Street Name Fluency and Housing Prices

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Research questions

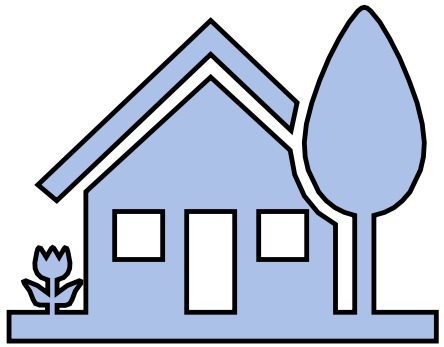
- Does street name affect house price value?

Main Findings

- Shorter street names (one word) have 11.48% higher prices than names with three+ words.
- Street names with fewer letters are priced with a -0.6% discount.
- Homes with unique street names have statistically higher prices of 1.4% (or A$9,481) than those with more common names.
  - Homes with less fluent street names are valued more conditional on the street name is rare or the home is in the luxury price range.

Motivation

- Little research on whether street name matters for real estate
- Implications to what people value in homes
- Implications to town planning and naming of streets



Examples in Economics where name matters:

- Stock market: Green and Jame (2013) find that companies with easy-to-pronounce names experience higher breadth of ownership, greater share turnover and higher valuation ratios.
  - The reasoning is that that people find fluent stimuli more appealing than less fluent stimuli (e.g. Alter and Oppenheimer (2009)

- Life outcomes due to name:
  - Discrimination by name: Bertrand and Sendhil (2004)
  - Name reflects socioeconomic status: Fryer and Levitt (2004)

Related literature

- Disfluency may be preferred for special occasion products (like homes):
  - Pocheptsova, Labroo and Dhar (2010) find people prefer special occasion products more when they have disfluent advertising as disfluency is associated with exclusivity.

- E.g. in Appendix A from Pocheptsova et al (2010), participants preferred the special cheese more when the ad was written in hard to read font in the bottom picture (disfluent).

Data and method

- Sample Period: from January 2000 to June 2016
  - 958,408 housing sales transactions in Sydney, Australia
  - Variables: address, price, housing characteristics date of sale, geocode of sales
- Hedonic regression model:

$$\ln(P_{ijst}) = \alpha_t + \beta_k fluency_{ij} + property\ char_i + \beta_l longstreet_{ij} + \beta_m majorstreet_{ij} + \mu_s + \gamma_t + \tau_t + \varepsilon_{it}$$

- Fluency are street name fluency measures
- Property char relate to the home (baths, beds, parking, new dev, auction, dwelling type)
- Suburb, year/quarter fixed effects and monthly time trend.

Name fluency measures

1. ***Englishness Group*** – measures how often the word is used in the English media from Mark Davies' n-grams corpus of Historical American English.

- Rank 1: Unused in English,
- Rank 2: Some use in English
- Rank 3: Used often.
- (If multiple word street, use lowest ranked word value)

2. ***Words Group*** - the number of words in the street name.

- Group 1: there are 3 words or more in the street name
- Group 2: 2 words,
- Group 1: contains only 1 word

Name fluency measures (Continued)

3. ***MS Word*** – A Microsoft Word spell check.

- Value of 1 if all words in the street name in lower case pass the Microsoft word spell check,
- Value of 0 otherwise

*4.****Popname Group*** – Measures number of suburbs which have same street name in Australia

- Group 1 = Only one suburb.
- Group 2 = Between 2 and 5 suburbs and
- Group 3 = 6 or more suburbs.

Name fluency measures (Continued)

5. ***Syllable Group*** – Counts the number of syllables in a street name.

- To do this we first use the word list from Carnegie Mellon University Sphinx website: http://www.speech.cs.cmu.edu/cgi-bin/cmudict which contains syllables counts of 134,000 words.
- For words not contained in Sphinx we count the syllables ourselves.

6. ***Letters Group*** – Street names are ranked in three equal groups based on the number of letters in the street name.

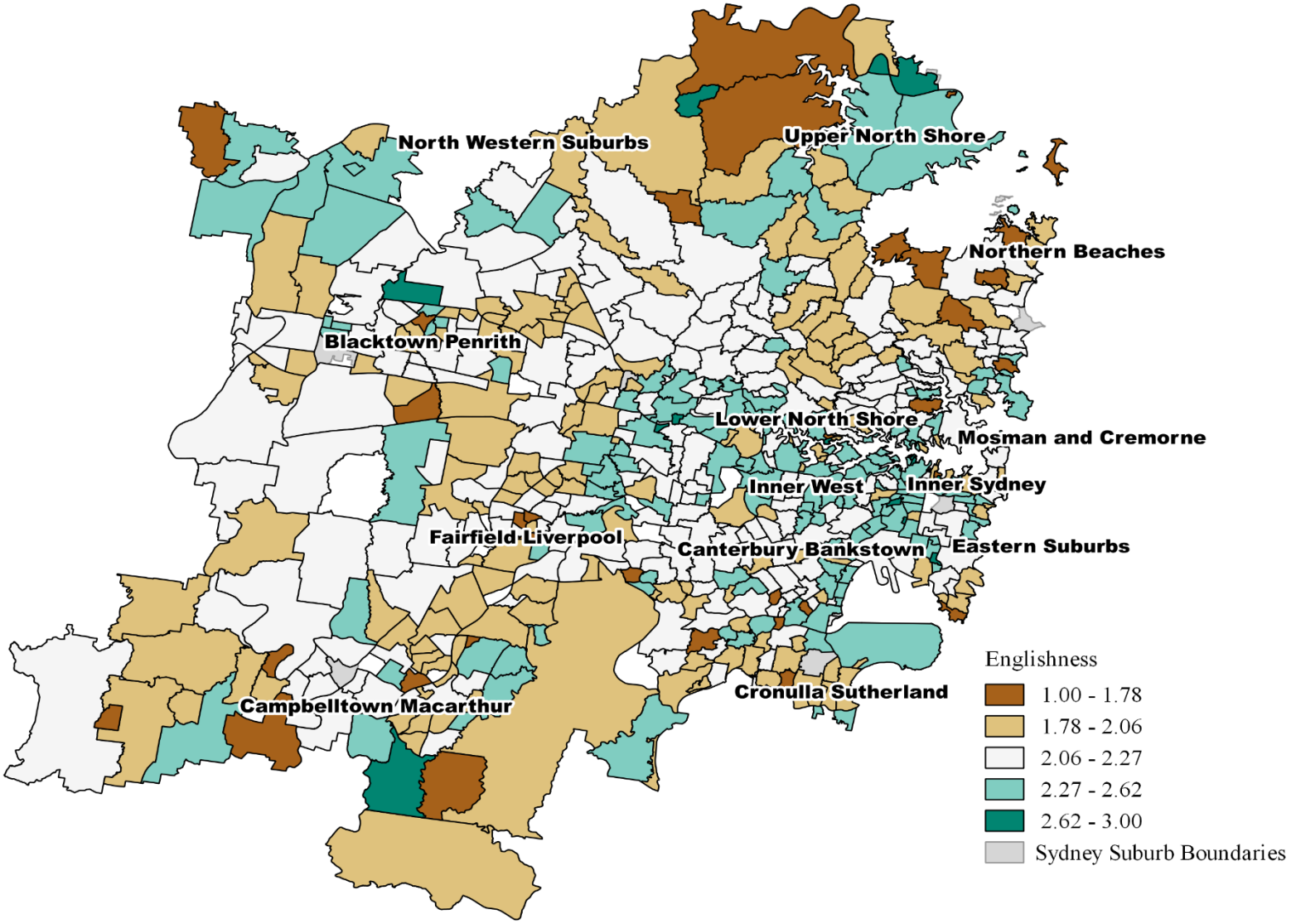
- A value of 1 is given for the group with the most number of letters.
- A value of 2 is given for the middle group and
- A value 3 for the group of street names with the least number of letters.
- The larger group/rank the more fluent.

