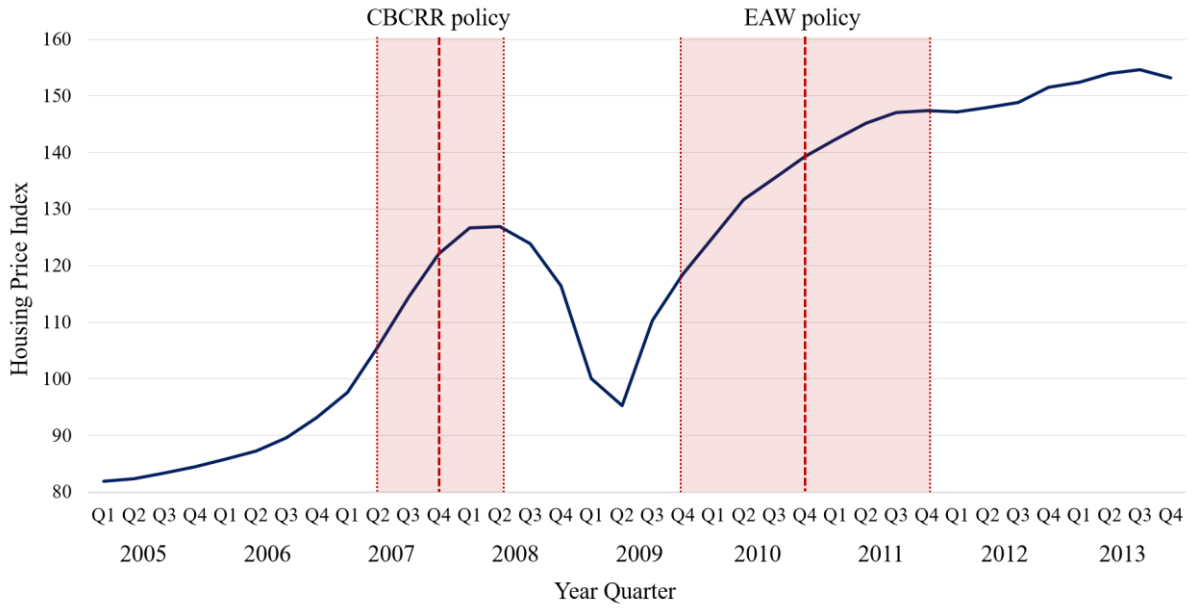

Notes: The figure plots the coefficient on *Panama* dummy for DID Pre-trend test, and the dependent variable is the natural logarithm of property selling price. *Panama* is a binary variable equal to 1 if the seller is implicated by name in the Panama Papers. The event studied here is the implementation of Cross-Border Currency/ Bearer Negotiable Instruments Reporting Regime (CBCRR) on 1st November 2007, we use sample covering 6 months before and after the policy introduction. Control variables include *Ln (Purchase Price)*, *Unit Size*, *Property Age (as at sell)*, and *Floor Level*. The upper panel includes additional *Foreigner* control, while the bottom panel includes buyer country fixed effect. Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

Figure 10: Transaction Volume by Property Segments Pre- and Post-CBCRR Policy Shock




Notes: The figure shows the proportion of transaction volume by property segments. The time indicator in the horizontal axis is denoted as Event Quarter, it corresponds to the implementation of Cross-Border Currency/ Bearer Negotiable Instruments Reporting Regime (CBCRR) policy on 1st November 2007. For instance, Event Quarter$_0$ comprises property transactions occurred within the three-month period after the policy was implemented, while Event Quarter$_{-1}$ comprises transactions occurred in the 3-month period before the policy introduction. Properties are categorized into five quartiles based on properties' average transacted price per square foot in developer sales (the upper panel), or properties' absolute transacted price (the bottom panel), with the top quartile containing properties in the highest-end segment (5th quartile).

Figure 11: Singapore Housing Price Index




Notes: The figure plots the housing price index obtained from REALIS. The red dotted vertical lines indicate the period during which the policies, namely Cross-Border Currency/ Bearer Negotiable Instruments Reporting Regime (CBCRR) and Estate Agents (Estate Agency Work) Regulation (EAW), were introduced. The shaded time periods represent 1-year rolling window (6-month before and after) of CBCRR policy, and 2-year rolling window (1-year before and after) of EAW policy.

