The Provision of Transnational and Intergenerational Public Goods

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Introduction

- Many real life public goods span nations and generations
  1. climate change mitigation
  2. transnational biodiversity conservation
- QUESTION: Will behavior change?
  - **Transnational Public Goods:** individuals contributing to and affected by public goods provision belong to different countries
  - **Intergenerational Public Goods:** individuals in the present generation can affect individuals in the future generation

Why is this important for the Philippines?

- Developed countries are the responsible for 79% of the world's emissions from 1850 to 2011 (Center for Global Development)
- Poor people will feel the impacts first and worst
  - vulnerable geography
  - less ability to cope with damage
- Importance:
  1. Philippines will be one of those affected the most
     - Global Climate Risk Index 2015: Philippines #1 (2013 data)
     - Philippines has no natural barriers, mangrove forests are disappearing, sea level rice, increase ocean temperature, extreme rainfall events
  2. How will rich/poor countries behave?
  3. How will the present generation behave?

Research Questions

1. Do individuals contribute more to a public good when the public good is transnational?
2. Do individuals contribute more to a public good when the public good is intergenerational?
   a. Do individuals contribute more to a public good if it gives better institutions to future generations?
   b. Do individuals contribute more to a public good if it gives higher endowments to future generations?
3. Do individuals contribute more to a public good when the public good is both transnational and intergenerational?

Economic Experiment? ◂ Yes ◂ No

What is an Economic Experiment?

"While physics and mathematics may tell us how the universe began, they are not much use in predicting human behavior because there are far too many equations to solve."

- Stephen Hawking

What is an Economic Experiment?

Controlled Data: Makes use of randomization to identify a treatment effect	Laboratory Experiment AFE: Artefactual Field Experiment FFE: Framed Field Experiment	Lab Lab Field
Naturally-Occurring Data: Examples of empirical models that require making identification assumptions to identify treatment effects from naturally-occurring data	NFE: Natural Field Experiment NE: Natural Experiment PSM: Propensity Score Matching IV: Instrumental Variables Estimation STR: Strutural Modelling	Field Empirical Empirical Empirical Empirical

Transnational and Intergenerational Literature

- Sandler 2009: Theoretical TIPG with OLG

Transnational Literature

- Transnationality as Global Public Goods: Blackwell and McKee 2003, Fellner and Lunser 2014, Nitta 2015
- Transnationality as Group Heterogeneity
  1. Heterogeneity in the lab: Anderson et al. 2008, Fellner et al. 2011, Oxoby and Spraggon 2013
  2. Cross-country heterogeneity in the field: Henrich et al. 2001, Gachter et al. 2004, Gneezy et al. 2005
  3. Intercountry heterogeneity in the field: Cappelan et al. 2013 (dictator), Chuah et al. 2007 (ultimatum), Carpenter and Cardenas 2011 (CPR), Castro 2008 (PG), Buchan et al. 2009 (PG)

Intergenerational Literature

- Public goods: Chaudhuri et al. 2006, Offerman et al. 2001 (intergenerational advice); Van der Heijden et al. 1998 (information on past choices); Duffy and Lafky 2014 (dynamic OLG)
- Other games: Schotter and Sopher 2003 (battle of sexes, ultimatum, trust); Fisher et al. 1995, Hauser et al 2014 (common pool resource game)
- Externalities: Engel and Rockenbach 2011 (bystanders), Sherstyuk et al. 2014 (intergenerational prisoner's dilemma)

Public Goods Game

$$\pi_i = (E - x_i) + \beta \sum_{j=1}^{n} x_j, \ \forall i, j = 1, ..., n$$

- Experiment Parameters: $E = 20$, $\beta = 0.4$
- Nash Equilibrium: $x_i^* = 0$, $\pi_i^* = E$
- Optimum: $x_i^o = E$, $\pi_i^o = \beta n E$
  - If $n \geq 3$ and $\beta \leq 0.5$, then $\pi_i^o \geq \pi_i^*$
  - CHEAT! If $x_{-i}^* = E$, then $x_i^{**}(x_{-i}^*) = 0$
    - $\pi(x_i^{**}) = E + \beta(n-1)E > \pi_i^o$

General Design Features

General Design Features

- One-shot, pen and paper
- Instructions: Danish, Spanish and English
- Exchange Rates: PPP converted based on minimum wage
- Instructors were locals and trained in Denmark
- Experimenters were trained in Denmark
- Why these countries?
  1. transnational
  2. cross-country variation
  3. same time zone
  4. Montagu's Harrier

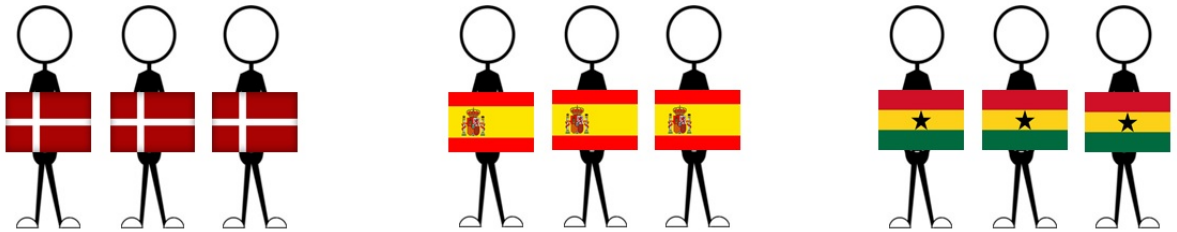
Montagu's Harrier

Montagu's Harrier: ca. 1 m. wingspan, 300 grams

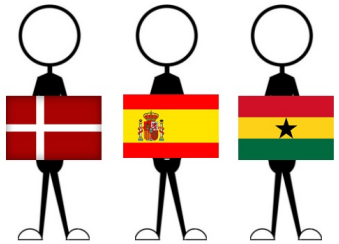
- Denmark for breeding
- Spain for resting
- Ghana for wintering

