The Provision of Transnational and Intergenerational Public Goods

Anna Lou Abatayo[a]
Lea Skræp Svenningsen[b]
Bo Jellesmark Thorsen[b,c]

[a]Department of Economics, Bocconi University
[b]Department of Food and Resource Economics, University of Copenhagen
[c]Center for Macroecology, Evolution and Climate, University of Copenhagen

September 28, 2017

Introduction

- Many real life public goods span nations and generations
  1. climate change mitigation
  2. transnational biodiviersity 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

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?

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

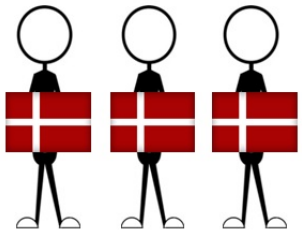
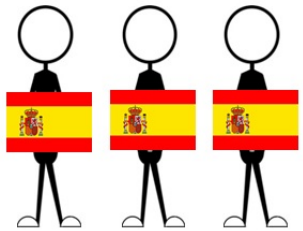
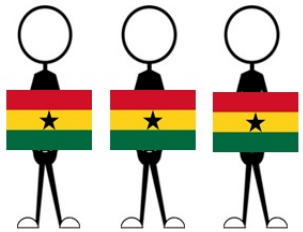
Montagu's Harrier

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

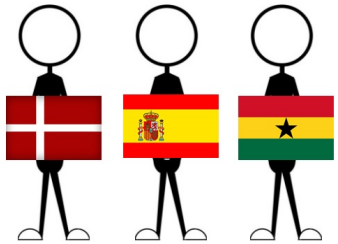
- Denmark for breeding
- Spain for resting
- Ghana for wintering

