

Internet Appendix to “Where the Heart Is: Information Production and the Home Bias”¹

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This Internet Appendix contains tables omitted from the body of the paper for brevity. Specifically, Table A.I displays summary statistics for credit ratings and analyst characteristics, by subsample; Table A.II displays coefficients from regressions of offer yields (or credit spreads) on credit ratings, home analyst indicators, bond characteristics, and various fixed effects; and Table A.III reports results from an analysis of certain potential selection effects.

¹ Cornaggia, Jess, Kimberly J. Cornaggia, and Ryan Israelsen, 2018, Internet Appendix to “Where the Heart Is: Information Production and the Home Bias” available on SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2518040

1. Sample description

Panels A and B of Table A.I characterize credit analysts and provide credit ratings distributions for the sample of 962,646 bond-month observations with home and outside analysts rating the same bond at the same time. By construction, each bond-month will have one home and one outside lead analyst, resulting in 1,925,292 bond-month-analyst observations; half of the observations reflect home analysts' ratings (described in Panel A) and the other half reflect outside analysts' ratings (described in Panel B). When comparing Panels A and B, it is important to keep in mind that we are comparing different groups of ratings, not distinct groups of people. For example, an analyst from Connecticut will have observations in Panel A when she rates munis issued in Connecticut (provided that her counterpart at the other CRA is not from Connecticut). This same analyst will have observations in Panel B when she rates munis issued outside Connecticut (provided that her counterpart at the other CRA is from Connecticut).

Panel A shows that 57% of the home analysts work at Moody's, implying that 43% work at S&P. The average rating (AA-) is the same for home and outside analysts and is much higher than the average corporate bond rating (See Cornaggia, Cornaggia, and Hund, 2017). We also observe that 69% of the bond-month observations are insured. *Advanced degree* is an indicator variable taking a value of one if the analyst has an advanced degree and zero if the analyst has a terminal bachelor's degree or lower education level. *Issuer tenure* measures the number of years an analyst has rated the issuer. *Agency tenure* is the number of years the analyst has worked at her employing CRA. *In-state rating* is an indicator variable taking a value of one if the analyst currently works in an office in the same state as the issuer whose bonds the analyst is rating and zero if the analyst works in a different state than the issuer. Most analysts in both panels have advanced degrees and approximately half (59% and 44%) are female. Their average age is similar (36 years at the median) and they have been employed by their respective CRAs an average 5.65 and 6.01 years, respectively. On average, analysts cover municipalities from their state of origin longer than municipalities from other states (average 2.81 years versus 2.34 years, respectively). Perhaps most interesting is the difference in the proportion of analysts who reside currently (i.e., contemporaneous to the rating) in the state of issuance. In Panel A, 45% of the home analysts continue to reside in their home state. In Panel B, 53% of outside analysts currently work in the states with issuers they rate, though they grew up elsewhere.

Descriptive statistics in Panels A and B are for the sample of bond-month observations with ratings from one home analyst and one outside analyst. Panel C displays the rating and analyst statistics for the complete set of analyst pairs ($N = 10,034,742$ bond-month-analyst observations) including observations where both or neither analyst is from the state of the issuer. For this larger sample the average rating is still AA-, the percentage of wrapped bonds is smaller (57% compared to 69%), and 21% of bond-month observations have a credit rating from an analyst residing in the state of the issuer.

Panel D characterizes our sample of 61,652 new muni issues. Most (69%) new issues are general obligation (*GO*) bonds with an average maturity of 9.5 years. The average bond has a \$242 million par value and pays approximately 4.24% coupons. Roughly half are negotiated issues and 87% are callable. At least one CRA employs a lead rating analyst from the issuing state in 21% of 61,652 new issues; Moody's (S&P) employs a home analyst to rate 15% (14%) of these bonds. We report rating level statistics for both raters across the full sample of new issues, irrespective of analyst state of origin. S&P is more issuer-friendly in this sample; its ratings are 0.55 notches higher on average.