**Appendix**

A1: Summary Statistics for Countries/Region of Individuals Connected to The Panama Papers

| COUNTRY/ REGION | N | % |
|---|---|---|
| Taiwan | 13658 | 25.79 |
| China-Hong Kong | 10409 | 19.66 |
| China | 7487 | 14.14 |
| United States | 3653 | 6.90 |
| Singapore | 3364 | 6.35 |
| Indonesia | 2287 | 4.32 |
| Russia | 2012 | 3.80 |
| Malaysia | 1319 | 2.49 |
| Thailand | 605 | 1.14 |
| United Kingdom | 602 | 1.14 |
| India | 592 | 1.12 |
| Canada | 537 | 1.02 |
| Australia | 485 | 1.01 |
| Philippines | 446 | 0.92 |
| Japan | 444 | 0.84 |
| Cyprus | 289 | 0.84 |
| Switzerland | 271 | 0.55 |
| United Arab Emirates | 203 | 0.51 |
| Germany | 162 | 0.38 |
| Venezuela | 161 | 0.31 |

Notes: The table provides summary statistics of officers, who are individuals responsible for offshore entities implicated in the Panama Papers. Countries are sorted by the number of officers.

A2: Summary Statistics of Panama-linked Transactions by Country/Region

| RANK | COUNTRY/REGION | N | FREQ (%) | % of TOTAL |
|---|---|---|---|---|
| 1 | Singapore | 1386 | 59.46 | 0.33 |
| 2 | Indonesia | 442 | 18.96 | 6.30 |
| 3 | China | 270 | 11.58 | 4.65 |
| 4 | Malaysia | 56 | 2.40 | 3.36 |
| 5 | China-Hong Kong | 28 | 1.20 | 9.93 |
| 6 | United Kingdom | 26 | 1.12 | 4.02 |
| 7 | Others | 19 | 0.82 | 10.27 |
| 8 | India | 18 | 0.77 | 4.18 |
| 9 | Taiwan | 16 | 0.69 | 4.61 |
| 10 | South Korea | 13 | 0.56 | 1.24 |
| 11 | Australia | 10 | 0.43 | 3.14 |
| 12 | United States | 9 | 0.39 | 2.92 |
| 13 | Canada | 5 | 0.21 | 4.35 |
| 14 | Austria | 4 | 0.17 | 28.57 |
| 14 | Germany | 4 | 0.17 | 5.13 |
| 14 | Philippines | 4 | 0.17 | 2.55 |
| 14 | Thailand | 4 | 0.17 | 6.35 |
| 18 | Bangladesh | 3 | 0.13 | 5.66 |
| 18 | Japan | 3 | 0.13 | 0.88 |
| 19 | Sri Lanka | 2 | 0.09 | 7.69 |
| 19 | Sweden | 2 | 0.09 | 10.00 |
| 20 | France | 1 | 0.04 | 1.01 |
| 20 | Ireland | 1 | 0.04 | 2.78 |
| 20 | Nepal | 1 | 0.04 | 10.00 |
| 20 | Russia | 1 | 0.04 | 3.57 |
| 20 | Spain | 1 | 0.04 | 8.33 |
| 20 | Switzerland | 1 | 0.04 | 2.08 |
| 20 | Vietnam | 1 | 0.04 | 0.50 |

Notes: The table provides summary statistics of property transactions in Singapore housing market whose buyers are implicated in the Panama Papers. Countries/regions are sorted by the number of Panama-linked transactions.

A3: Summary Statistics of Transparency Indicators by Purchaser's Connection to The Panama Papers

| | | | | | |
|---|---|---|---|---|---|
| | | **Panama==0** | | | |
| | (1) | (2) | (3) | (4) | (5) |
| VARIABLES | N | mean | sd | min | max |
| CPI | 441,881 | 83.28 | 8.676 | 17.43 | 90 |
| Bribery % | 441,863 | 6.37 | 3.17 | 1 | 61 |
| No. Power Players $_{Panama}$ | 442,056 | 0.060 | 0.464 | 0 | 4 |
| No. Power Players $_{Both}$ | 442,056 | 0.099 | 0.559 | 0 | 5 |
| | | **Panama==1** | | | |
| CPI | 2,312 | 67.84 | 22.54 | 26.14 | 87.14 |
| Bribery % | 2,312 | 11.4 | 8.50 | 1 | 61 |
| No. Power Players $_{Panama}$ | 2,331 | 0.535 | 1.307 | 0 | 4 |
| No. Power Players $_{Both}$ | 2,331 | 0.977 | 1.457 | 0 | 5 |

Notes: The table presents summary statistics of transparency indicators identified by the *Panama buyer* status. *CPI* is the average of Corruption Perception Index (CPI) from 2012 to 2018 obtained from Transparency International; *Bribery %* is the average bribery rate from 2004 to 2018 collected from Global Corruption Barometer; *No. Power Players*$_{panama}$ is the number of current and former heads of government and their close associates implicated by name in the Panama Papers; *No. Power Players*$_{Both}$ considers information from both the Panama Papers and the Paradise Papers.

