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**Do poverty and shocks increase impatience? Empirical evidence from Vietnam for the new approach of poverty reduction, land and environment sustainable management policies in developing countries**

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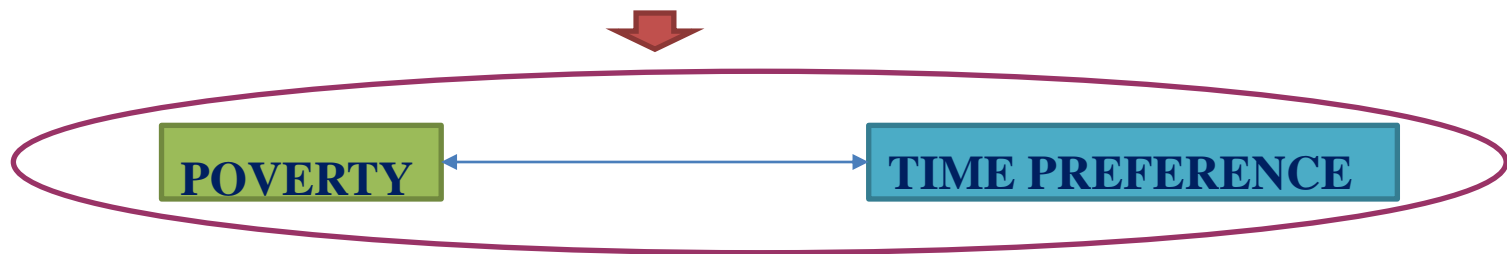
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**Chavas (2004):** increasing income => increase patience => providing incentives for sustained growth and conservation.

**Tanaka et al. (2010):** higher-income households => lower discount rates.

**Moseley (2001):** poor households have very low time discounting rates.



**Exponential or hyperbolic:** *Exponential* cannot capture *present bias* and the *magnitude effect*

**Choice-based or matching:** matching provides a lower discount rate while choice-based better predicts real-world behaviour and outcomes. Quickly reaches switching point with matching method.

**Incentivised or non-incentivised:** *non-incentivised* experiments might lead to the *hypothetical response*. *Incentivised* experiments imply some significant drawbacks.

**High stake & low stake:** Hermann and Musshoff (2016) designated the high stake as \$300, three times higher than the low stake of \$100.

- (1) The method of Benhabib et al. (2010): a family of hyperbolic time-discounting models that nest quasi-hyperbolic and exponential discounting.**
- (2) Matching**
- (3) Non-incentivised**
- (4) High stake = 1,000,000 VND (43.48 USD), low stake = 300,000 VND (13.04 USD)**

The different amount can be any number from VND 0 to VND 300,000.

You are indifferent between VND \_\_\_\_\_ today and VND 300,000 3 days from now.

You are indifferent between VND \_\_\_\_\_ today and VND 300,000 2 weeks from now.

You are indifferent between VND \_\_\_\_\_ today and VND 300,000 1 month from now.

You are indifferent between VND \_\_\_\_\_ today and VND 300,000 3 months from now.

You are indifferent between VND \_\_\_\_\_ today and VND 300,000 6 months from now.

You are indifferent between VND \_\_\_\_\_ today and VND 300,000 1 year from now.

Now you will answer a similar set of six questions with the same waiting periods but for a larger amount.

The different amount can be any number from VND 0 to VND 1,000,000.

You are indifferent between VND \_\_\_\_\_ today and VND 1,000,000 3 days from now.

You are indifferent between VND \_\_\_\_\_ today and VND 1,000,000 2 weeks from now.

You are indifferent between VND \_\_\_\_\_ today and VND 1,000,000 1 month from now.

You are indifferent between VND \_\_\_\_\_ today and VND 1,000,000 3 months from now.

You are indifferent between VND \_\_\_\_\_ today and VND 1,000,000 6 months from now.

You are indifferent between VND \_\_\_\_\_ today and VND 1,000,000 1 year from now.

$$x = y\alpha(1-(1-\theta)rt)^{1/(1-\theta)} - \frac{b}{y}, \quad (1)$$

Present bias ( $\alpha$ ), Hyperbolicity ( $\theta$ ), Time discount ( $r$ ), Fixed cost component ( $b$ ) of the discounting function,  $x$  denotes an immediate amount,  $y$  indicates a future amount, the future time (or delay)  $t$ .  $t$  is calculated by dividing the number of days of each question listed by 365.

The monetary unit of  $x$ ,  $y$ , and  $b$  is Vietnam dong (VND).

