- raw pre-period building density means show (1) differences between project areas and spillover areas and (2) differences between constructed and unconstructed projects

- we are going to use two strategies:

  1. our high-res spatial data provides a unique opportunity to control for spatially precise fixed effects (2001 census subplaces) which erase mean differences between constructed and unconstructed projects in the pre-period and;

  2. after controlling for 2001 census subplace fixed effects, constructed and unconstructed projects have the same pattern in the preperiod: both have higher informal building density in project areas, which means it is important to include unconstructed projects as counterfactuals in a DDD setting

     – by project type, greenfield and in-situ have perfect pre-trends, while unlabeled projects have a few differences

- raw building changes over time suggest some crowd-in close to project boundaries, especially for in-situ upgrading projects[1]

- empirical strategy is a DDD with each observation linked to its closest project and controlling for 2001 census subplace fixed effects

  – there are around 1000 sub-places in 2001

  – using 2001 subplaces is a nice way to tie our hands on geography, and subplaces are likely to be drawn in more thoughtful ways than simply imposing arbitrary 3km grid cells

  – specifications define spillover areas as 0-250m and 250-500m distances away from projects

    * why 250m? because the average area of the 250m buffers is just about equal to the average area of the projects themselves (which is 1.2 km2), which is consistent with some rough assumption that spatial effects might be proportional to size of footprint; also, the effects mostly dissipate at further distances [2]

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[1] I don't want to show "demeaned" changes over time because that is not exactly what the regression is picking up, in fact the regression results are more consistent with the raw changes than the demeaned changes

[2] one concern is that there is error in drawing the project boundaries so what we are calling spillover may actually just be mislabeled project areas: three responses

· the raw data show seriously sharp breaks in densities at boundaries

· casual observation suggests that boundaries are often drawn generously (ie. in many cases, houses do not fill the total shapes)

- Standard errors are clustered at the project/treatment level (ie. about 300 projects by inside, spillover, and control areas for about 900 groups total). This approach follows from recommendations from Imbens and Athey's recent paper. I also tried spatially auto-correlated Conley errors, which are actually a lot smaller than the clustered errors (I don't think you can do these errors on top of clustering), but might be worth reporting also

- **My headline takeaways:**

    – Greenfield projects are characterized by increases in formal housing (with improved services) and backyard informal housing, and small decreases in informal non-bkyd housing. These new houses slightly crowd-in new formal development (with better services) around their footprints. New and improved greenfield houses act as a positive amenity, noisily increasing house prices

    – In-situ projects knock down a lot of informal non-bkyd housing (which is totally offset by new bkyd housing) and replace this informal housing with new formal housing (with improved services). This big shift in housing quality noisily crowds-in new development of both formal and informal housing (with no strong net effect on services) nearby. This massive increase in nearby formal housing supply offsets the gain to local amenities and drives down local formal housing prices

Table 1. Housing Project Areas Description

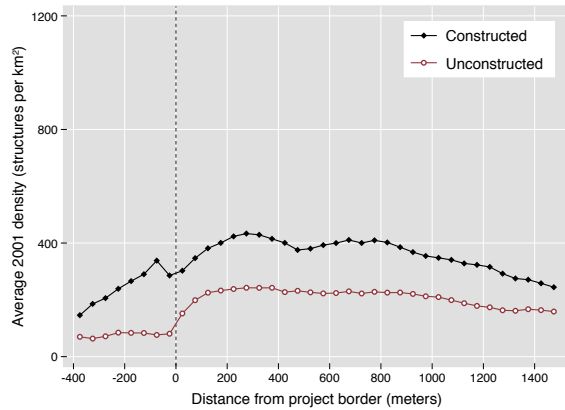|	All		Greenfield		In-Situ	
	Const.	Unconst.	Const.	Unconst.	Const.	Unconst.
Number of Projects	164	137	41	19	25	29
Area (km2)	1.21	1.19	1.75	2.53	1.60	0.88
Median Construction Yr.	2006	2006	2006	2005	2004	2006
Delivered Houses	302	0	420	0	557	0
House Price in 1 km (R†)	189,304	218,635	194,214	186,841	179,596	208,571
Distance to CBD‡ (km)	32.4	28.0	40.6	40.5	32.3	30.6