Transnational Setup

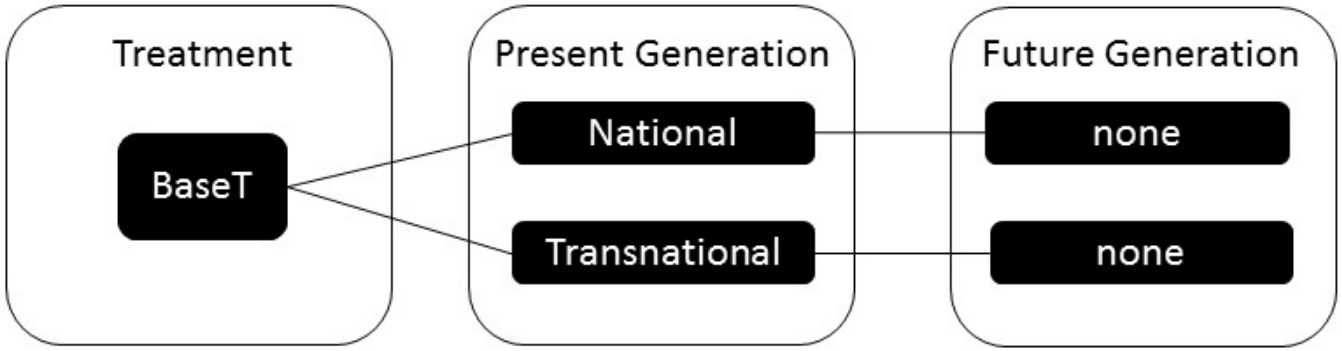
- National Public Good

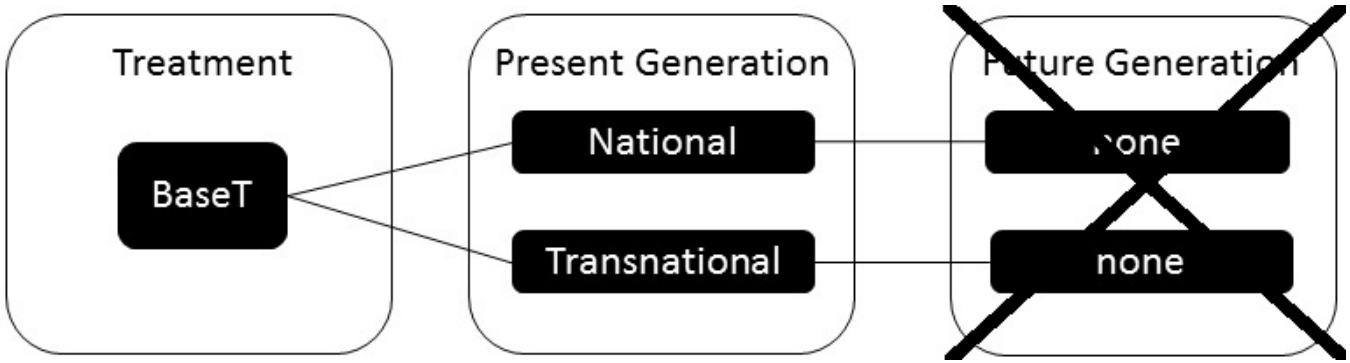
- Transnational Public Good



Transnational Decision Set

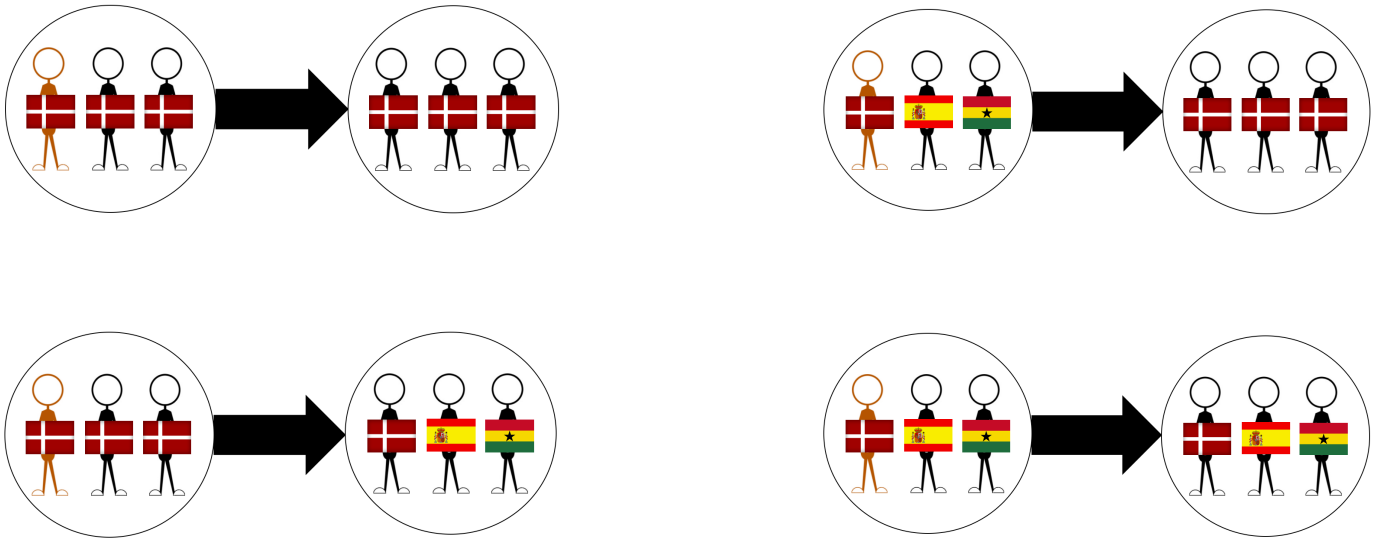


Transnational Decision Set

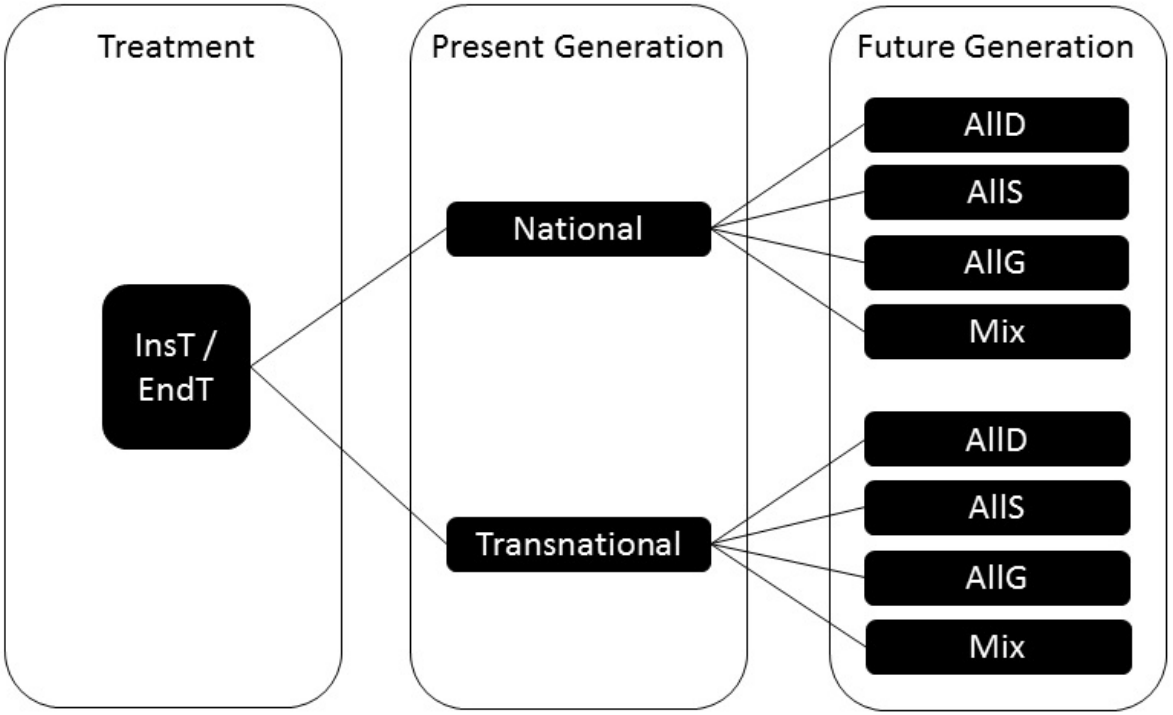


