

Air-Pollution Concern, Social Capital, and Subjective Well-Being: Evidence from the American West

Ahsan Kibria, Tom Trotter, Paul Lewin

Abstract

We examine whether social capital moderates the relationship between air-pollution concern and, consequently, subjective well-being. Drawing on the well-being development framework and the community resilience literature, we conceptualize social capital as a resilience resource that may buffer the consequences of perceived air pollution stress. Using survey data from the Western United States, we employed a series of multivariate, quantile, and ordered-response models and find that social capital is positively associated with subjective well-being and that the relationship between air-pollution concern and well-being becomes less adversely impacted as social capital increases. This pattern is evident for community trust, institutional trust, and perceptions of a welcoming community and is robust across alternative measures of subjective well-being. Additional analyses provide evidence consistent with a mechanism linking air-pollution concern, social capital, and satisfaction with local pollution conditions. It is suggested that social capital contributes to well-being as a protective factor not only directly but also by strengthening resilience to concerns about air pollution.

Keywords: Household Well-Being; Life Satisfaction; Social Capital; Community Trust; Environmental Concern; Community Resilience; protective factors

JEL: I31, Q51, R11, Z13

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I. Introduction

Concerns about air pollution have become an increasingly visible feature of life in the American West. Wildfire smoke, seasonal inversions, and recurring air-quality alerts have heightened public awareness of air quality and its potential consequences for quality of life. At the same time, a growing literature demonstrates that environmental conditions and environmental perceptions are associated with subjective well-being, including life satisfaction and happiness (van Kamp et al., 2003; Welsch, 2006).

Research in well-being economics has also shown that welfare depends on far more than income and material living standards. Subjective well-being is shaped by a broad set of economic, social, and environmental factors that influence how individuals experience and evaluate their lives (Dolan et al., 2008; Helliwell, 2006). Parallel literature identifies social capital as one of the strongest and most consistent correlates of subjective well-being. Individuals residing in communities characterized by trust, cooperation, and strong social relationships generally report higher levels of well-being than those living in less connected social environments (Helliwell & Putnam, 2004; Helliwell, 2006).

Despite substantial evidence linking environmental perceptions and social capital to subjective well-being, these findings have largely developed independently. Studies of environmental concern tend to focus on its direct association with well-being, while studies of social capital emphasize its direct contribution to life satisfaction and happiness. As a result, relatively little attention has been devoted to understanding whether social capital alters how individuals respond to perceived environmental risks.

The community resilience literature suggests an important connection between these perspectives. Social capital is widely viewed as an adaptive capacity that helps individuals and communities cope with uncertainty, disruption, and external stressors (Norris et al., 2008; Aldrich & Meyer, 2015). In this view, social capital functions not only as a source of well-being but also as a resource that shapes how adverse conditions are experienced and interpreted.

We examine this proposition using survey data from the Western United States. Specifically, we ask three questions. First, is air-pollution concern associated with subjective well-being? Second, is social capital associated with higher levels of subjective well-being? Third, and most importantly, does social capital attenuate the relationship between air-pollution concern and subjective well-being? We focus on community trust as our primary measure of social capital, while institutional trust and welcoming community are examined as additional dimensions of social capital.

Our findings indicate that social capital plays an important role in shaping the relationship between air-pollution concern and subjective well-being by acting as a core protective factor. Higher levels of social capital are associated with greater life satisfaction and happiness, and the relationship between air-pollution concern and subjective well-being becomes less adverse as social capital increases. These patterns are evident across multiple measures of social capital, alternative measures of subjective well-being, and several estimation approaches.

This paper contributes to the existing literature in three ways. First, it extends research on environmental perceptions and subjective well-being by demonstrating that the consequences of air-pollution concern are conditional rather than uniform. Second, it contributes to the social-capital literature by showing that social capital functions not only as a direct contributor to well-being but also as a resilience resource or protective factor. Third, it connects well-being and

resilience literature by illustrating how social resources shape the relationship between perceived environmental stress and subjective well-being.

II. Theoretical Framework

We adopt a well-being development framework in which subjective well-being is generated through the combined influence of environmental, social, and material resources:

$$W_i = f(E_i, S_i, M_i)$$

where W_i denotes subjective well-being, E_i represents environmental conditions and perceptions, S_i captures social capital, and M_i reflects material and socioeconomic resources. Consistent with this framework, individuals derive utility not only from economic outcomes but also from the quality of their social and environmental surroundings (Dolan et al., 2008; Helliwell, 2006).

In this paper, we focus on concern about local air pollution. Rather than treating air-pollution concern as a measure of actual pollution exposure, we conceptualize it as a form of perceived environmental stress. Individuals concerned about air pollution may experience lower levels of well-being because such concerns increase uncertainty regarding environmental quality, health, and future community conditions. Air-pollution concern therefore represents a subjective assessment of environmental risk that may influence how individuals evaluate their quality of life (van Kamp et al., 2003; Welsch, 2006).