A4: Transparency Indicators by Country/Region

| COUNTRY/ REGION | CPI | Bribery % | No. Power Players | No. Power Players (2) |
|---|---|---|---|---|
| Sweden | 87.14 | 1.00 | 0 | 0 |
| Switzerland | 85.57 | 3.00 | 1 | 3 |
| Singapore | 85.00 | 5.83 | 0 | 0 |
| Canada | 82.00 | 3.38 | 0 | 3 |
| Germany | 79.86 | 2.75 | 0 | 0 |
| Australia | 79.71 | 2.33 | 1 | 1 |
| United Kingdom | 78.86 | 3.67 | 3 | 5 |
| China-Hong Kong | 75.86 | 3.90 | 0 | 0 |
| Japan | 73.96 | 3.09 | 0 | 1 |
| United States | 73.71 | 5.00 | 0 | 4 |
| Austria | 73.14 | 4.71 | 0 | 1 |
| Ireland | 72.86 | 4.00 | 0 | 0 |
| France | 70.29 | 4.50 | 1 | 1 |
| Taiwan | 61.71 | 8.56 | 0 | 0 |
| Spain | 59.29 | 3.18 | 2 | 2 |
| South Korea | 54.86 | 4.00 | 0 | 0 |
| Malaysia | 49.14 | 23.00 | 1 | 1 |
| China | 38.86 | 16.20 | 4 | 4 |
| India | 38.43 | 40.64 | 1 | 3 |
| Sri Lanka | 37.71 | 15.83 | 0 | 0 |
| Thailand | 36.57 | 21.56 | 0 | 0 |
| Philippines | 35.43 | 17.88 | 0 | 0 |
| Indonesia | 35.14 | 24.73 | 0 | 2 |
| Vietnam | 32.14 | 45.00 | 0 | 0 |
| Nepal | 29.29 | 31.67 | 0 | 0 |
| Russia | 28.29 | 24.90 | 2 | 2 |
| Bangladesh | 26.14 | 61.00 | 0 | 0 |

Notes: The table ranks country/region by transparency indicators. *CPI* is the average of Corruption Perception Index (CPI) from 2012 to 2018 obtained from Transparency International; *Bribery %* is the average bribery rate from 2004 to 2018 collected from Global Corruption Barometer; *No. Power Players*$_{panama}$ is the number of current and former heads of government and their close associates implicated by name in the Panama Papers; *No. Power Players*$_{Both}$ considers information from both the Panama Papers and the Paradise Papers.

A5: Descriptive Statistics of Original Sample and Propensity Score Matched Sample

| | Treatment | | Control | | |
|---|---|---|---|---|---|
| VARIABLES | Mean | SD | Mean | SD | Diff. |
| **Before Matching** | | | | | |
| Project Size | 231.241 | 8.396 | 74.715 | 3.168 | -156.527*** |
| Dist. to CBD | 6.588 | 0.141 | 6.305 | 0.062 | -0.284** |
| Dist. to MRT | 1.085 | 0.029 | 1.014 | 0.016 | -0.071** |
| Dist. to School | 0.724 | 0.017 | 0.646 | 0.008 | -0.078*** |
| Property Age | 17.106 | 0.367 | 25.425 | 0.333 | 8.319*** |
| Tenure | 0.682 | 0.017 | 0.913 | 0.006 | 0.231*** |
| Project Observations | 786 | | 2352 | | |
| **After Matching** | | | | | |
| Project Size | 163.066 | 7.710 | 138.692 | 8.588 | -24.374** |
| Dist. to CBD | 6.461 | 0.167 | 6.313 | 0.168 | 0.237 |
| Dist. to MRT | 1.043 | 0.037 | 1.085 | 0.036 | 0.051 |
| Dist. to School | 0.662 | 0.018 | 0.715 | 0.020 | 0.027* |
| Property Age | 18.000 | 0.482 | 18.018 | 0.625 | 0.790 |
| Tenure | 0.766 | 0.019 | 0.780 | 0.019 | 0.027 |
| Project Observations | 500 | | 500 | | |

Note: The table compares the development characteristics of *Panama* projects and non-*Panama* projects pre- and post-matching using matching caliper width of 0.01. We report the mean, the standard deviation and the mean differences based on t-test. *Project Size* is the number of property units in the development; distance measures include distance to Central Business District (km), distance to nearest primary school (km) and distance to nearest MRT Station (km); *Property Age* is the age of development as in 2019; *Tenure* is a binary variable equal to 1 if the property is a freehold project.