Transnational Setup

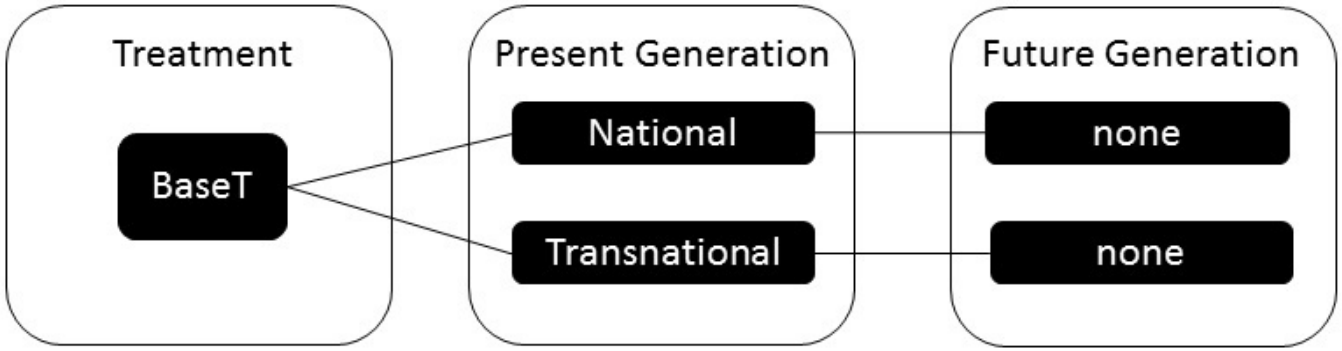
- National Public Good



- Transnational Public Good



Transnational Decision Set



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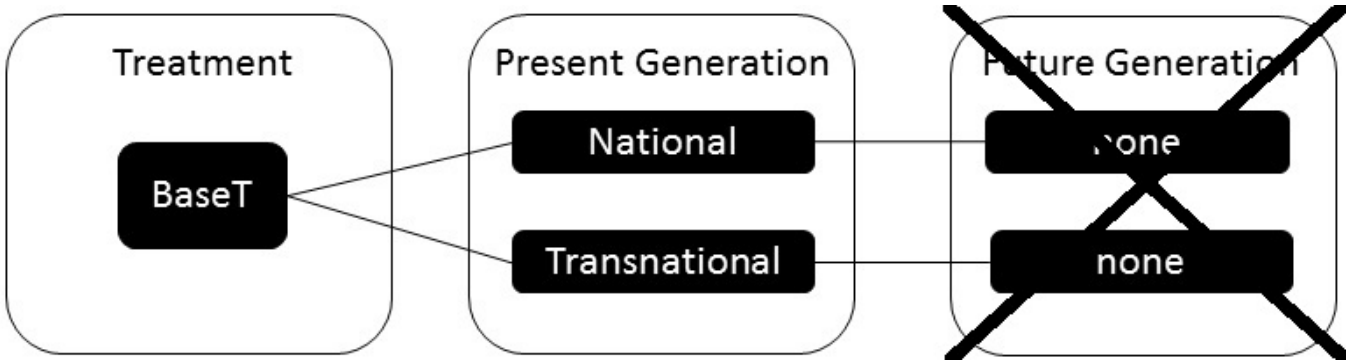
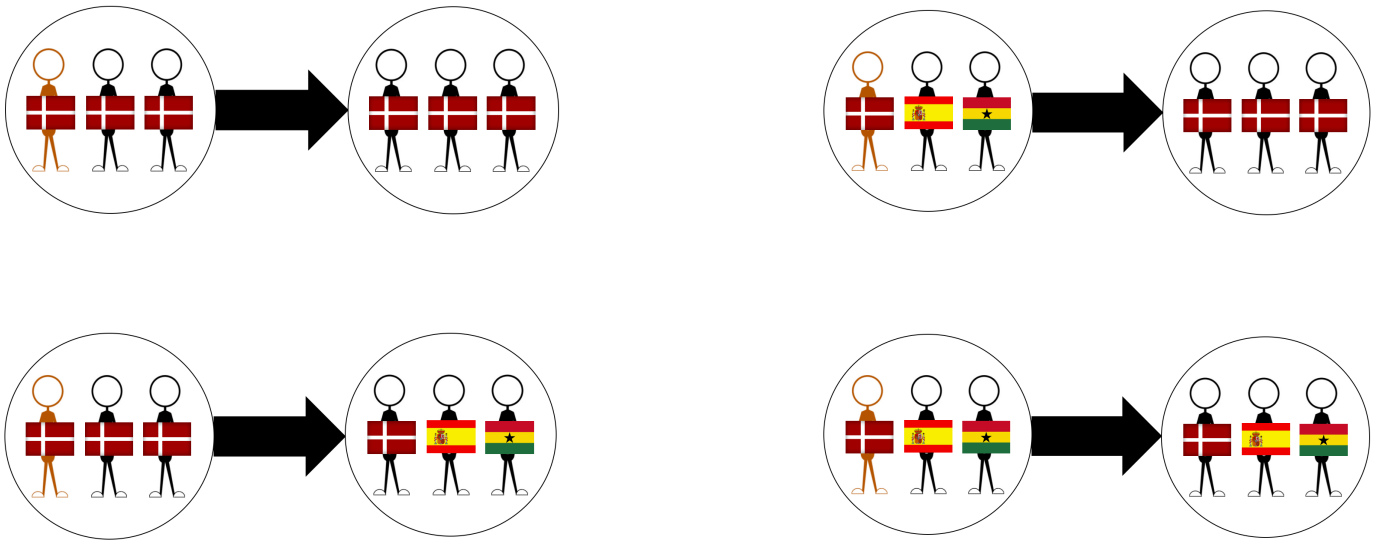


Intergenerational Public Goods

- Contributions by groups in the present generation affect groups in the future generation



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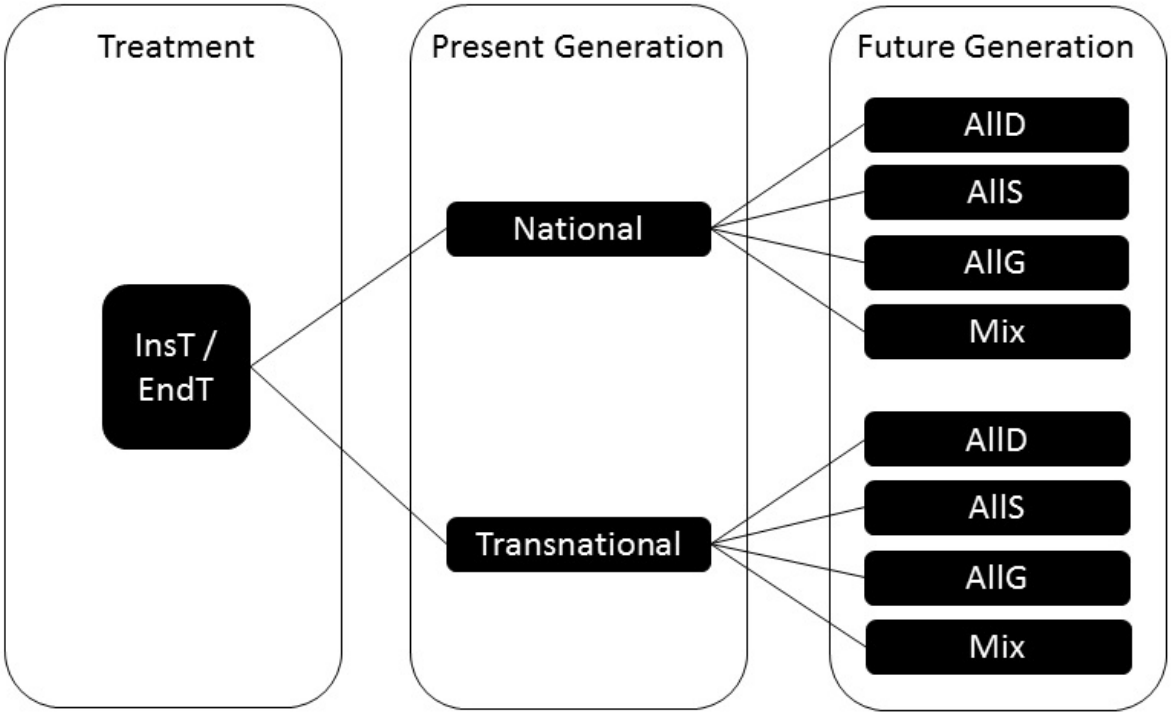


