

Moderating Role of Environmental Self-Efficacy in the Relationship Between Environmental Risk Perception and Pro-environmental Behavior: Focusing on the Differences between Developing and Developed Countries

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Introduction

Globally, 195 countries have acknowledged the urgency of climate change by signing multilateral environmental agreements (UNFCCC, 2021). Yet governmental efforts alone are insufficient; effective mitigation requires active individual pro-environmental behavior. Everyday actions—such as recycling, energy conservation, and eco-friendly consumption—can reduce greenhouse gas emissions by about 31% (Matasci et al., 2021), highlighting the substantial role of individual practices.

Pro-environmental behavior often stems from risk perception, yet the salience of risks differs across contexts. In developing countries, weak regulation and reliance on biomass make atmospheric risks pressing health threats, while in developed countries, stronger regulation shifts concern toward agriculture and long-term sustainability. Despite this, prior research has often treated risk perception as a single construct, overlooking contextual differences. Moreover, risk perception alone does not guarantee action; self-efficacy is pivotal. Its influence varies cross-nationally—stronger in individualistic, advanced societies, but constrained by structural barriers in developing countries.

To this end, the present study applies the Risk Perception Attitude (RPA) Framework (Rimal & Real, 2003) to investigate the factors influencing pro-environmental behavior in developing and developed countries. The framework posits that behavioral patterns depend on the combination of risk perception and self-efficacy: high risk with low efficacy can produce helplessness or avoidance, whereas high efficacy enables risk perception to translate into action. Thus, both constructs are crucial for understanding the mechanisms of pro-environmental behavior.

In sum, this study extends the application of the RPA Framework to the environmental domain by examining how risk perception and self-efficacy shape pro-environmental behavior across national contexts. This comparative approach provides insights for promoting pro-environmental practices and informing climate change policy.

Objective

The objective of this study is to examine the factors influencing pro-environmental behavior across developing and developed countries.

The specific research questions are:

- RQ1. Do PAER (Perceived Agricultural Environmental Risk) and PAter (Perceived Atmospheric Environmental Risk) significantly influence PEB (Pro-Environmental Behavior)?
- RQ2. Does PSE (Perceived Self-Efficacy) moderate the relationship between PAER/PAter and PEB?
- RQ3. Are there cross-national differences between developing and developed countries in the pathways through which PAER, PAter, and PSE affect PEB?

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Method

Data and Sample

Data were obtained from the International Social Survey Programme (ISSP) 2020 Environment Module. After excluding cases with missing values on the variables of interest, the final analytic sample consisted of 27,255 respondents across 28 countries. To classify countries into different developmental contexts, we used the Human Development Index (HDI). Following the threshold of $HDI < 0.85$ to define developing countries, six countries were categorized as developing, while the remaining 22 countries were categorized as developed.

Variables

- **Dependent Variable:** PEB was measured as the sum score of three behaviors: recycling efforts, avoiding environmentally harmful product purchases, and engaging in pro-environmental actions despite additional costs or time. The variable ranged from 3 to 13.
- **Independent Variables:**
 - *PAER*: Average of three items on the perceived severity of risks related to agricultural issues (e.g., pesticide use, water pollution, and genetically modified crops).
 - *PAtER*: Average of three items on the perceived severity of risks related to atmospheric issues (e.g., car emissions, industrial air pollution, and climate change).
- **Moderate Variable:**
 - *PSE*: Average of three reverse-coded items capturing individuals' confidence in their ability to perform pro-environmental actions. Higher scores indicate higher self-efficacy.

Analysis

Regression analyses tested the effects of perceived agricultural and atmospheric environmental risks on pro-environmental behavior. Interaction terms with perceived self-efficacy were included to examine moderation. Group comparisons between developing and developed countries were conducted using separate regressions.

Results

For developing countries, *PAER* had a significant positive effect on PEB ($\beta = 0.15, p < .001$), whereas *PAtER* was not significant. *PSE* showed a significant positive association with PEB ($\beta = 0.07, p < .05$). Moreover, the interaction between *PAER* and *PSE* was significant ($\beta = 0.10, p < .05$), indicating that individuals with higher self-efficacy were more likely to translate perceptions of agricultural risk into pro-environmental actions. Importantly, the interaction between *PAER* and *PAtER* was negative and significant ($\beta = -0.10, p < .05$), suggesting that when both risks were perceived as high, the positive effects did not accumulate but instead weakened each other's influence on behavior.