A6: Tests for Panama Premium by Local Buyers

| | Foreign Buyers | Local Buyers | | | Foreign Buyers | Local Buyers Resale Transactions | |
|---|---|---|---|---|---|---|---|
| | OLS | OLS | OLS | Probit | Probit | Probit | OLS |
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Panama | 0.037*** | 0.034*** | 0.036*** | 0.039** | 0.006 | 0.010*** | 0.033*** |
| | (0.007) | (0.006) | (0.006) | (0.016) | (0.020) | (0.002) | (0.011) |
| Panama Seller | | | | | | | 0.037** |
| | | | | | | | (0.017) |
| Panama*Panama Seller | | | | | | | 0.216** |
| | | | | | | | (0.087) |
| Observations | 19,773 | 80,308 | 79,475 | 61,186 | 12,755 | 21,768 | 24,169 |
| R-squared | 0.872 | 0.872 | 0.872 | | | | 0.875 |
| PropertyControls | Y | Y | Y | Y | Y | Y | Y |
| Buyer Attribute Controls | N | N | Y | N | N | N | N |
| Year FE | N | N | N | Y | Y | Y | N |
| YearMonth FE | Y | Y | Y | N | N | N | Y |
| PlanningRegion FE | N | N | N | Y | Y | Y | N |
| PostalSector FE | Y | Y | Y | N | N | N | Y |

Notes: The table reports regression estimates for OLS regression in Columns 1 to 3 and 7, and marginal effects in Probit regressions in Columns 4 to 6. In Columns 1-3 and 7, the dependent variable is the natural logarithm of property transacted price. In Columns 4 and 5, the dependent variable *Superior Unit Dummy* takes the value of 1 if the property purchased has a new sale price higher than the average new sale price of all units within the project; in Column 6, *Panama Seller Dummy* is the dependent variable, which is equal to 1 if the buyer purchases the property from a seller who is implicated by name in the Panama Papers. *Panama* is a binary variable equal to 1 if the seller is implicated by name in the Panama Papers. Property Controls not reported here include *No. of Purchased Units, Unit Size, Property Age (as at purchase), Floor Level, Freehold Tenure, distance measures, property type* and *type of sale* (i.e., new sale, resale, sub-sale). *Buyer Attribute Controls* includes buyer's race (eg., Chinese, Indian, Malay, others), marital status dummy, age, gender, and agent indicator that takes a value of 1 if the buyer is a property agent. Regressions in Columns 1 and 5 are estimated using sample of transactions involving foreign buyers while Columns 2-4 use transactions made by local buyers with buyer's details; Column 6 and 7 are estimated using resale transactions by local buyers. Clustered standard errors at the project level (OLS Regression) and robust standard errors (Probit Regression) are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance

A7: HDB Upgraders and Connection to the Panama Papers

| Dependent Variable: | Ln (Transacted Price S$ psf) | Mortgage Dummy | CPF Dummy |
|---|---|---|---|
| VARIABLES | (1) | (2) | (3) |
| Panama | 0.015** | -0.049** | -0.066*** |
| | (0.007) | (0.021) | (0.021) |
| Ln (Purchase Price) | | -0.073*** | 0.057*** |
| | | (0.007) | (0.006) |
| Observations | 34,548 | 29,979 | 33,276 |
| R-squared | 0.890 | | |
| Property Controls | Y | N | N |
| Buyer Attr. Controls | N | Y | Y |
| YearMonth FE | Y | N | N |
| PostalSector FE | Y | N | N |
| Sample | HDB Upgraders | HDB Upgraders | HDB Upgraders |

Notes: The table reports regression estimates for OLS regression in Column 1, and marginal effects in Probit regressions in Column 2 and 3. In Column 1, the dependent variable is the natural logarithm of property transacted price; in Column 2, *Mortgage Dummy* takes the value of 1 if the buyer obtains a mortgage to finance the property purchase; in Column 3, *Mortgage Dummy* is equal to 1 if the buyer purchases the property using CPF savings. *Panama* is a binary variable equal to 1 if the seller is implicated by name in the Panama Papers; *Ln (Purchase Price)* is the natural logarithm of purchase price psf. *Property Controls* not reported here include *No. of Purchased Units*, *Unit Size*, *Property Age (as at purchase)*, *Floor Level*, *Freehold Tenure*, *distance measures*, *property type* (i.e., condominium, apartment, terrace house, semi-detached house and detached house) and *type of sale* (i.e., new sale, resale, sub-sale). *Buyer Attributes Controls* include buyer's *race*, *gender*, *age (as at purchase)*, *marital status*, , and agent indicator that takes a value of 1 if the buyer is a property agent. All regressions are estimated using sample of transactions whose buyers are HDB upgraders who dwell in subsidized public housing as at purchase. Clustered standard errors at the project level (OLS Regression) and robust standard errors (Probit Regression) are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