Intergenerational Public Goods

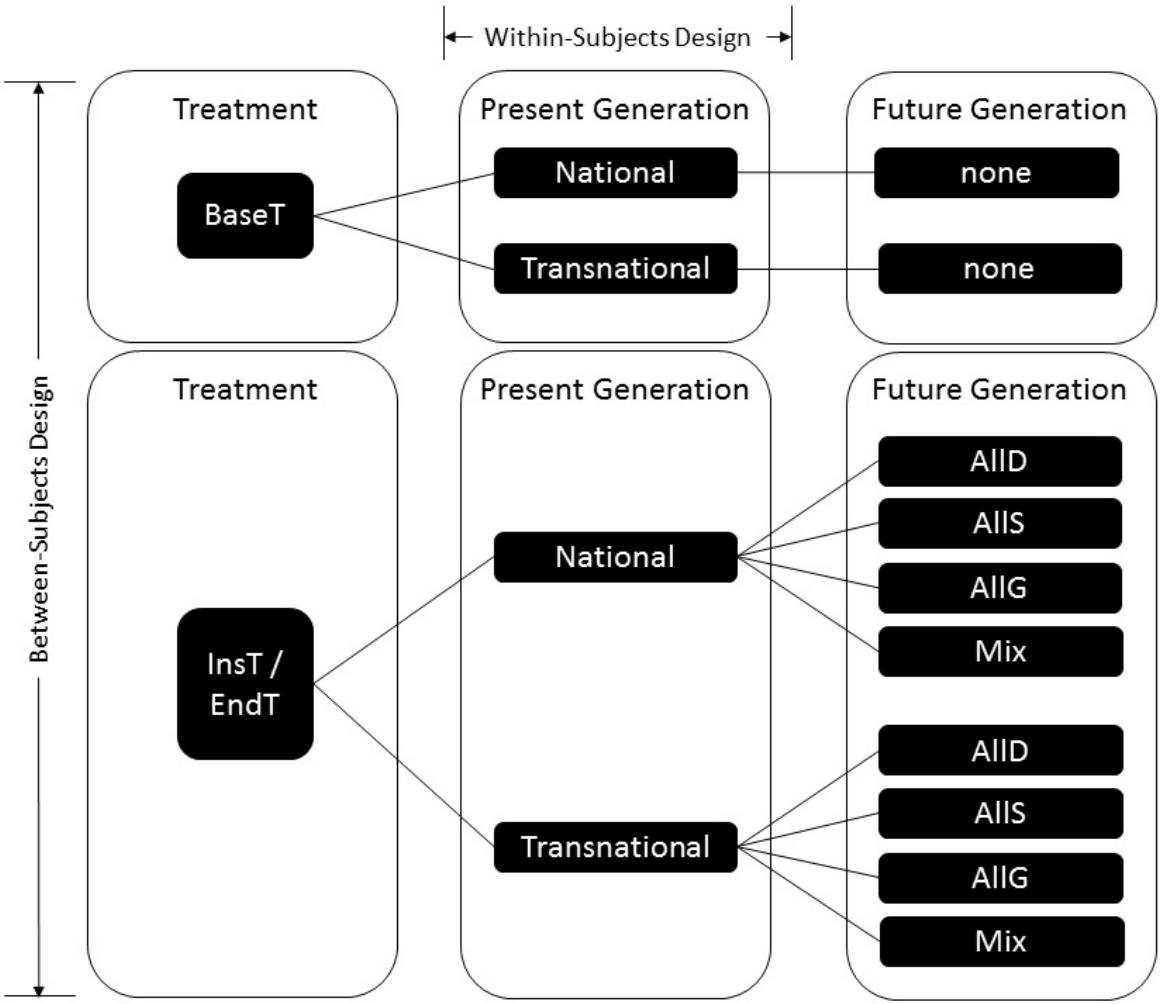
- Effect can be one of two ways:
  1. Increase Future MPCR (InsT)

$$\pi_i^F = (E - x_i^F) + \beta\left(1 + \frac{\sum_{i=1} x_i^P}{\sum_{i=1}^n E}\right) \sum_{j=1}^n x_j^F$$

  2. Increase Future Endowment (EndT)

$$\pi_i^F = \left[E\left(1 + \frac{\sum_{i=1} x_i^P}{\sum_{i=1}^n E}\right) - x_i^F\right] + \beta \sum_{j=1}^n x_j^F$$

Design Summary



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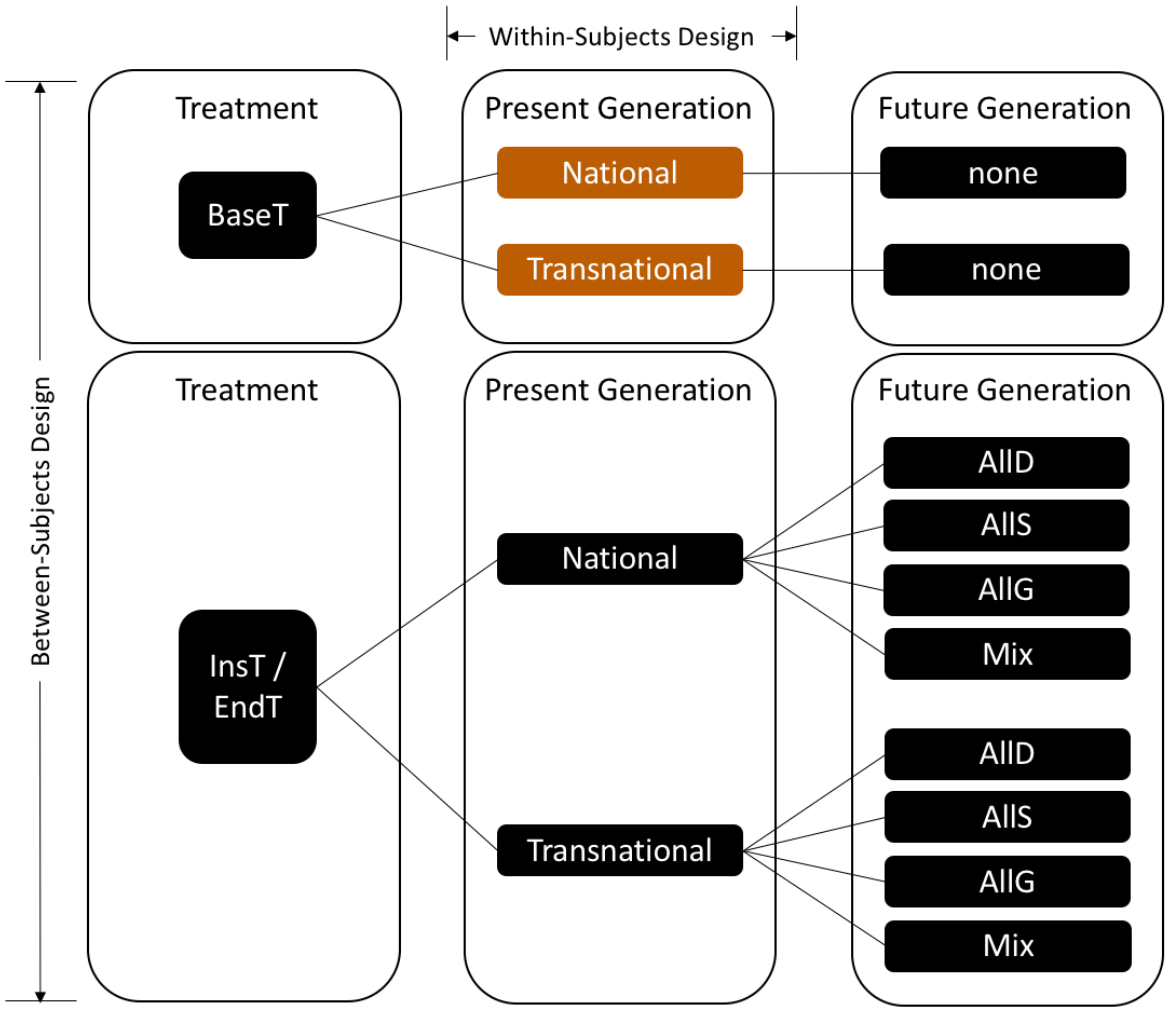

