

# Early-Life Circumstance and Adult Locus of Control: Evidence from 72 Countries

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## Abstract

Using longitudinal survey data from 72 countries and rainfall shortage as an exogenous variation in early-life circumstance, this study examines the causal effect of rainfall shortage in early life on adult locus of control. It is uncovered that experience of shortage before age 5 is significantly associated with the perception of external control in later life. The impact is larger for females in agricultural economies. Furthermore, the children affected by rainfall shortage are less likely to vote in later life. However, the impact disappears in early 30s.

Keywords: Locus of control; the World Values Survey; Early-life circumstance

JEL classification: O15; I15; D91

## 1. Introduction

Non-cognitive traits have been recognized as vital to underpinning human development. In particular, Locus of Control (LOC)—individual beliefs regarding the causal relationship of own efforts and their consequences on life—predicts socio-economic status, human capital, and subjective well-being. Given these arguments, it is essential for policymaker and researchers to understand their development process.

The literature on the development of LOC is classified into two strands. The first strand argues the stability of traits during adulthood. Some researchers claim their stability among adults (Cobb-Clark and Schurer 2013), while the others find significant changes with experience of negative shocks, such as unemployment (Preuss and Hennecke 2018). Therefore, there is no consensus whether it is indeed stable over time. The second strand relates to development of the traits during childhood. LOC of adolescents is shown to be determined by their experience during childhood, such as quality of parenting, economic adversity, and social disorganization (Ahlin and Lobo Antunes 2015). However, these studies rely on self-reported variables to characterize the early-life circumstance, and rigorous evidence is scarce. It is also unexplored how long the impact of early-life circumstance persists.

This study bridges these gaps in the literature by examining the causal effect of rainfall shortage in early life on adult LOC. Rainfall has significant effects on the economy at the national and household levels particularly in less developed countries. Hence, it could also

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affect children’s LOC. This study asks whether those who experienced rainfall shortage during childhood are more likely to demonstrate external control, the perception that they cannot control their life outcomes, than those who did not experience shortage. If the trait is stable during adulthood as suggested in the literature, the impact should last until elderly.

## 2. Datasets

This study employs two datasets. The first is the longitudinal data of World Values Survey (WVS). This study uses the following question to elicit LOC: *Some people feel they have completely free choice and control over their lives, while other people feel that what they do has no real effect on what happens to them.* The possible answer for the question ranges from 1 (no choice at all) to 10 (a great deal of choice). Second, for the climatic information, this study uses the dataset used in Barrios et al. (2010). This dataset includes annual rainfall and average temperature of most countries between 1950 and 2006.

In characterizing the early-life circumstance of survey respondents, this study first computes the deviation of rainfall and temperature from national average, i.e.,  $\log R_{ct} - \log \bar{R}_c$  where  $R_{ct}$  denotes rainfall or temperature in country  $c$  in year  $t$ , and  $\bar{R}_c$  is the national average. Then, this study defines that a country suffers from “rainfall shortage” or “low rainfall” if the annual rainfall of the year deviates by more than 1 standard deviation below the national average, while “high rainfall” is defined as the deviation of annual rainfall by more than 1 standard deviation above the national average. Likewise, I define high temperature and low temperature in the same manner.

## 3. Identification Strategy

This study estimates the impact of experiencing rainfall shortage in early life on adult outcome with the following OLS model;

$$LOC_{iabcw} = \alpha Weather_{bc} + \beta Male_{iabcw} + \delta_a + \theta_b + \gamma_{cw} + \varepsilon_{iabcw} \quad (1)$$

where  $LOC_{iabcw}$  denotes the LOC score of individual  $i$  who were born in year  $b$  in country  $c$  and participated in the  $w$ -th wave of WVS survey at the age of  $a$ .  $Weather_{bc}$  includes 12 indicators of extreme weather experienced by the birth cohort  $b$  in country  $c$ .  $Male_{iabcw}$  is the indicator of male respondent.  $\delta_a$ ,  $\theta_b$ , and  $\gamma_{cw}$  are the age, year of birth, and country-wave fixed effects, respectively.  $\gamma_{cw}$  controls for the unobserved heterogeneity, such as macro-economic condition of the country when the survey was conducted, and the implementation procedure of the survey. I do not control for the socio-economic status of the respondent at the time of survey, because they could be determined by early-life circumstance.