Const. refers to constructed projects and unconst. refers to unconstructed projects.
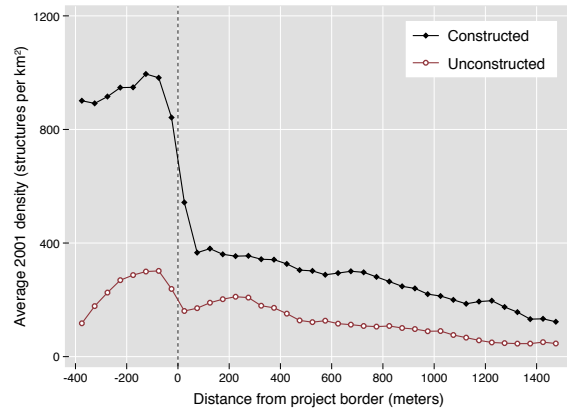*Calculated from *expected* completion dates using Gauteng National Treasury budget reports.
† The USD averaged to about 7.70 Rands during the 2001-2011 period.
‡Measured as the average minimum distance with respect to Johannesburg and Pretoria CBDs.
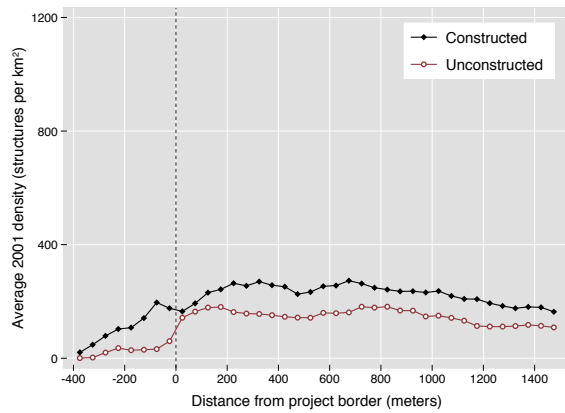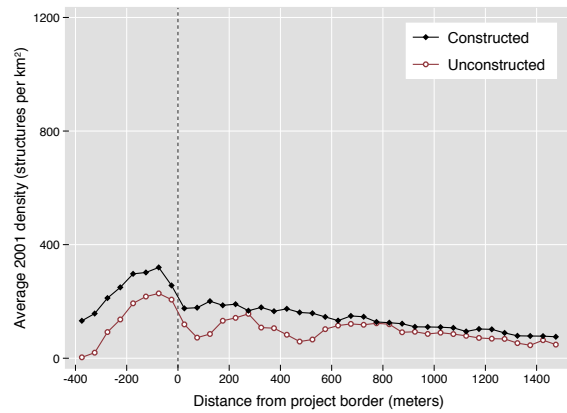
(a) All Projects pre-period formal raw data

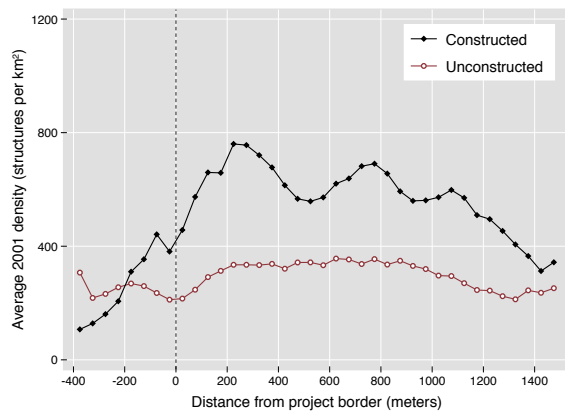**(b) All Projects** pre-period informal raw data