Social capital constitutes a second key input into the production of well-being. Following Putnam (2000), social capital refers to the networks, norms, and trust that facilitate cooperation and collective action. Social capital is expected to contribute directly to subjective well-being because trust reduces uncertainty, strengthens social support, and improves access to information and community resources (Helliwell & Putnam, 2004; Helliwell, 2006).

However, social capital may play a broader role than simply enhancing well-being directly. The community resilience literature identifies social capital as an adaptive capacity that helps individuals and communities respond to stress and uncertainty (Norris et al., 2008; Aldrich & Meyer, 2015). This perspective is closely related to the concept of protective factors, which are social and institutional resources that reduce vulnerability to stressors and help maintain positive outcomes under adverse conditions (Masten, 2001; Fergus & Zimmerman, 2005).

Viewed through this lens, social capital functions as a protective resource because it provides access to supportive relationships, trusted information networks, mutual aid systems, and collective problem-solving capacity. Individuals embedded in communities characterized by stronger social capital should therefore be better equipped to cope with perceived environmental stress than individuals residing in communities with weaker social resources.

Accordingly, we argue that the relationship between air-pollution concern and subjective well-being depends on the stock of social capital available to individuals and the communities in which they reside. To capture this, we extend the well-being development framework as follows:

$$W_i = \alpha + \beta E_i + \gamma S_i + \delta(E_i \times S_i) + \varepsilon_i$$

where the interaction term allows social capital to influence not only the level of subjective well-being but also the relationship between perceived environmental stress and well-being. Formally,

$$\frac{\partial^2 W}{\partial E \partial S} > 0$$

A positive cross-partial derivative implies that social capital mitigates the well-being losses associated with perceived environmental stress, including air pollution. In other words, the relationship between air pollution concern and subjective well-being becomes less adverse as social capital increases.

This simple framework yields three testable hypotheses:

H1: Air-pollution concern is associated with subjective well-being.

H2: Higher levels of social capital are associated with greater subjective well-being.

H3: Social capital acts as a resilience resource or protective factor that attenuates the relationship between air-pollution concern and subjective well-being.

We test these hypotheses using community trust as our primary measure of social capital and examine institutional trust and welcoming community as alternative dimensions of social capital.

III. Data

We use data from the 2025 Western Regional Survey conducted by the Western Rural Development Center¹ (Bednarik et al., 2026). The survey collected information on environmental concerns, community conditions, social capital, socioeconomic circumstances, and subjective well-being among residents of the Western United States. Respondents were drawn from Arizona, California, Colorado, Hawai‘i, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

The survey is particularly well suited to the objectives of this study because it contains detailed measures of perceived air pollution, social capital, and subjective well-being. The analysis is based on respondents with valid observations for the variables included in the empirical models. The estimation sample contains approximately 4,300 observations, depending on the specification.

¹ <https://purr.purdue.edu/publications/4973/1>

Table 1 provides descriptive statistics for the variables used in the analysis. Respondents report relatively high levels of life satisfaction and happiness, while average air-pollution concern is moderate. Community trust, institutional trust, and perceptions of community inclusiveness exhibit substantial variation across respondents, indicating meaningful differences in local social capital. The sample also displays considerable variation in financial circumstances, income, and demographic characteristics.

[Insert Table 1 about here]

Table 1: Summary Statistics

	count	mean	sd	min	max
Life Satisfaction	4445	7.01	2.26	0.00	10.00
Happiness	4422	7.22	2.27	0.00	10.00
Pollution Satisfaction	4473	3.69	1.08	1.00	5.00
Air Pollution Concern	4497	2.42	1.07	1.00	5.00
Community Trust	4485	3.89	0.69	1.00	5.00
Institutional Trust	4478	3.51	0.97	1.00	5.00
Welcoming Community	4487	3.68	0.80	1.00	5.00
Financial Stress	4493	2.72	1.17	1.00	5.00
Log Income	4406	11.03	0.87	9.43	12.90
Age	4497	50.13	17.26	18.00	93.00
Female	4497	0.51	0.50	0.00	1.00
Bachelor's Degree+	4497	0.51	0.50	0.00	1.00
Rural	4451	0.20	0.40	0.00	1.00

***Note:** Life Satisfaction and Happiness are measured on 0-10 scales. Air Pollution Concern, Community Trust, Institutional Trust, Welcoming Community, Financial Stress, and Pollution Satisfaction are measured on 1-5 scales. Higher values indicate greater levels of the respective construct.*

The primary outcome variable is life satisfaction, measured using the standard life-evaluation question, “All things considered, how satisfied are you with life?” Responses are recorded on an 11-point scale ranging from 0 to 10, where higher values indicate greater life satisfaction.

