An Econometric Analysis of the Effect of Mining on Local Real Estate Values

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Research Motivation

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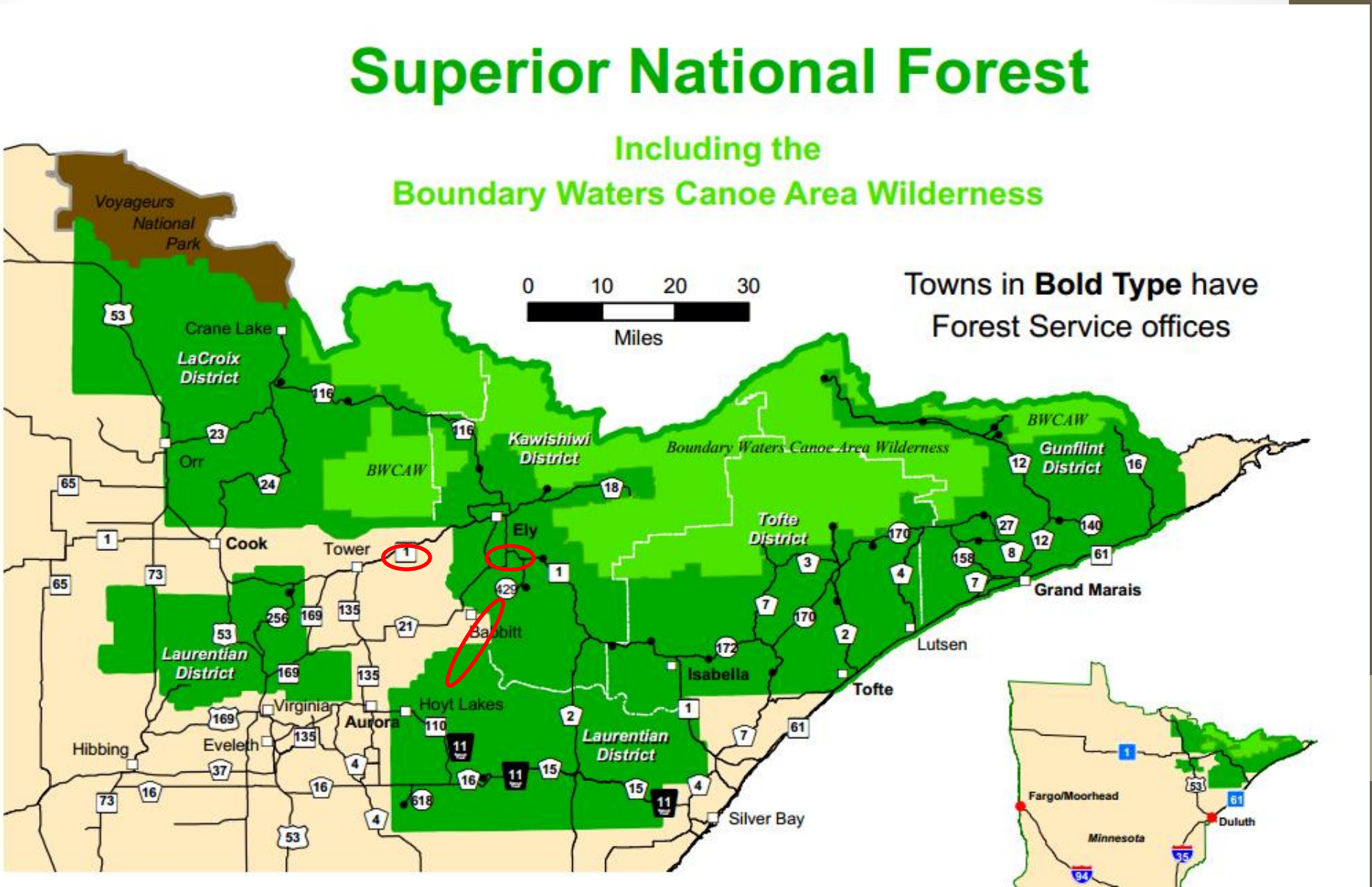


Research Motivation

- Ridgeway Mine in Fairfield County, South Carolina.
- An open-pit precious metal mine operating from 1988 to 1999. It produced doré bar composed of approximately 60 percent gold and 40 percent silver.
- Reasons:
  - Availability of free real estate transaction data.
  - Free online GIS map.
  - Geographic features are less complicated.