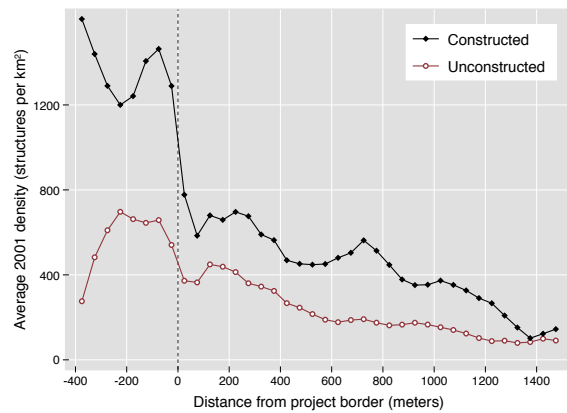**(c) Greenfield** pre-period formal raw data

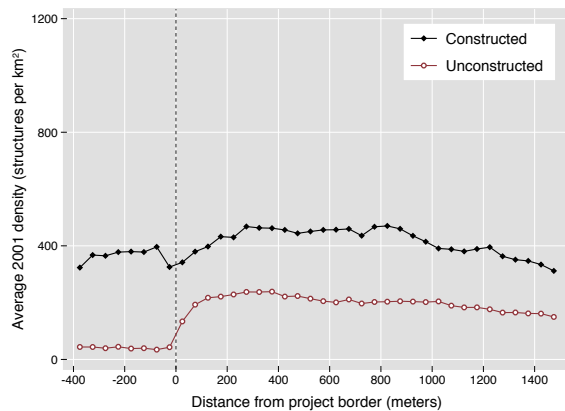**(d) Greenfield** pre-period informal raw data

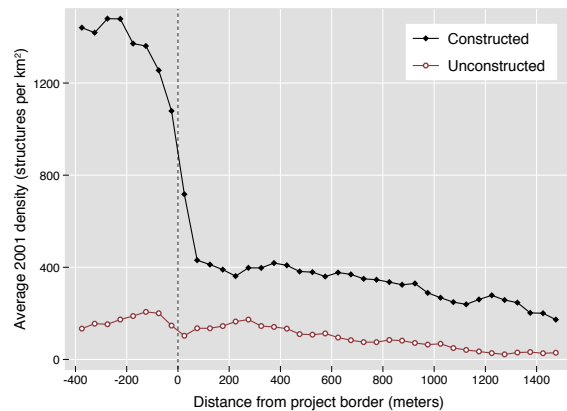**(e) In-Situ** pre-period formal raw data

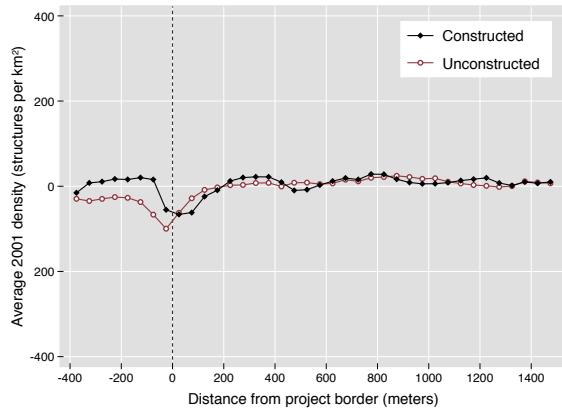**(f) In-Situ** pre-period informal raw data