To assess robustness, we employ happiness as an alternative measure of subjective well-being. While life satisfaction reflects a cognitive evaluation of one's overall circumstances, happiness captures a more affective dimension of well-being. Consistent results across both measures would strengthen confidence in the proposed resilience mechanism.

Satisfaction with local pollution conditions is used as a mechanism outcome. This measure captures respondents' evaluations of environmental quality in their communities and provides insight into whether concerns about air pollution influence broader well-being through environmental perceptions.

The principal environmental variable is air-pollution concern. Respondents were asked how concerned they were about air pollution as an environmental issue in their communities. Responses are measured on a five-point scale, with higher values indicating greater concern.

The emphasis on perceived air pollution is intentional. Individuals often evaluate their well-being based on how they perceive environmental conditions rather than on objective measures alone. Consequently, perceptions of environmental risk represent an important channel through which environmental conditions may influence subjective well-being. The average level of air-pollution concern is 2.42 on the five-point scale, indicating moderate concern among respondents.

The principal measure of social capital is the Community Trust Index. The index is constructed from survey items measuring trust in neighborhood residents, coworkers, religious communities, educators, retailers, and health-care providers. Higher values indicate greater interpersonal trust. Community trust serves as the primary measure (or indicator) of social capital throughout our analysis. Two additional indicators are used in robustness tests; these are the Institutional Trust

Index and Welcoming Community Index. Institutional Trust Index captures trust in local government, police, and local media, while the Welcoming Community Index measures perceptions of inclusiveness, fairness, and social integration within the community.

The empirical models control for household income, financial stress, age, gender, educational attainment, and rural residence. Income is measured as the logarithm of household income, while financial stress captures subjective economic strain. Educational attainment is represented by an indicator for respondents holding at least a bachelor's degree. State fixed effects are included in all multivariate specifications to account for unobserved geographic heterogeneity.

Table 2 reports pairwise correlations among the principal variables. Life satisfaction and happiness are strongly positively correlated, while community trust is positively associated with both measures of subjective well-being. Air-pollution concern is negatively correlated with pollution satisfaction, consistent with the expectation that individuals expressing greater concern about air pollution evaluate local environmental conditions less favorably. The correlation matrix does not indicate problematic multicollinearity among the explanatory variables.

[Insert Table 2 about here]

Table 2: Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Life Satisfaction	1.00												
(2) Happiness	0.81***	1.00											
(3) Pollution Satisfaction	0.33***	0.30***	1.00										
(4) Air Pollution Concern	-0.02	-0.02	-0.21***	1.00									
(5) Community Trust	0.38***	0.37***	0.35***	0.04**	1.00								
(6) Institutional Trust	0.40***	0.39***	0.35***	0.12***	0.60***	1.00							
(7) Welcoming Community	0.40***	0.38***	0.37***	0.05***	0.55***	0.52***	1.00						
(8) Financial Stress	-0.35***	-0.36***	-0.09***	0.27***	-0.13***	-0.07***	-0.07***	1.00					
(9) Log Income	0.33***	0.30***	0.22***	0.08***	0.28***	0.30***	0.24***	-0.20***	1.00				
(10) Age	-0.01	0.02	-0.04***	-0.15***	0.00	-0.13***	-0.09***	-0.26***	-0.14***	1.00			
(11) Female	-0.15***	-0.12***	-0.15***	-0.08***	-0.17***	-0.24***	-0.19***	0.01	-0.24***	0.23***	1.00		
(12) Bachelor's Degree+	0.22***	0.21***	0.18***	0.09***	0.24***	0.29***	0.22***	-0.09***	0.47***	-0.10***	-0.21***	1.00	
(13) Rural	-0.04***	-0.03**	0.04**	-0.08***	-0.09***	-0.08***	-0.09***	0.06***	-0.16***	-0.03*	0.09***	-0.13***	1.00

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

IV. Empirical Strategy

The objective of the empirical analysis is to examine whether social capital moderates the relationship between air-pollution concern and subjective well-being. We conceptualize air-pollution concern as a measure of perceived environmental stress and social capital as both a direct determinant of well-being and a resilience resource that may attenuate the adverse consequences of such stress. Accordingly, the empirical strategy focuses on estimating the direct effects of air-pollution concern and social capital, as well as their interaction.

We begin by estimating the following well-being equation:

$$W_i = \alpha + \beta_1 AP_i + \beta_2 SC_i + \gamma X_i + \delta_s + \varepsilon_i$$

where W_i denotes subjective well-being, AP_i measures air-pollution concern, SC_i represents social capital, X_i is a vector of demographic and socioeconomic controls, and δ_s denotes state fixed effects. Life satisfaction serves as the primary outcome measure. Following common practice in the subjective well-being literature, the baseline models are estimated using ordinary least squares (OLS), which yields straightforward interpretations and generally produces conclusions similar to ordinal estimators (Ferrer-i-Carbonell & Frijters, 2004).