Offer yield is the raw offer yield on the bond, averaging 3.67%. We measure credit spreads in several ways for completeness. We calculate spreads by subtracting duration-matched Treasury yields. For robustness, we calculate duration two ways. We estimate *Spread to Treasury*₁ with duration calculated using each bond's time to maturity, regardless of whether the bond is callable. We estimate *Spread to Treasury*₂ with duration calculated by substituting the callable bonds' call dates in lieu of their maturity dates. *Spread to after-tax Treasury*₁ (*Spread to after-tax Treasury*₂) is similar to *Spread to Treasury*₁ (*Spread to Treasury*₂) except we use an after-tax yield on the duration-matched Treasury security. Because BABs are generally taxable, we employ after-tax yields of BABs (rather than raw yields) for both after-tax spread variables. We assume a marginal tax rate of 35%.

2. Regressions of offer yields (spreads)

Table IX in the manuscript reports F-tests of summed regression coefficients from Equations (5) and (6) in order to test the extent to which muni investors identify home bias and adjust offer yields accordingly. The difference in yields on like-rated bonds for which the rating is

obtained from a home analyst versus an outside analyst is the sum of coefficients on the direct effect of the home analyst indicator and the interaction term for the home analyst and the rating.

For completeness, we tabulate the coefficients on ratings levels, home analyst indicators, and interaction terms from Equations (5) and (6) here in Table A.II in Panels A and B, respectively. As expected, more favorable ratings are associated with lower yields. Relative to the benchmark rating category (bonds with BBB ratings and below), each higher rating category is associated with lower average offer yields (and spreads) in both panels. The differences are significant at 1% in levels other than those closest to the omitted benchmark (level A- for S&P is significant at 5% and levels A1 - A3 for Moody's are significant at 5% or 10%). This significant reduction in average yields (spreads) is largely monotonic.

3. Additional selection concerns

Section III.D of the manuscript discusses selection concerns including the potential assignment of home analysts by CRAs based on expected information advantage and the potential for home analysts to select issuers from their home states to ensure that these issuers receive favorable credit ratings. Table A.III reports results from the final empirical analysis designed to test the latter selection type.

We conjecture that issuers with frequent analyst turnover are more likely to have randomly assigned analysts than issuers with little or no analyst turnover. Issuers with infrequent turnover could be covered by home analysts who intentionally stick with the issuer to provide favorable ratings as long as possible. For each bond, we compute the percentage of months where the lead analyst changes. We average these percentages across issuers, and then sort the issuers into above- and below-median subsamples based on this characteristic. We then repeat our baseline regressions (i.e., those in Table I) on the subsamples in report the results in Table A.III. We observe that the coefficient on Home analyst is virtually the same for the two subsamples. If anything, the effect is stronger among issuers that experience more frequent lead analyst turnover, although the pooled regression indicates that this difference is not statistically significant.