When  $\theta = 1$  and  $\alpha = 1$  exponential form:

$$x = y\exp\{-rt\} - \frac{b}{y} \quad (2)$$

When  $\theta = 2$  and  $\alpha = 1$  hyperbolic form:

$$x = y \left( \frac{1}{(1+rt)} \right) - \frac{b}{y} \quad (3)$$

The quasi-hyperbolic discounting appears if  $\alpha < 1$ , while the fixed cost component appears if  $b > 0$ . According to Benhabib et al. (2010), the specifications (2) and (3) are consistent with preferences reversal and magnitude effect phenomena.

$$\text{Time discounting rate}_i = \alpha_0 + \alpha_1 \text{Poverty}_i + \beta X_i + Z_i + u_i$$

**Time discounting rate<sub>i</sub> are time discounting rates of farmer i measured from Benhabib et al.'s discounting models.**

**Poverty<sub>i</sub> is the multidimensional poverty (MP) index, the income per capita per month, relative income per capita per month within the village of farmer i or the mean income per capita per month.**

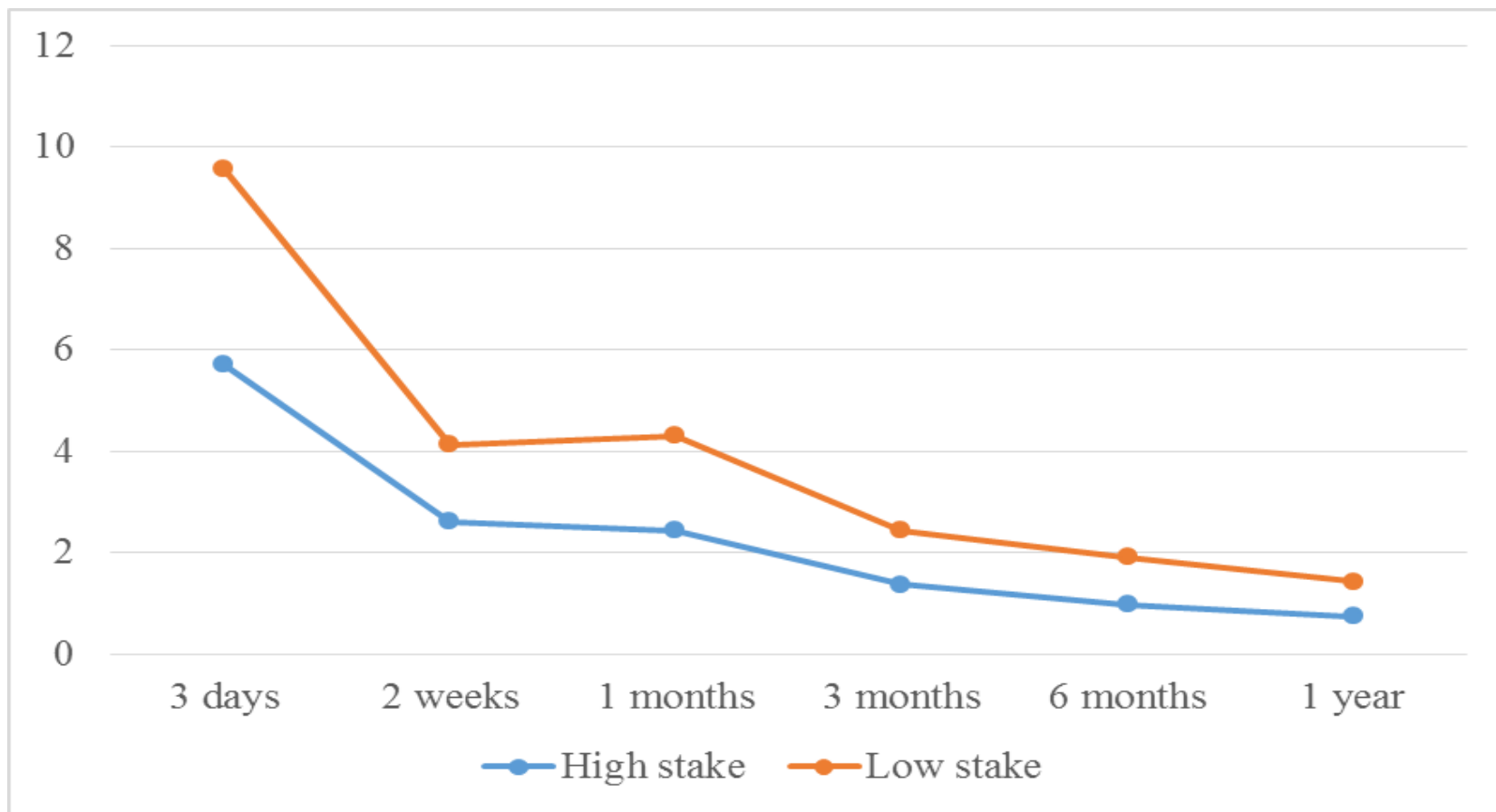
**X<sub>i</sub> : borrowing status, demographic characteristics, shocks, etc.**

