

Assignment 1

This assignment displays the explanation and insights obtained from different data visualizations using the census and house price data of Penshurst, New South Wales.

Data Collection and Preparation

For the suburb Penshurst, NSW, its census data is obtained from the national statistical agency- Australian Bureau of Statics and the house, unit price are collected from the trusted real estate platform “PriceFinder” for the years 2006, 2011, 2016 and 2021. Some entries in 2006 are left as blank as they are not available. The collected data is then formatted into one decimal place. The time-series data and categorical data are also formatted before visualizing in different charts, which are explained in the data visualization charts and explanation section below.

Dataset characteristics and data types

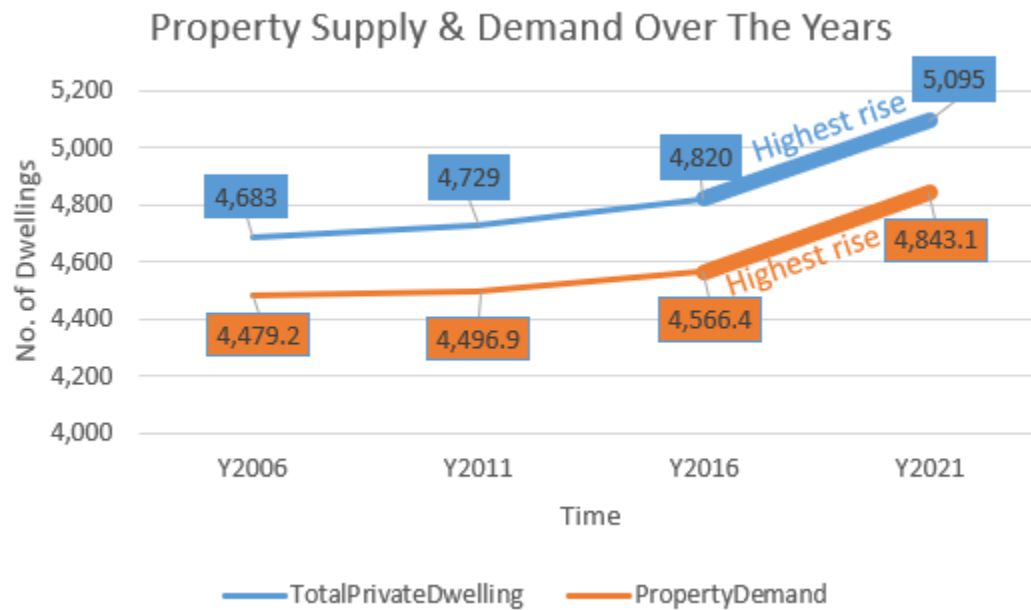
The data obtained is structured data with 52 rows and 4 columns. The dataset characteristics and data types are as follows.

Attribute	Data Type
Location	Categorical (Nominal)
Time	Categorical (Nominal)
MedianHousePrice	Quantitative (Ratio-Scale)
MedianUnitPrice	
MedianPersonalWeeklyIncome	
MedianFamilyWeeklyIncome	
MedianHouseholdWeeklyIncome	
MedianMortgageWeeklyPayment	
MedianWeeklyRent	
Population	
MedianAge	
Families	
TotalPrivateDwelling	
Married(%)	
Separated+Divorced(%)	
Widowed(%)	
NeverMarried(%)	
BirthInAustralia(%)	
Worked full-time(%)	
Worked part-time(%)	
Unemployment(%)	
PeopleTravelledToWorkByPublicTransport(%)	

PeopleTravelledToWorkByCar(%)
AverageMotorVehiclesPerDwelling
CoupleFamilyNoChidren(%)
CoupleFamilyHasChidren(%)
OneParentFamily(%)
OtherFamily(%)
OccupiedDwellings(%)
UnoccupiedDwelling(%)
SeparateHouse(dwellings%)
SemiDetached(dwellings%)
FlatUnitApartment(dwellings%)
0xBedroom(%)
1xBedroom(%)
2xBedroom(%)
3xBedroom(%)
4xBedroom+(%)
AverageNumberBedroomsPerDwelling
AverageNumberPeoplePerHousehold
FullyOwned(%)
OwnedWithMortgage(%)
Rented(%)
FamilyHouseHolds(%)
SinglePersonHouseHolds(%)
GroupHouseHold(%)
LessThan\$650WeeklyIncome(%)
MoreThan\$3000WeeklyIncome(%)
HouseholdsRentPayments<30%Income (%)
HouseholdsRentPayments>30%Income(%)
HouseholdsMortgageRepayments<30%Income(%)
HouseholdsMortgageRepayments>30%Income(%)