EXAMPLES

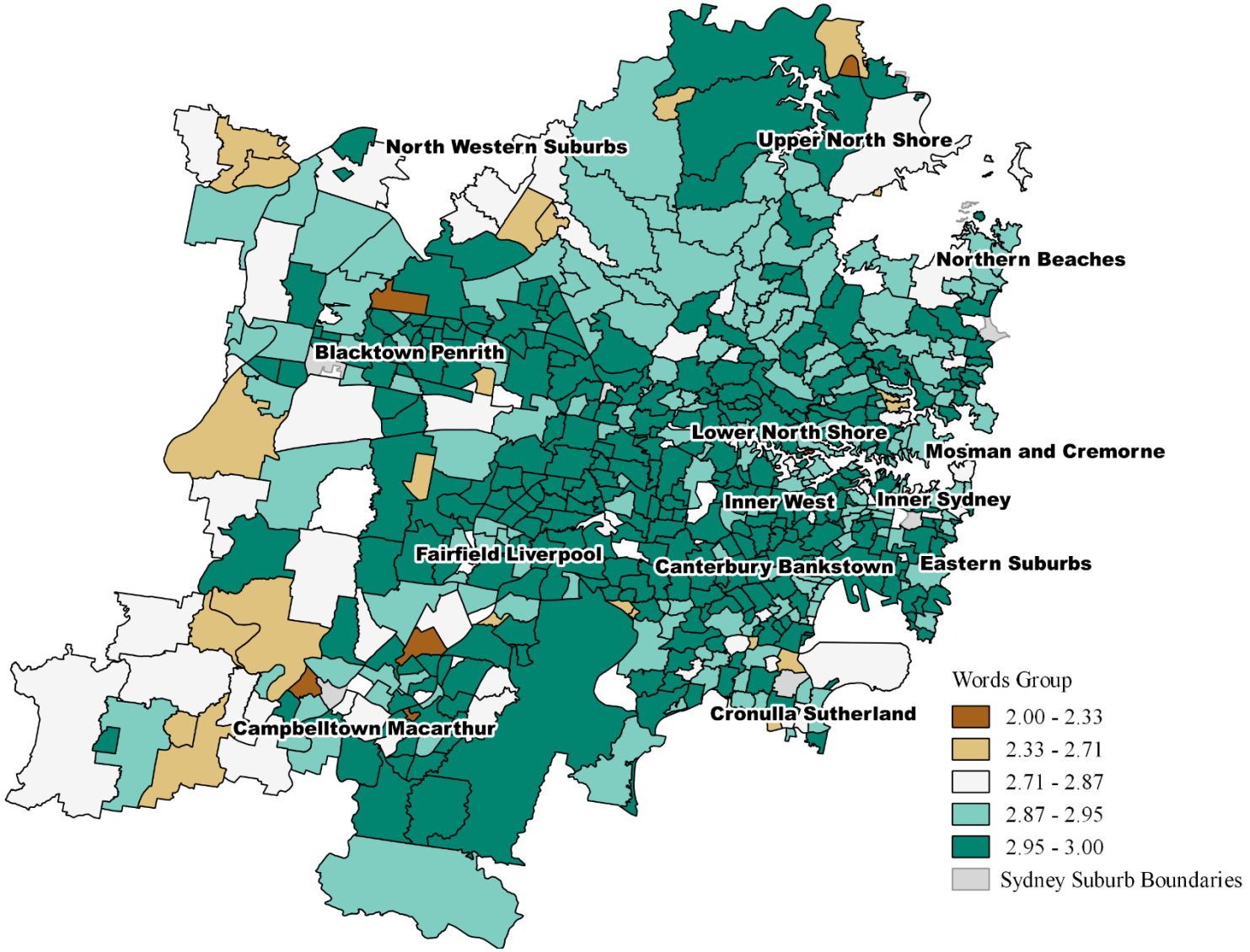
Street Name	Englishness Group	Words Group	MS Word	Popname Group	Syllable Group	Letters Group	Total Score
Low Fluency (Score <=6)							
AVENUE OF OCEANIA	1	1	0	1	1	1	5
SIR JOHN JAMISON	1	1	0	1	1	1	5
SIR WARWICK FAIRFAX	1	1	0	1	1	1	5
ABBE RECEVEUR	1	2	0	1	1	1	6
LILLI PILLI POINT	2	1	0	1	1	1	6
YUNGA BURRA	1	2	0	1	1	1	6
Medium Fluency (Score = 11)							
ABIGAIL	2	3	0	2	2	2	11
BANDICOOT	2	3	1	2	2	1	11
CHARLIE	3	3	0	1	2	2	11
EXCELSIOR	2	3	1	3	1	1	11
GARFIELD	2	3	0	3	2	1	11
HIGHLAND RIDGE	3	2	1	2	2	1	11
High Fluency (Score = 16)							
COOK	3	3	3	1	3	3	16
HOOD	3	3	3	1	3	3	16
SPRING	3	3	3	1	3	3	16
VIEW	3	3	3	1	3	3	16
WHITE	3	3	3	1	3	3	16
YOUNG	3	3	3	1	3	3	16

- Note: Higher score means more fluent names (shorter, less words, common in English language, popular street name)