A8: Real Estate Agents and Connection to the Panama Papers

| Dependent Variable: | Ln (Transacted Price S$ psf) | Hold Dummy | Ln ($\frac{Selling\ Price\ S\$\ psf}{Purchase\ Price\ S\$\ psf}$) |
|---|---|---|---|
| VARIABLES | (1) | (2) | (3) |
| Panama | 0.042*** | 0.083*** | 0.059*** |
| | (0.007) | (0.032) | (0.023) |
| Agent | -0.009*** | | |
| | (0.002) | | |
| Panama*Agent | -0.042*** | | |
| | (0.014) | | |
| Observations | 80,308 | 6,355 | 3,084 |
| R-squared | 0.872 | | 0.432 |
| Property Controls | Y | Y | Y |
| Year FE | N | Y | N |
| YearMonth FE | Y | N | Y |
| PlanningRegion FE | N | Y | N |
| PostalSector FE | Y | N | Y |
| Sample | Local Buyers | Agent-buyers | Agent-buyers |

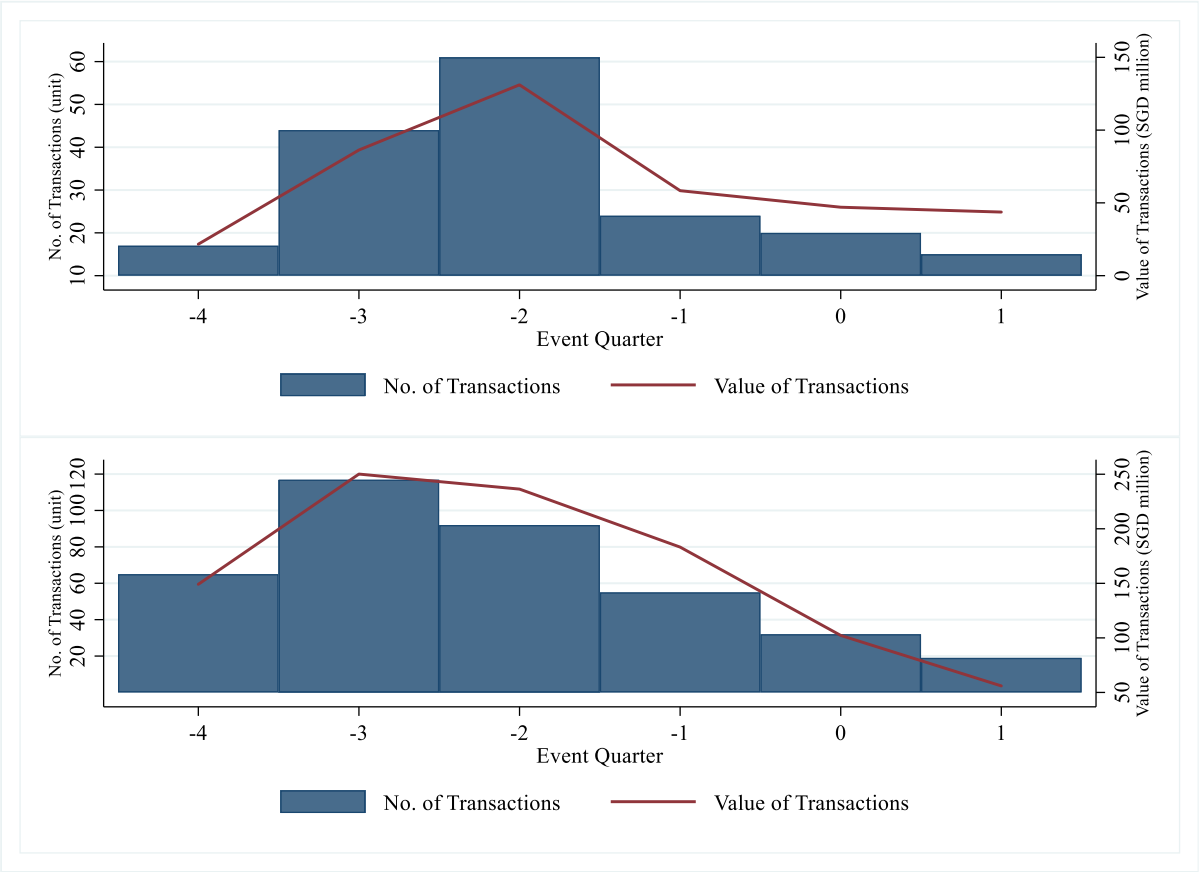
Notes: The table reports regression estimates for OLS regression in Column 1 and 3, and marginal effects in Probit regressions in Column 2. In Column 1, the dependent variable is the natural logarithm of property transacted price; in Column 2, *Hold Dummy* takes the value of 1 if the buyer does not resell the property as of 2018:08; in Column 3, the dependent variable is the natural logarithm of ratio of property selling price to property transacted price. *Panama* is a binary variable equal to 1 if the seller is implicated by name in the Panama Papers; *Agent* is a binary variable equal to 1 if the buyer is a real estate agent. In Columns 1 and 2, *Property Controls* not reported here include *No. of Purchased Units, Unit Size, Property Age (as at purchase), Floor Level, Freehold Tenure, distance measures, property type* (i.e., condominium, apartment, terrace house, semi-detached house and detached house) and *type of sale* (i.e., new sale, resale, sub-sale). In Column 3, *Property Controls* include *Unit Size, Property Age (as at sell), Floor Level, Freehold Tenure, distance measures, property type* (i.e., condominium, apartment, terrace house, semi-detached house and detached house). Regression in Column 1 is estimated using sample of transactions by local buyers with buyer's details, while those in Column 2 and 3 are estimated using sample of transactions whose buyers are real estate agents. Clustered standard errors at the project level (OLS Regression) and robust standard errors (Probit Regression) are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