(g) Other pre-period formal raw data
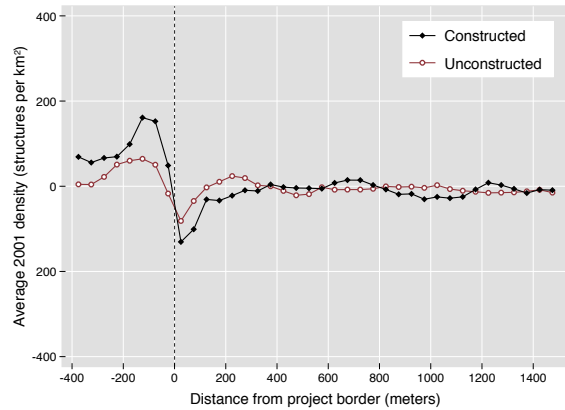
(h) Other pre-period informal raw data
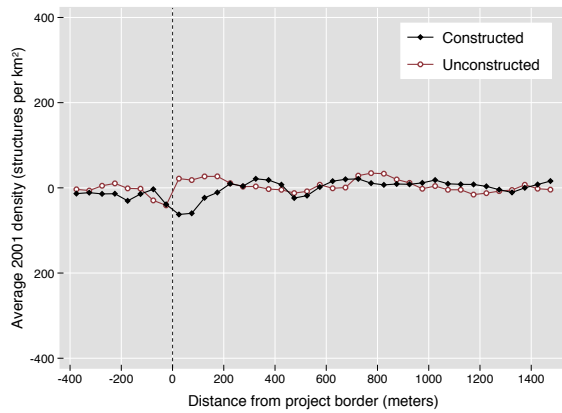

3

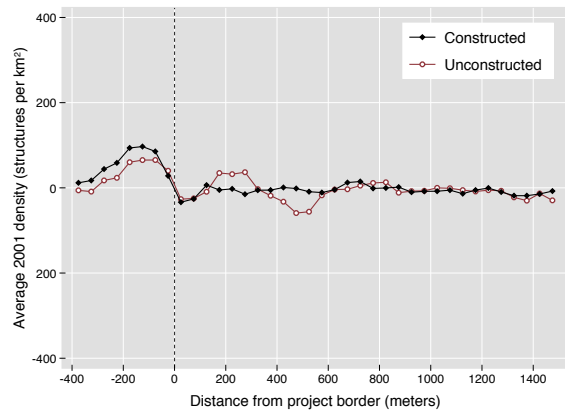**(a) All Projects** pre-period formal fe

(b) All Projects pre-period informal fe

(c) Greenfield pre-period formal fe

(d) Greenfield pre-period informal fe

(e) In-Situ pre-period formal fe

(f) In-Situ pre-period informal fe
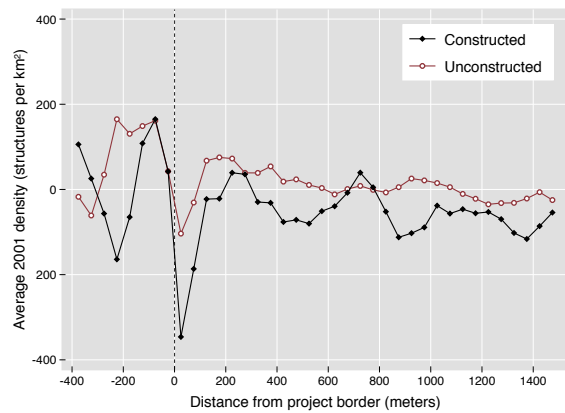
(g) Other pre-period formal fe