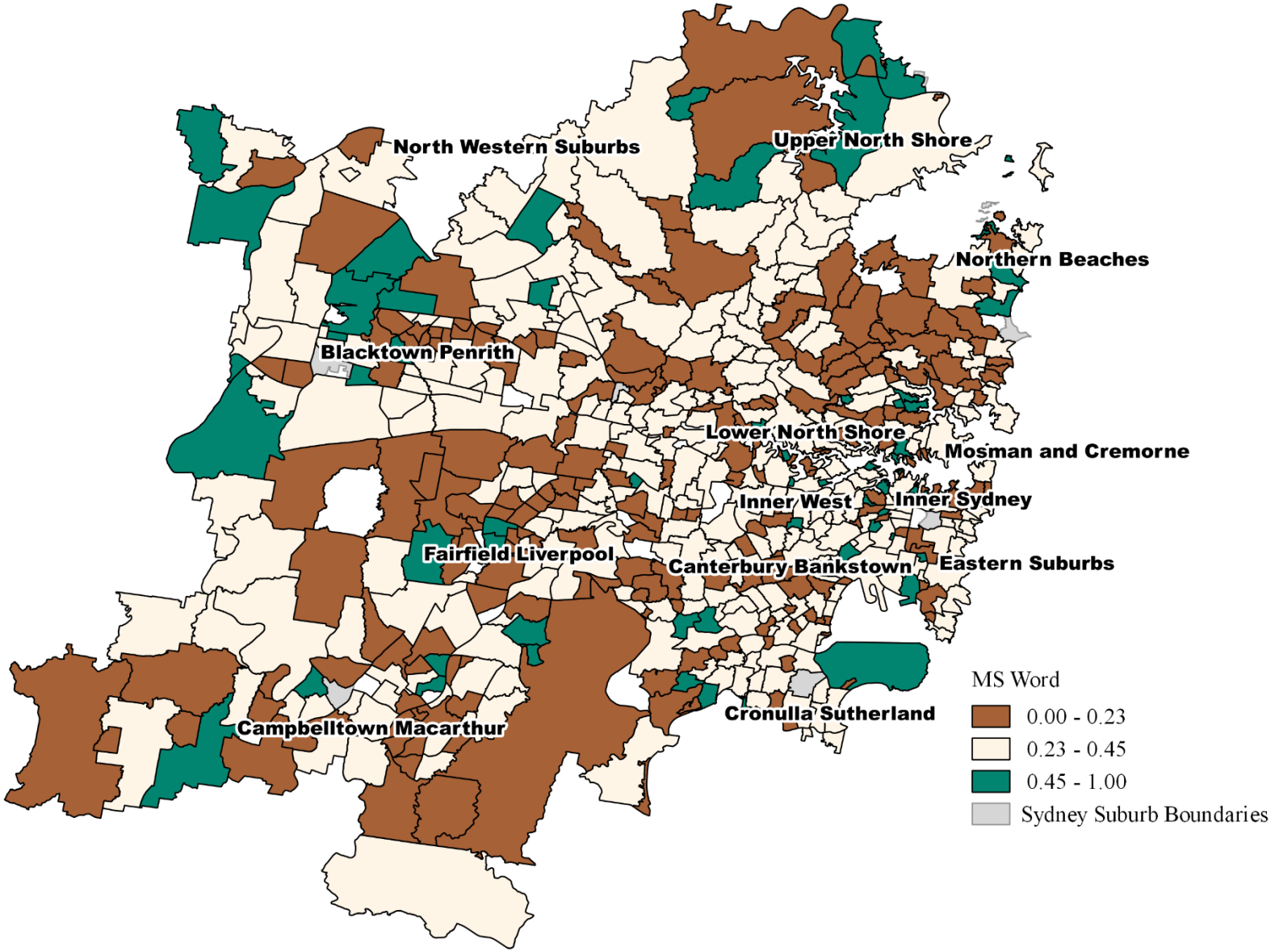
Heatmap 1: Englishness Group



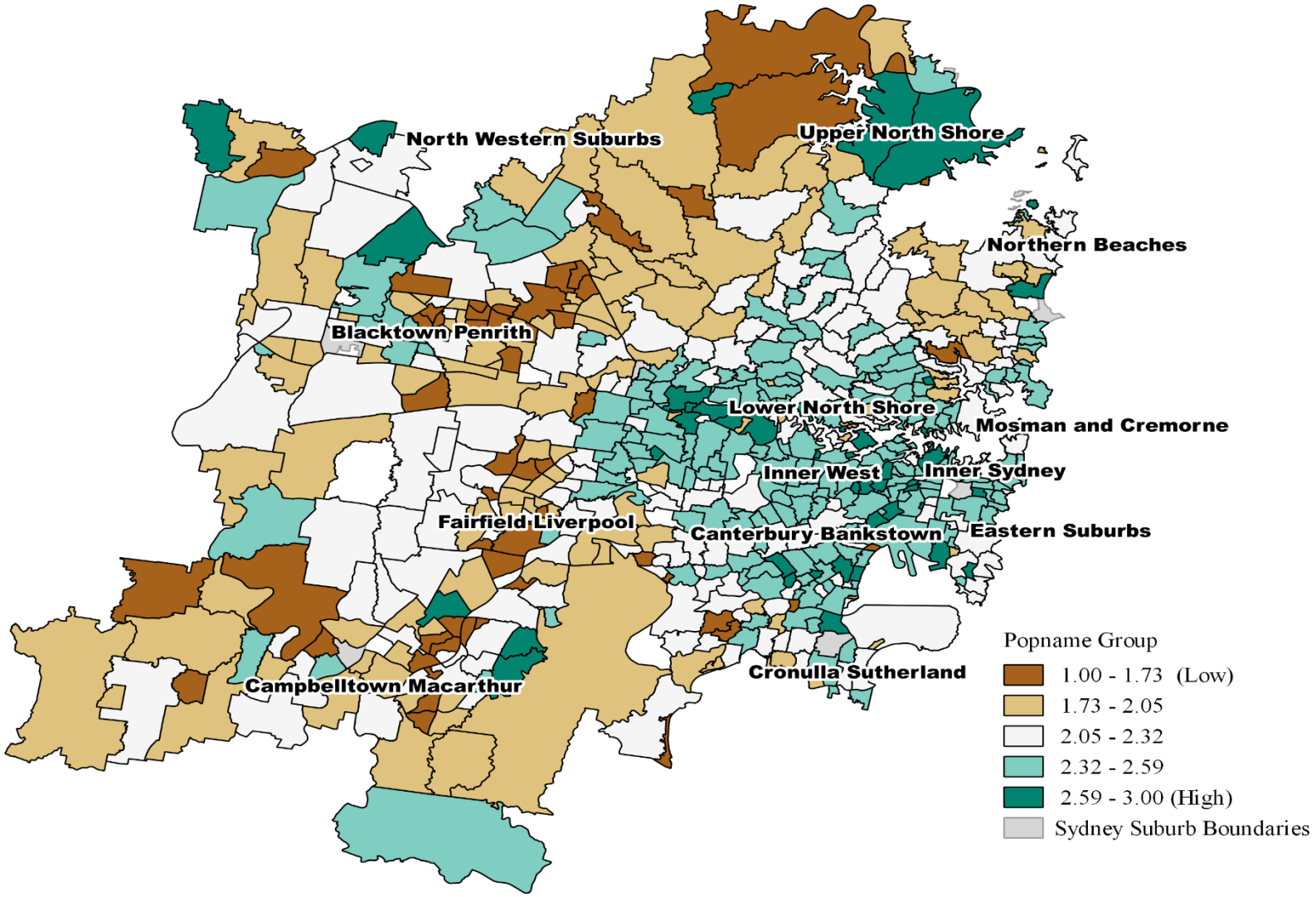
Heatmap 2: Words Group



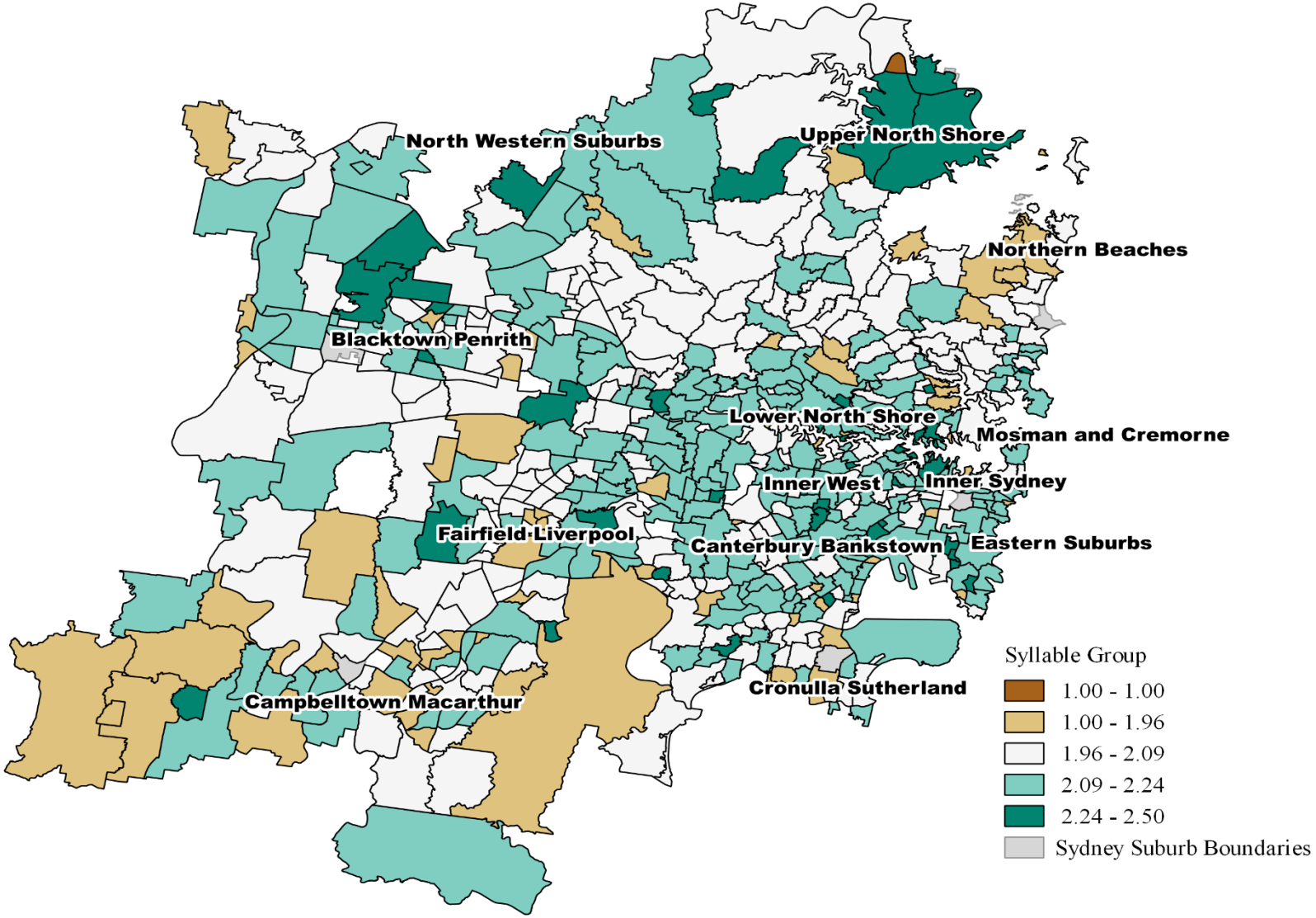
Heatmap 3: MS Word



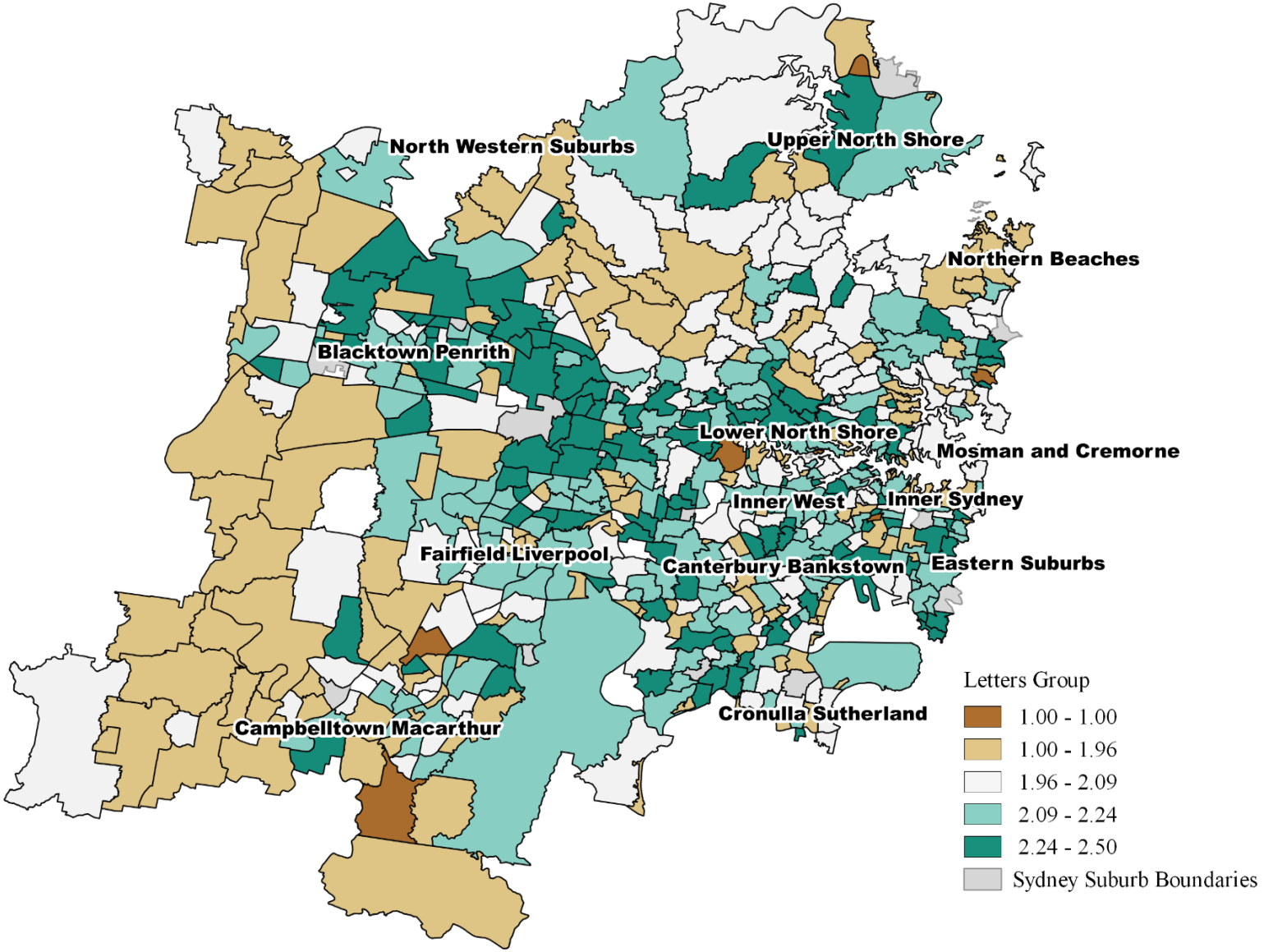
Heatmap 4: Popname Group



Heatmap 5: Syllable Group



Heatmap 6: Letters Group



Summary Statistics

Fluency Score	Price	House	Size	Beds	Baths	Parking	New	Long Street	Major Street	N
5 to 6 (low fluency)	698.56	0.73	5.66	3.33	1.90	0.87	0.04	0.34	0.09	1,799
7 to 8	728.98	0.65	5.35	3.06	1.71	0.76	0.04	0.25	0.06	28,014
9 to 10	711.22	0.62	4.78	3.00	1.65	0.75	0.04	0.28	0.11	154,583
11 to 12	673.89	0.59	4.35	2.95	1.61	0.76	0.04	0.25	0.08	351,709
13 to 14	660.55	0.55	3.74	2.83	1.57	0.75	0.05	0.21	0.06	288,555
15 to 16 (high fluency)	671.32	0.50	3.40	2.73	1.55	0.72	0.05	0.22	0.06	133,748
All Sales	677.19	0.57	4.14	2.89	1.60	0.75	0.05	0.24	0.07	958,408

- Almost monotonic decrease in prices as street name fluency increases! (inconsistent to name fluency)
- However also less fluent name homes are houses, larger and have more beds bath and parking (need to control for)

Hedonic Model Results

Dep Var: Log(Price)	(1)	(2)	(3)	(4)	(5)	(6)
Englishness Group	0.000					
	(0.002)					
Words Group		0.000				
		(0.009)				
MS Word			0.003			
			(0.004)			
Popname Group				-0.007***		
				(0.002)		
Syllable Group					-0.001	
					(0.003)	
Letters Group						-0.003**
						(0.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Clustered Standard Error	Suburb	Suburb	Suburb	Suburb	Suburb	Suburb
Adjusted R-square	0.8493	0.8493	0.8493	0.8493	0.8493	0.8493