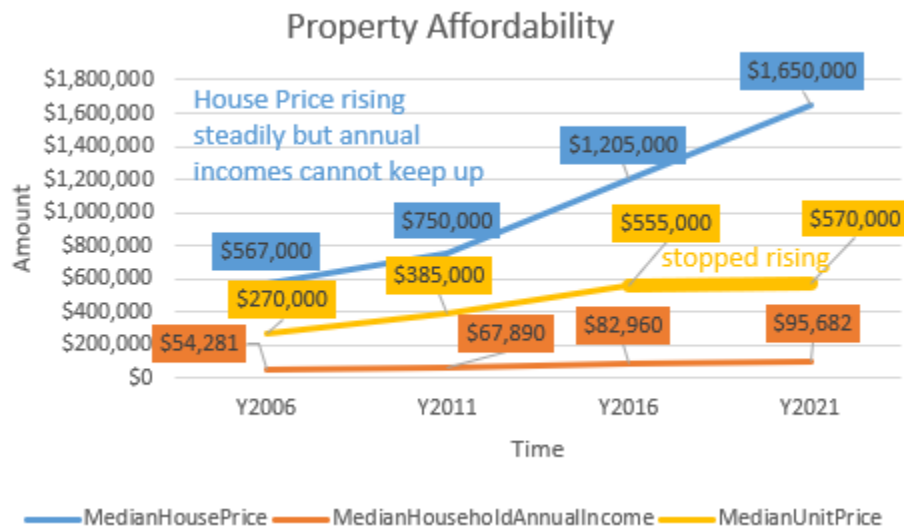
Data Visualization Charts and Explanation

Property Supply Vs Demand



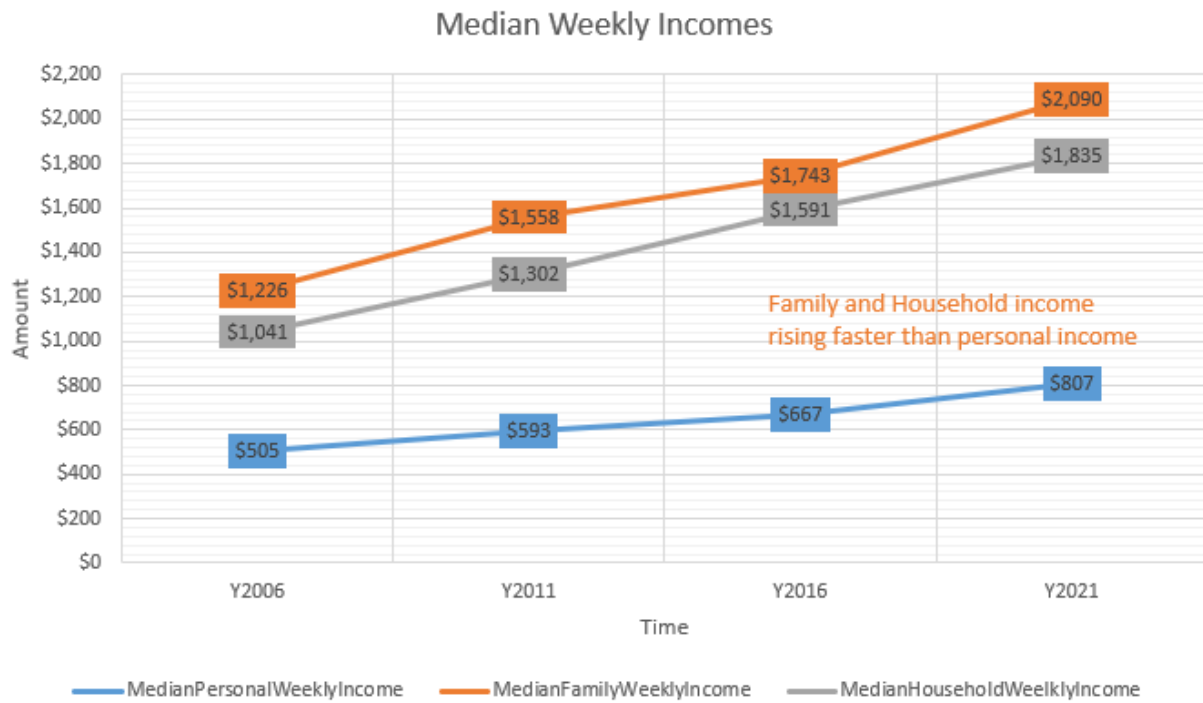
The line chart above shows the total number of dwellings and property demand over the years. Property demand for each year is obtained by dividing population with the average number of people per household for that year. Both total dwellings and property demand rose noticeably higher from 2016 to 2021 compared to the steady increase in the years before. To emphasize the interval that had higher rise, the line is bolded with text in the chart.