For developed countries, both *PAER* ($\beta = 0.12, p < .001$) and *PAtER* ($\beta = 0.10, p < .001$) were significant positive predictors of PEB. *PSE* demonstrated a positive effect ($\beta = 0.49, p < .001$), representing the most influential factor. The interaction between *PAER* and *PSE* was positive and significant ($\beta = 0.05, p < .01$), indicating that self-efficacy enhanced the positive effect of agricultural risk. By contrast, the interaction between *PAtER* and *PSE* was negative and significant ($\beta = -0.11, p < .001$), suggesting that higher self-efficacy weakened the effect of atmospheric risk. Furthermore, the interaction between *PAER* and *PAtER* was also negative and significant ($\beta = -0.07, p < .001$).

Conclusion

This study highlights both commonalities and differences in the determinants of PEB across developing and developed countries.

In both contexts, environmental risk perceptions and self-efficacy jointly shape behavior. Yet when agricultural and atmospheric risks are perceived simultaneously at high levels, their effects offset rather than reinforce each other, producing a dampening effect. This aligns with the RPA framework,

which suggests that high-risk perceptions without sufficient efficacy may discourage action.

In developing countries, PAER is the primary driver of PEB, amplified by self-efficacy, while atmospheric risks play a weaker role due to limited regulatory and infrastructural capacity. In developed countries, self-efficacy is most decisive, with both PAER and PAtER contributing independently. Notably, self-efficacy strengthens the effect of PAER but reduces that of PAtER.

Climate action strategies should reflect these dynamics. In developing countries, agricultural risk should be linked to practical actions in farming, water use, and waste management, while avoiding excessive or competing messages. In developed countries, interventions should build confidence and channel it toward sustainable agriculture and responsible consumption, emphasizing agricultural risks where efficacy reinforces engagement.

Across both contexts, raising awareness of risks alone is insufficient; strategies must show how risks translate into actions, thereby strengthening self-efficacy and fostering sustained pro-environmental behavior.

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Table 1
Result of regression analysis

| Variables | Developing countries | | Developed countries | |
|---------------------------------|----------------------|-------|---------------------|-------|
| | β | SE | β | SE |
| PAER | 0.15*** | -0.04 | 0.12*** | -0.02 |
| PAter | 0.07 | -0.05 | 0.10*** | -0.02 |
| PSE | 0.07* | -0.04 | 0.49*** | -0.02 |
| PAER*PSE | 0.10* | -0.05 | 0.05** | -0.02 |
| PAter*PSE | -0.05 | -0.05 | -0.11*** | -0.02 |
| PAER*PAter | -0.10* | -0.04 | -0.07*** | -0.02 |
| PAER*PAter*PSE | -0.05 | -0.04 | 0.01 | -0.02 |
| Control Variables | | | | |
| PEC | 0.44*** | -0.02 | 0.43*** | -0.01 |
| EA | 0.02 | -0.03 | 0.18*** | -0.01 |
| PNEP | 0.06* | -0.03 | -0.03* | -0.01 |
| Gender(ref = Female) | | | | |
| Male | -0.11* | -0.05 | -0.11*** | -0.02 |
| Age | 0.01 | 0.01 | 0.02*** | 0.001 |
| Marital status(ref = Married) | | | | |
| Never married | -0.30*** | -0.06 | -0.04 | -0.03 |
| Separated/Divorced/Widowed | -0.34*** | -0.08 | -0.20*** | -0.03 |
| Household size | 0.01 | -0.01 | 0.03** | -0.01 |
| Education(ref = < High school) | | | | |
| High school | -0.24*** | -0.06 | 0.18*** | -0.03 |
| Associate degree | -0.08 | -0.08 | 0.30*** | -0.04 |
| Bachelor's degree | 0.31*** | -0.08 | 0.42*** | -0.04 |
| Master's or Doctoral degree | -0.44*** | -0.12 | 0.44*** | -0.04 |
| Constant | 6.22*** | -0.17 | 6.03*** | -0.1 |
| Observations | 7,088 | | 20,167 | |
| R-squared | 0.10 | | 0.25 | |

Note. PAER = Perceived Agricultural Environmental Risk; PAter = Perceived Atmospheric Environmental Risk; PSE = Perceived Self-Efficacy; PEC = Perceived Environmental Concern; EA = Ecological Awareness; PNEP = Perceived Neighborhood Environmental Problems. * $p < .05$, ** $p < .01$, *** $p < .001$