To evaluate the resilience hypothesis (H3), we augment the baseline model with an interaction term:

$$W_i = \alpha + \beta_1 AP_i + \beta_2 SC_i + \beta_3 (AP_i \times SC_i) + \gamma X_i + \delta_s + \varepsilon_i$$

A positive interaction coefficient indicates that social capital decreases the relationship between air-pollution concern and subjective well-being. To facilitate interpretation, we examine marginal effects and predicted values across varying levels of social capital.

The baseline analysis is conducted using life satisfaction as the primary indicator of subjective well-being. Because average effects may conceal important heterogeneity, we additionally estimate quantile regressions at the 25th, 50th, and 75th percentiles of the life-satisfaction distribution. This allows us to assess whether the moderating role of social capital differs across levels of well-being.

We next evaluate the sensitivity of the results to an alternative measure of subjective well-being by re-estimating the models using self-reported happiness. Whereas life satisfaction reflects a broader cognitive evaluation of life circumstances, happiness captures a more personal dimension of well-being. Consistent findings across both outcomes would strengthen confidence in the proposed resilience mechanism.

To explore a potential mechanism, we estimate analogous models using satisfaction with local pollution conditions as the dependent variable. If social capital operates as a resilience resource, individuals with greater social capital should exhibit a weaker association between air-pollution concern and evaluations of local environmental quality.

Several additional analyses assess the robustness of the findings. First, we replace community trust with Institutional Trust and Welcoming Community to determine whether the resilience effect extends beyond interpersonal trust. Second, we estimate ordered probit models to ensure that the results are not sensitive to the treatment of life satisfaction as a continuous outcome. Finally, we examine rural-urban heterogeneity by estimating separate models for rural and urban/suburban respondents. All models are estimated using heteroskedasticity-robust standard errors and include state fixed effects where indicated.

V. Results and Discussion

Table 3 reports the baseline estimates relating to air-pollution concern, community trust, and life satisfaction. Model 1 indicates that the direct relationship between air-pollution concern and subjective well-being is sensitive to model specification. While the coefficient is small and statistically insignificant in simpler models, it becomes positive after the inclusion of socioeconomic controls and remains positive across several specifications. This pattern suggests that concerns about air pollution may be correlated with characteristics such as income, education, or environmental awareness that are themselves associated with higher levels of well-being. One possible explanation is that concern about air quality is more prevalent among individuals with greater socioeconomic resources, higher levels of education, or stronger civic engagement. While the cross-sectional nature of the data prevents a definitive interpretation, the result suggests that concern about air pollution may capture more than air pollution stress alone.

Furthermore, the introduction of community trust in Model 2 substantially improves explanatory power, with trust exhibiting a strong positive association with life satisfaction ($\beta = 1.281$, $p < .01$). The inclusion of socioeconomic controls and state fixed effects leaves the trust coefficient largely unchanged, suggesting a robust relationship between social capital and subjective well-being.

Model 5 provides the principal test of the resilience hypothesis. The interaction between air-pollution concern and community trust is positive and statistically significant ($\beta = 0.116$, $p < .05$). This finding indicates that the relationship between air-pollution concern and life satisfaction varies systematically across levels of social capital. Individuals residing in higher-trust communities appear less vulnerable to the consequences for well-being associated with perceived air-pollution stress. Community trust therefore contributes not only directly to

subjective well-being but also indirectly by buffering the potential effects of concerns about local air pollution.

The results provide strong support for H2 and H3. Evidence for H1 is comparatively limited. The direct relationship between air-pollution concern and life satisfaction is weak and sensitive to specification, which indicates that air-pollution concern influences well-being primarily through its interaction with social capital rather than through a uniform direct effect.

[Insert Table 3 about here]