Number of Observations	958,408	958,408	958,408	958,418	958,408	958,408

→ Common and shorter names have less value, inconsistent to fluency!

Fluency Categorical Dummies

Dep Var: Log(Price)	Englishness (1)	Words (2)	Popname (3)	Syllable (4)	Letters (5)
Fluency Measure = 3 (High)	0.001	0.118***	-0.014**	0.000	-0.006**
	(0.003)	(0.031)	(0.006)	(0.006)	(0.003)
Fluency Measure = 2 (Mid)	0.002	0.136***	-0.004	0.001	-0.001
	(0.003)	(0.031)	(0.006)	(0.006)	(0.004)
Other Housing Char	Yes	Yes	Yes	Yes	Yes
Suburb Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year/Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes
Cluster SE	Suburb	Suburb	Suburb	Suburb	Suburb
Adj Rsq	0.8493	0.8494	0.8493	0.8493	0.8493
N	958,408	958,408	958,408	958,418	958,408

- Streets with ***more words*** have significantly ***lower*** prices than one-word streets.
- Streets with ***Common names*** and those with ***fewer letters*** have ***lower*** prices.

Explanation: Consumption Domain Effects

- Results are inconsistent with fluent street names having higher housing prices.
- Can be explained by consumption domain effect (Pocheptsova et al, 2010)
  - For ***special-occasion*** items, less fluency is desirable as it is associated with exclusivity.
- Test hypothesis by interacting fluency measures with whether a home has a rare street name (street name in 6 or fewer suburbs in Australia) or is a luxury price home (top quartile of sales prices in the year).
- Idea is that people prefer *less fluency* when the home's attributes are also more exclusive (either having a special street name or being a luxury home).

Rare Street

	Five Fluency Measures				