Research Question

- **How does the mining operation affect local property value ?**

Preview of Results

- Using 15 years of housing sales data and geographic information system (GIS), we found that generally the Ridgeway mine had a negative impact on local property values, but the negative impact accelerates as the property approaches the mine.

- To our best knowledge, this is the first academic study that quantifies a non-linear effect of an environmental stigma on local property values.

Literature Review

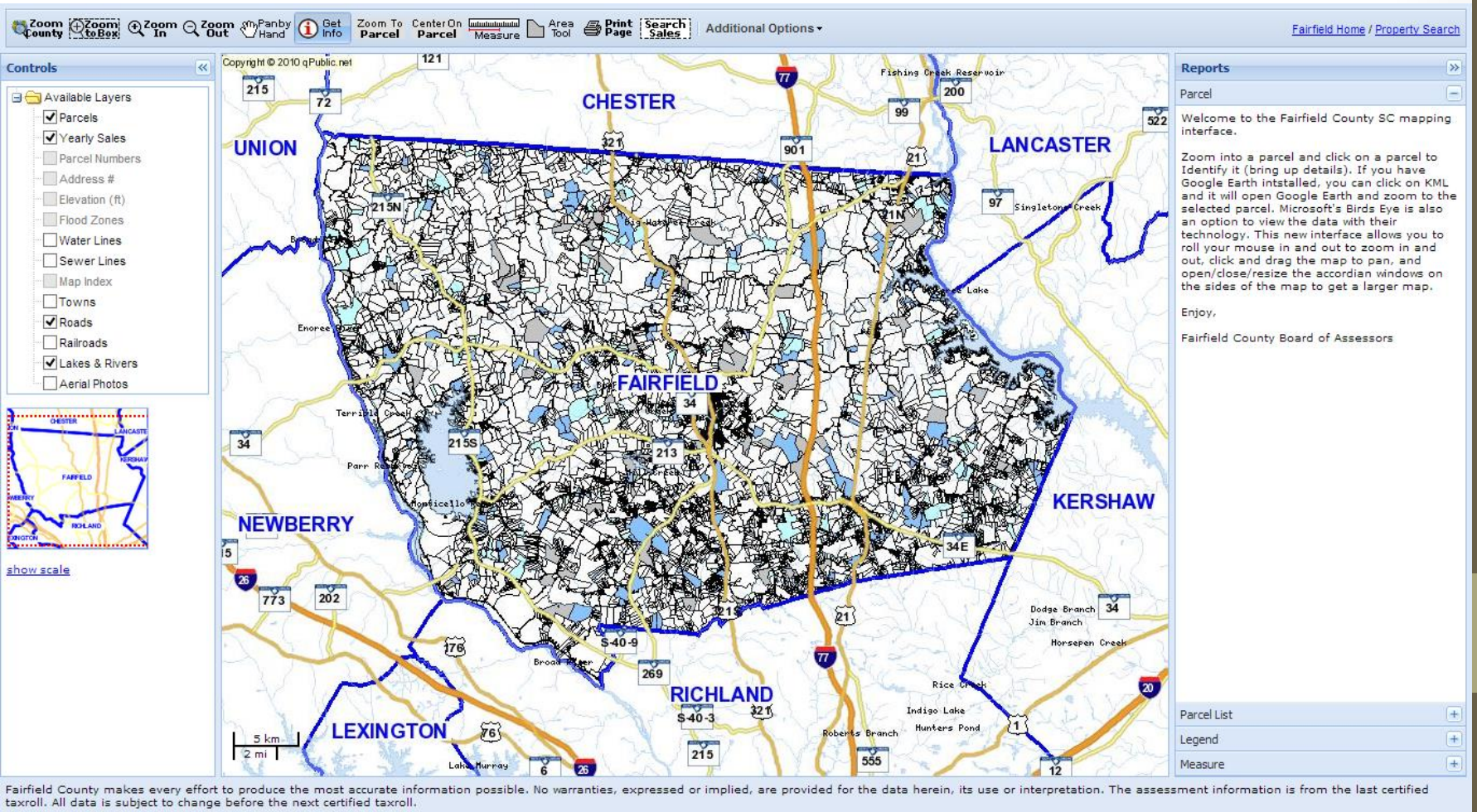
- **Williamson, Thurston and Heberling, 2008. *The Annals of Regional of Regional Science.***
- **"Valuing acid mine drainage remediation in West Virginia: a hedonic modeling approach"**
- Using hedonic pricing model, the authors identified an inverse relationship between sale price and distance from the acid mine drainage-impaired stream (negative coefficient of the distance variable)
- Houses near AMD-impaired streams face a greater implicit cost. Houses further than 0.25 mile from a stream are not significantly affected.