Table 3. Community Trust, Air Pollution Concern, and Life Satisfaction

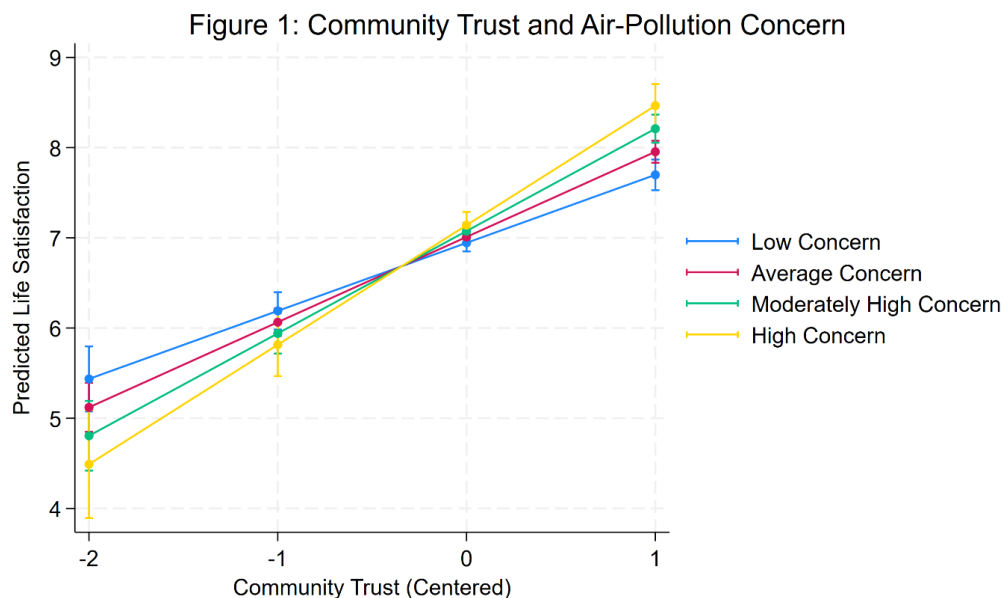
	(1) Air Only	(2) + Trust	(3) + Controls	(4) + State FE	(5) + Interaction
Air Pollution Concern	-0.024 (0.034)	-0.053* (0.031)	0.076** (0.031)	0.071** (0.031)	0.072** (0.031)
Community Trust		1.281*** (0.058)	0.947*** (0.056)	0.951*** (0.055)	0.946*** (0.055)
Financial Stress			-0.577*** (0.029)	-0.583*** (0.029)	-0.595*** (0.030)
Log Income			0.420*** (0.044)	0.413*** (0.044)	0.406*** (0.044)
Age			-0.006*** (0.002)	-0.005*** (0.002)	-0.005*** (0.002)
Female			-0.168*** (0.063)	-0.176*** (0.063)	-0.173*** (0.063)
Bachelor's Degree+			0.203*** (0.069)	0.198*** (0.069)	0.195*** (0.069)
Rural			0.192** (0.079)	0.203** (0.080)	0.201** (0.080)
Air Pollution Concern × Community Trust					0.116** (0.049)
_cons	7.006*** (0.034)	6.993*** (0.032)	4.148*** (0.520)	4.449*** (0.546)	4.573*** (0.549)
Observations	4327	4327	4327	4327	4327
R-squared	0.000	0.152	0.284	0.291	0.292
State FE	No	No	No	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 1 illustrates the substantive significance of the interaction effect. The difference in predicted life satisfaction between respondents reporting high and low levels of air-pollution concern decreases as community trust increases. The estimated crossover point occurs at a community trust value of approximately 3.27, indicating that the adverse association between air-pollution concern and well-being is concentrated among individuals with relatively low levels of community trust. Approximately 17 percent of respondents fall below this threshold. These findings are consistent with the interpretation of community trust as a resilience resource that attenuates the well-being consequences of perceived environmental stress.

[Insert Figure 1 about here]



Note: Community trust is mean-centered in the interaction specification.

While the OLS estimates describe average relationships, they may conceal important heterogeneity across the well-being distribution. To examine this possibility, Table 4 presents quantile regression estimates.

[Insert Table 4 about here]

Table 4. Quantile Regression Estimates of Life Satisfaction

	(1) 25th Percentile	(2) Median	(3) 75th Percentile
Air Pollution Concern	0.055 (0.043)	-0.003 (0.037)	0.023 (0.036)
Community Trust	1.249*** (0.066)	1.062*** (0.057)	0.724*** (0.056)
Air Pollution Concern × Community Trust	0.151*** (0.056)	0.148*** (0.048)	0.093** (0.047)
Financial Stress	-0.714*** (0.041)	-0.489*** (0.035)	-0.388*** (0.035)
Log Income	0.471*** (0.059)	0.441*** (0.051)	0.363*** (0.050)
Age	0.001 (0.003)	-0.004 (0.002)	-0.004* (0.002)
Female	-0.262*** (0.092)	-0.102 (0.078)	-0.047 (0.077)
Bachelor's Degree+	0.290*** (0.099)	0.086 (0.084)	-0.043 (0.083)
Rural	0.148 (0.111)	0.143 (0.095)	0.210** (0.094)
_cons	2.915*** (0.768)	3.866*** (0.657)	5.809*** (0.647)
Observations	4327	4327	4327
State FE	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The quantile estimates reveal substantial heterogeneity across the well-being distribution.

Community trust is positively associated with life satisfaction at all quantiles, although its effect diminishes toward the upper end of the distribution. The interaction between air-pollution concern and community trust remains positive and statistically significant throughout, but is strongest at the 25th percentile ($\beta = 0.151$, $p < .01$) and weakest at the 75th percentile ($\beta = 0.093$, $p < .05$). These results indicate that the resilience effect of social capital is most pronounced

among individuals with lower levels of well-being, reinforcing the findings from the OLS models.