Property Affordability

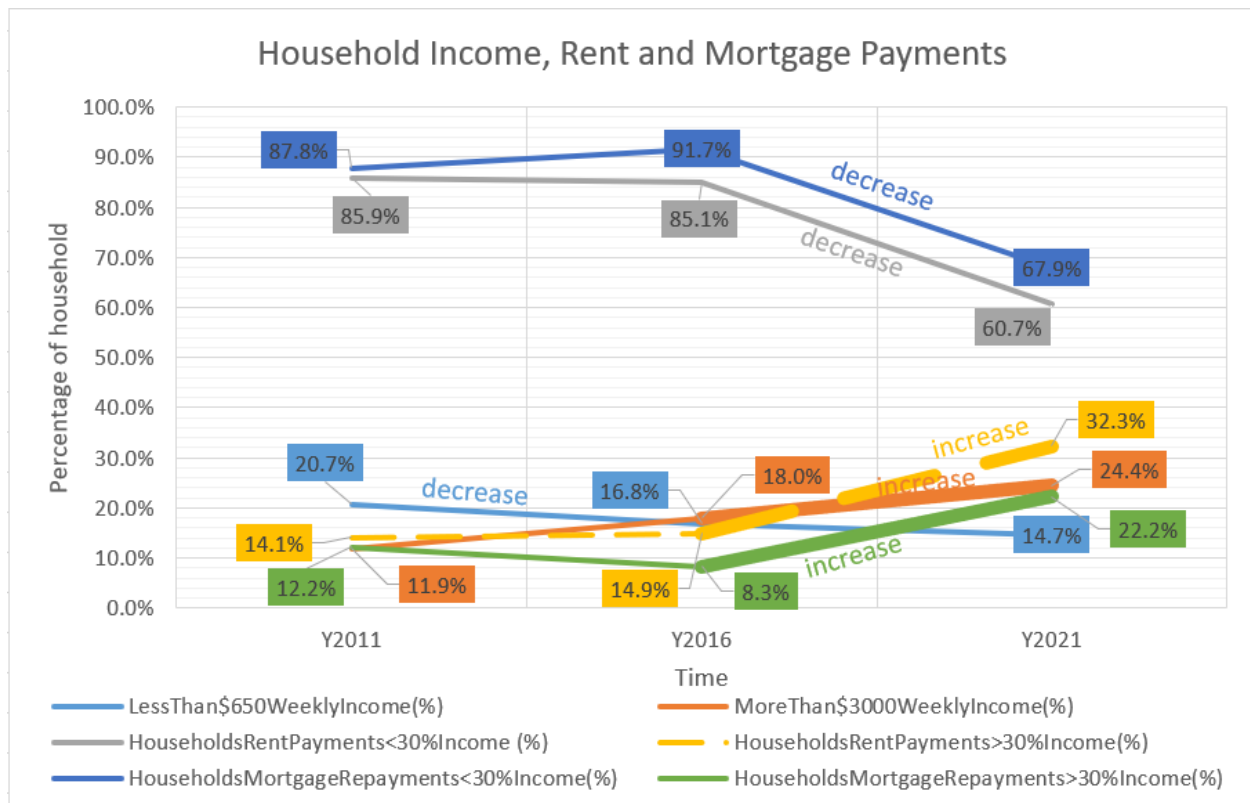


The line chart above shows the median house, unit price and median household annual income. The median household annual income is obtained by multiplying median household weekly income with 52.142 weeks. Although the house price rises at a steady rate from 2006 to 2021, the annual income for each household remains almost unchanged when compared to the house price. This could be one reason why there are increasing number of Australians who cannot own a house in the recent years. Although the median unit price rose at linear rate, it stopped rising from 2016 to 2021, which could mean the unit demand decrease. The point where it stopped rising is bolded and shown with text. Some labels had to be manually rearranged due to label overlapping.