Table A.I Summary Statistics

Panels A and B of this table display summary statistics for observations in tests of whether there is a home bias in credit ratings. Panel A (Panel B) reports summary statistics for bond-month observations associated with home (outside) analysts. Each panel summarizes 962,646 bond-month-analyst observations. Panel C includes observations where analysts at both S&P and Moody's are home analysts, or both are outside analysts. Panel C summarizes 10,034,742 bond-month-analyst observations. An analyst is a home (outside) analyst if he/she received his/her social security number in the same state as the issuer (a different state than the issuer). *Rating level* is a numerical translation of S&P and Moody's 21-point alphanumeric scales. Ratings are increasing in credit quality, such that AAA or Aaa = 21, AA+ or Aa1 = 20, etc. *Insured* is an indicator variable taking a value of one if the bond is wrapped with third-party insurance. *Moody's* is an indicator variable taking a value of one if the analyst works at Moody's and zero if the analyst works at S&P. *Female* is an indicator taking a value of one if the analyst's name is a traditionally female name and zero otherwise. *Advanced degree* is an indicator variable taking a value of one if the analyst has an advanced degree and zero if the analyst has a bachelor's degree or lower level of education. *Age* is the analyst's age in years. *Issuer tenure* is the number of years the analyst has provided ratings for the issuer. *Agency tenure* is the number of years the analyst has worked at his/her employing rating agency. We divide *Age*, *Issuer tenure*, and *Agency tenure* by ten in regressions to ease interpretation of coefficients. *In-state rating* is an indicator variable taking a value of one if the analyst currently works in an office in the same state as the issuer whose bonds the analyst is rating and zero if the analyst works in a different state than the issuer. Panel D displays characteristics of 61,652 new municipal bond issues. *Offer yield* is the raw offer yield on the bond. *Spread to Treasury₁* is the bond's offer yield minus duration-matched Treasury, where we calculate duration using the bond's time to maturity regardless of whether the bond is callable. *Spread to after-tax Treasury₁* is the bond's offer yield minus the after-tax yield of duration-matched Treasury, where we calculate duration using the bond's time to maturity regardless of whether the bond is callable. *Spread to Treasury₂* is the bond's offer yield minus duration-matched Treasury, where we calculate duration using the bond's call date if the bond is callable and the bond's time to maturity if the bond is not callable. *Spread to after-tax Treasury₂* is the bond's offer yield minus the after-tax yield of duration-matched Treasury, where we calculate duration using the bond's call date if the bond is callable and the bond's time to maturity if the bond is not callable. For both *Spread to after-tax Treasury₁* and *Spread to after-tax Treasury₂*, we assume a tax rate of 35% when calculating after-tax yields for Treasuries. If a bond is a Build America Bond, we substitute its raw yield with its after-tax yield, again assuming a 35% tax rate. *S&P home analyst* is an indicator variable taking a value of one if the new issue is rated by a home analyst at S&P and zero if the new issue is rated by an S&P analyst born outside the issuer's state. *Moody's home analyst* is an indicator variable taking a value of one if the new issue is rated by a home analyst at Moody's and zero if the new issue is rated by a Moody's analyst born outside the issuer's state. *S&P rating level (Moody's rating level)* is a numerical translation of S&P's (Moody's) 21-point alphanumeric scale. Ratings are increasing in credit quality, such that AAA (Aaa) = 21, AA+ (Aa1) = 20, etc. *Par* is the bond's par value measured in millions of dollars. *Maturity* is the bond's maturity measured in years. *Coupon* is the bond's coupon expressed as a percentage. *Outstanding bonds* is the number of other bonds outstanding for the issuer at the time of issuance. *GO* is an indicator variable taking a value of one if the bond is a general obligation bond and zero if the bond is a revenue bond or other type. *BAB* is an indicator variable taking a value of one if the bond is a Build America Bond and zero if not. *Negotiated* is an indicator variable taking a value of one if the offering was negotiated and zero if it was competitive. *Callable* is an indicator taking a value of one if the bond is callable and zero if not.

Panel A: Observations for Home Analysts in Home Bias Tests

	Mean	SD	10 th pct	Median	90 th pct
Rating level	17.91	2.01	15	18	21
	(≈AA-/Aa3)		(=A-/A3)	(=AA-/Aa3)	(=AAA/Aaa)
Insured	0.69	0.46	0	1	1
Moody's	0.57	0.49	0	1	1
Female	0.59	0.49	0	1	1
Advanced degree	0.91	0.29	1	1	1
Age	36.98	7.73	28	36	49
Issuer tenure	2.81	2.26	0.42	2.25	6.17
Agency tenure	5.65	3.27	1.58	5.33	10.50
In-state rating	0.45	0.50	0	0	1

Panel B: Observations for Outside Analysts in Home Bias Tests

	Mean	SD	10 th pct	Median	90 th pct
Rating level	17.86	2.08	15	18	21
	(≈AA-/Aa3)		(=A-/A3)	(=AA-/Aa3)	(=AAA/Aaa)
Insured	0.69	0.46	0	0	1
Moody's	0.43	0.49	0	1	1
Female	0.44	0.50	0	0	1
Advanced degree	0.82	0.38	0	1	1
Age	38.56	8.51	30	36	50
Issuer tenure	2.34	2.07	0.33	1.75	5.08
Agency tenure	6.01	2.91	2.00	6.17	9.83
In-state rating	0.53	0.50	0	1	1

Panel C: Observations for Tests with Analyst Characteristics

	Mean	SD	10 th pct	Median	90 th pct
Rating level	18.33	1.97	16	18	21
	(≈AA-/Aa3)		(=A/A2)	(=AA-/Aa3)	(=AAA/Aaa)
Insured	0.57	0.50	0	1	1
Moody's	0.50	0.50	0	0.5	1
Female	0.46	0.50	0	0	1
Advanced degree	0.87	0.34	0	1	1
Age	39.59	9.83	29	37	52
Issuer tenure	2.55	2.14	0.33	2.00	5.67
Agency tenure	6.03	3.02	2.08	6.00	10.25
In-state rating	0.21	0.41	0	0	1