Literature Review

- **Boxall, Chan and MaMillan, 2005. Resource and Energy Economics.**
- **The impact of oil and natural gas facilities on rural residential property values: a spatial hedonic analysis**
- Their econometric results show that property values are negatively correlated with the number of sour gas wells and flaring oil batteries with in 4 km of the property.
- Health hazards associated with potential rates of H_2S release also have a significant negative association with property prices.

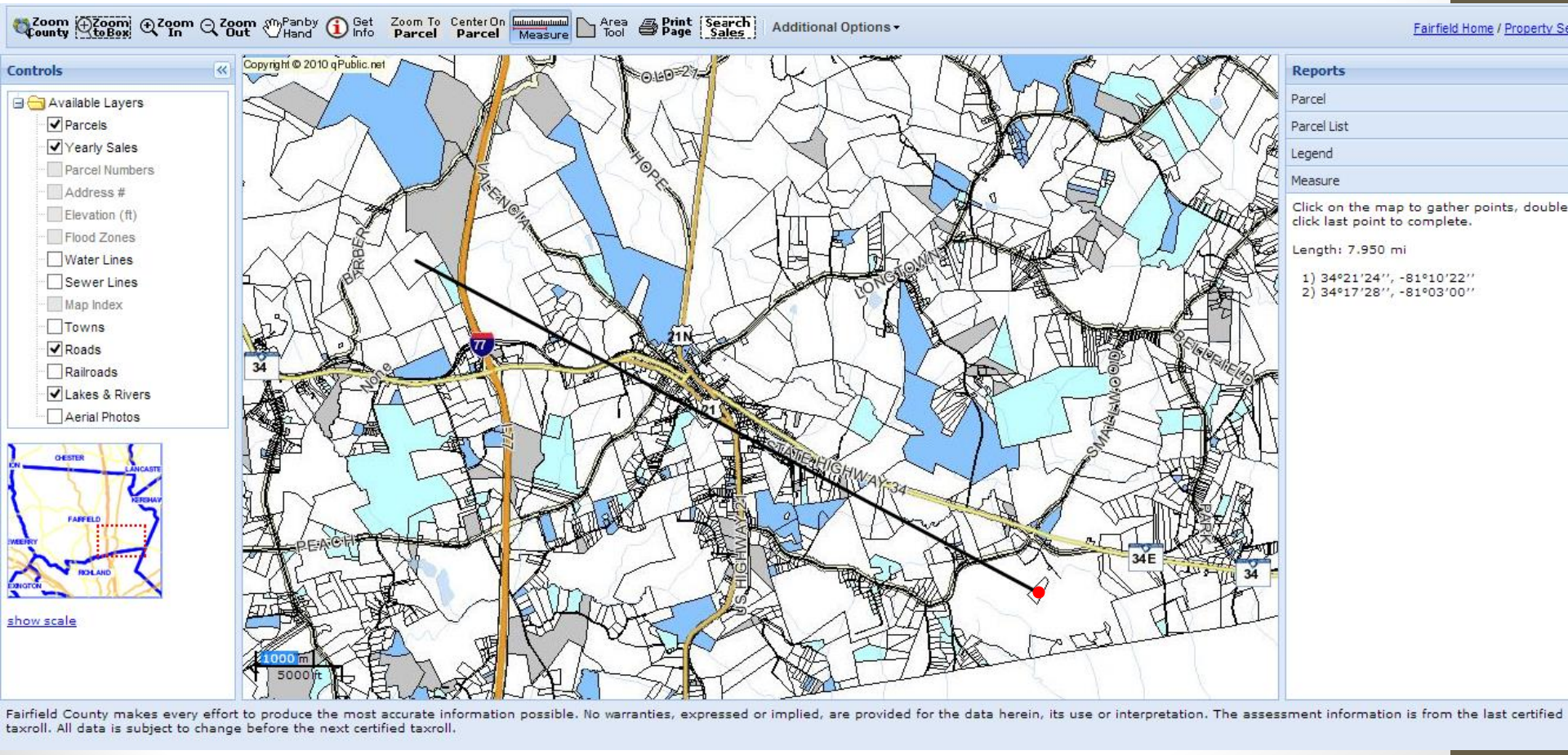
Data

- Fairfield County Accessor's Office website