Intergenerational Public Goods

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



Intergenerational Decision Set



Intergenerational Public Goods

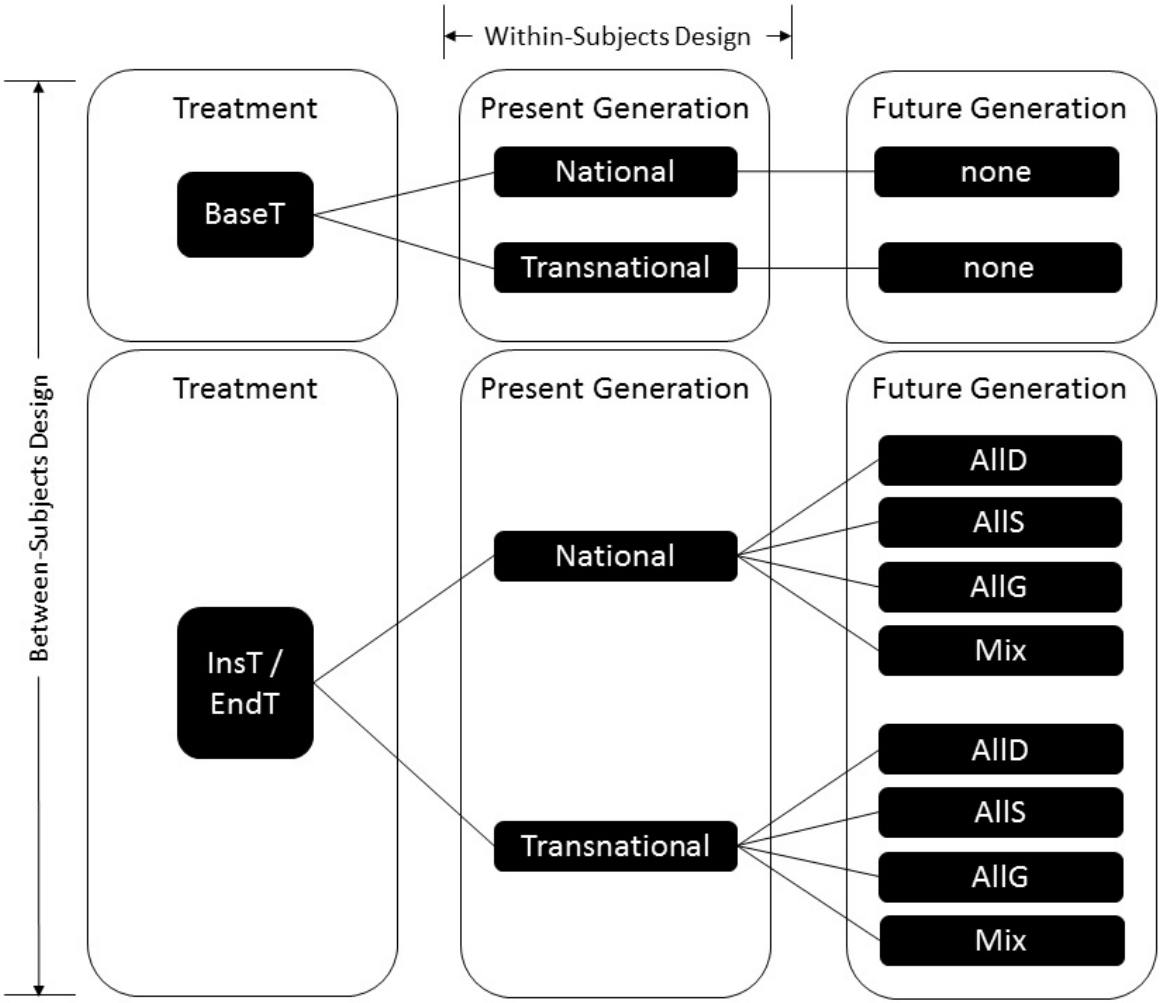
- Effect can be one of two ways:
  1. Increase Future MPCR (InsT)