(h) Other pre-period informal fe

4
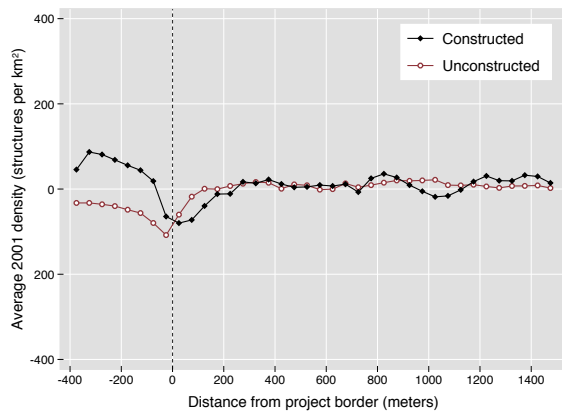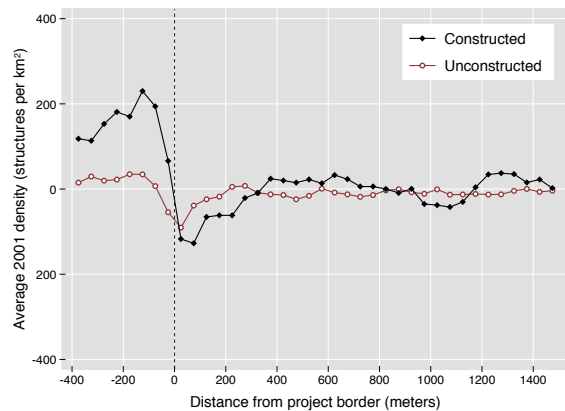
(a) All Projects changes formal raw data
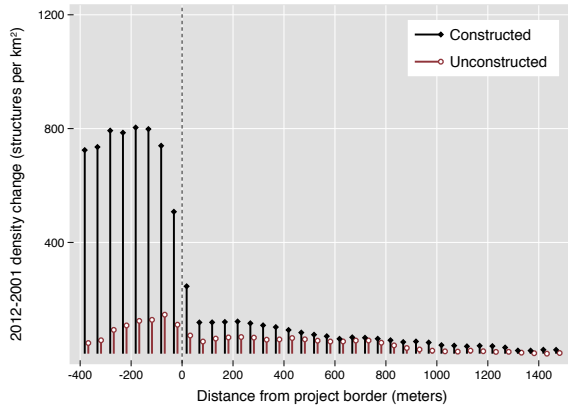
(b) All Projects changes informal raw data

(c) Greenfield changes formal raw data

(d) Greenfield changes informal raw data

(e) In-Situ changes formal raw data

(f) In-Situ changes informal raw data

(g) Other changes formal raw data
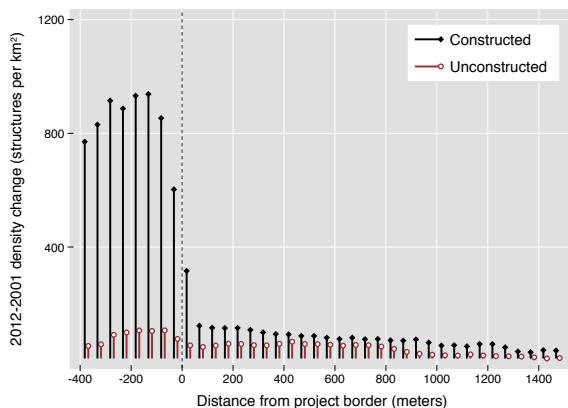
(h) Other changes informal raw data