A9: CBCRR DID Robustness Test using sample without Panama-linked Buyers

| | Dependent Variable: Ln (Sell Price psf) | | | |
|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) |
| Panama | 0.024** | 0.024** | 0.023 | 0.022 |
| | (0.011) | (0.011) | (0.015) | (0.014) |
| Panama*AftCBCRR | -0.055** | -0.055** | -0.058** | -0.055** |
| | (0.022) | (0.022) | (0.028) | (0.028) |
| Ln (Purchase Price) | 0.171*** | 0.171*** | 0.152*** | 0.152*** |
| | (0.011) | (0.010) | (0.012) | (0.011) |
| Foreigner | 0.005 | | 0.009* | |
| | (0.005) | | (0.005) | |
| Observations | 24,786 | 24,786 | 15,356 | 15,356 |
| R-squared | 0.951 | 0.951 | 0.957 | 0.957 |
| PropertyControls | Y | Y | Y | Y |
| SellYearMonth FE | Y | Y | Y | Y |
| Project FE | Y | Y | Y | Y |
| SamplePeriod | +-1 year | +-1 year | +-6 months | +-6 months |

Notes: The table reports regression estimates for DID regression, and the dependent variable is the natural logarithm of property selling price. *Panama* is a binary variable equal to 1 if the seller is implicated by name in the Panama Papers; AftCBCRR takes the value of 1 if the transaction occurs after the implementation of Cross-Border Currency/ Bearer Negotiable Instruments Reporting Regime (CBCRR) on 1st November 2007. *Ln (Purchase Price)* is the natural logarithm of purchase price psf; *Foreigner* has a value of 1 if the buyer is not a Singapore citizen. Control variables not reported here include *Unit Size*, *Property Age (as at sell)*, and *Floor Level*. Columns 1 and 2 are estimated based on two-year rolling window (1 year pre- and post-treatment); while Columns 3 and 4 are estimated based on 1-year rolling window (6 months pre- and post-treatment). Transactions that involve Panama-linked buyers are excluded from all samples. Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

A10: Transaction Volume by Panama-linked Individuals Pre- and Post-CBCRR Policy Shock




Notes: The figure shows the total number and value of Panama-linked transactions before and after the implementation of Cross-Border Currency/ Bearer Negotiable Instruments Reporting Regime (CBCRR) policy on 1st November 2007. The upper panel shows the total volume and value of transactions involving Panama-linked sellers, while the bottom panel shows transactions involving Panama-linked buyers. Transaction time is denoted as Event Quarter which corresponds to the date of policy implementation; for instance, Event Quarter$_0$ comprises property transactions occurred within the three-month period after the policy was implemented, while Event Quarter.$_{-1}$ comprises transactions occurred in the 3-month period before the policy introduction.

A11: EAW DID Robustness Tests Using Sample with Buyer's Details

| | Dependent Variable: Ln (Purchase Price psf) | | | |
|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) |
| Panama | 0.006 | 0.007 | 0.007* | 0.007* |
| | (0.006) | (0.006) | (0.004) | (0.004) |
| Panama*Aft EAW | -0.026** | -0.026** | -0.020** | -0.020** |
| | (0.012) | (0.011) | (0.009) | (0.009) |
| Foreigner | 0.015*** | | 0.016*** | |
| | (0.002) | | (0.002) | |
| Observations | 18,046 | 18,046 | 32,891 | 32,891 |
| R-squared | 0.965 | 0.966 | 0.964 | 0.965 |
| PropertyControls | Y | Y | Y | Y |
| YearMonth FE | Y | Y | Y | Y |
| Project FE | Y | Y | Y | Y |
| BuyerCountry FE | N | Y | N | Y |
| SamplePeriod | +-1 year | +-1 year | +-2 years | +-2 years |