Table 5 examines whether the findings extend to an alternative measure of subjective well-being. The results closely mirror those reported for life satisfaction. Community trust remains strongly associated with happiness, and the interaction between air-pollution concern and community trust remains positive and statistically significant in the fully specified model ($\beta = 0.098$, $p < .10$). Although somewhat smaller than the corresponding coefficient reported for life satisfaction, the estimate indicates that community trust also moderates the relationship between air-pollution concern and happiness.

The consistency of the findings across life satisfaction and happiness suggests that the resilience effect is not sensitive to the choice of well-being indicator. Air-pollution concern appears to be less consequential for individuals residing in communities characterized by higher levels of trust, regardless of whether well-being is measured through evaluative or affective dimensions.

[Insert Table 5 about here]

Table 5. Community Trust, Air Pollution Concern, and Happiness

	(1) Air Only	(2) + Trust	(3) + Controls	(4) + State FE	(5) + Interaction
Air Pollution Concern	-0.037 (0.034)	-0.065** (0.031)	0.085*** (0.031)	0.087*** (0.032)	0.087*** (0.032)
Community Trust		1.242*** (0.060)	0.924*** (0.058)	0.923*** (0.058)	0.918*** (0.058)
Financial Stress			-0.612*** (0.030)	-0.615*** (0.030)	-0.625*** (0.031)
Log Income			0.353*** (0.044)	0.346*** (0.044)	0.341*** (0.044)
Age			-0.004** (0.002)	-0.004* (0.002)	-0.004* (0.002)
Female			-0.090 (0.064)	-0.093 (0.064)	-0.090 (0.064)

Bachelor's Degree+			0.235*** (0.069)	0.228*** (0.069)	0.225*** (0.069)
Rural			0.231*** (0.080)	0.227*** (0.081)	0.225*** (0.082)
Air Pollution Concern × Community Trust					0.098* (0.053)
_cons	7.227*** (0.035)	7.213*** (0.032)	5.072*** (0.522)	5.367*** (0.553)	5.466*** (0.556)
Observations	4300	4300	4300	4300	4300
R-squared	0.000	0.141	0.272	0.276	0.277
State FE	No	No	No	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A central question is how social capital moderates the relationship between air-pollution concern and subjective well-being. If community trust functions as a resilience resource, one potential pathway is through environmental evaluation. Individuals embedded in higher-trust communities may interpret and assess local environmental conditions differently than those residing in lower-trust communities. To investigate this possibility, Table 6 examines satisfaction with local pollution conditions. If social capital alters how concerns about air pollution are translated into evaluations of local environmental quality, then the buffering effect observed in the well-being models should also emerge here.

The results provide strong support for this mechanism. Air-pollution concern is negatively associated with satisfaction with local pollution conditions across all specifications, indicating that individuals expressing greater concern about air pollution evaluate local environmental quality less favorably. By contrast, community trust is positively associated with pollution satisfaction, suggesting that individuals residing in higher-trust communities report more favorable assessments of local environmental conditions. Most importantly, the interaction between air-pollution concern and community trust remains positive and statistically significant

in the fully specified model ($\beta = 0.069$, $p < .01$). This finding indicates that the negative relationship between air-pollution concern and pollution satisfaction becomes less pronounced as community trust increases.

These findings provide some of the strongest evidence in support of the resilience framework developed in this study. The results suggest that community trust does not simply increase subjective well-being directly; it also influences how individuals evaluate local environmental conditions in the presence of environmental concerns. This pattern is consistent with the interpretation that social capital buffers the consequences of perceived environmental stress, helping explain why residents of higher-trust communities report higher levels of subjective well-being despite concerns about air pollution.

[Insert Table 6 about here]

Table 6. Community Trust, Air Pollution Concern, and Pollution Satisfaction

	(1) Air Only	(2) + Trust	(3) + Controls	(4) + State FE	(5) + Interaction
Air Pollution Concern	-0.216** (0.017)	-0.228*** (0.015)	-0.259*** (0.016)	-0.248*** (0.016)	-0.248*** (0.016)
Community Trust		0.558*** (0.025)	0.478*** (0.026)	0.472*** (0.026)	0.467*** (0.026)
Financial Stress			0.038** (0.015)	0.031** (0.015)	0.023 (0.015)
Log Income			0.140*** (0.021)	0.133*** (0.021)	0.129*** (0.021)
Age			-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Female			-0.161*** (0.031)	-0.158*** (0.031)	-0.156*** (0.031)
Bachelor's Degree+			0.170*** (0.035)	0.162*** (0.034)	0.161*** (0.034)
Rural			0.199*** (0.037)	0.168*** (0.038)	0.167*** (0.038)
Air Pollution Concern × Community Trust					0.069***