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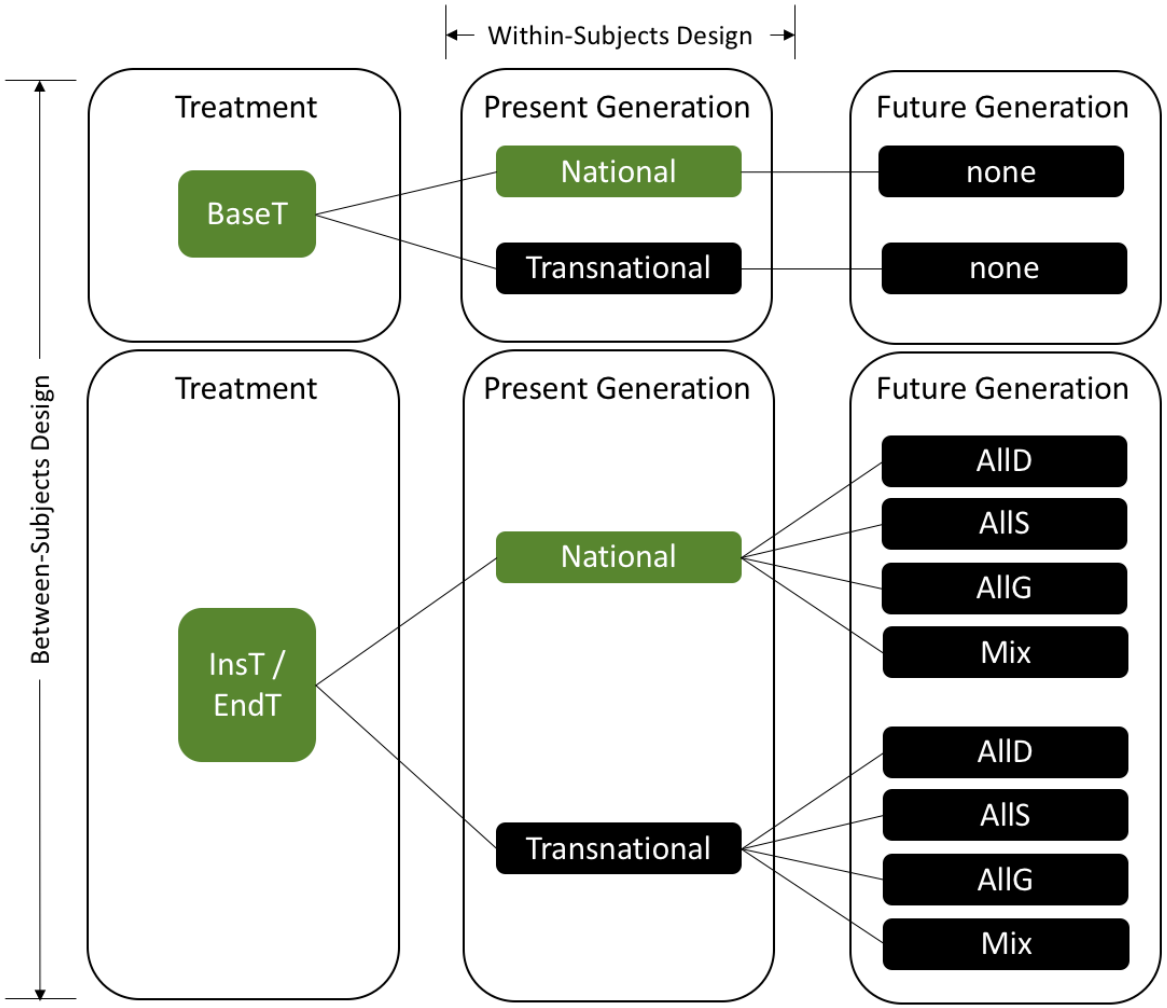

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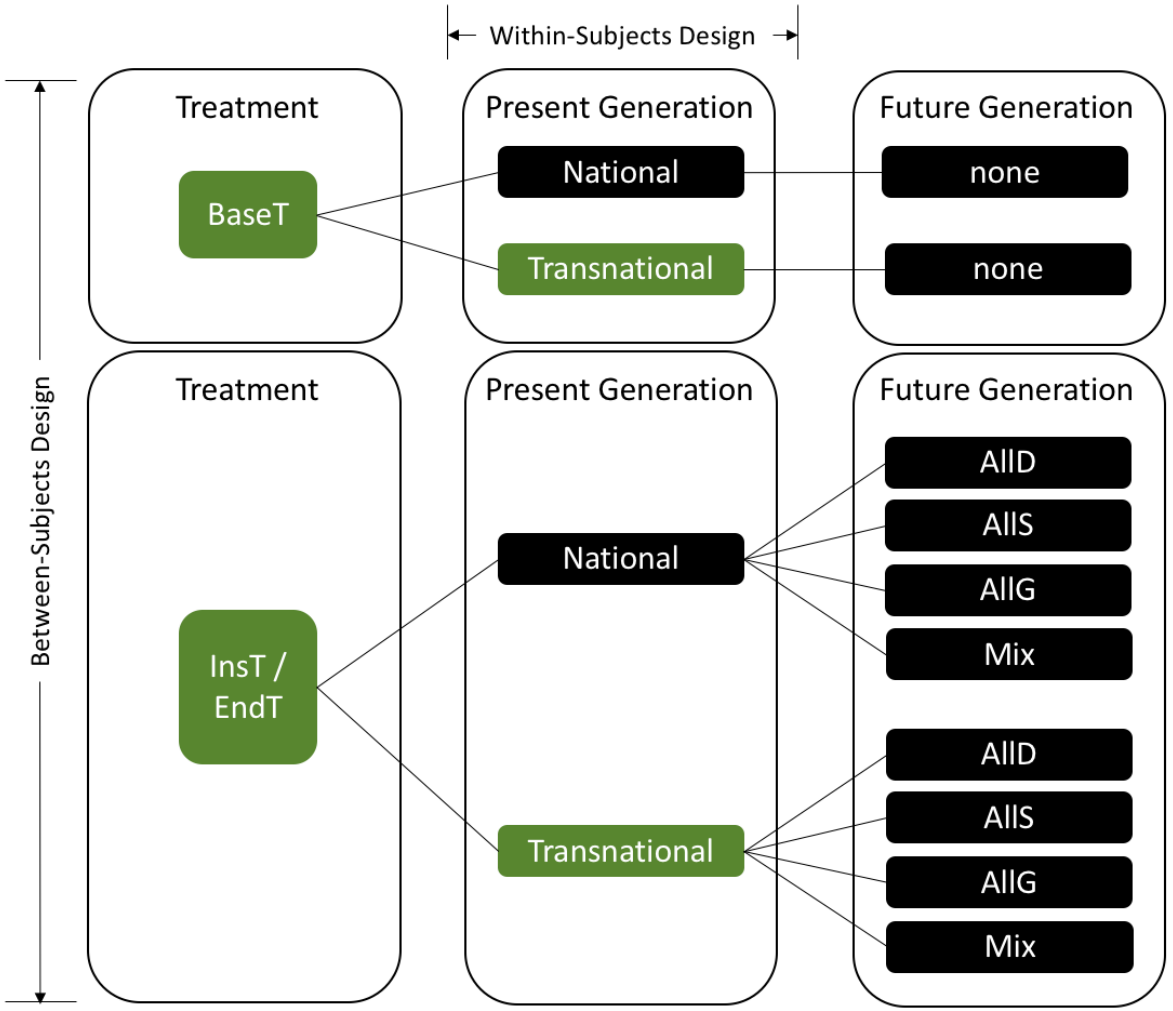