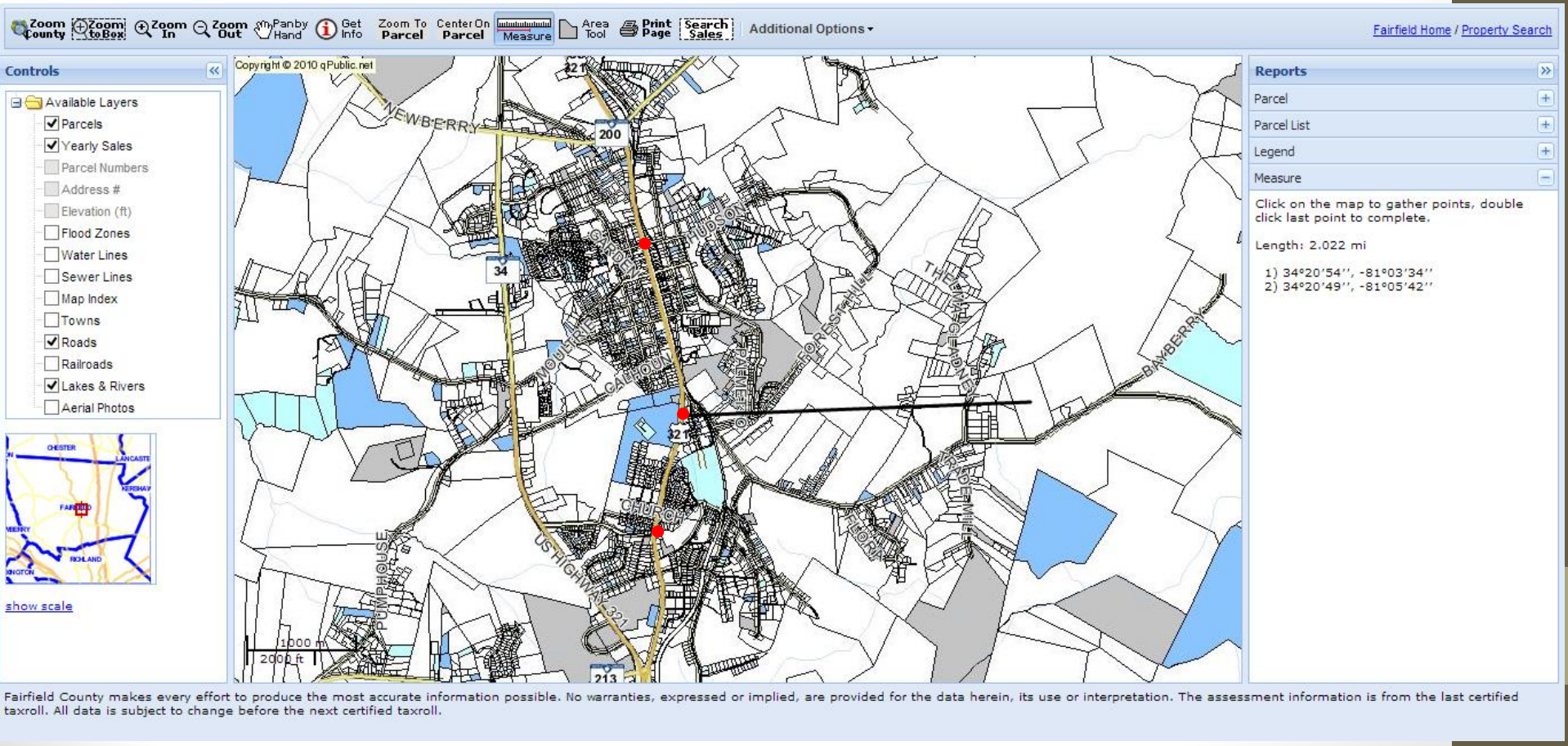
Data

- Distance between the parcel and the mine



Data

- Distance between the parcel and the central area



Data

Table 1. Summary Statistics

Variable	Obs	Mean	Std. Dev	Min	Max
Sale Price	828	69914.1	132900.08	100	1694274.60
Distance between parcel and mine (D_m)	828	12.74	5.35	0.297	32.482
Distance between parcel and the central (D_c)	828	10.04	75.63	0	2177.553
Dummy for mining operation (D)	828	0.75	0.43	0	1
Heated Square Footage (HS)	828	3744.65	9028.41	200	162602
Acreage (AC)	828	8.19	36.72	0.016	559.26

*Sales price are converted to 1995 dollars value.

Regression Method

- **Hedonic Pricing Model**
  - To estimate the real estate prices which reflect the value of local environmental attributes
  - Controlling the non-environmental factors, the remaining difference in price can be attributed to the difference in environmental quality.

- **Regression Equation**

$$P = \beta_0 + \beta_1 D_m^2 + \beta_2 D_m + \beta_3 D_c^2 + \beta_4 D_c + \beta_5 D + \beta_6 HS + \beta_7 AC + \varepsilon$$

D_m = distance between parcel and mine
D_c = distance between parcel and the central
D = dummy for mining operation
HS = heated square footage
AC = acreage