Finance

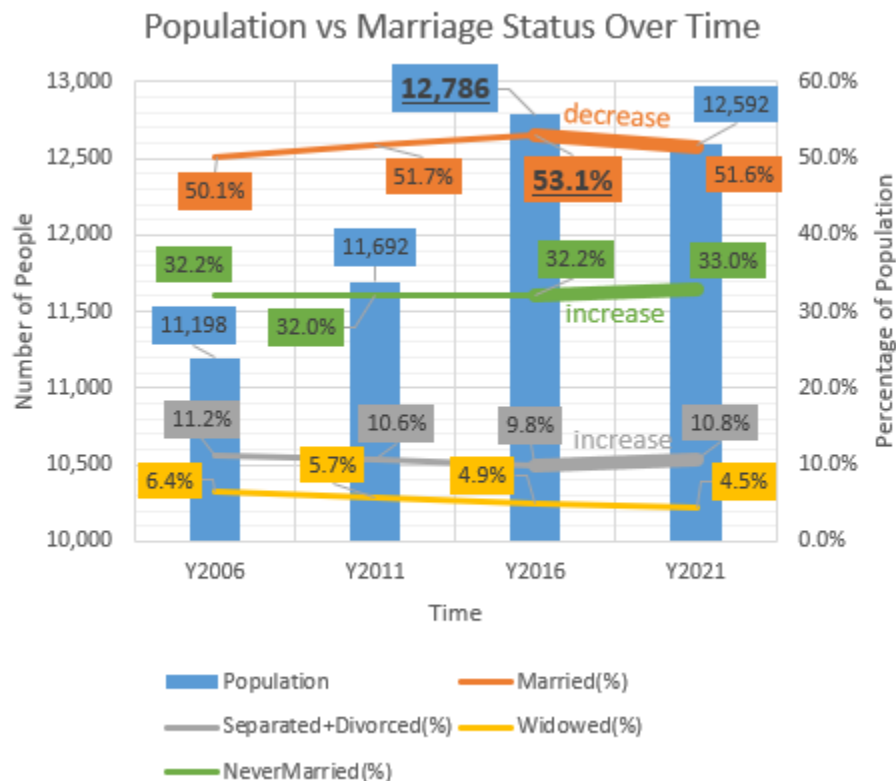


The line chart shows the median family, household and personal weekly incomes. This simple chart shows that all these income types are rising throughout the years, with median family and household weekly income rising faster than median personal income.



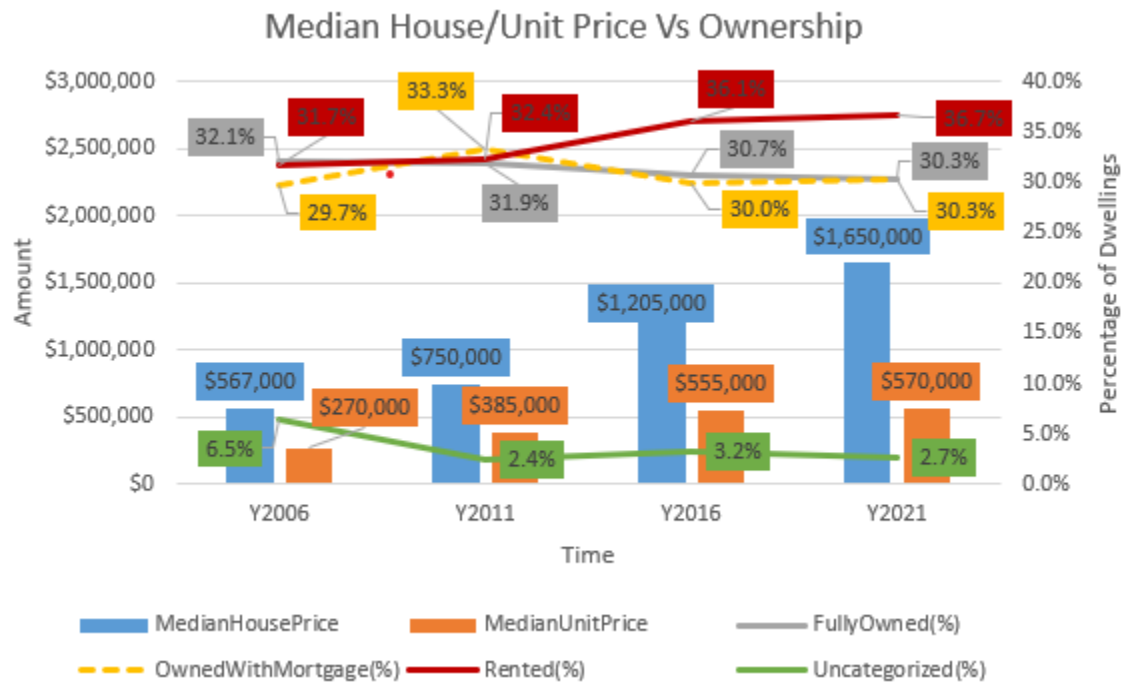
The line chart above shows percentages of households with different incomes, different rent payments and mortgage repayments. Although the number of households with more than \$3000 weekly income is increasing, there is a sudden increase of households paying rent and repaying mortgages the amount higher than 30% of their incomes from 2016 to 2021. At the same time, there is also a sudden decrease in households paying rent and mortgage the amount less than 30% of their incomes. Opposite to the high-income earners, there is a gradual decrease in people earning below 650\$ throughout the years as well.