Notes: The table reports regression estimates for DID regression, and the dependent variable is the natural logarithm of property transacted price. *Panama* is a binary variable equal to 1 if the buyer is implicated by name in the Panama Papers; *Aft EAW* has a value of 1 if the transaction occurs after the Estate Agents (Estate Agency Work) Regulations (EAW) takes effect. *Foreigner* has a value of 1 if the buyer is not a Singapore citizen. Control variables not reported here include *No. of Purchased Units, Unit Size, Property Age (as at purchase), Floor Level, and type of sale* (i.e., new sale, resale, sub-sale). Columns 1 and 2 are estimated based on two-year rolling window (1 year pre- and post-treatment); Columns 3 and 4 are estimated based on four-year rolling window (2 years pre- and post-treatment). The samples exclude transactions with missing buyer's details. Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

A12: DID Robustness Tests using Non-Agent Sample

| | Dependent Variable: Ln (Purchase Price psf) | | | | | |
|---|---|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) |
| Panama | 0.005 | 0.005 | 0.005 | 0.005 | 0.009** | 0.009** |
| | (0.006) | (0.006) | (0.004) | (0.004) | (0.004) | (0.004) |
| Panama* AftEAW | -0.029*** | -0.029*** | -0.026*** | -0.026*** | -0.044*** | -0.045*** |
| | (0.011) | (0.011) | (0.009) | (0.009) | (0.011) | (0.011) |
| Foreigner | 0.008*** | | 0.009*** | | 0.005*** | |
| | (0.002) | | (0.001) | | (0.002) | |
| Observations | 64,782 | 64,782 | 127,767 | 127,767 | 335,862 | 335,862 |
| R-squared | 0.951 | 0.952 | 0.943 | 0.943 | 0.930 | 0.931 |
| PropertyControls | Y | Y | Y | Y | Y | Y |
| YearMonth FE | Y | Y | Y | Y | Y | Y |
| Project FE | Y | Y | Y | Y | Y | Y |
| BuyerCountry FE | N | Y | N | Y | N | Y |
| Sample Period | +-1 year | +-1 year | +-2 years | +-2 years | 1995:2012 | 1995:2012 |

Notes: The table reports regression estimates for DID regression, and the dependent variable is the natural logarithm of property transacted price. *Panama* is a binary variable equal to 1 if the buyer is implicated by name in the Panama Papers; *Aft EAW* has a value of 1 if the transaction occurs after the Estate Agents (Estate Agency Work) Regulations (EAW) takes effect. *Foreigner* has a value of 1 if the buyer is not a Singapore citizen. Control variables not reported here include *Unit Size*, *Property Age (as at purchase)*, *Floor Level*, *and type of sale* (i.e., new sale, resale, sub-sale). Columns 1 and 2 are estimated based on two-year rolling window (1 year pre- and post-treatment); Columns 3 and 4 are estimated based on four-year rolling window (2 years pre- and post-treatment); Columns 5 and 6 are estimated using the sample of transactions from 1995 to 2012. Agent-buyer transactions are excluded from all samples. Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

A13: EAW DID Placebo Tests

| Dependent Variable: Ln (Purchase Price psf) | | | | | | |
|---|---|---|---|---|---|---|
| **Placebo year** | **201311** | | **201411** | | **201511** | |
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) |
| Panama | 0.022 | 0.004 | -0.006 | 0.010 | 0.005 | -0.000 |
| | (0.024) | (0.011) | (0.027) | (0.018) | (0.016) | (0.014) |
| Panama*Aft Placebo | -0.039 | -0.010 | 0.002 | 0.004 | 0.009 | 0.015 |
| | (0.035) | (0.017) | (0.030) | (0.021) | (0.018) | (0.016) |
| Foreigner | 0.015*** | 0.015*** | 0.013*** | 0.015*** | 0.010*** | 0.013*** |
| | (0.003) | (0.002) | (0.004) | (0.003) | (0.003) | (0.003) |
| Observations | 36,393 | 84,635 | 26,282 | 65,168 | 28,775 | 64,240 |
| R-squared | 0.936 | 0.927 | 0.938 | 0.931 | 0.943 | 0.940 |
| PropertyControls | Y | Y | Y | Y | Y | Y |
| YearMonth FE | Y | Y | Y | Y | Y | Y |
| Project FE | Y | Y | Y | Y | Y | Y |
| SamplePeriod | +-1 year | +-2 years | +-1 year | +-2 years | +-1 year | +-2 years |

Notes: The table reports regression estimates for DID Placebo regression, and the dependent variable is the natural logarithm of property transacted price. Placebo year is used to falsify the policy shock in November 2010 when the EAW policy took effect. *Panama* is a binary variable equal to 1 if the buyer is implicated by name in the Panama Papers; *Aft Placebo* has a value of 1 if the transaction occurs after the placebo treatment. *Foreigner* has a value of 1 if the buyer is not a Singapore citizen. Control variables not reported here include *No. of Purchased Units, Unit Size*, *Property Age (as at purchasel)*, *Floor Level*, *and type of sale* (i.e., new sale, resale, sub-sale). Columns 1 ,3 and 5 are estimated based on two-year rolling window (1 year pre- and post-treatment); Columns 2,4 and 6 are estimated based on four-year rolling window (2 years pre- and post-treatment). Standard errors are clustered at the project level, and are included in the parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.