_cons	3.699*** (0.016)	3.693*** (0.015)	2.068*** (0.255)	2.341*** (0.262)	(0.024) 2.414*** (0.263)
Observations	4312	4312	4312	4312	4312
R-squared	0.045	0.171	0.210	0.227	0.229
State FE	No	No	No	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Having established evidence consistent with a mechanism linking air-pollution concern, environmental evaluations, and subjective well-being, Table 7 examines whether the resilience effect is unique to community trust or reflects broader dimensions of social capital. The results provide strong evidence that the buffering effect extends beyond interpersonal trust. Institutional Trust ($\beta = 0.068$, $p < .05$) and Welcoming Community ($\beta = 0.083$, $p < .05$) both exhibit positive and significant interactions with air-pollution concern.

These findings suggest that the resilience effect is not driven by a single trust measure. Rather, multiple dimensions of social capital help shape how individuals respond to perceived air-pollution stress. Whether expressed through trust in neighbors, confidence in local institutions, or perceptions of community inclusiveness, stronger social capital appears to mitigate the well-being consequences associated with environmental concern.

[Insert Table 7 about here]

Table 7. Alternative Social Capital Measures and Life Satisfaction

	(1) Institutional Trust	(2) Welcoming Community
Air Pollution Concern	0.026 (0.031)	0.067** (0.031)
Institutional Trust	0.760*** (0.038)	
Air Pollution Concern $\times$ Institutional Trust	0.068** (0.033)	
Financial Stress	-0.601*** (0.029)	-0.607*** (0.029)

Log Income	0.396*** (0.043)	0.431*** (0.042)
Age	-0.002 (0.002)	-0.002 (0.002)
Female	-0.099 (0.063)	-0.137** (0.062)
Bachelor's Degree+	0.117* (0.069)	0.169** (0.068)
Rural	0.190** (0.080)	0.209*** (0.080)
Welcoming Community		0.929*** (0.044)
Air Pollution Concern $\times$ Welcoming Community		0.083** (0.041)
_cons	4.477*** (0.543)	4.054*** (0.530)
Observations	4320	4323
R-squared	0.307	0.316
State FE	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Having established robustness across alternative dimensions of social capital, Table 8 examines whether the findings are sensitive to the choice of estimator. The ordered probit estimates closely mirror the OLS results presented earlier. Across all specifications, the social-capital measures remain positively associated with life satisfaction, while the interaction terms remain positive and statistically significant. Community Trust ($\beta = 0.061$, $p < .01$), Institutional Trust ($\beta = 0.033$, $p < .05$), and Welcoming Community ($\beta = 0.045$, $p < .05$) each continue to moderate the relationship between air-pollution concern and life satisfaction. These results indicate that the resilience effect is robust to alternative modeling approaches and does not depend on treating life satisfaction as a continuous outcome.

[Insert Table 8 about here]

Table 8. Ordered Probit Estimates of Life Satisfaction

	(1) Community Trust	(2) Institutional Trust	(3) Welcoming Community
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Life Satisfaction			
Air Pollution Concern	0.033** (0.016)	0.010 (0.016)	0.031** (0.016)
Community Trust	0.486*** (0.025)		
Air Pollution Concern × Community Trust	0.061*** (0.020)		
Financial Stress	-0.298*** (0.016)	-0.304*** (0.016)	-0.311*** (0.016)
Log Income	0.212*** (0.022)	0.209*** (0.022)	0.227*** (0.022)
Age	-0.003*** (0.001)	-0.001 (0.001)	-0.001 (0.001)
Female	-0.090*** (0.033)	-0.052 (0.034)	-0.067** (0.033)
Bachelor's Degree+	0.078** (0.036)	0.038 (0.036)	0.063* (0.036)
Rural	0.113*** (0.041)	0.107*** (0.041)	0.120*** (0.041)
Institutional Trust		0.396*** (0.018)	
Air Pollution Concern × Institutional Trust		0.033** (0.015)	
Welcoming Community			0.506*** (0.021)
Air Pollution Concern × Welcoming Community			0.045** (0.018)
Observations	4327	4320	4323
State FE	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Finally, Table 9 explores whether the resilience effect varies across place types. Community trust is positively associated with life satisfaction in both rural and urban/suburban communities.

However, the interaction between air-pollution concern and community trust is statistically significant only among urban and suburban respondents ($\beta = 0.190$, $p < .01$).

The absence of a comparable effect among rural respondents suggests that the buffering role of social capital is not uniform across geographic contexts. While community trust remains an important correlate of well-being in rural communities, its protective function appears to be

concentrated in urban and suburban settings, where environmental concerns and social interactions may be experienced differently.