Population

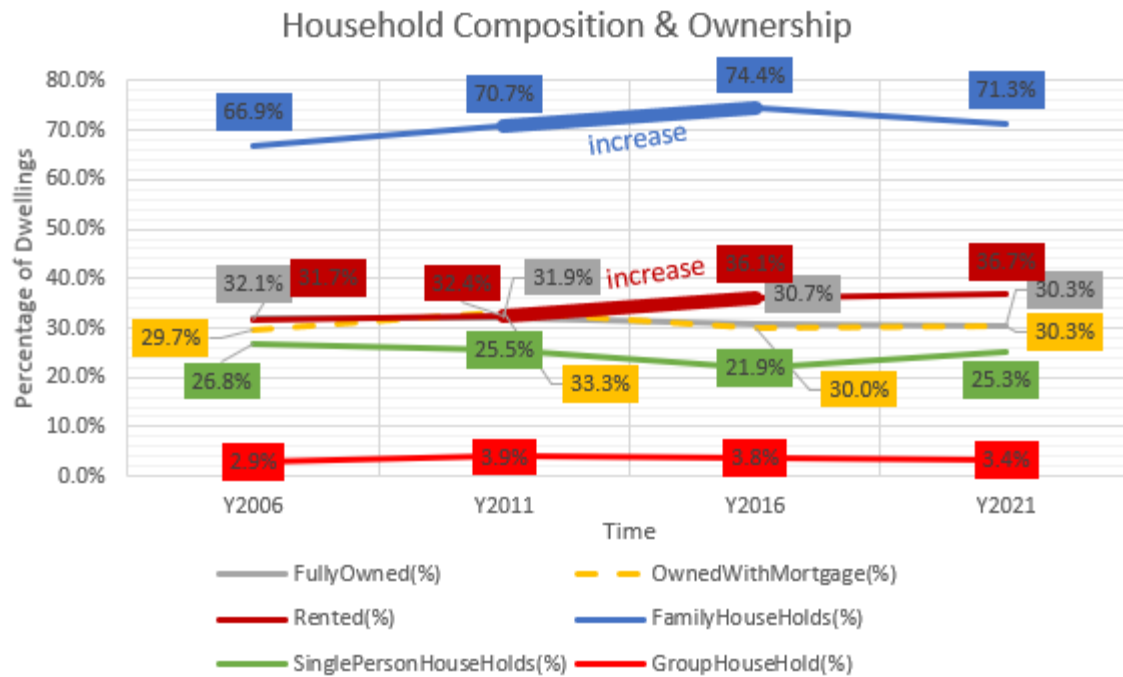


The above combo chart, lines and columns combined, shows the total population and marriage status over time. The population had a notable increase in 2016, which corresponds to the 1.5% increase in married people who might have been moving into the suburb that year. The population then starts decreasing in 2021 but with a slight increase in divorced, separated or single people. One reason could be due to more time spent at home during covid lockdown. The widowed percentage decreased steadily through 2006 to 2021. The point with highest population and married percentage is shown with bolded, underline label, whereas notable parts between 2016 to 2021 are shown in bold and text. This chart posed more overlapped labels which had to be rearranged.