5
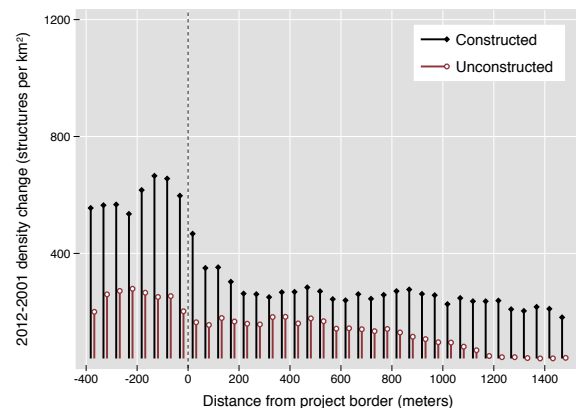
Table 2. Building Density

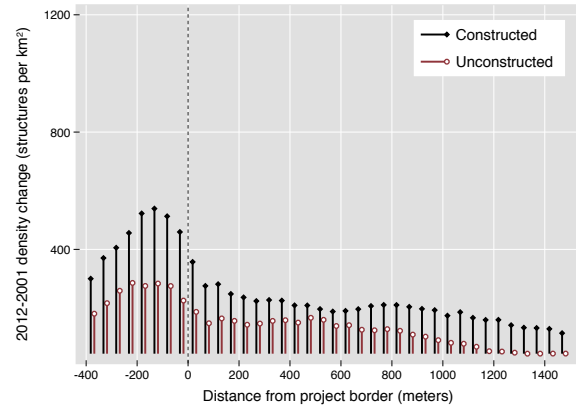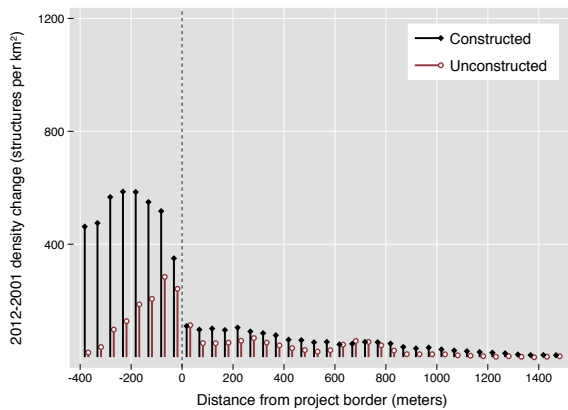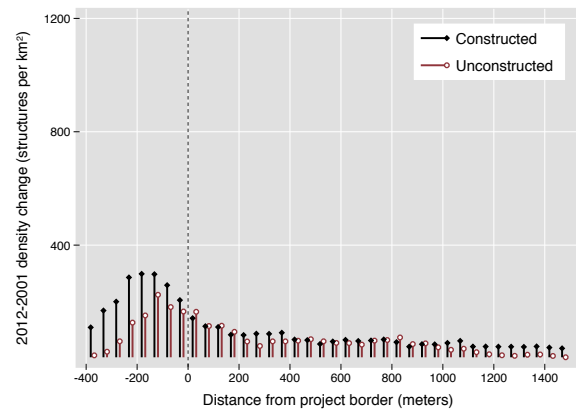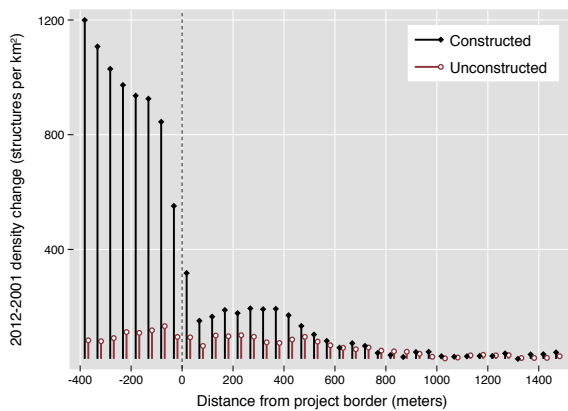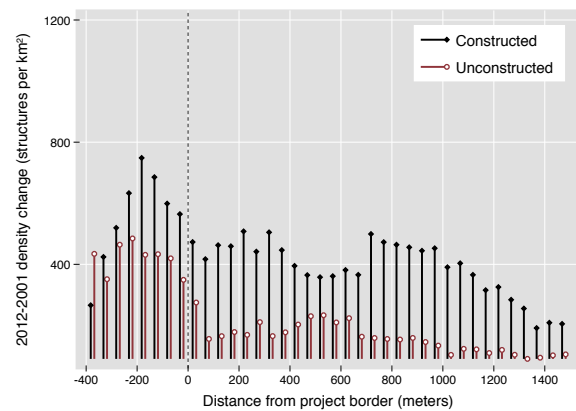|	(1) Total	(2) Formal	(3) Informal	(4) Informal Bkyd.	(5) Informal Non-Bkyd.
All Projects					
inside project	611.592[a]	620.033[a]	-8.441	521.964[a]	-530.405[a]
	(191.184)	(98.725)	(139.037)	(124.975)	(131.385)
0-500m outside project	-189.479[c]	-28.176	-161.303[b]	-95.671	-65.632
	(98.595)	(54.169)	(82.296)	(71.083)	(69.985)
R^2	0.305	0.276	0.263	0.189	0.259
Greenfield					
inside project	300.851	171.702	129.149	87.898	41.251
	(349.583)	(289.394)	(106.795)	(194.841)	(144.318)
0-500m outside project	-105.918	-76.529	-29.389	-113.755	84.366
	(235.140)	(107.801)	(144.512)	(112.770)	(85.988)
In-Situ Upgrading					
inside project	1439.960[b]	1193.277[a]	246.684	1168.161[a]	-921.478[b]
	(578.606)	(196.043)	(484.009)	(292.300)	(435.532)
0-500m outside project	-200.201	126.071	-326.273	46.457	-372.729[c]
	(268.022)	(137.120)	(236.728)	(162.396)	(217.809)
Other					
inside project	992.993[a]	835.990[a]	157.003	707.527[a]	-550.524[a]
	(243.992)	(103.474)	(191.455)	(151.698)	(150.363)
0-500m outside project	-78.348	-4.187	-74.161	-67.165	-6.996
	(175.377)	(66.771)	(141.681)	(95.335)	(102.451)
Mean Outcome 2001	524.85	261.16	263.69	96.38	167.31
Mean Outcome 2011	836.05	384.05	452.00	286.03	165.98
R^2	0.308	0.278	0.265	0.194	0.261
N	6,822,716	6,822,716	6,822,716	6,822,716	6,822,716