Panel D: Observations in Tests with Offer Yields and Spreads as Dependent Variables

	Mean	SD	10 th pct	Median	90 th pct
Offer yield	3.6656	1.0837	2.1200	3.8000	4.8600
Spread to Treasury ₁	-0.1217	0.7491	-0.9077	-0.2533	0.8435
After-tax spread to Treasury ₁	1.2035	0.6821	0.4656	1.0962	2.0694
Spread to Treasury ₂	-0.2855	0.7797	-1.0739	-0.4358	0.7324
After-tax spread to Treasury ₂	1.0970	0.6575	0.4350	0.9787	1.9491
Home analyst at either rater	0.21	0.41	0	0	1
S&P home analyst	0.14	0.36	0	0	1
Moody's home analyst	0.15	0.36	0	0	1
S&P rating level	19.48	1.59	18	20	21
	(≈AA)		(=AA-)	(=AA+)	(=AAA)
Moody's rating level	18.93	1.83	16	19	21
	(≈Aa2)		(=A2)	(=Aa2)	(=Aaa)
Par	242	573	7	53	514
Maturity	9.5	6.2	2	9	18
Coupon	4.24	0.98	3.00	4.25	5.25
Outstanding bonds	911	1,488	87	354	2,272
GO	0.69	0.46	0	1	1
BAB	0.04	0.19	0	0	0
Negotiated	0.52	0.50	0	1	1
Callable	0.87	0.33	0	1	1

Table A.II

Home Analysts and Yields and Spreads on New Bond Issues – OLS Regressions

This table displays results from OLS regressions with offer yields and spreads on new issues as dependent variables. The dependent variable in columns (1) through (5) are as follows. *Offer yield*, is the raw offer yield on the bond. *Spread to Treasury₁* is the bond's offer yield minus duration-matched Treasury, where we calculate duration using the bond's time to maturity regardless of whether the bond is callable. *Spread to after-tax Treasury₁* is the bond's offer yield minus the after-tax yield of duration-matched Treasury, where we calculate duration using the bond's time to maturity regardless of whether the bond is callable. *Spread to Treasury₂* is the bond's offer yield minus duration-matched Treasury, where we calculate duration using the bond's call date if the bond is callable and the bond's time to maturity if the bond is not callable. *Spread to after-tax Treasury₂* is the bond's offer yield minus the after-tax yield of duration-matched Treasury, where we calculate duration using the bond's call date if the bond is callable and the bond's time to maturity if the bond is not callable. For both *Spread to after-tax Treasury₁* and *Spread to after-tax Treasury₂*, we assume a tax rate of 35% when calculating after-tax yields for Treasuries. If a bond is a Build America Bond, we substitute its raw yield with its after-tax yield, again assuming a 35% tax rate. The independent variables in Panel A include indicator variables for S&P's ratings assigned to new issues. The independent variables in Panel B include indicator variables for Moody's ratings assigned to new issues. *S&P home analyst* is an indicator variable taking a value of one if the new issue is rated by a home analyst at S&P and zero if the new issue is rated by an S&P analyst who grew up outside the issuer's state. *Moody's home analyst* is an indicator variable taking a value of one if the new issue is rated by a home analyst at Moody's and zero if the new issue is rated by a Moody's analyst who grew up outside the issuer's state. We define bond controls in Internet Appendix Table A.I Panel D. Issuer type FE are indicator variables for whether the bond is issued by a city, county, state, or other level of government. We cluster standard errors at the issuer level. Standard errors are in parentheses below coefficient estimates. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: S&P Home Analysts and Offer Yields and Spreads