Ownership

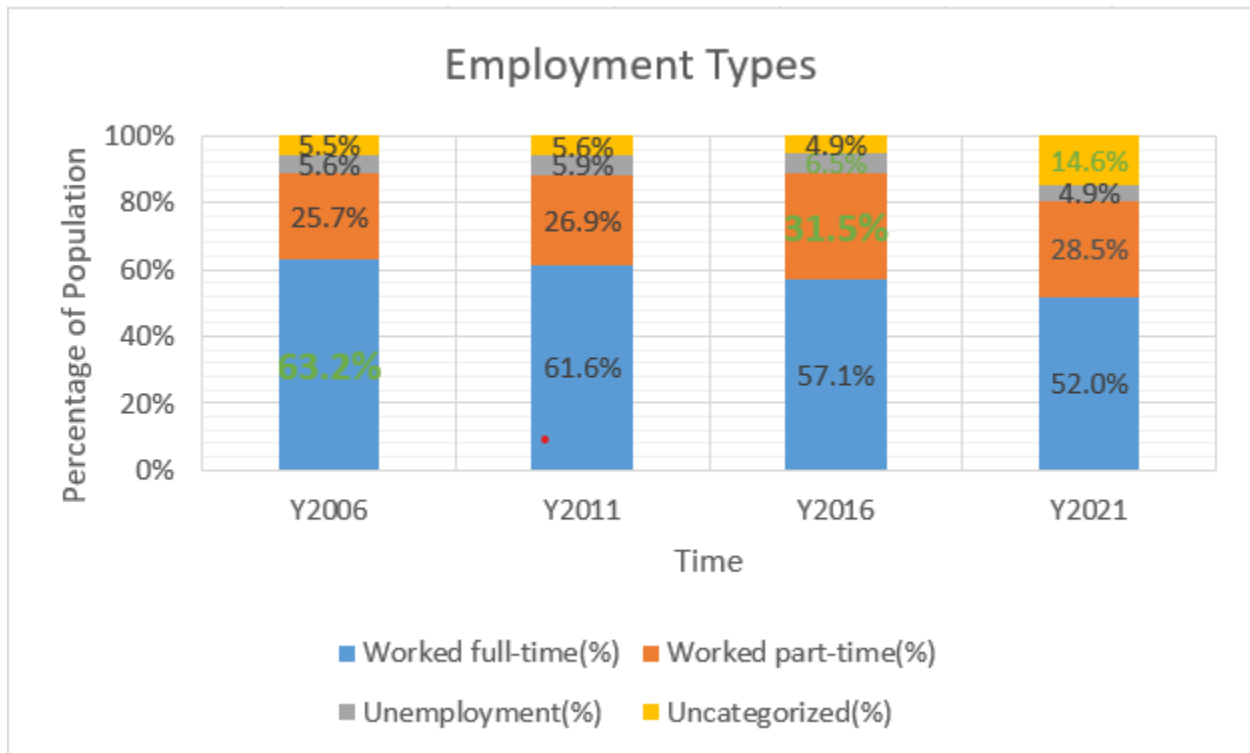


The combo chart (lines and columns) above shows the median house/unit price and property ownership types. Despite median house, unit price increasing at around linear rates for all four years, the rent percentage increased from 2011 to 2016, which could be due to the increase of foreign students and unaffordable houses. Owners with mortgage increased from 2006 to 2011, and then decreased from 2011 to 2016, which could also mean some owners paid all the debts. For this chart, there were three lines overlapping so two of them were changed to short and long-dashed lines for differentiation. The axis of the amount was also elongated to make more room for labels while keeping the chart tidy.



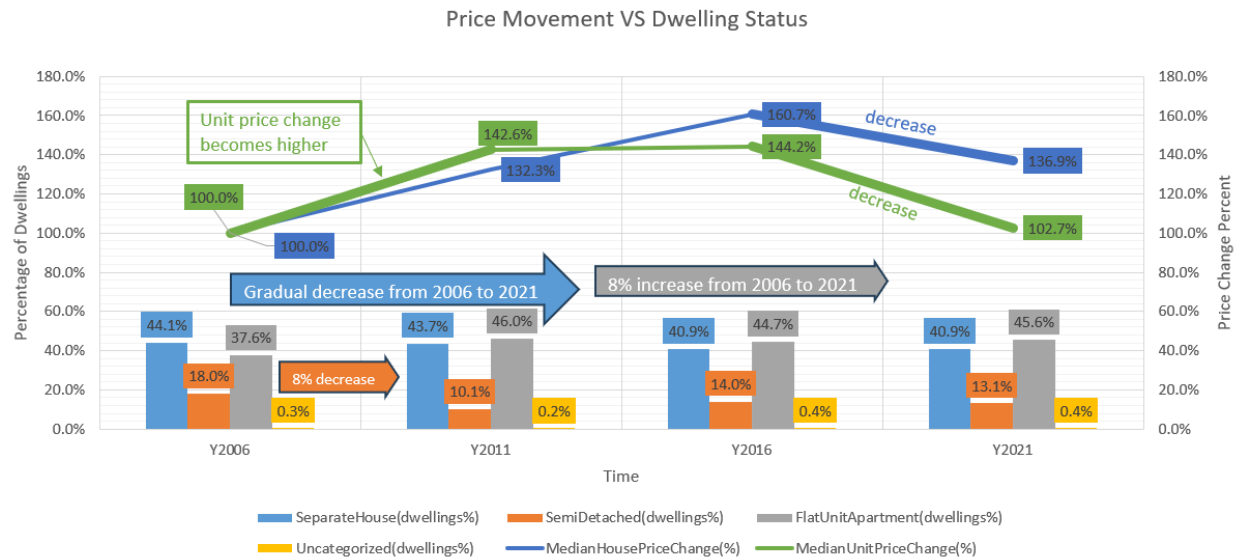
In the line chart above, property ownership types are shown with household composition. Since both family household percentage and rental percentage increase at around the same rate between 2011 and 2016, it can be guessed that more families rented properties during this period.