[Insert Table 9 about here]

Table 9. Rural-Urban Heterogeneity in the Relationship Between Air Pollution Concern, Community Trust, and Life Satisfaction

	(1) Rural	(2) Urban/Suburban
Air Pollution Concern	0.056 (0.077)	0.065* (0.035)
Community Trust	0.892*** (0.113)	0.944*** (0.063)
Air Pollution Concern × Community Trust	-0.133 (0.100)	0.190*** (0.057)
Financial Stress	-0.545*** (0.081)	-0.607*** (0.032)
Log Income	0.368*** (0.104)	0.419*** (0.048)
Age	-0.002 (0.005)	-0.006*** (0.002)
Female	-0.271* (0.157)	-0.152** (0.069)
Bachelor's Degree+	0.215 (0.173)	0.205*** (0.075)
_cons	4.557*** (1.345)	4.624*** (0.602)
Observations	850	3477
R-squared	0.271	0.304
State FE	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

These findings point to a decisive conclusion. Social capital contributes directly to subjective well-being and, more importantly, functions as a resilience resource that moderates the relationship between air-pollution concern and well-being. This pattern is evident across multiple measures of well-being, multiple dimensions of social capital, alternative model specifications, and different segments of the well-being distribution.

VI. Conclusion

We examined whether social capital moderates the relationship between air-pollution concern and subjective well-being. Our central argument was that social capital serves not only as a direct contributor to well-being but also as a resilience resource or protective factor that buffers how individuals respond to stress attributed to perceived air pollution.

Our findings support the central argument of the paper that higher levels of social capital are associated with more positive subjective well-being. Community trust, institutional trust, and perceptions of a welcoming community all contribute to more positive and statistically significant relationships with life satisfaction and happiness. Further, the relationship between air-pollution concern and subjective well-being becomes less adverse as social capital increases. Across multiple specifications, individuals residing in communities characterized by stronger trust, greater institutional confidence, and more inclusive social environments appear less vulnerable to concerns about air pollution. While the direct relationship between air-pollution concern and subjective well-being is sensitive to specification, the interaction results consistently indicate that the relationship depends on the level of social capital available to individuals and communities.

Our findings contribute to the literature in several respects. First, we extend research on perceptions of environmental quality and subjective well-being by demonstrating that the relationship between air-pollution concern and well-being is conditional rather than uniform. Second, we contribute to the social-capital literature by showing that social capital is associated not only with higher levels of subjective well-being, as documented by Helliwell and Putnam (2004) and Helliwell (2006), but also with how individuals respond to perceived environmental stress. Third, we connect the well-being and community resilience literature by showing that

social capital operates as a resilience resource or protective factor linking these two areas of study. While prior research emphasizes the importance of social capital in helping individuals and communities adapt to uncertainty and external stressors (Norris et al., 2008; Aldrich & Meyer, 2015), our findings suggest that these resilience-enhancing properties extend to concerns about air pollution and are reflected in subjective well-being outcomes.

More broadly, our results suggest that air-pollution concern and social capital operate jointly in the development of subjective well-being. The well-being consequences of air-pollution concern depend, at least in part, on the social resources available to individuals and communities. Viewed through a well-being production lens, social capital is more than a direct source of well-being; it also influences how perceived environmental stress is translated into welfare outcomes. This finding underscores the importance of considering interaction effects between environmental and social conditions when evaluating well-being status.

Our findings also have implications for well-being policy. Discussions of subjective well-being frequently emphasize income, employment, public services, and environmental quality. While these remain important determinants of personal welfare, our results suggest that social conditions warrant equal attention. Individuals residing in communities characterized by stronger trust, greater social cohesion, and higher confidence in local institutions appear better positioned to maintain well-being when concerns about air pollution arise. Although the present analysis does not establish causal relationships, the evidence is consistent with the view that efforts to strengthen civic participation, social inclusion, welcoming community organizations, and confidence in local institutions may complement environmental and economic policies by enhancing resilience. From a well-being perspective, social capital may therefore represent more

than a desirable community attribute; it may also influence communities' capacity to sustain well-being under conditions of perceived environmental stress.

Several limitations warrant consideration. First, the analysis relies on cross-sectional survey data and therefore cannot establish causal relationships. Second, the study focuses on perceived air-pollution concern rather than objective measures of air quality. Future research should examine whether the relationships identified here persist over time and whether similar patterns emerge when subjective perceptions are considered alongside objective environmental indicators.

Despite these limitations, our findings consistently suggest that social capital plays an important role in shaping how individuals respond to concerns about air pollution. More broadly, the results underscore the value of considering interactions between environmental perceptions and social resources when explaining variation in subjective well-being. Such interactions are likely to be increasingly important in understanding how individuals and communities interact and adapt to environmental uncertainty.

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