Table 3. Census Household-level Estimates

	(1) Formal	(2) Informal	(3) Own Dwelling
All Projects			
inside project	0.523[a]	-0.459[a]	-0.045
	(0.076)	(0.068)	(0.095)
0-500m outside project	0.048	-0.034	0.071
	(0.047)	(0.035)	(0.046)
R^2	0.516	0.606	0.413
Greenfield			
inside project	0.237[b]	-0.166	0.035
	(0.111)	(0.110)	(0.110)
0-500m outside project	0.135	-0.098	0.138
	(0.085)	(0.067)	(0.089)
In-Situ Upgrading			
inside project	0.574[a]	-0.542[a]	0.011
	(0.090)	(0.088)	(0.107)
0-500m outside project	0.101	-0.066	-0.012
	(0.066)	(0.052)	(0.066)
Other			
inside project	0.438[a]	-0.404[a]	-0.065
	(0.089)	(0.080)	(0.108)
0-500m outside project	-0.010	0.021	-0.008
	(0.057)	(0.049)	(0.052)
Mean Outcome 2001	0.59	0.33	0.69
Mean Outcome 2011	0.66	0.23	0.46
R^2	0.528	0.620	0.417
N	19,614	19,614	19,606

[c] $p<0.10$, [b] $p<0.05$, [a] $p<0.01$

Table 4. Census Household-level Estimates

	(1) Flush Toilet	(2) Water Indoors	(3) Electricity Cooking	(4) Number of Rooms	(5) Household Size	(6) Population Density
All Projects						
inside project	0.261[a]	0.314[a]	0.093	0.843[a]	0.180	-220.636
	(0.092)	(0.073)	(0.089)	(0.257)	(0.123)	(623.221)
0-500m outside project	-0.015	0.045	0.019	0.158	0.203[b]	518.618
	(0.036)	(0.045)	(0.035)	(0.158)	(0.081)	(431.419)
R^2	0.538	0.552	0.512	0.661	0.569	0.733
Greenfield						
inside project	0.229[c]	0.015	0.097	0.025	0.108	1666.981
	(0.122)	(0.137)	(0.124)	(0.344)	(0.185)	(1318.548)
0-500m outside project	0.052	0.208[b]	0.009	0.284	0.238	-1554.381
	(0.059)	(0.089)	(0.060)	(0.356)	(0.176)	(983.131)
In-Situ Upgrading						
inside project	0.365[a]	0.209[b]	-0.023	0.176	-0.029	3141.860[a]
	(0.123)	(0.086)	(0.108)	(0.296)	(0.171)	(915.500)
0-500m outside project	0.115[c]	0.023	0.130[b]	-0.034	0.124	-15.305
	(0.064)	(0.072)	(0.058)	(0.209)	(0.102)	(743.859)
Other						
inside project	0.237[b]	0.285[a]	0.199[c]	0.941[a]	0.450[a]	-946.312
	(0.108)	(0.088)	(0.110)	(0.347)	(0.150)	(761.296)
0-500m outside project	-0.069	-0.010	-0.095[c]	0.095	0.017	414.940
	(0.049)	(0.051)	(0.052)	(0.189)	(0.094)	(570.274)
Mean Outcome 2001	0.81	0.47	0.76	3.19	3.73	10,803.51
Mean Outcome 2011	0.84	0.53	0.83	3.58	3.25	10,277.89
R^2	0.543	0.559	0.519	0.665	0.572	0.734
N	19,613	19,613	19,613	19,487	19,493	20,012