	Englishness	Words	MS Word	Syllable	Letters
Dep Var: Log(Price)	(1)	(2)	(3)	(4)	(5)
Fluency Measure = 3 (High)	0.001	0.142***	0.003	0.007	-0.005
	(0.004)	(0.035)	(0.004)	(0.007)	(0.004)
Fluency Measure = 2 (Mid)	0.004	0.158***		0.008	-0.001
	(0.004)	(0.036)		(0.006)	(0.004)
Fluency Measure = 3 (High)*Rare	0.001	-0.139***	0.007	-0.033	-0.007
	(0.006)	(0.044)	(0.008)	(0.027)	(0.007)
Fluency Measure = 2 (Mid)*Rare	-0.010	-0.135***		-0.026**	0.000
	(0.007)	(0.047)		(0.013)	(0.007)
Other Housing Char, FE	Yes	Yes	Yes	Yes	Yes
Cluster SE	Suburb	Suburb	Suburb	Suburb	Suburb
Adj Rsq	0.8493	0.8495	0.8493	0.8493	0.8493
N	958,408	958,408	958,408	958,408	958,408

- Consistent with consumption domain effect, **rare** streets have **higher** prices when street has more words or more syllables (less fluent).

Luxury Homes

	Five Fluency Measures				
	Englishness	Words	MS Word	Syllable	Letters
Dep Var: Log(Price)	(1)	(2)	(3)	(4)	(5)
Fluency Measure = 3 (High)	0.001	0.086***	0.003	0.002	-0.006**
	(0.003)	(0.025)	(0.003)	(0.006)	(0.003)
Fluency Measure = 2 (Mid)	0.002	0.097***		0.002	0.000
	(0.003)	(0.025)		(0.005)	(0.003)
Fluency Measure = 3 (High)*Lux	-0.013	-0.109*	0.012	-0.041*	-0.010
	(0.017)	(0.064)	(0.011)	(0.024)	(0.010)
Fluency Measure = 2 (Mid)*Lux	-0.014	-0.042		-0.048**	-0.012
	(0.015)	(0.065)		(0.019)	(0.014)
Lux	**0.562*** **	**0.653*** **	**0.548*** **	**0.595*** **	**0.557*** **
	(0.018)	**(0.062)**	**(0.013)**	**(0.023)**	**(0.014)**

- Consistent with consumption domain effect, **luxury** homes have higher prices when street has more words or more syllables (less fluent, more unique).