A14: Pre-trend Tests on the effect of EAW Policy Shock on Selling Price

| | Dependent Variable: Ln (Sell Price psf) | | | |
|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) |
| Panama | 0.010 | 0.012 | 0.009 | 0.011 |
| | (0.019) | (0.019) | (0.011) | (0.011) |
| Panama*Before$_{-5}$ | 0.005 | 0.003 | -0.002 | 0.000 |
| | (0.030) | (0.030) | (0.026) | (0.025) |
| Panama*Before$_{-4}$ | -0.015 | -0.017 | -0.007 | -0.009 |
| | (0.024) | (0.024) | (0.019) | (0.019) |
| Panama*Before$_{-3}$ | -0.009 | -0.009 | -0.006 | -0.006 |
| | (0.026) | (0.026) | (0.024) | (0.024) |
| Panama*Before$_{-2}$ | -0.021 | -0.023 | -0.010 | -0.012 |
| | (0.025) | (0.024) | (0.022) | (0.022) |
| Panama*Before$_{-1}$ | -0.015 | -0.025 | -0.004 | -0.005 |
| | (0.030) | (0.034) | (0.025) | (0.028) |
| Panama*After $_{0}$ | -0.036 | -0.037 | -0.040 | -0.041 |
| | (0.033) | (0.033) | (0.029) | (0.029) |
| Panama*After$_{+1}$ | -0.002 | -0.003 | -0.006 | -0.007 |
| | (0.020) | (0.020) | (0.014) | (0.014) |
| Panama*After$_{+2}$ | 0.005 | 0.003 | 0.001 | -0.001 |
| | (0.023) | (0.023) | (0.017) | (0.017) |
| Panama*After$_{+3}$ | 0.003 | 0.004 | 0.010 | 0.010 |
| | (0.026) | (0.027) | (0.022) | (0.023) |
| Panama*After$_{+4}$ | -0.007 | -0.011 | 0.002 | -0.001 |
| | (0.030) | (0.030) | (0.027) | (0.027) |
| Panama*After$_{+5}$ | -0.047 | -0.047 | -0.023 | -0.022 |
| | (0.035) | (0.035) | (0.028) | (0.027) |
| Panama*After$_{+6}$ | | | -0.062* | -0.059 |
| | | | (0.037) | (0.037) |
| Panama*After$_{+7}$ | | | -0.003 | -0.007 |
| | | | (0.022) | (0.022) |
| Panama*After$_{+8}$ | | | -0.055*** | -0.056*** |
| | | | (0.021) | (0.020) |
| Panama*After$_{+9}$ | | | -0.010 | -0.011 |
| | | | (0.021) | (0.021) |
| Panama*After$_{+10}$ | | | -0.083*** | -0.085*** |
| | | | (0.024) | (0.024) |
| Panama*After$_{+11}$ | | | -0.009 | -0.011 |
| | | | (0.023) | (0.023) |
| Observations | 30,866 | 30,866 | 55,734 | 55,734 |
| R-squared | 0.952 | 0.952 | 0.946 | 0.946 |
| PropertyControls | Y | Y | Y | Y |
| YearMonth FE | Y | Y | Y | Y |
| Project FE | Y | Y | Y | Y |
| Sample Period | +-1 year | +-1 year | +-2 year | +-2 year |

Notes: The table reports regression estimates for DID Pre-trend test, and the dependent variable is the natural logarithm of property selling price. *Panama* is a binary variable equal to 1 if the seller is implicated by name in the Panama Papers. The *Before* dummies are bi-monthly indicators that have values of 1 if the property is sold in the respective two-month period before the implementation of Estate Agents (Estate Agency Work) Regulations (EAW). For example, *Before$_{-1}$* equals to 1 if the property is sold within two months before the regulation takes effect. *After* has a value of 1 if the property is sold after the regulation implementation. Control variables not reported here include *Unit Size*, *Property Age (as at sell)*, *Floor Level*, *and type of sale* (i.e., new sale, resale, sub-sale). Columns 1 and 3 include additional *Foreigner* control, while Columns 2 and 4 include buyer country fixed effect. Columns 1 and 2 are estimated based on two-year rolling window (1 year pre- and post-treatment), while Columns 3 and 4 are estimated based on four-year rolling window (2 year pre- and post-treatment), with the reference base being periods *Before$_{-5}$*. Standard errors are clustered at the project level, and are included in the

parenthesis of the respective coefficient. The significant of each coefficient is indicated by: *** 1 per cent significance ** 5 per cent significance; * 10 per cent significance.