A challenge in examining the impact of early life circumstance using data from developing countries is sample selection. First, the risk of stillbirth and child mortality may increase during the extreme weather. Second, those who experienced extreme weather in their early life may be less educated and may not respond to the WVS. Another potential issue is measurement error in LOC scale, weather, and reported age. These issues are carefully discussed in the full paper.

## 4. Results

### 4.1. Main Results

Table 1 presents the estimation result of Equation (1). In Columns (1) and (2), observations from both OECD and non-OECD countries are included. Columns (3) and (4) use only the non-OECD countries. It shows that in non-OECD countries, those who experienced rainfall shortage at the age of 0 to 5 have lower LOC score. They are less likely to perceive that they can control their life. This is robust to the inclusion of the other extreme weather variables. Next, this study also estimates the heterogeneity in the impact across gender. Although the results are not reported in this manuscript, it is shown that it is larger for females.

**Table 1: The Impact of Rainfall Shortage in Early Life on Adult Locus of Control**

	Full		Non-OECD	
	(1)	(2)	(3)	(4)
Low rainfall during utero	-0.028 (0.021)	-0.027 (0.021)	-0.041 (0.026)	-0.046* (0.026)
Low rainfall at 0 to 5	-0.014 (0.017)	-0.010 (0.017)	-0.050** (0.020)	-0.042** (0.021)
Low rainfall at 6 to 10	0.012 (0.017)	0.010 (0.017)	0.020 (0.020)	0.026 (0.019)
Other weather variables	No	Yes	No	Yes
Age fixed effects	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes
Male fixed effects	Yes	Yes	Yes	Yes
Mean of dep. var.	6.96	6.96	6.89	6.89
Observations	185,418	185,418	127,990	127,990

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Standard errors clustered at the country and survey wave level are in parentheses.

### 4.2. Behavioral Impact

This section examines the association between early-life rainfall and behavioral approximation for LOC. In particular, I investigate the impact on voting behavior. It is expected that those who experienced rainfall shortage in their early life and perceive external control are less likely to vote. Table 2 shows consistent patterns. Columns (2) and (4) suggest that the females who

experienced rainfall shortage before 5 is less likely to vote by 7.0 to 8.9 percentage points. The impact on males is, however, significantly smaller, as expected. Again, the rainfall during utero and schooling period has small and insignificant effects.

**Table 2: Behavioral Impact**

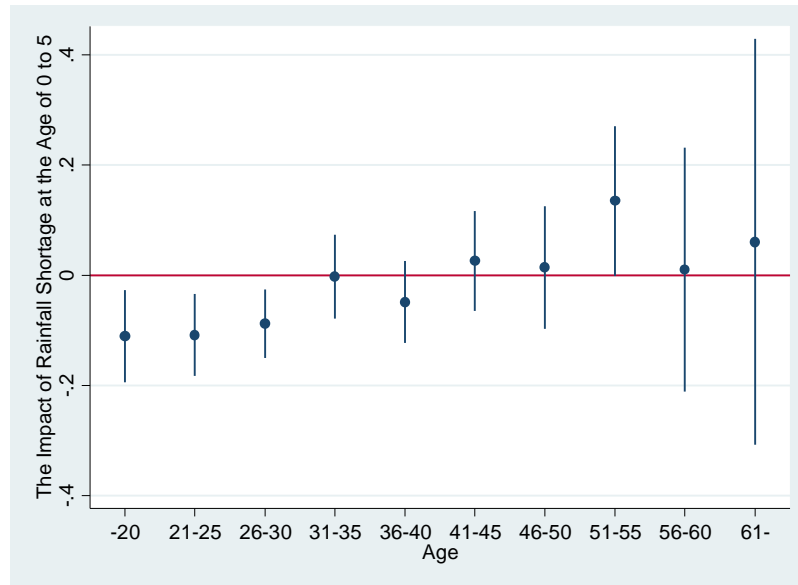
	Vote for National Election		Vote for Local Election	
	(1)	(2)	(3)	(4)
Low rainfall during utero	0.000	-0.014	-0.012	-0.032
	(0.019)	(0.027)	(0.020)	(0.029)
× Male		0.027		0.039
		(0.035)		(0.039)
Low rainfall at 0 to 5	-0.067***	-0.089***	-0.047**	-0.070***
	(0.021)	(0.020)	(0.021)	(0.022)
× Male		0.043**		0.044**
		(0.017)		(0.020)
Low rainfall at 6 to 10	-0.027	-0.035	-0.034	-0.046*
	(0.024)	(0.023)	(0.027)	(0.026)
× Male		0.016		0.024
		(0.020)		(0.022)
Other weather variables interacted with gender	No	Yes	No	Yes
Age fixed effects	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes
Male fixed effects	Yes	Yes	Yes	Yes
Mean of dep. var.	1.33	1.33	1.31	1.31
Observations	39,711	39,711	38,731	38,731