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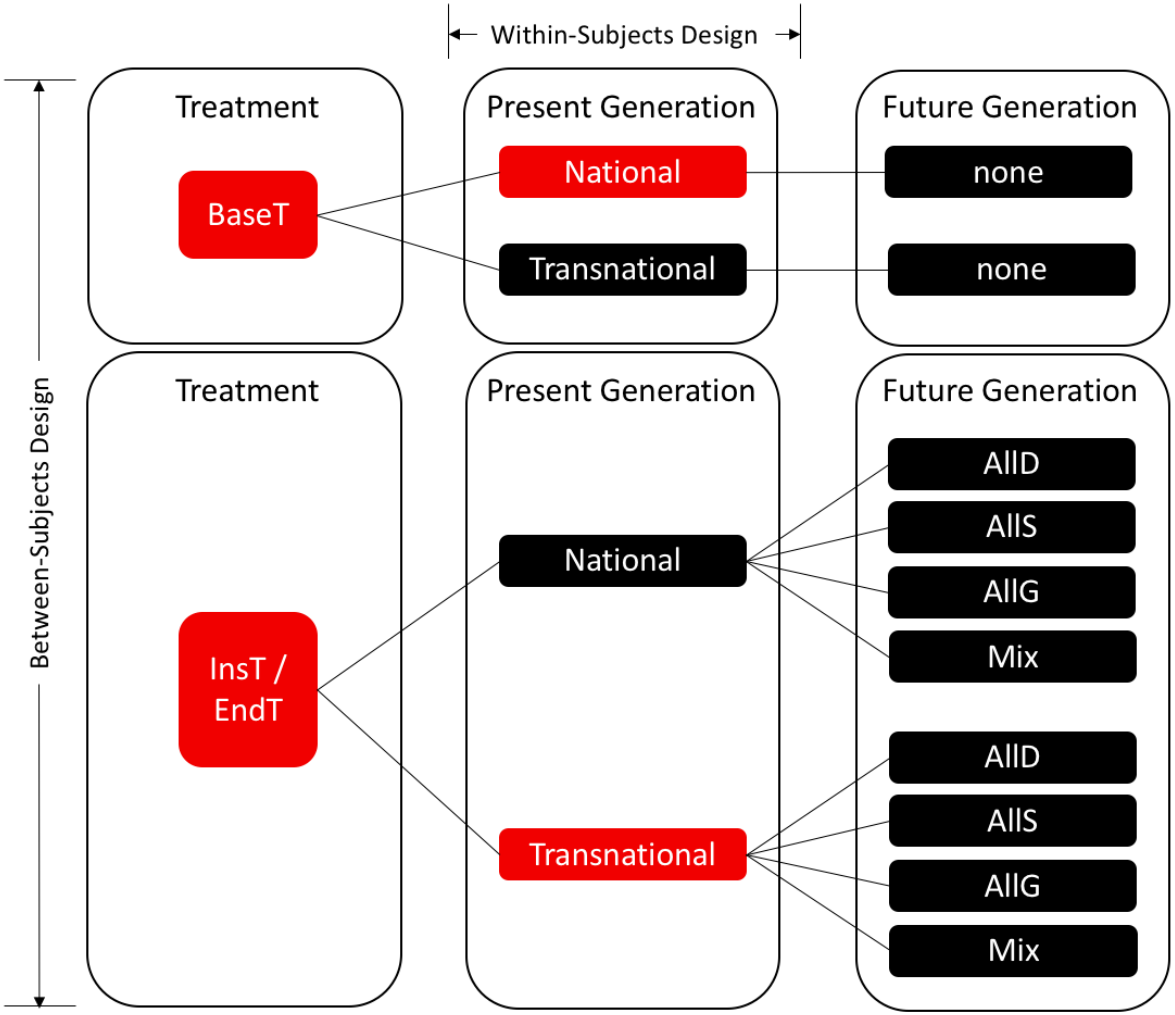
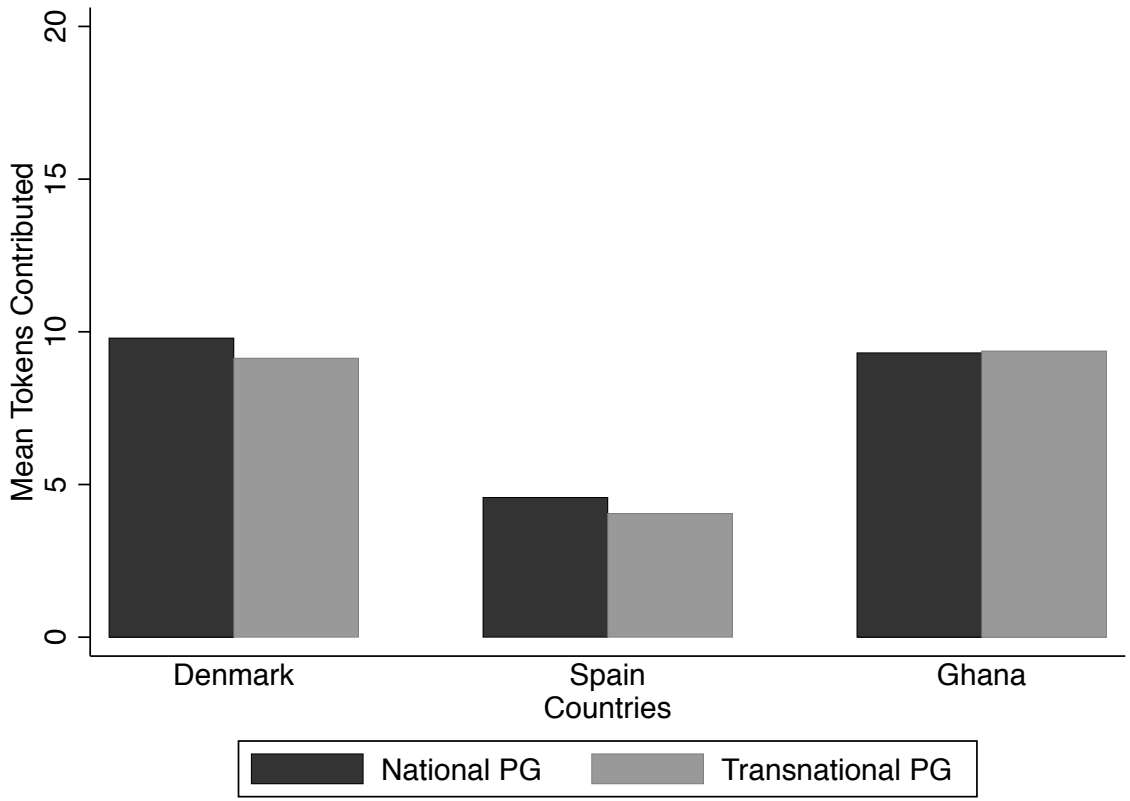


Summmary Statistics

Denmark			
Code	**Treatment Name**	**# Sessions**	**# Participants**
BaseT	Baseline	7	82
InsT	Institution Treatment	7	84
EndT	Endowment Treatment	6	71
Spain			
Code	**Treatment Name**	**# Sessions**	**# Participants**
BaseT	Baseline	7	84
InsT	Institution Treatment	7	83
EndT	Endowment Treatment	6	71
Ghana			
Code	**Treatment Name**	**# Sessions**	**# Participants**
BaseT	Baseline	7	84
InsT	Institution Treatment	7	84
EndT	Endowment Treatment	6	72

Notes: We invited 12 participants for each session. However, sessions with fewer than 12 participants were ran due to participants not showing up on the experiment day. Two sessions in Denmark had 10 and 11 participants. Two sessions in Spain had 11 participants.

Transnational Results



Transnational Results

Dependent Variable: Tokens Contributed

	Denmark		Spain		Ghana		Pooled	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Transnational	-0.6685**	-0.6822**	-0.5238**	-0.4827**	0.0595	0.0851	-0.3735**	-0.3729*
	(0.3176)	(0.3406)	(0.2183)	(0.2415)	(0.3784)	(0.4428)	(0.1799)	(0.1918)
Order	-0.4065	-0.4203	0.0952	0.0436	-0.2738	0.0325	-0.191	-0.1271
	(0.3176)	(0.3406)	(0.2183)	(0.2415)	(0.3784)	(0.4428)	(0.1799)	(0.1918)
Denmark							0.1241	0.427
							(0.9136)	(1.2101)
Spain							-5.0298***	-3.8383***
							(0.7115)	(1.3047)
Constant	10.0009***	-11.7787	4.5238***	-4.9611	9.4464***	12.7551	9.6215***	0.4819
	(0.8147)	(8.5668)	(0.4969)	(6.2234)	(0.5866)	(9.5319)	(0.5491)	(4.1892)
Controls	no	yes	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0	0.24	0	0.17	0	0.18	0.16	0.2
N	164	162	168	158	168	144	500	464

Notes: *Transnational* is a dummy that takes on the value of 1 if the public good is transnational and 0 otherwise. *Demmark* and *Spain* are dummies that take on the value of 1 if the individual is Dane and Spaniard, respectively, and 0 otherwise. Control variables include gender, age, belief, risk, trust, cooperativeness, wealth, and care. *Order* is an ordinal variable that specifies the order at which allocative decisions were made. OLS regressions run. Robust standard errors clustered on an individual level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