Heterogeneity Analysis

- **Buyers who speak English as second language**: Evidence that Asian-named buyers prefer names with less letters (i.e. more fluent) than Non-Asian buyers. [TABLE 5]

- **Buyers of New Homes:** New home buyers pay more for street names with less syllables and letters (more fluent) [TABLE 6]

- **Royal names Interaction:** Royal street names attract a higher premium, particularly for luxury homes and when the royal name is uncommon as a street name. [TABLE 7]

- **High Google trend names:** Street names with high search interest on google have higher prices in the following year of the high search. [TABLE 8]

Asian buyers (English as second language)

Dep Var: Log(Price)	(1)	(2)	(3)	(4)	(5)	(6)
Englishness Group	0.000					
	(0.002)					
Englishness Group*Asian Buyer	0.000					
	(0.002)					
Words Group		0.000				
		(0.01)				
Words Group*Asian Buyer		0.001				
		(0.007)				
MS Word			0.002			
			(0.004)			
MS Word*Asian Buyer			0.003			
			(0.003)			
Popname Group				-0.008***		
				(0.003)		
Popname Group *Asian Buyer				0.003		
				(0.002)		
Syllable Group					-0.001	
					(0.003)	
Syllable Group *Asian Buyer					0.002	
					(0.003)	
Letters Group						**-0.004****
						(0.002)
Letters Group *Asian Buyer						**0.003****
						(0.001)
Asian Buyer	-0.010**	-0.013	-0.011***	-0.014***	-0.015**	-0.016***
	(0.004)	(0.021)	(0.002)	(0.004)	(0.007)	(0.004)

→Asian buyers prefer less letters, more fluency due to English as second language.

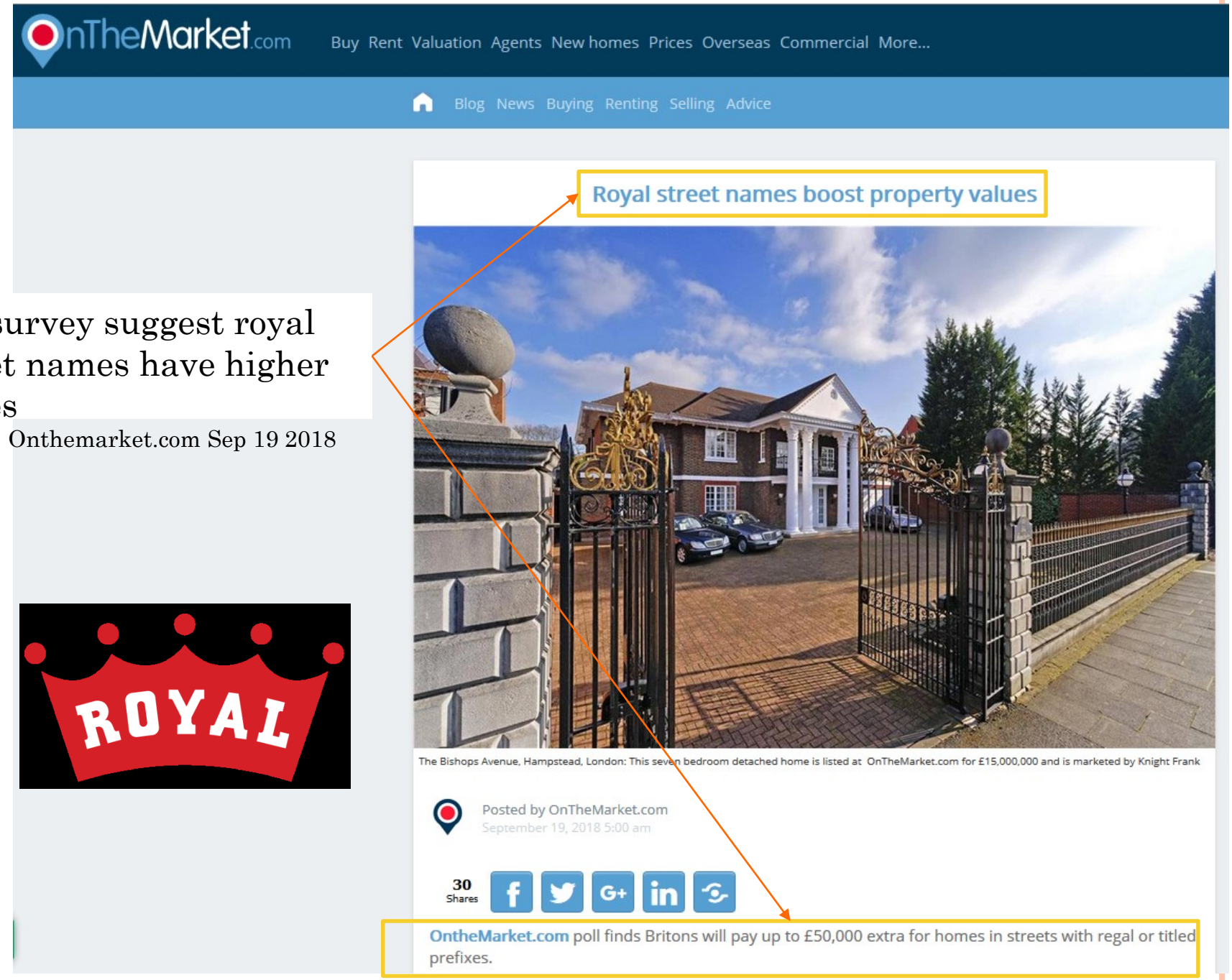
New homes

Dep Var: Log(Price)	(1)	(2)	(3)	(4)	(5)	(6)
Englishness Group	0.000					
	(0.002)					
Englishness Group*New	0.000					
	(0.006)					
Words Group		-0.001				
		(0.009)				
Words Group*New		0.023				
		(0.017)				
MS Word			0.002			
			(0.004)			
MS Word*New			0.014			
			(0.009)			
Popname Group				-0.008***		
				(0.002)		
Popname Group *New				0.012		
				(0.008)		
Syllable Group					-0.002	
					(0.003)	
Syllable Group *New					0.027***	
					(0.009)	
Letters Group						-0.004***
						(0.001)
Letters Group*New						0.013***
						(0.004)
New	0.136***	0.069	0.132***	0.105***	0.081***	0.11***
	(0.016)	(0.051)	(0.008)	(0.025)	(0.021)	(0.012)

→New Home buyers prefer less letters and syllables (more fluency), consistent with buyers seeking familiarity in new homes.