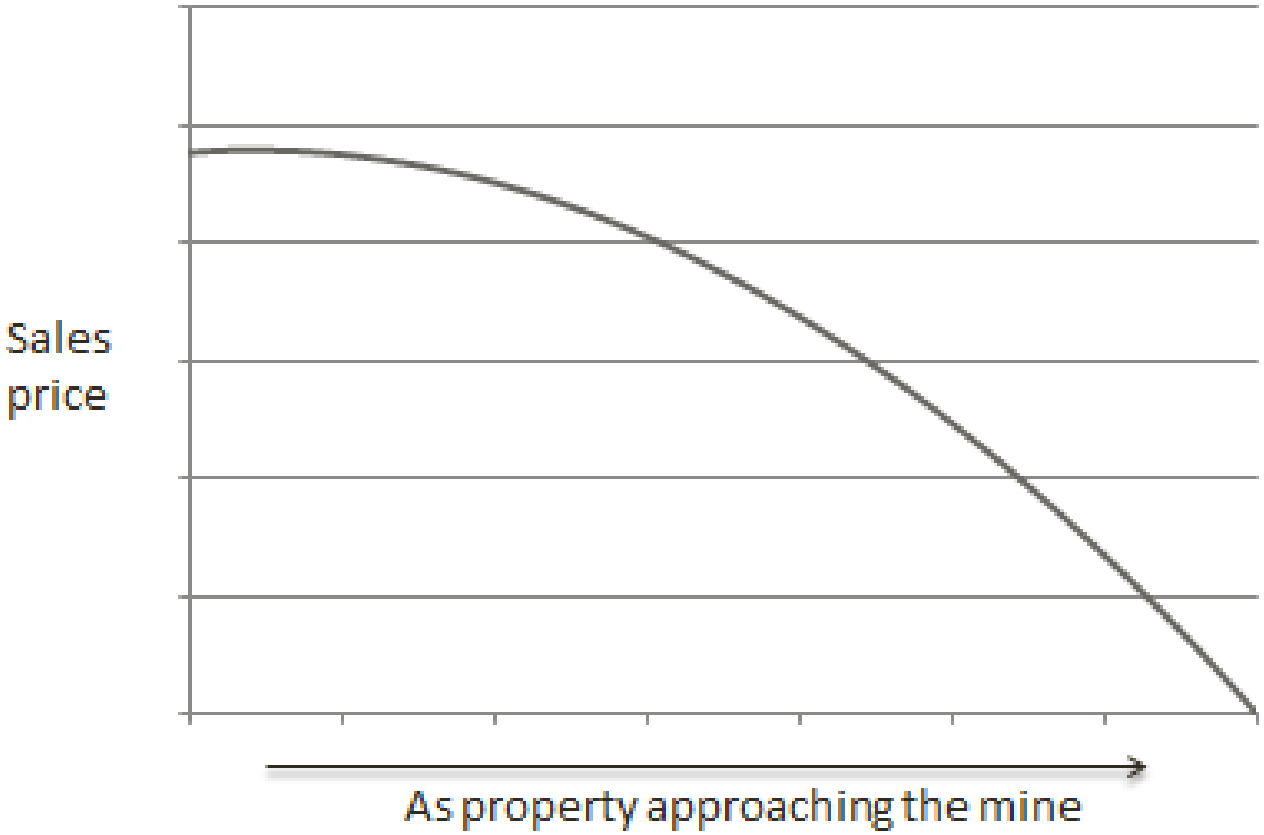
Regression Results

Table 2: Hedonic model for the effects of gold mining on local property prices

	(1)	(2)	(3)	(4)
	Sales Price	Sales Price	Sales Price	Sales Price
Distance between parcel and mine ($D_{m)}$	-1417.598*	-1422.995*	6292.903**	14578.545***
	[0.071]	[0.069]	[0.0188]	[0.000]
Squared distance between parcel and mine (D_m^2)			-267.343***	-554.053***
			[0.0027]	[0.000]
Distance between parcel and the central (D_c)		74.906		5092.517***
		[0.173]		[0.000]
Squared distance between parcel and the central (D_c^2)				-2.307***
				[0.000]
Dummy for mining operation (**D**)	-69938.44***	-70136.66***	-70527.70***	-67007.491***
	[0.000]	[0.000]	[0.000]	[0.000]
Heated Square Footage (**HS**)	-0.283*	-0.296*	-0.278*	-0.480
	[0.553]	[0.535]	[0.559]	[0.302]
Acreage (**AC**)	1389.515***	1390.572***	1397.224***	1353.623***
	[0.000]	[0.000]	[0.000]	[0.000]
Constant	130013.91***	129516.57***	83181.67***	-6870.695
	[0.000]	[0.000]	[0.000]	[0.781]
Observations	828	828	828	828
Adjusted R-Square	0.1906	0.1915	0.1985	0.233
p-values in brackets	="* p<0.1	** p<0.05	*** p<0.01"	