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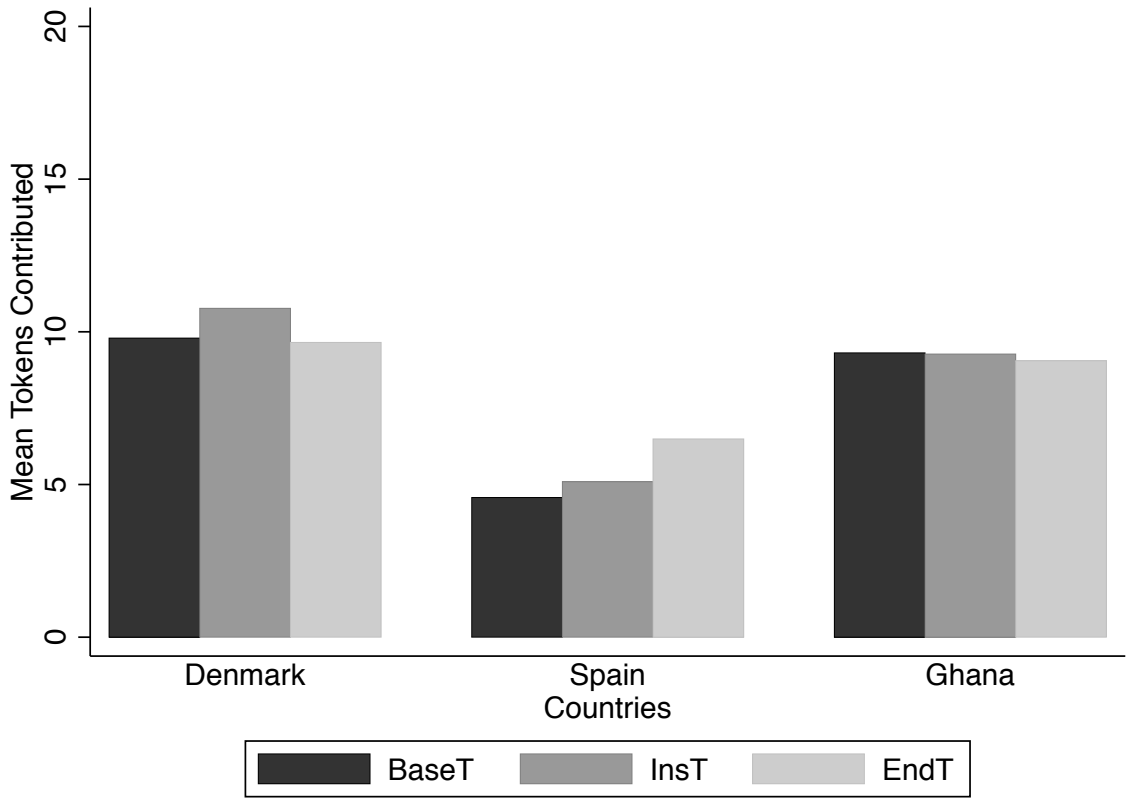
Intergenerational Results: National PGs



Intergenerational Results: National PGs

Dependent Variable: Tokens Contributed

	Denmark		Spain		Ghana		Pooled	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
InsT	0.5552	0.7875	0.5977	0.7098	-0.1124	0.12	0.3529	0.3361
	(1.0843)	(1.0269)	(0.7375)	(0.8343)	(0.8244)	(0.8572)	(0.5141)	(0.5232)
EndT	-0.5546	-0.285	2.0055**	1.9659**	-0.3312	0.0632	0.3716	0.2894
	(1.0734)	(1.0815)	(0.8437)	(0.8231)	(0.7872)	(0.8131)	(0.5243)	(0.5489)
Denmark							1.0132*	2.2557***
							(0.5981)	(0.8579)
Spain							-3.5900***	-1.6996*
							(0.5216)	(0.8768)
Constant	9.7444***	1.4735	4.0529***	5.0409**	8.7720***	-11.0055*	8.3815***	2.5047
	(0.9014)	(3.6498)	(0.5459)	(2.5387)	(0.6910)	(5.6619)	(0.5115)	(2.6158)
Controls	no	yes	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.01	0.24	0.03	0.11	0.01	0.14	0.1	0.15
N	702	681	700	675	708	600	2110	1956

Notes: *InsT* and *EndT* are dummies that takes on the value of 1 if an observation belonged to InsT and EndT, respectively, and 0 otherwise. *Demmark* and *Spain* are dummies that take on the value of 1 if the individual is Dane and Spaniard, respectively, and 0 otherwise. Control variables include gender, age, belief, risk, trust, cooperativeness, wealth, and care. *Order* is an ordinal variable that specifies the order at which allocative decisions were made. OLS regressions run. Robust standard errors clustered on an individual level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Intergenerational Results: National PGs

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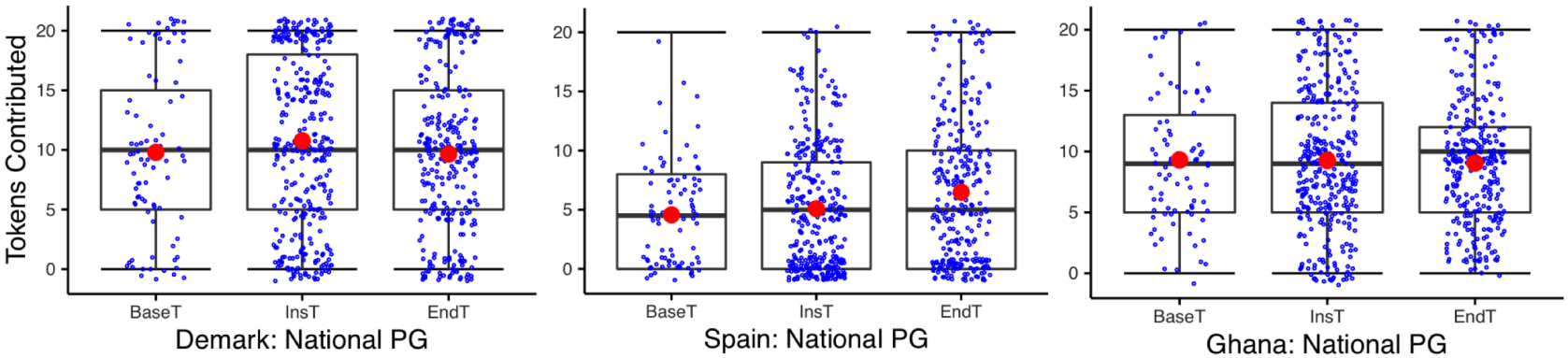
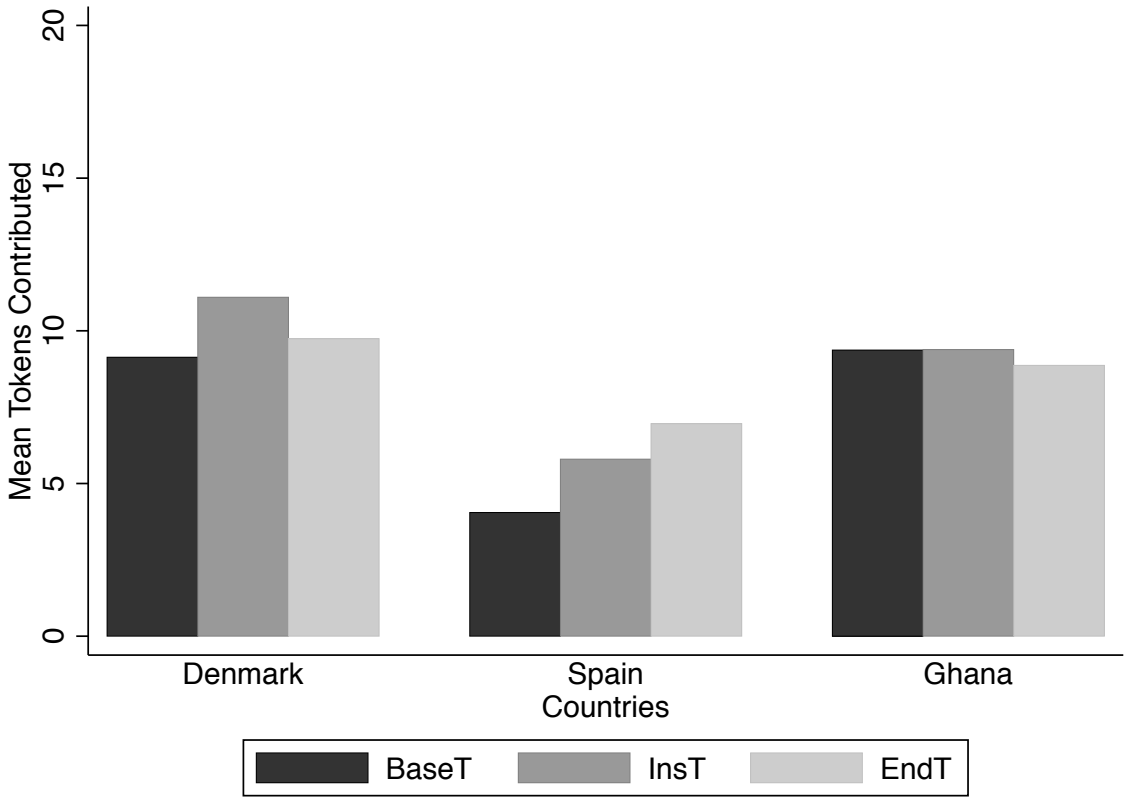


Notes: Box and whiskers plot overlaid with actual allocative decisions consisting of 2 decisions for individuals under BaseT and 8 decisions for individuals under InsT and EndT. The lower and upper hinges of the box plot corresponds to the first and third quartiles. The upper whisker extends from the hinge to the highest value that is within 1.5 * inter-quartile range of the hinge. Data beyond the end of the whiskers are outliers. Within each box is the mean (big dot) and the median (horizontal line).