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

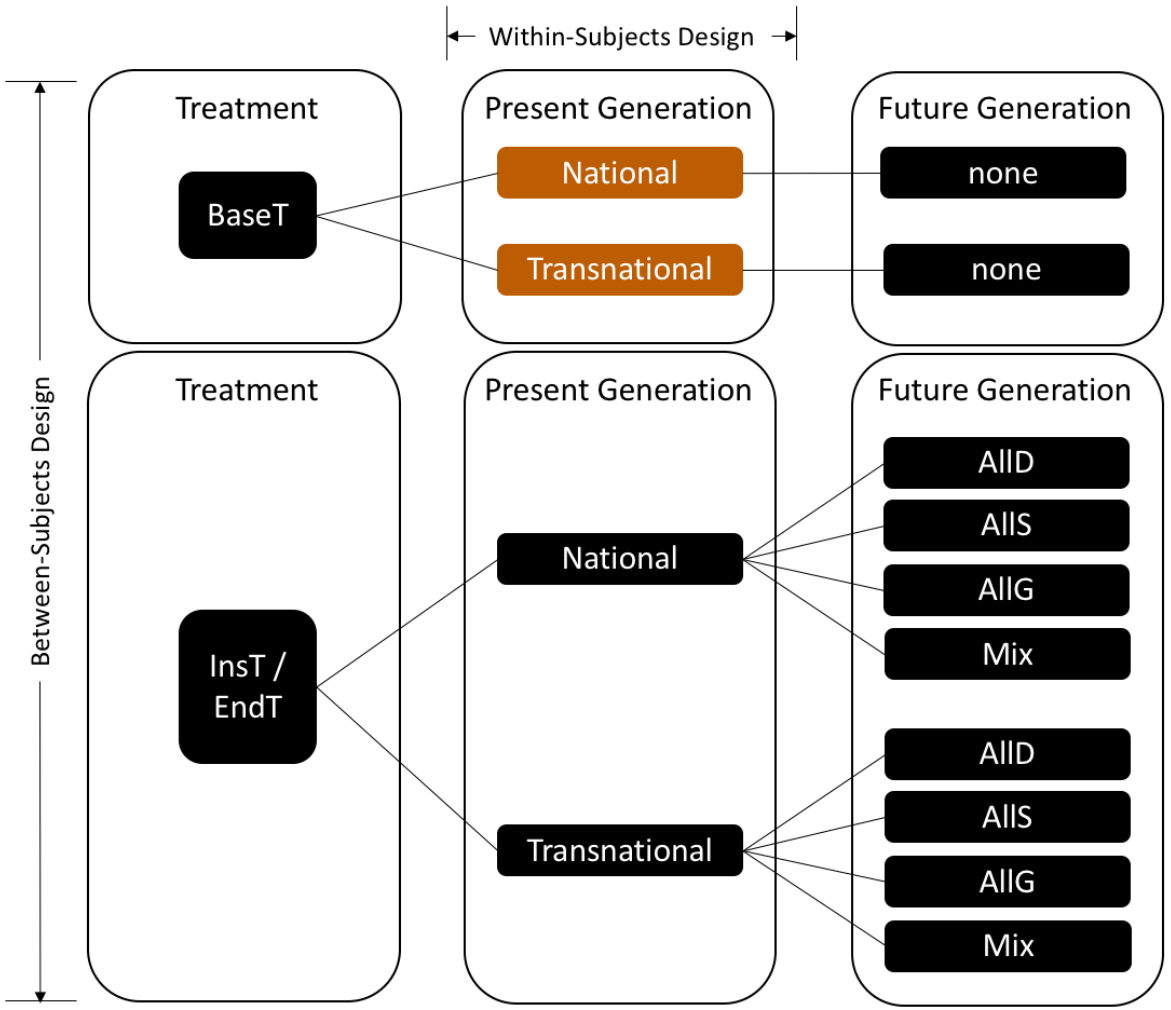
  2. Increase Future Endowment (EndT)