	Offer yield	Spread to Treasury ₁	After-tax spread to Treasury ₁	Spread to Treasury ₂	After-tax spread to Treasury ₂
	(1)	(2)	(3)	(4)	(5)
AAA	-0.9319 (0.1740)***	-1.2618 (0.2570)***	-1.1390 (0.2246)***	-1.2451 (0.2612)***	-1.1281 (0.2274)***
AA+	-0.8882 (0.1742)***	-1.2281 (0.2588)***	-1.1019 (0.2259)***	-1.2133 (0.2631)***	-1.0923 (0.2288)***
AA	-0.7974 (0.1727)***	-1.1000 (0.2570)***	-0.9874 (0.2243)***	-1.0931 (0.2612)***	-0.9830 (0.2271)***
AA-	-0.6724 (0.1750)***	-0.9680 (0.2593)***	-0.8673 (0.2265)***	-0.9438 (0.2640)***	-0.8516 (0.2296)***
A+	-0.5878 (0.1733)***	-0.8249 (0.2553)***	-0.7356 (0.2226)***	-0.8128 (0.2599)***	-0.7277 (0.2257)***
A	-0.5649 (0.1769)***	-0.8011 (0.2694)***	-0.7146 (0.2340)***	-0.7755 (0.2710)***	-0.6979 (0.2350)***
A-	-0.3989 (0.1891)**	-0.6639 (0.2789)**	-0.5690 (0.2425)**	-0.6254 (0.2828)**	-0.5440 (0.2451)**
S&P home analyst	-0.2583 (0.2043)	-0.5127 (0.3089)*	-0.4222 (0.2654)	-0.4556 (0.3018)	-0.3850 (0.2598)
Moody's home analyst	0.0506 (0.0396)	0.0109 (0.0351)	0.0243 (0.0313)	-0.0394 (0.0382)	-0.0084 (0.0291)
AAA × S&P home analyst	0.4372 (0.2237)*	0.4878 (0.3085)	0.4655 (0.2652)*	0.3334 (0.3098)	0.3651 (0.2597)
AA+ × S&P home analyst	0.2656 (0.2110)	0.5545 (0.3130)*	0.4480 (0.2687)*	0.5375 (0.3073)*	0.4370 (0.2637)*
AA × S&P home analyst	0.2627 (0.2106)	0.5694 (0.3116)*	0.4570 (0.2686)*	0.5502 (0.3069)*	0.4445 (0.2647)*
AA- × S&P home analyst	0.1291 (0.2143)	0.6358 (0.3171)**	0.4627 (0.2684)*	0.2493 (0.3020)	0.2115 (0.2609)
A+ × S&P home analyst	0.2006 (0.2578)	0.2952 (0.3502)	0.2585 (0.3087)	0.2619 (0.3781)	0.2369 (0.3254)
A × S&P home analyst	0.3173 (0.2194)	0.4795 (0.3226)	0.4235 (0.2791)	0.4684 (0.3167)	0.4163 (0.2746)
A- × S&P home analyst	0.5906 (0.2467)**	0.8427 (0.4462)*	0.7507 (0.3650)**	0.7388 (0.4596)	0.6832 (0.3727)*
Constant	2.3875 (0.2018)***	0.6550 (0.2462)***	1.2424 (0.2224)***	1.0242 (0.2541)***	1.4824 (0.2271)***
Bond controls?	Yes	Yes	Yes	Yes	Yes
Issuer type FE?	Yes	Yes	Yes	Yes	Yes
Issuer state FE?	Yes	Yes	Yes	Yes	Yes
Issuance year FE?	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.73	0.53	0.56	0.44	0.47
N	61,652	61,652	61,652	61,652	61,652