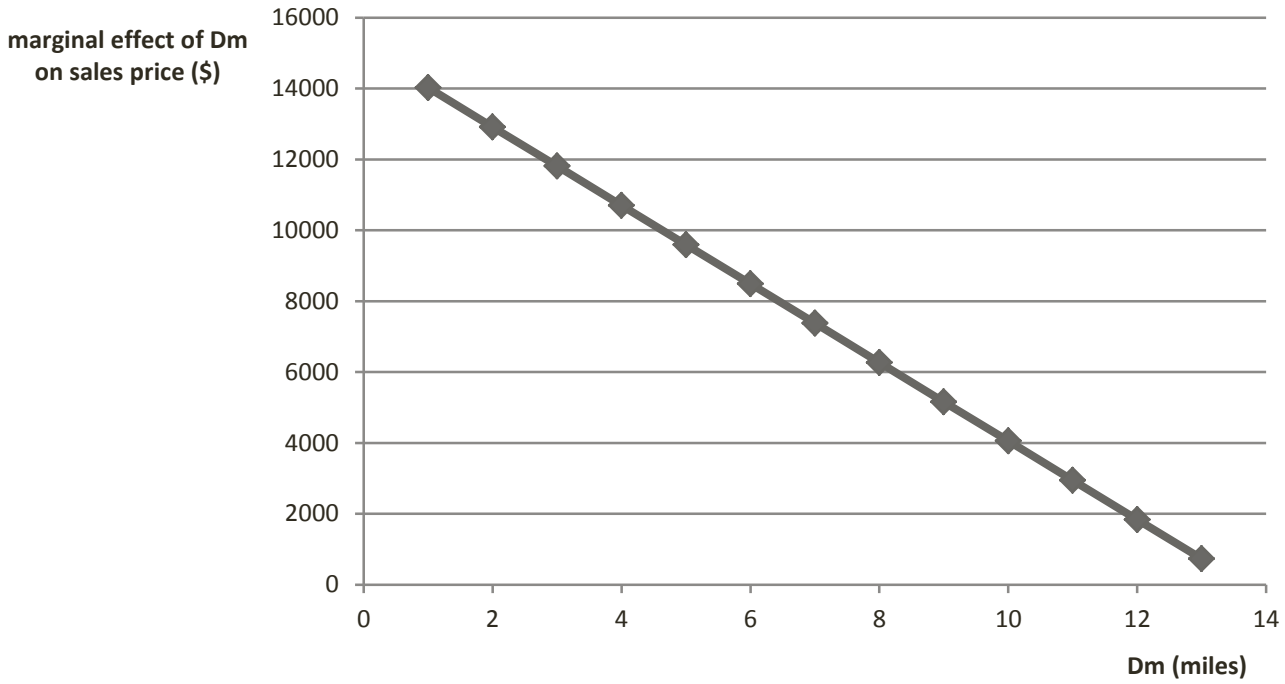
Regression Results

- *$y = -554.053\ x^2 + 14578.545\ x$ + Other Variables*



Regression Results

- Marginal effect of Dm on property price



Implications

- We believe the impacts implied by this analysis and estimates will be of interest to and potentially valuable to residents, mining companies and regulators.
- The diminishing negative economic consequence related to the proximity to the mining site may help people to better understand the economic reasons underlying concerns and disagreements.
- This work may also assist all the players in making better site decisions and regulators in mediating disputes and assessing the merits for compensation (different levels of compensation based on the distance from the mine to the house).

Caution

- Real estate data sample is only limited within one county.
- The mining location is at the boarder of the county, so it should also have significant impact on other counties.
- People living in Fairfield county may go to other counties for shopping and work, therefore the “distance between parcel and the central” may not have strong explanatory power.
- Other control variables reflecting the characteristics of the houses are not included due to the availability of the data.
- However, our results are broadly consistent with studies of the impacts of other industries having potentially detrimental influences on the use and enjoyment of property.

Conclusions

- The regression results strongly suggest that the presence of the gold mine generally had a significant negative impact on the values of local residential properties.
- The negative impact of the mine on property values accelerates as the property approaches the mining sit.
- This analysis can be helpful for people to understand the economic consequence of mining operation. However, the quantitative relationship may need to be interpreted with caution when applying it to other mining site, since it is subject to certain unique characteristics of the gold mine and local real estate market.

Questions?

Thank You!