▸ AllD ▸ AllS ▸ AllG ▸ Mix ▸ Average

Intergenerational Results: Transnational PGs



Intergenerational Results: Transnational PGs

Dependent Variable: Tokens Contributed

	Denmark		Spain		Ghana		Pooled	
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
InsT	1.6492	2.0470**	1.6916**	1.7704**	-0.1374	0.0655	1.0684**	1.1053**
	(1.0668)	(1.0167)	(0.7592)	(0.8425)	(0.8403)	(0.8629)	(0.5190)	(0.5275)
EndT	0.2932	0.5746	2.8629***	2.9932***	-0.6532	0.0028	0.8299	0.8853*
	(1.0434)	(1.0795)	(0.7874)	(0.7708)	(0.7812)	(0.8324)	(0.5091)	(0.5360)
Denmark							1.1427*	2.5110***
							(0.5883)	(0.8552)
Spain							-3.1137***	-1.5920*
							(0.5184)	(0.8503)
Constant	9.5348***	4.8627	4.3845***	4.5266*	9.6524***	-9.9158*	8.5125***	3.3733
	(0.8567)	(3.6157)	(0.6225)	(2.5905)	(0.6439)	(5.1763)	(0.5172)	(2.4179)
Controls	no	yes	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.02	0.21	0.03	0.11	0.01	0.11	0.09	0.13
N	702	681	700	675	708	600	2110	1956

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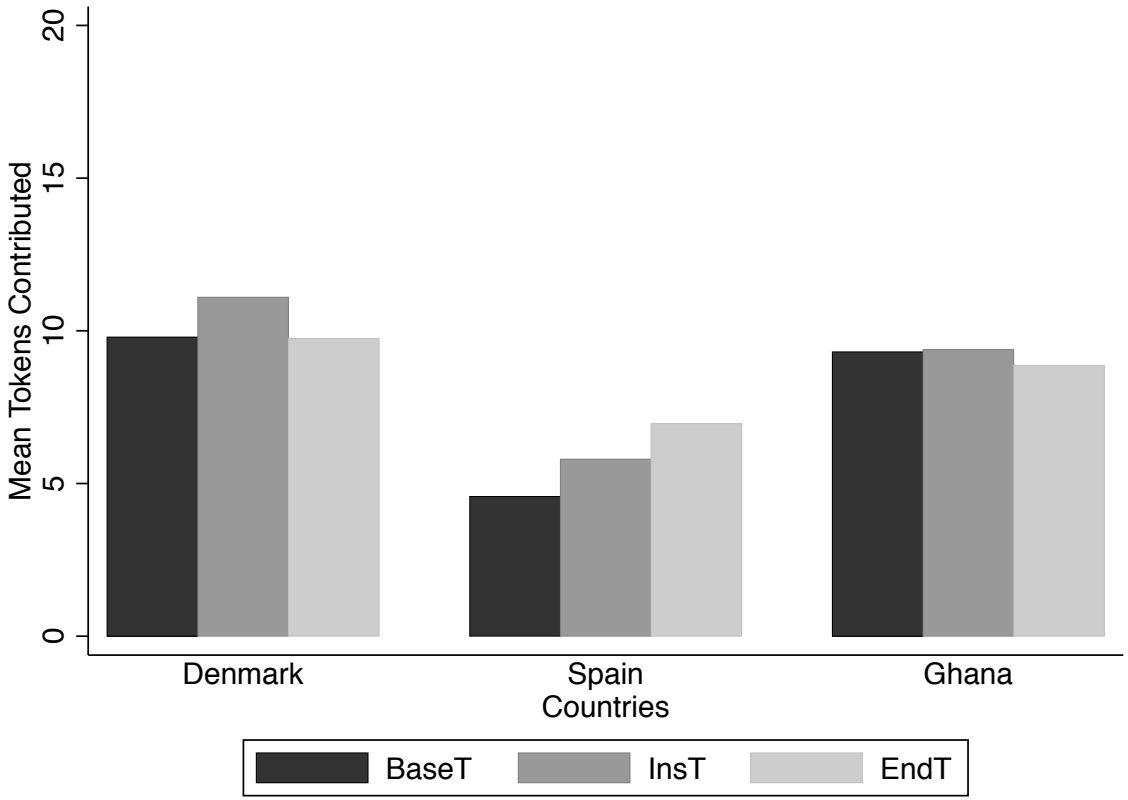
Controls	no	yes	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.02	0.21	0.03	0.11	0.01	0.11	0.09	0.13
N	702	681	700	675	708	600	2110	1956

Notes: *InsT* and *EndT* are dummies that takes on the value of 1 if an observation belonged to InsT and EndT, respectively, and 0 otherwise. *Demmark* and *Spain* are dummies that take on the value of 1 if the individual is Dane and Spaniard, respectively, and 0 otherwise. Control variables include gender, age, belief, risk, trust, cooperativeness, wealth, and care. *Order* is an ordinal variable that specifies the order at which allocative decisions were made. OLS regressions run. Robust standard errors clustered on an individual level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Transnational & Intergenerational Results



Transnational & Intergenerational Results (InsT)

Dependent Variable: Tokens Contributed

	Denmark		Spain		Ghana		Pooled	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Transnational	-0.6675**	-0.6808**	-0.5238**	-0.4845**	0.0595	0.0963	-0.3722**	-0.3713**
	(0.3150)	(0.3229)	(0.2177)	(0.2295)	(0.3811)	(0.4220)	(0.1797)	(0.1885)
Intergenerational	0.5972	1.7233*	0.5295	0.5945	-0.1577	-0.1838	0.3213	0.2741
	(1.0949)	(1.0246)	(0.7355)	(0.7905)	(0.8170)	(0.8732)	(0.5136)	(0.5163)
Trans * Inter	0.9979**	1.0192**	1.2255***	1.1845***	0.0536	0.0201	0.7528***	0.7664***
	(0.4447)	(0.4585)	(0.3195)	(0.3351)	(0.4532)	(0.4621)	(0.2376)	(0.2427)
Denmark							1.3117*	3.6975***
							(0.7658)	(1.0232)
Spain							-4.1142***	-1.1214
							(0.6466)	(1.0130)
Constant	9.9819***	-3.4997	4.5424***	4.0123	9.2024***	-14.2992**	8.8436***	-2.3184
	(0.7979)	(3.8952)	(0.4945)	(3.2540)	(0.5751)	(6.5279)	(0.5308)	(2.9915)
Controls	no	yes	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.01	0.38	0.01	0.05	0	0.12	0.13	0.23
N	836	818	832	798	840	736	2508	2352