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

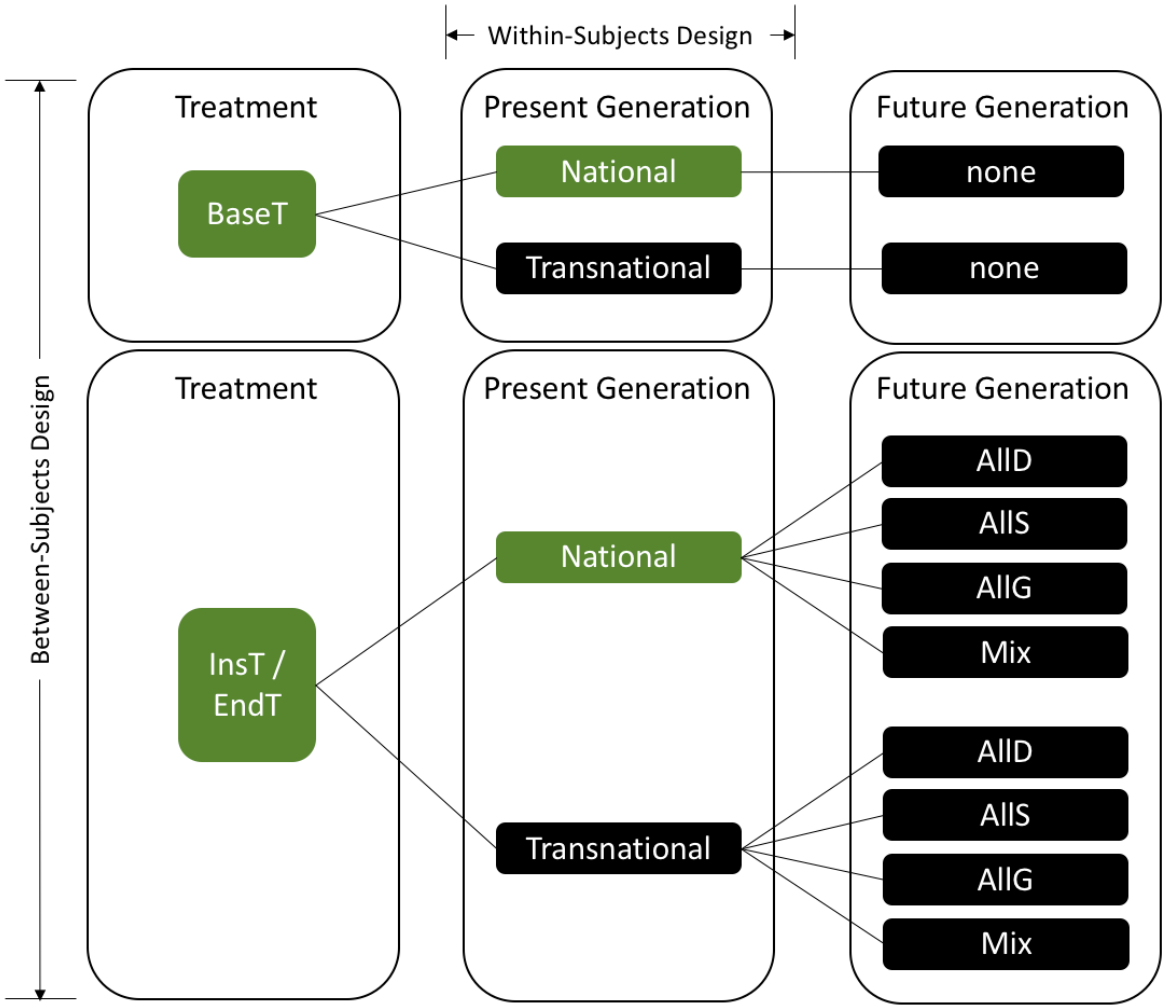
Design Summary



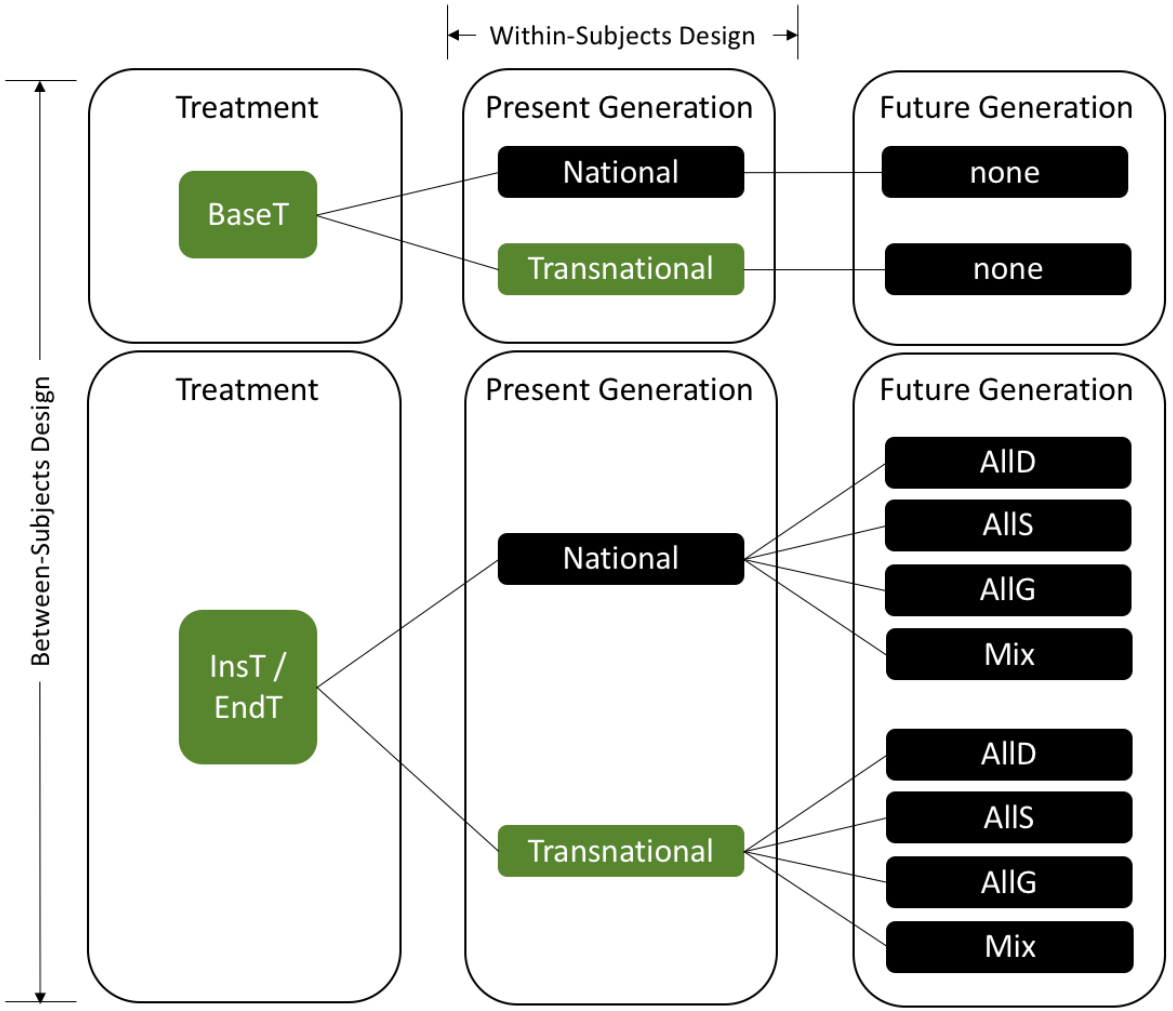
Design Summary



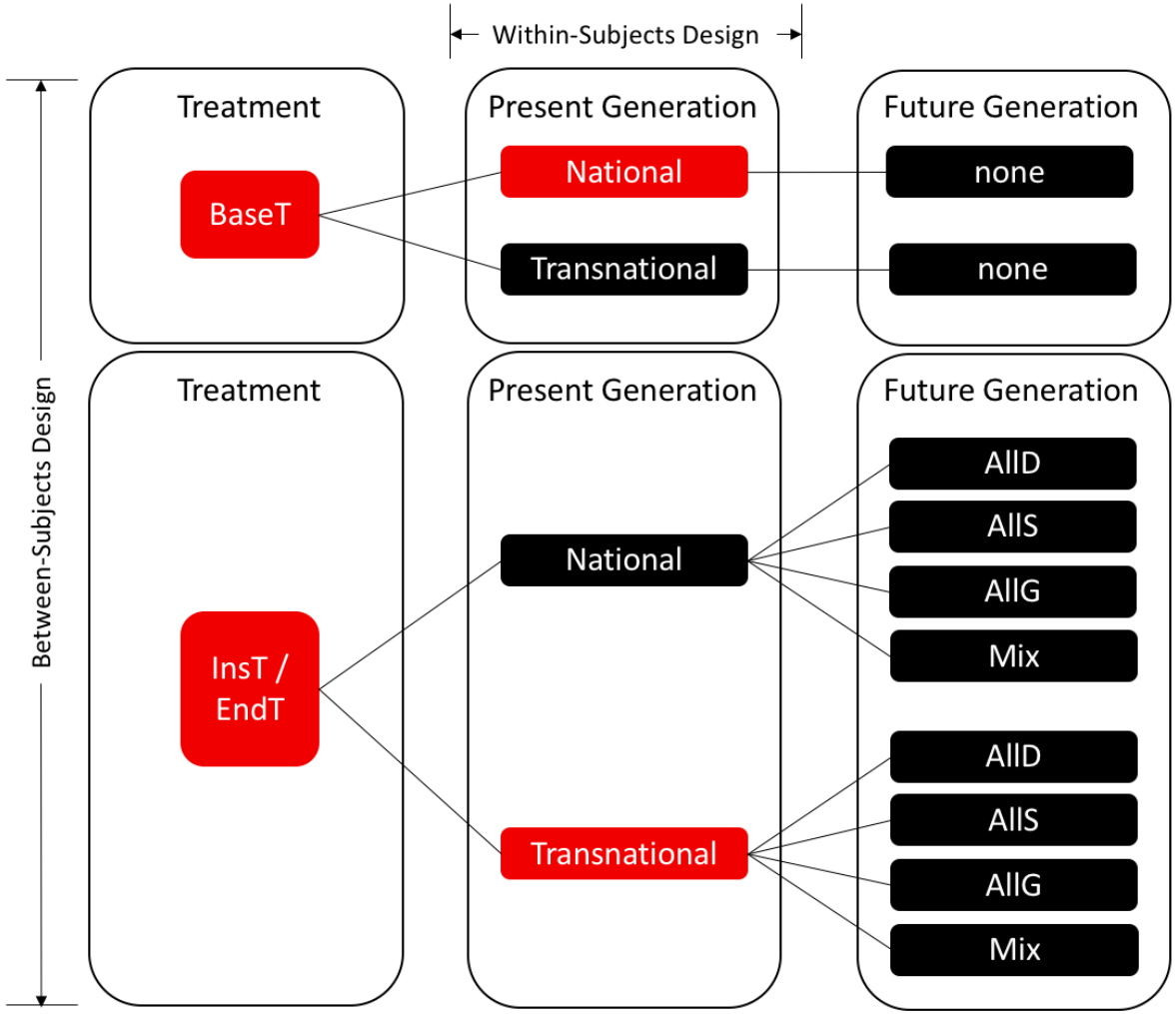
Design Summary



Design Summary



Design Summary

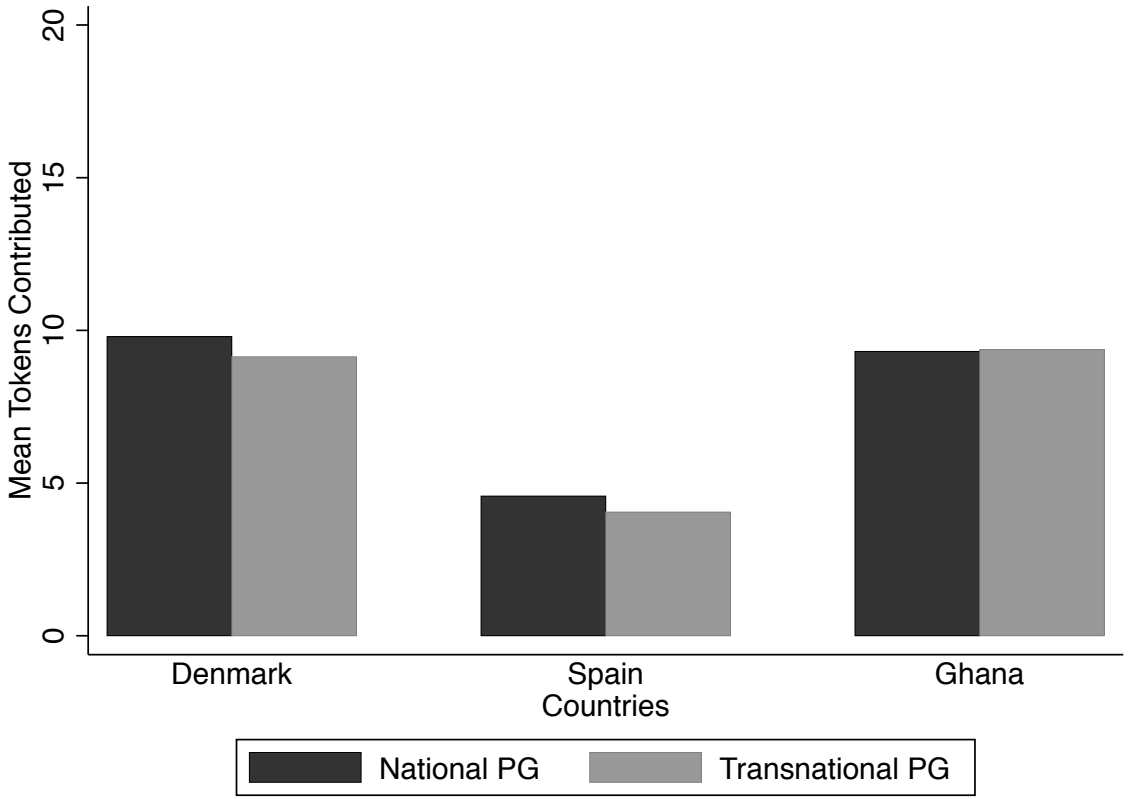


Summmary Statistics

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	
	(1)	(2)	(3)	(4)	(5)	(6)
Transnational	-0.6685**	-0.6822**	-0.5238**	-0.4827**	0.0595	0.0851
	(0.3176)	(0.3406)	(0.2183)	(0.2415)	(0.3784)	(0.4428)
Constant	10.0009***	-11.7787	4.5238***	-4.9611	9.4464***	12.7551
	(0.8147)	(8.5668)	(0.4969)	(6.2234)	(0.5866)	(9.5319)
Controls	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes
R-squared	0.00	0.24	0.00	0.17	0.00	0.18
N	164	162	168	158	168	144

Notes: *Transnational* is a dummy that takes on the value of 1 if the public good is transnational 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 the decision sheets are given. OLS regressions run. Robust standard errors clustered on an individual level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