**Z<sub>i</sub> is a set of IVs. I chose the distance to the nearest industrial zone/company, arable land area, distance to the nearest car-accessible road, total non-living expenses, and water salinity to instrument poverty.**

<u>Dimension</u>	<u>Indicator (weight)</u>	<u>Deprivation cutoff</u>
Education	Adult education ([1/5][1/2] = 1/10)	At least a household member who is between 15 and 29 years old who did not graduate from secondary school and is not currently attending school.
	Child school attendance ([1/5][1/2] = 1/10)	At least a household member who is between 5 and 14 years old who is not currently attending school.
Healthcare	Access to health services ([1/5][1/2] = 1/10)	There has been at least a household member who was (or is still) ill or injured AND in need of a caregiver (or, without a caregiver, unable to participate in normal activities), AND was not seeking medical treatment in the last 12 months.
	Health insurance ([1/5][1/2] = 1/10)	At least a household member aged 6 or older without health insurance.
Housing	Housing quality ([1/5][1/2] = 1/10)	Household is living in non-solid house or simple house.
	Living area ([1/5][1/2] = 1/10)	Housing area per capita is less than 8m <sup>2</sup> .
Water and sanitation	Water sources ([1/5][1/2] = 1/10)	Do not have safe drinking water.
	Latrine ([1/5][1/2] = 1/10)	Do not have hygienic latrine.
Information access	Use of telecommunications services ([1/5][1/2] = 1/10)	No family members use a telephone or have internet subscriptions.
	Assets for information access ([1/5][1/2] = 1/10)	Household has no TV, no radio, no computer; and the commune/village radio-loudspeaker system cannot be heard.

(Sources: Circular No. 17/2016/TT-BLDTBXH of the Ministry of Labor, Invalids and Social Affairs; Decision No. 59/2015/QĐ-TTg of the Prime Minister)





**Magnitude effect and present bias**

# Results

**Table 2.** Specification with no present bias

	<u>Mean</u>	<u>Std. Dev.</u>	<u>Median</u>	<u>Min</u>	<u>Max</u>	<u>75%</u>	<u>90%</u>	<u>95%</u>
r	6.10E+11	1.24E+13	1.88	0.08	2.97E+14	3.32	6.79	29.70
r (outliers dropped)	2.15	1.57	1.73	0.08	7.98	2.79	4.31	5.66
$\theta$	8.10	6.88	6.61	-4.19	76.85	9.30	13.22	16.92

**Table 3.** Specification with fixed cost component

	<u>Mean</u>	<u>Std. Dev.</u>	<u>Median</u>	<u>Min</u>	<u>Max</u>	<u>75%</u>	<u>90%</u>	<u>95%</u>
r	7.4E+10	1.21E+12	0.76	-1.02E+13	1.84E+13	1.46	4.72	16.80
r (outliers dropped)	1.13	1.26	0.72	0.00	8.55	1.27	2.15	4.00
$\theta$	4.76	16.70	4.41	-362.48	40.08	6.74	9.84	12.50
b	34,464	24,081	33,999	-60,724	131,827	48,952	62,321	73,772

**Table 4.** Specification with fixed and variable costs component

	<u>Mean</u>	<u>Std. Dev.</u>	<u>Median</u>	<u>Min</u>	<u>Max</u>	<u>75%</u>	<u>90%</u>	<u>95%</u>
r	4.12	31.70	1.21	-0.62	669.71	2.06	4.23	8.32
r (outliers dropped)	1.62	1.37	1.18	0.03	8.97	1.94	3.19	4.66
$\theta$	7.68	7.55	5.96	-34.88	95.99	9.48	13.75	17.61
b	49,828	33,721	52,118	-112,113	197,394	68,592	85,922	100,687
$\alpha$	1.04	0.07	1.05	0.53	1.24	1.07	1.09	1.11