Workforce



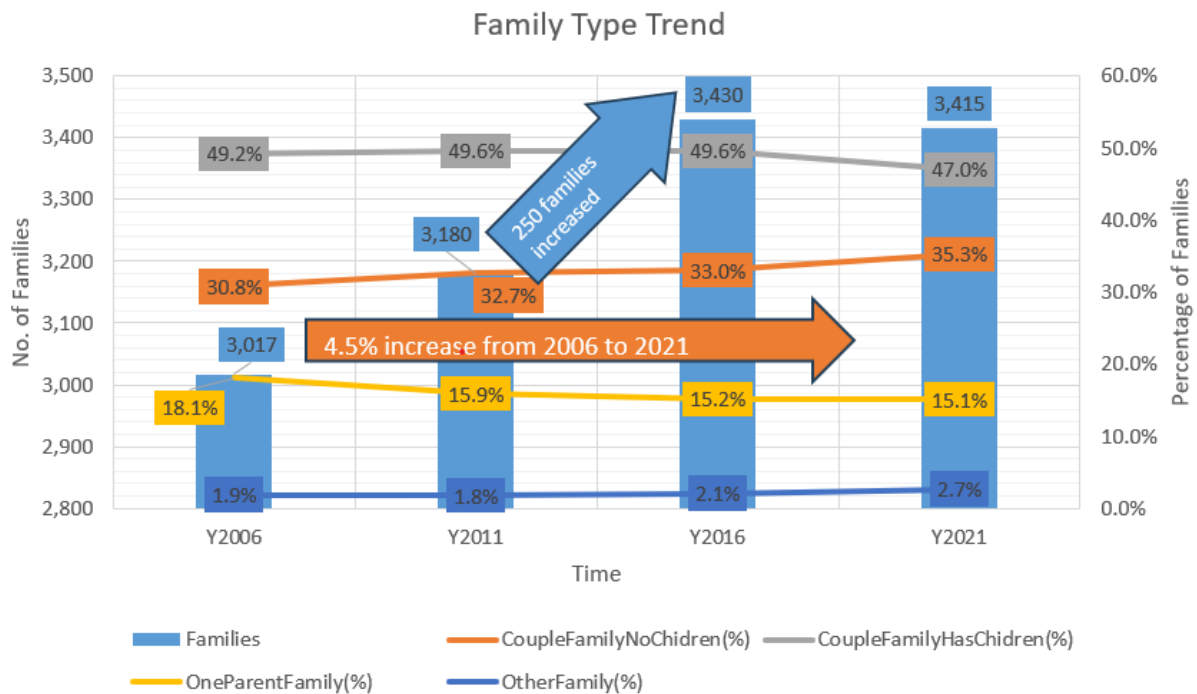
The 100% stacked column chart above shows the percentage of different employment types over the years. It shows that full-time employees make up the largest percentage of the population at 63.2%, which gradually decreases over the years. The number of part-time employees follow at second place, with notable increase in 2016, after which it decreases again in 2021. The text with the highest numbers over the years are colored green.