UK survey suggest royal street names have higher prices

Source: Onthemarket.com Sep 19 2018



List of Royal Names

List of Royal Names (28 in total)	N	% in Royal Names	% in Sample
PRINCES	2,190	16.673%	0.229%
KING	1,851	14.092%	0.193%
QUEEN	1,650	12.562%	0.172%
CROWN	1,159	8.824%	0.121%
QUEENS	1,153	8.778%	0.120%
KINGS	675	5.139%	0.070%
KING GEORGES	604	4.598%	0.063%
PRINCE	598	4.553%	0.062%
DUKE	406	3.091%	0.042%
PRINCESS	352	2.680%	0.037%
QUEEN VICTORIA	317	2.413%	0.033%
OLD PRINCES	284	2.162%	0.030%
LORD	272	2.071%	0.028%
PRINCE EDWARD	255	1.941%	0.027%
BUCKINGHAM	224	1.705%	0.023%
PALACE	177	1.348%	0.018%
PRINCE ALBERT	142	1.081%	0.015%
PRINCE ALFRED	134	1.020%	0.014%
PRINCE CHARLES	114	0.868%	0.012%
KING EDWARD	106	0.807%	0.011%
PRINCE EDWARD PARK	101	0.769%	0.011%
ROYAL	101	0.769%	0.011%
GREAT BUCKINGHAM	82	0.624%	0.009%
ROYAL GEORGE	67	0.510%	0.007%
KING WILLIAM	38	0.289%	0.004%
DUCHESS	36	0.274%	0.004%
PRINCESS MARY	28	0.213%	0.003%
KING GEORGE	19	0.145%	0.002%
Total	13,135	100%	1.371%

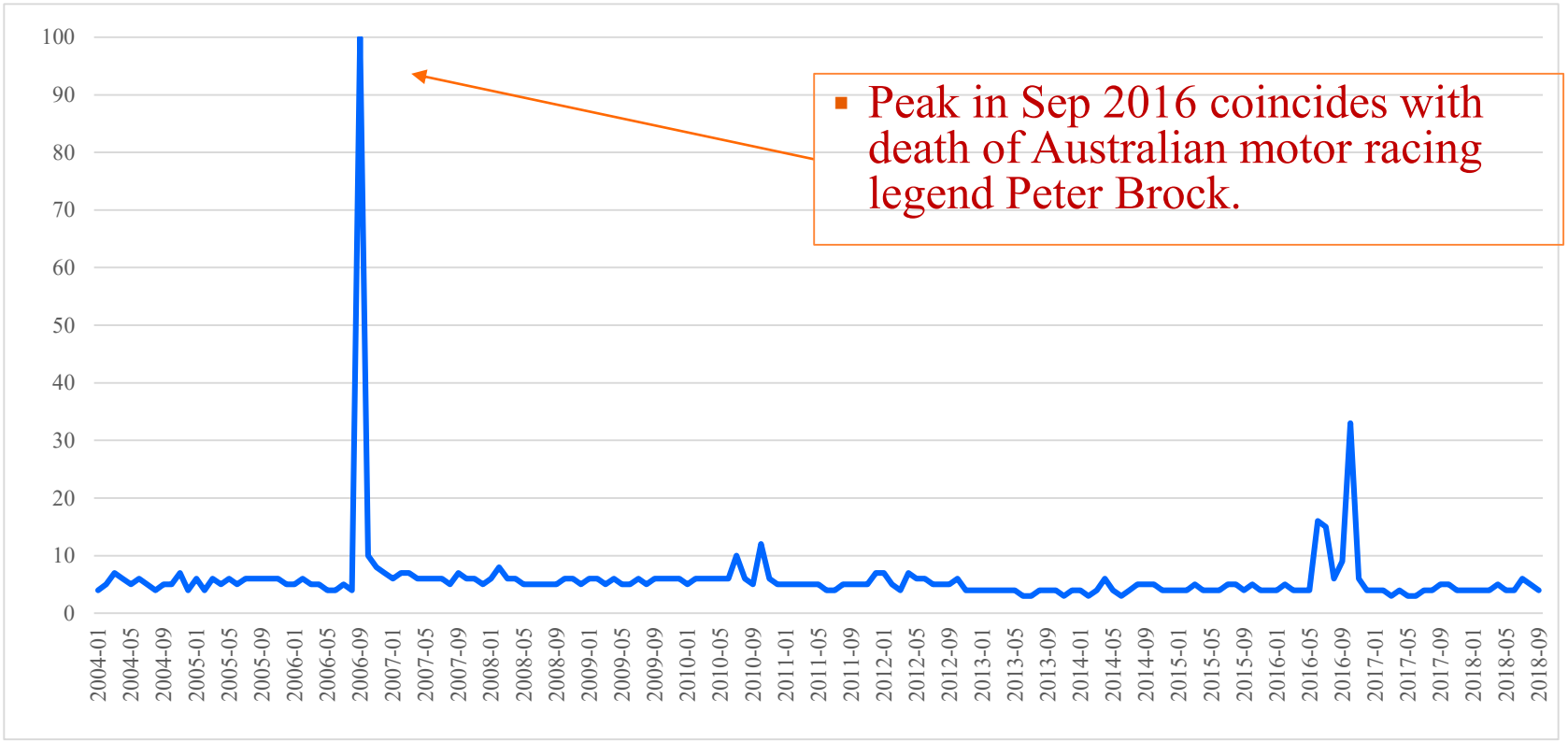
Royal Names

Dep Var: Log(Price)	(1)	(2)	(3)	(4)
Aussie	0.005***			
	(0.001)			
Royal*Aussie	0.008			
	(0.01)			
Chinese		-0.003		
		(0.002)		
Royal*Chinese		-0.020		
		(0.014)		
Investor			-0.003**	
			(0.001)	
Royal*Investor			-0.009	
			(0.008)	
Lux				0.39***
				(0.011)
Royal*Lux				0.035*
				(0.02)
Royal	0.031**	0.035***	0.034***	0.008
	(0.012)	(0.013)	(0.012)	(0.009)

→Royal street names have higher prices, particularly when the home is a luxury home (high priced)

Google Trends Example:

Figure 3: Trends Index for Google Search of 'Brock' in Australian Region



- Expect prices to increase within 1 year window after 'Brock' peaks in Google Trends Search in Australia region

Street Names with high Google trend

Dep Var: Log(Price)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GTrend	0.003**	0.013***	0.001	0.004**	0.015*	0.007	0.004
	(0.002)	(0.004)	(0.033)	(0.002)	(0.008)	(0.007)	(0.004)
		(0.002)					
Englishness Group		0.001					
		(0.002)					
Englishness Group*GTrend		-0.004**					
		(0.002)					
Words Group			-0.002				
			(0.009)				
Words Group*GTrend			0.001				
			(0.011)				
MS Word				0.004			
				(0.004)			
MS Word*GTrend				-0.003			
				(0.003)			
Popname Group					-0.007***		
					(0.002)		
Popname Group *GTrend					-0.004		
					(0.003)		
Syllable Group						0.000	
						(0.003)	
Syllable Group *GTrend						-0.002	
						(0.003)	
Letters Group							-0.003*
							(0.002)
Letters Group*Gtrend							0.000
							(0.002)

→Homes on streets increase in value one year after the street name peaks in search interest on google trends.