## Appendix 2. Discount rates with hyperbolic specification without fixed cost component

	<u>Mean</u>	<u>Std. Dev.</u>	<u>Median</u>	<u>Min</u>	<u>Max</u>	<u>90%</u>	<u>95%</u>	<u>% greater than 10</u>
Tanaka et al.'s data	74.84	158.72	16.92	0.62	652.33	241.81	624.42	64.04
Our data	1.24	2.59	0.69	0.03	28.03	1.62	3.41	1.74

## Appendix 3. Comparing discount rates with quasi-hyperbolic specification and general form

	<u>Mean</u>	<u>Std. Dev.</u>	<u>Median</u>	<u>Min</u>	<u>Max</u>	<u>90%</u>	<u>95%</u>	<u>% greater than 10</u>
Tanaka et al.'s data	-695.52	33748.70	4.62	-156094.00	171804.30	110.13	33659.29	43.37
Our data	4.12	31.70	1.21	-0.62	669.71	4.23	8.32	8.30

Kirby and Marakovic (1996)	1.825
Chapman and Elstein (1995)	0.75 to 4
Benhabib et al. (2010)	4.72

Determinants of time preference: IVs regression models

	Fixed cost			Fixed and variable cost		
	(1)	(2)	(3)	(4)	(5)	(6)
Multi-dimensional poverty	-0.011 (0.032)			-0.447 (0.539)		
Logarithm of income percapita per month		-0.254 (0.291)			-0.379* (0.218)	
Logarithm of mean village income			-0.355 (0.693)			-1.082* (0.587)
Relative village income			-0.146 (0.177)			-0.122 (0.140)
Borrowing status	0.661 (0.485)	0.561 (0.441)	0.649 (0.517)	0.988** (0.446)	1.001** (0.431)	0.809* (0.459)
Social capital	0.523 (0.362)	0.355 (0.318)	0.521 (0.354)	0.255 (0.375)	0.233 (0.381)	0.260 (0.368)
Shock(s)	-0.181 (0.131)	-0.228* (0.128)	-0.204 (0.132)	-0.231 (0.148)	-0.292** (0.148)	-0.295** (0.148)
Distance to car road	0.051 (0.109)	0.049 (0.094)	0.055 (0.100)	-0.069 (0.121)	-0.078 (0.106)	-0.084 (0.102)
Extraversion	-0.028 (0.050)	-0.018 (0.051)	-0.037 (0.063)	0.064 (0.068)	0.054 (0.066)	0.017 (0.069)
Agreeableness	-0.023 (0.104)	0.039 (0.097)	-0.020 (0.104)	0.019 (0.094)	0.022 (0.092)	0.037 (0.093)
Conscientiousness	0.135** (0.066)	0.088 (0.059)	0.128* (0.068)	0.144* (0.077)	0.120 (0.075)	0.101 (0.075)
Emotional Stability	-0.050 (0.068)	-0.062 (0.064)	-0.035 (0.068)	-0.127 (0.079)	-0.094 (0.074)	-0.081 (0.071)
Openness	-0.182*** (0.063)	-0.136*** (0.064)	-0.153** (0.065)	-0.248*** (0.073)	-0.203*** (0.074)	-0.201*** (0.073)
Demographic characteristics	Yes	Yes	Yes	Yes	Yes	Yes
<i>Instrumental variables</i>	Yes	Yes	Yes	Yes	Yes	Yes
Cragg-Donald Wald F statistic	2.79	8.18	6.92	1.89	7.85	7.00
P value of Kleibergen-Paap rk Wald F statistic	0.01	0.00	0.00	0.06	0.00	0.00
P value of Hansen J statistic	0.41	0.38	0.30	0.31	0.44	0.75
Stock-Yogo weak ID test critical values		5.91	6.61		5.91	6.61
(% maximal IV size)		(20%)	(10%)		(20%)	(10%)

\*\*\*,\*\*, \* indicate  $p \leq 0.01$ ,  $p \leq 0.05$ , and  $p \leq 0.1$ , respectively. Standard errors are in paratheses.

- 1) The models with multiple components of time preferences fit field data on farmers.**
- 2) Experiment using hypothetical rewards still provide reasonable estimates.**
- 3) Poverty is not statistically significantly correlated with time preference if measured by multidimensional standards, but statistically significant if measured by income.**
- 4) Having experienced a natural disaster in the previous 12 months increases patience; openness to experience exhibited a significantly negative correlation with the impatience of farmers across all models.**

**THANK YOU  
FOR YOUR ATTENTION!**