Notes: *Transnational* is a dummy that takes on the value of 1 if a public good is transnational and 0 otherwise. *Intergenerational* is a dummy that takes on the value of 1 if an observation belongs to either InsT or EndT and 0 otherwise. *Trans* $*$ *Inter* is an interaction variable that interacts *Transnational* and *Intergenerational*. It is equal to 1 if an observation is both transnational and intergenerational, 0 otherwise. *Demmark* and *Spain* are dummies that take on the value of 1 if the individual is Dane and Spaniard, respectively, and 0 otherwise. Control variables include gender, age, belief, risk, trust, cooperativeness, wealth, and care. *Order* is an ordinal variable that specifies the order at which allocative decisions were made. OLS regressions run. Robust standard errors clustered on an individual level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Transnational & Intergenerational Results (InsT)

Go To

Dependent Variable: Tokens Contributed

	Denmark		Spain		Ghana		Pooled	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Transnational	-0.6675**	-0.6808**	-0.5238**	-0.4845**	0.0595	0.0963	-0.3722**	-0.3713**
	(0.3150)	(0.3229)	(0.2177)	(0.2295)	(0.3811)	(0.4220)	(0.1797)	(0.1885)
Intergenerational	0.5972	1.7233*	0.5295	0.5945	-0.1577	-0.1838	0.3213	0.2741
	(1.0949)	(1.0246)	(0.7355)	(0.7905)	(0.8170)	(0.8732)	(0.5136)	(0.5163)
Trans * Inter	0.9979**	1.0192**	1.2255***	1.1845***	0.0536	0.0201	0.7528***	0.7664***
	(0.4447)	(0.4585)	(0.3195)	(0.3351)	(0.4532)	(0.4621)	(0.2376)	(0.2427)
Denmark							1.3117*	3.6975***
							(0.7658)	(1.0232)
Spain							-4.1142***	-1.1214
							(0.6466)	(1.0130)
Constant	9.9819***	-3.4997	4.5424***	4.0123	9.2024***	-14.2992**	8.8436***	-2.3184
	(0.7979)	(3.8952)	(0.4945)	(3.2540)	(0.5751)	(6.5279)	(0.5308)	(2.9915)
Controls	no	yes	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.01	0.38	0.01	0.05	0	0.12	0.13	0.23
N	836	818	832	798	840	736	2508	2352

Notes: *Transnational* is a dummy that takes on the value of 1 if a public good is transnational and 0 otherwise. *Intergenerational* is a dummy that takes on the value of 1 if an observation belongs to either InsT or EndT and 0 otherwise. *Trans* $*$ *Inter* is an interaction variable that interacts *Transnational* and *Intergenerational*. It is equal to 1 if an observation is both transnational and intergenerational, 0 otherwise. *Demmark* and *Spain* are dummies that take on the value of 1 if the individual is Dane and Spaniard, respectively, and 0 otherwise. Control variables include gender, age, belief, risk, trust, cooperativeness, wealth, and care. *Order* is an ordinal variable that specifies the order at which allocative decisions were made. OLS regressions run. Robust standard errors clustered on an individual level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Transnational & Intergenerational Results (EndT)

Dependent Variable: Tokens Contributed

	Denmark		Spain		Ghana		Pooled	
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Transnational	-0.6678**	-0.6813**	-0.5238**	-0.4910**	0.0595	0.0946	-0.3722**	-0.3705*
	(0.3155)	(0.3239)	(0.2187)	(0.2315)	(0.3790)	(0.4235)	(0.1798)	(0.1889)
Intergenerational	-0.5089	-0.5625	1.9429**	1.9334**	-0.3633	0.1165	0.3607	0.3322
	(1.0872)	(1.0725)	(0.8550)	(0.7772)	(0.7804)	(0.7752)	(0.5281)	(0.5467)
Trans * Inter	0.7530*	0.7631	0.9880***	0.9883***	-0.2436	-0.1209	0.4961**	0.5674**
	(0.4515)	(0.4694)	(0.3550)	(0.3703)	(0.4441)	(0.5030)	(0.2429)	(0.2577)
Denmark							0.5978	0.4579
							(0.7118)	(0.9747)
Spain							-2.8713***	-3.0239***
							(0.6516)	(1.0603)
Constant	9.9877***	10.2836**	4.4374***	6.3182	9.3031***	-5.3246	8.6596***	8.9179***
	(0.7960)	(4.7479)	(0.4965)	(3.9660)	(0.5721)	(7.5358)	(0.5120)	(3.0184)
Controls	no	yes	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.00	0.17	0.04	0.22	0.00	0.13	0.07	0.11
N	732	706	736	710	744	608	2212	2024

Notes: *Transnational* is a dummy that takes on the value of 1 if a public good is transnational and 0 otherwise. *Intergenerational* is a dummy that takes on the value of 1 if an observation belongs to either InsT or EndT and 0 otherwise. *Trans* $*$ *Inter* is an interaction variable that interacts *Transnational* and *Intergenerational*. It is equal to 1 if an observation is both transnational and intergenerational, 0 otherwise. *Demmark* and *Spain* are dummies that take on the value of 1 if the individual is Dane and Spaniard, respectively, and 0 otherwise. Control variables include gender, age, belief, risk, trust, cooperativeness, wealth, and care. *Order* is an ordinal variable that specifies the order at which allocative decisions were made. OLS regressions run. Robust standard errors clustered on an individual level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Transnational & Intergenerational Results (EndT)

Go To

Dependent Variable: Tokens Contributed

	Denmark		Spain		Ghana		Pooled	
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Transnational	-0.6678**	-0.6813**	-0.5238**	-0.4910**	0.0595	0.0946	-0.3722**	-0.3705*
	(0.3155)	(0.3239)	(0.2187)	(0.2315)	(0.3790)	(0.4235)	(0.1798)	(0.1889)
Intergenerational	-0.5089	-0.5625	1.9429**	1.9334**	-0.3633	0.1165	0.3607	0.3322
	(1.0872)	(1.0725)	(0.8550)	(0.7772)	(0.7804)	(0.7752)	(0.5281)	(0.5467)
Trans * Inter	0.7530*	0.7631	0.9880***	0.9883***	-0.2436	-0.1209	0.4961**	0.5674**
	(0.4515)	(0.4694)	(0.3550)	(0.3703)	(0.4441)	(0.5030)	(0.2429)	(0.2577)
Denmark							0.5978	0.4579
							(0.7118)	(0.9747)
Spain							-2.8713***	-3.0239***
							(0.6516)	(1.0603)
Constant	9.9877***	10.2836**	4.4374***	6.3182	9.3031***	-5.3246	8.6596***	8.9179***
	(0.7960)	(4.7479)	(0.4965)	(3.9660)	(0.5721)	(7.5358)	(0.5120)	(3.0184)
Controls	no	yes	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.00	0.17	0.04	0.22	0.00	0.13	0.07	0.11
N	732	706	736	710	744	608	2212	2024

Notes: *Transnational* is a dummy that takes on the value of 1 if a public good is transnational and 0 otherwise. *Intergenerational* is a dummy that takes on the value of 1 if an observation belongs to either InsT or EndT and 0 otherwise. *Trans* $*$ *Inter* is an interaction variable that interacts *Transnational* and *Intergenerational*. It is equal to 1 if an observation is both transnational and intergenerational, 0 otherwise. *Demmark* and *Spain* are dummies that take on the value of 1 if the individual is Dane and Spaniard, respectively, and 0 otherwise. Control variables include gender, age, belief, risk, trust, cooperativeness, wealth, and care. *Order* is an ordinal variable that specifies the order at which allocative decisions were made. OLS regressions run. Robust standard errors clustered on an individual level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Conclusion

1. Does it change behavior?
   - Transnational: Danish and Spanish contributions are lower
   - Intergenerational: Danish contributions are higher when an intergenerational public good affects future institutions while Spanish contributions are higher when an intergenerational public good affects future endowments.
   - Transnational & Intergenerational: Danish and Spanish contributions are higher
   - Ghanaians are not affected by the type of public good
2. So what?
   - Not all public goods are created equal
     - Δ due to transnational &/or intergenerational
     - Δ due to which country it is affecting

Implications for the Philippines?

- Will Filipinos behave like Ghanaians? or like Spaniards?
- How do present events influence whether Filipinos agree to a certain policy?
- What changes a representative Filipino's behavior?

Questions?