Standard errors clustered at the project level in parenthesis. [c] $p<0.10$, [b] $p<0.05$, [a] $p<0.01$

Table 5. Triple Difference Estimates on Log-Prices

	(1)	(2)
All Projects		
inside project	-0.197	-0.186
	(0.222)	(0.217)
0-500m outside project	-0.048	-0.044
	(0.061)	(0.061)
Lot Size Controls		✓
r2	0.52	0.52
N	67,751	67,751
Greenfield		
inside project	0.118	-0.010
	(0.167)	(0.172)
0-500m outside project	0.171	0.185
	(0.164)	(0.162)
In-Situ Upgrading		
inside project	0.082	0.142
	(0.308)	(0.286)
0-500m outside project	-0.179[c]	-0.177[b]
	(0.091)	(0.089)
Other		
inside project	-0.321	-0.280
	(0.274)	(0.267)
0-500m outside project	0.045	0.047
	(0.079)	(0.079)
Lot Size Controls		✓
r2	0.52	0.52
N	67,751	67,751

Standard errors clustered at the project level in parenthesis.
[c] $p<0.10$, [b] $p<0.05$, [a] $p<0.01$

Table 6. Effect of Housing Projects on Socio-demographics

	(1) Age	(2) P.O.B. not Gauteng	(3) Unemployed	(4) Years of Education	(5) Monthly Income
All Projects					
inside project	-1.860	0.000	0.008	0.353[a]	1735.372[a]
	(1.272)	(0.019)	(0.019)	(0.123)	(434.956)
0-500m outside project	-1.899	-0.007	-0.023	0.013	638.710
	(1.386)	(0.013)	(0.018)	(0.090)	(494.776)
R^2	0.264	0.803	0.506	0.577	0.561
Greenfield					
inside project	-0.486	-0.008	0.048	-0.204	-473.738
	(2.365)	(0.046)	(0.045)	(0.169)	(491.177)
0-500m outside project	-0.109	-0.003	0.023	0.141	-527.027
	(2.012)	(0.025)	(0.043)	(0.171)	(613.939)
In-Situ Upgrading					
inside project	-1.656	0.037	-0.044[c]	0.284	762.438
	(1.732)	(0.025)	(0.026)	(0.201)	(708.045)
0-500m outside project	-0.624	-0.056[b]	-0.034	0.326[b]	919.872
	(1.677)	(0.023)	(0.028)	(0.154)	(776.757)
Other					
inside project	-3.127	-0.058[b]	0.038	0.530[a]	3149.433[a]
	(1.961)	(0.026)	(0.026)	(0.192)	(564.659)
0-500m outside project	-2.297	-0.005	-0.037	-0.151	920.359
	(1.837)	(0.017)	(0.023)	(0.116)	(646.781)
Mean Outcome 2001	33.16	0.37	0.42	8.61	1,910.25
Mean Outcome 2011	28.55	0.42	0.33	9.70	4,509.91
R^2	0.267	0.804	0.508	0.580	0.567
N	19,861	12,059	19,815	19,857	19,812

Standard errors clustered at the project level in parenthesis. [c] $p<0.10$, [b] $p<0.05$, [a] $p<0.01$
P.O.B. means "place of birth." Monthly income is in Rands.