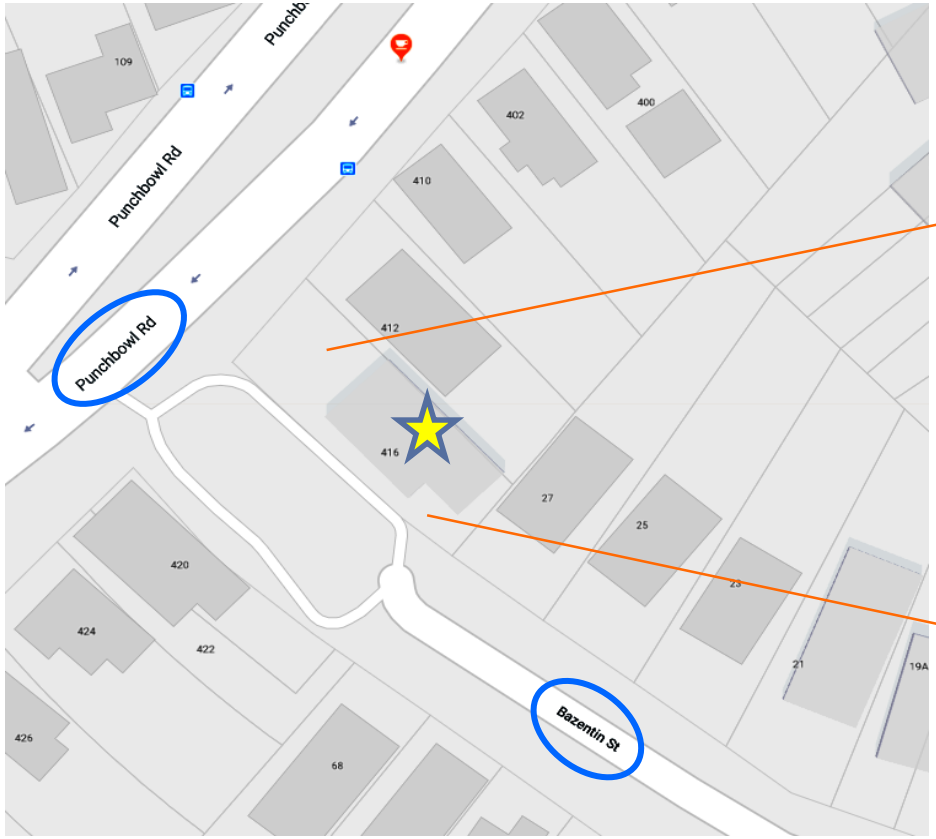
Homes with multiple street names

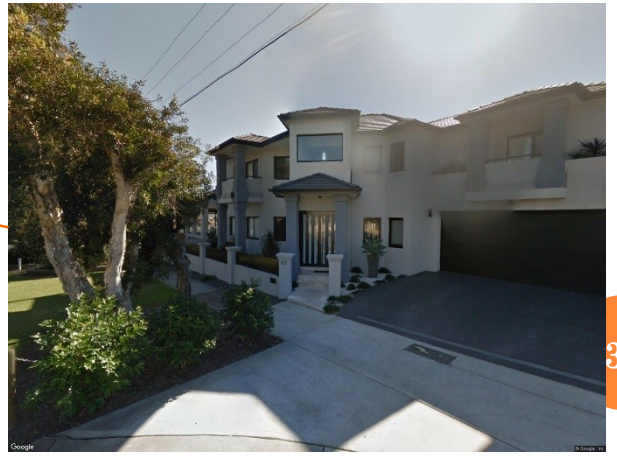
- Homes may have multiple street names if they are on a corner block or adjacent to two or more streets.
  - →Home price may be influenced by the fluency of both street names.
- To find homes with more than one address, we use geocode data from PSMA Australia's Geocoded National Address File (G-NAF) to identify geocodes with multiple addresses but with the same geocode.

EXAMPLE OF A HOME ON TWO STREETS SO HAS TWO STREET NAMES

- For example: geocode (-33.9063,151.0792) has two street names

1) 416 Punchbowl Road, Belfield and also
2) 29 Bazentin St, Belfield.





Homes with multiple street names

- We find 5,989 of home transactions with multiple streets out of the entire sample of 958,408 transactions.
- For each property that is located on multiple streets, we calculate the highest and the lowest fluency scores of all the associated street names along the six fluency dimensions
- We test whether it is the min or max fluency of the street names that affect the price:

$$\ln(P_{ijst}) = \alpha_t + \beta_1 minfluency_{ij} + \beta_2 maxfluency_{ij} + property\ char_i + \beta_l longstreet_{ij} + \beta_m majorstreet_{ij} + \mu_s + \gamma_t + \tau_t + \varepsilon_{it}$$

HOMES WITH MULTIPLE STREET NAMES

Dep Var: Log(Price)	(1)	(2)	(3)	(4)	(5)	(6)
Min Englishness Group	-0.005					
	(0.016)					
Max Englishness Group	-0.043*					
	(0.024)					
Min Words Group		-0.036				
		(0.025)				
Max Words Group		0.170***				
		(0.056)				
Min MSWord			-0.014			
			(0.077)			
Max MSWord			-0.047			
			(0.042)			
Min Popname Group				-0.01		
				(0.018)		
Max Popname Group				0.076*		
				(0.04)		
Min Syllable Group					-0.032	
					(0.023)	
Max Syllable Group					-0.048	
					(0.04)	
Min Letters Group						-0.028***
						(0.01)
Max Letters Group						0.009
						(0.009)

→Street name that has less words and is common drive fluency premium higher. More letters and more English sounding reduce premium

Robustness: Matched Homes analysis

- Potential endogeneity: names reflect the traits of the street rather than the name itself affecting value.
- E.g. 'Beach St' homes are more valuable not due to people liking the name 'Beach' but because streets near beaches are more valuable.
- Matched pair analysis tries to control for unobserved amenity and other spatial characteristics.

Method:

- Pair homes within 100 meters of each other in same suburb, on different streets and sold within 365 days apart.
- If more than one home matches, take pairs which have similar housing characteristics (beds, baths and land area), closest distance and sales data are closest.
- Helps to remove unobserved spatial and temporal features.

MATCHED HOME RESULTS

Dep Var: Log(Price)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Englishness Group	0.000						0.000
	(0.001)						(0.001)
Words Group		0.007					0.014
		(0.008)					(0.009)
MS Word			0.001				0.004
			(0.004)				(0.004)
Popname Group				-0.004**			-0.005**
				(0.002)			(0.002)
Syllable Group					-0.002		0.000
					(0.003)		(0.003)
Letters Group						-0.003**	-0.004**
						(0.001)	(0.002)
Other Housing Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustered SE	Suburb	Suburb	Suburb	Suburb	Suburb	Suburb	Suburb
Adjusted R-square	0.8656	0.8656	0.8656	0.8656	0.8656	0.8656	0.8656
Number of Observations	488,784	488,784	488,784	488,784	488,784	488,784	488,784

→Common names and streets with few letters have lower value.

Conclusion

- Street name, to a degree, matters in pricing homes.
- Longer street names have a discount.
- Consistent to name fluency affecting home value.
- Common street names also have a discount.
- Seems people value uniqueness in street name.
- Unique sounding names have higher prices particularly for luxury homes or when the name is rarely used as a street name.
- Non-English speaking buyers prefer fluent names (less letters).
- Royal or (Google) trendy names have higher prices.
- Analysis robust at the matched home level.