The sample of non-OECD countries are used to assure the sample size. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Standard errors clustered at the country and survey wave level are in parentheses.

#### 4.3. Persistence of the Impact

How long does the impact of rainfall shortage persist? Although previous studies demonstrate the long-term impact of early-life circumstance on various adult outcomes, this question is largely unexplored. This is presumably because many studies use cross-section data; it is technically impossible to isolate the age effect and cohort effect. Exploiting the repeated cross-section data of the WVS, this section looks at the heterogeneous impact of rainfall shortage across the age of respondents at the time of measuring LOC score. Specifically, I generate category variables of respondent's age by 5 years. Then, I estimate a model with the interaction terms between the dummy for rainfall shortage before 5 and the age categories.

Figure 1 depicts the point estimates of interaction terms and the 90% confidence intervals, using the non-OECD countries. Intriguingly, although the impact of rainfall shortage in childhood really persists until adulthood, it disappears in their early 30s. These findings are counter to the argument on the stability of personality in adulthood.



Note: The point estimates and 90% confidence intervals are depicted. X-axis is the age of respondents. Y-axis is the magnitude of point estimate.

**Figure 1: Persistence of the Impact of Early-Life Rainfall Shortage**

## 5. Conclusion

Using longitudinal survey data from 72 countries and rainfall shortage as an exogenous variation in early-life circumstance, this study uncovered that experience of shortage before age 5 is significantly associated with the perception of external control in later life. The association is larger for females and in agricultural economies. However, the impact disappears in early 30s.

These findings are critical because previous studies often assume the exogeneity of non-cognitive skills to evaluate its impact on individual's socio-economic success. However, this study suggests that an individual's locus of control is determined endogenously by his/her experience and macro-economic characteristics, and it changes over time. This study also contributes to the literature on the impact of early-life circumstance on adult outcomes. While previous studies have examined the outcomes of physical/mental health, education, and socio-economic status, the impact on non-cognitive skills is largely unexplored. Finally, this study is also related to the growing literature on the impact of experiencing negative shocks on personality and preferences. Prior studies show that experiencing natural disasters and conflicts influences individuals' time, risk and social preferences. However, these studies analyze the short-term impact and do not necessarily argue the experience in childhood. Furthermore, it is an open question in this literature how long the impact persists.

Importantly, my definition of rainfall shortage may be less severe than that of previous studies, such as wars, pandemic of diseases, and large-scale natural disasters. Nonetheless, I find

that such minor shocks have affected individuals' non-cognitive skills for around 25 years. More severe shocks may have a larger impact for a longer period. Furthermore, as shown in this study, experience of extreme weather in early life also influences individuals' education, health status, and voting behavior. These may partly explain the unequal development and cultural differences across countries. The government should consider its long-term consequences in providing safety net programs, such as disaster relief.

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