Panel B: Moody's Home Analysts and Offer Yields and Spreads

	Offer yield (1)	Spread to Treasury ₁ (2)	After-tax spread to Treasury ₁ (3)	Spread to Treasury ₂ (4)	After-tax spread to Treasury ₂ (5)
Aaa	-0.8001 (0.1722)***	-1.0896 (0.2700)***	-0.9823 (0.2325)***	-1.1079 (0.2709)***	-0.9942 (0.2332)***
Aa1	-0.8067 (0.1736)***	-1.0897 (0.2718)***	-0.9857 (0.2343)***	-1.1060 (0.2728)***	-0.9963 (0.2349)***
Aa2	-0.7172 (0.1729)***	-0.9827 (0.2728)***	-0.8842 (0.2348)***	-1.0005 (0.2739)***	-0.8958 (0.2355)***
Aa3	-0.6601 (0.1722)***	-0.9211 (0.2717)***	-0.8305 (0.2338)***	-0.9320 (0.2727)***	-0.8376 (0.2345)***
A1	-0.4221 (0.1758)**	-0.6296 (0.2690)**	-0.5518 (0.2330)**	-0.6493 (0.2698)**	-0.5646 (0.2335)**
A2	-0.3848 (0.1797)**	-0.6167 (0.2832)**	-0.5329 (0.2437)**	-0.6263 (0.2844)**	-0.5391 (0.2445)**
A3	-0.4018 (0.2132)*	-0.5215 (0.2978)*	-0.4723 (0.2629)*	-0.5536 (0.2967)*	-0.4931 (0.2622)*
S&P home analyst	0.0181 (0.0365)	0.0153 (0.0435)	0.0150 (0.0380)	0.0067 (0.0429)	0.0093 (0.0374)
Moody's home analyst	-0.0621 (0.2049)	-0.3389 (0.3237)	-0.2332 (0.2703)	-0.3757 (0.3058)	-0.2572 (0.2597)
Aaa × Moody's home analyst	0.0850 (0.2087)	0.4137 (0.3242)	0.2875 (0.2708)	0.4657 (0.3061)	0.3213 (0.2600)
Aa1 × Moody's home analyst	0.1989 (0.2071)	0.4323 (0.3214)	0.3425 (0.2681)	0.4650 (0.3035)	0.3638 (0.2573)
Aa2 × Moody's home analyst	-0.0204 (0.2066)	0.3087 (0.3234)	0.1849 (0.2699)	0.3617 (0.3058)	0.2194 (0.2595)
Aa3- × Moody's home analyst	0.0178 (0.2129)	0.2773 (0.3301)	0.1805 (0.2771)	0.3107 (0.3127)	0.2022 (0.2668)
A1 × Moody's home analyst	-0.0885 (0.2260)	0.1846 (0.3365)	0.0786 (0.2843)	0.2501 (0.3188)	0.1212 (0.2743)
A2 × Moody's home analyst	0.0665 (0.2270)	0.2683 (0.3381)	0.1918 (0.2864)	0.2712 (0.3204)	0.1937 (0.2755)
A3 × Moody's home analyst	0.0436 (0.2490)	0.0417 (0.3519)	0.0287 (0.3024)	-0.4256 (0.3370)	-0.2751 (0.2939)
Constant	2.3623 (0.2072)***	0.5329 (0.2638)**	1.1550 (0.2354)***	0.8519 (0.2661)***	1.3623 (0.2374)***
Bond controls?	Yes	Yes	Yes	Yes	Yes
Issuer type FE?	Yes	Yes	Yes	Yes	Yes
Issuer state FE?	Yes	Yes	Yes	Yes	Yes
Issuance year FE?	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.73	0.52	0.56	0.44	0.46
N	61,652	61,652	61,652	61,652	61,652

Table A.III
Frequency of Analyst Turnover as a Proxy for Likelihood of an Issuer Being Covered by Randomly Assigned Analysts

This table displays results from OLS regressions with *Rating level* as the dependent variable. *Rating level* is a numerical translation of S&P and Moody's 21-point alphanumeric scales. Ratings are increasing in credit quality, such that AAA or Aaa = 21, AA+ or Aa1 = 20, etc. *Home analyst* is an indicator variable taking a value of one if the bond was issued by a municipality in the lead analyst's home state. We define an analyst's home by where he/she received his/her social security number. Columns (1) and (2) split our main sample by whether the bond's issuer is covered by an above- or below-median number of unique analysts over the sample period. *Above median turnover* is an indicator taking a value of one if the bond's issuer is covered by relatively many different analysts during the sample period and zero if it is covered by relatively few different analysts during the sample period. We cluster standard errors at the bond level. Standard errors are in parentheses below coefficient estimates. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	Below median turnover (1)	Above median turnover (2)	Pooled (3)
Home analyst	0.09 (0.01)***	0.11 (0.01)***	0.12 (0.01)***
Home analyst × Above median turnover			-0.01 (0.02)
Agency FE?	Yes	Yes	Yes
Bond-Month FE?	Yes	Yes	Yes
Adjusted R ²	0.94	0.94	0.94
N	960,062	965,230	1,925,292