Dwelling

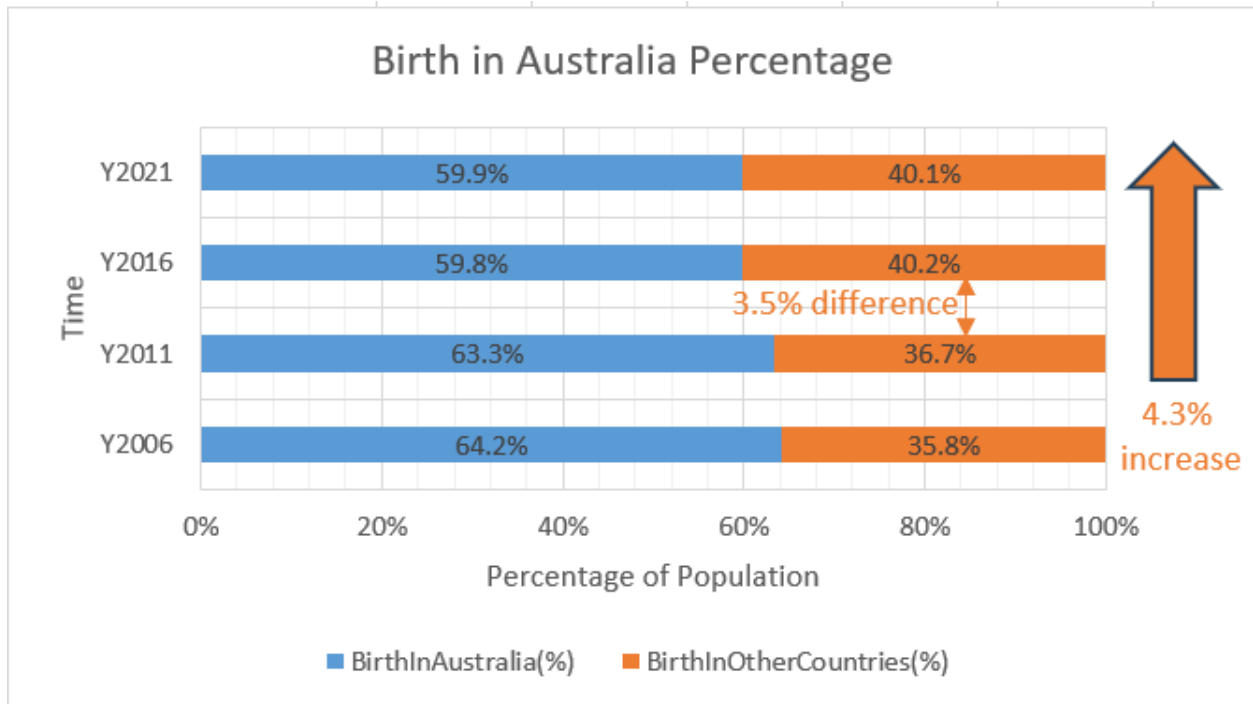


The combo chart (lines and columns) above shows the median house/ unit price movement in percentage and the percentage of dwellings over the years. 2006 was taken as the base for price movement. According to the chart, the semi-detached dwellings percentage decreased by 8% from 2006 to 2011. Median house price change rate soon overtakes median unit price from 2011 to 2016, after which both started decreasing at 2016~2021, with median house price change decreasing by around 24% and median unit price change decreasing by a staggering 41.5%. Throughout the years, the separate house dwelling percentage decreased at a gradual rate, while flat/ unit/ apartment percentage increased by 8% from 2006 to 2021.

Family



The combo chart (lines and columns) shows the family type trend, and the number of families changes throughout the years. Based on the chart, all types of families have no significant changes, only changing from around 0.1% to 2.3% every year. The only notable change in percentage from 2006 to 2021 is the 4.5% increase in couple families without children. Despite this, there was a significant increase in the number of families from 2011 to 2016.



The bar chart above shows the percentage of population born in Australia over time. Based on the chart, there is a 4.3% increase in foreign country born people between 2006 and 2021, a large portion (3.5%) of them found between 2011 and 2016.

Readability, storytelling, and challenges during data visualization

Different types of charts were used for visualization, such as line chart, bar chart, 100% stacked column chart, combo chart (lines and columns). All the important data are highlighted using different methods such as using different colors, bolding, underlining and enlarging texts, enclosing text in arrow shapes and thickening the lines in line chart.

However, while visualizing the collected and prepared data, a few challenges were encountered, such as important data being unclear, line overlapping, label overlapping, and cluttered chart. For the problem of data lines overlapping or crossing, different line types are used on top of different colors such as long dash, short dash. For overlapping labels, they are rearranged manually and for data with different scales causing cluttered charts, the chart axis is adjusted so that each data type is shown separately as much as possible.

Conclusion

Based on the observations, the potential buyers or investors of Penshurst property are encouraged to do the following. Based on the property supply vs demand and affordability charts, property prices are rising over time soaring to \$1,650,000 in 2021. Since unit prices are also catching up at a slower pace, investors should buy them and rent them out if they want return on investment faster. But if they can afford it, they should also consider buying houses as some high-income families are likely to purchase them. And based on workforce charts, the number of full-time employed people has been decreasing gradually, which could limit them from buying or renting some property types. Investors should be renting out at affordable rates since more people are likely to be looking for affordable properties. But based on dwelling charts, the number of flat/units/apartments have increased to 45.6% in 2021. Investors should be purchasing these properties quickly to avoid competition, and buyers should be purchasing houses fast since they are decreasing gradually. And since there is an increase in foreign-born people and families without children based on family charts, investors should purchase properties that have culturally diverse neighborhoods and amenities. Furthermore, based on ownership charts, there is a slight uptrend in rental properties, which could be popular among part-timers. But based on finance charts, there are also more households spending more than 30% of their incomes on rent and mortgage, which indicates affordability pressure. Investors should be careful about setting their rents and buyers should take caution when purchasing properties with mortgages.