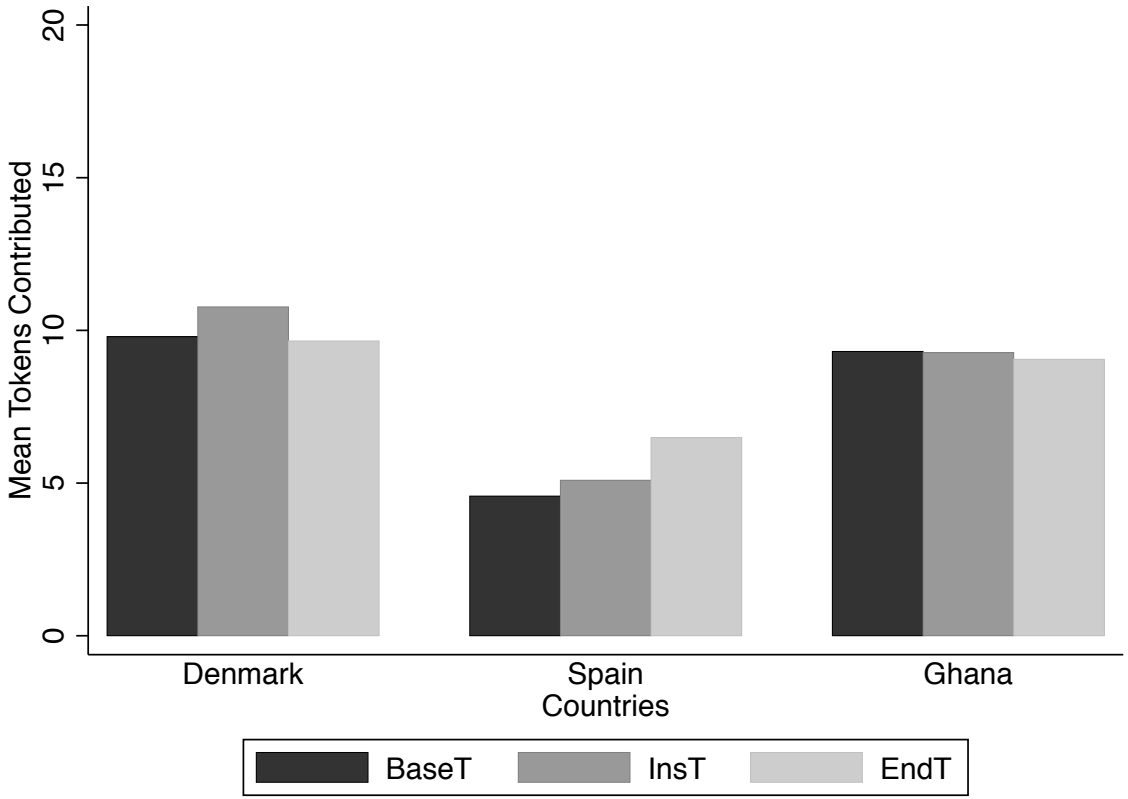
Transnational Results

Dependent Variable: Tokens Contributed

	Denmark		Spain		Ghana	
	(1)	(2)	(3)	(4)	(5)	(6)
Transnational	-0.6685**	-0.6822**	-0.5238**	-0.4827**	0.0595	0.0851
	(0.3176)	(0.3406)	(0.2183)	(0.2415)	(0.3784)	(0.4428)
Constant	10.0009***	-11.7787	4.5238***	-4.9611	9.4464***	12.7551
	(0.8147)	(8.5668)	(0.4969)	(6.2234)	(0.5866)	(9.5319)
Controls	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes
R-squared	0.00	0.24	0.00	0.17	0.00	0.18
N	164	162	168	158	168	144

Notes: *Transnational* is a dummy that takes on the value of 1 if the public good is transnational 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 the decision sheets are given. 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



Intergenerational Results: National PGs

Dependent Variable: Tokens Contributed

	Denmark		Spain		Ghana	
	(1)	(2)	(3)	(4)	(5)	(6)
InsT	0.5552	0.7875	0.5977	0.7098	-0.1124	0.12
	(1.0843)	(1.0269)	(0.7375)	(0.8343)	(0.8244)	(0.8572)
EndT	-0.5546	-0.285	2.0055**	1.9659**	-0.3312	0.0632
	(1.0734)	(1.0815)	(0.8437)	(0.8231)	(0.7872)	(0.8131)
Constant	9.7444***	1.4735	4.0529***	5.0409**	8.7720***	-11.0055*
	(0.9014)	(3.6498)	(0.5459)	(2.5387)	(0.6910)	(5.6619)
Controls	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes
R-squared	0.01	0.24	0.03	0.11	0.01	0.14
N	702	681	700	675	708	600

Notes: *InsT* and *EndT* are a dummies that takes on the value of 1 if an observation belonged to InsT and EndT, 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 the decision sheets are given. OLS regressions run. Robust standard errors clustered on an individual level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

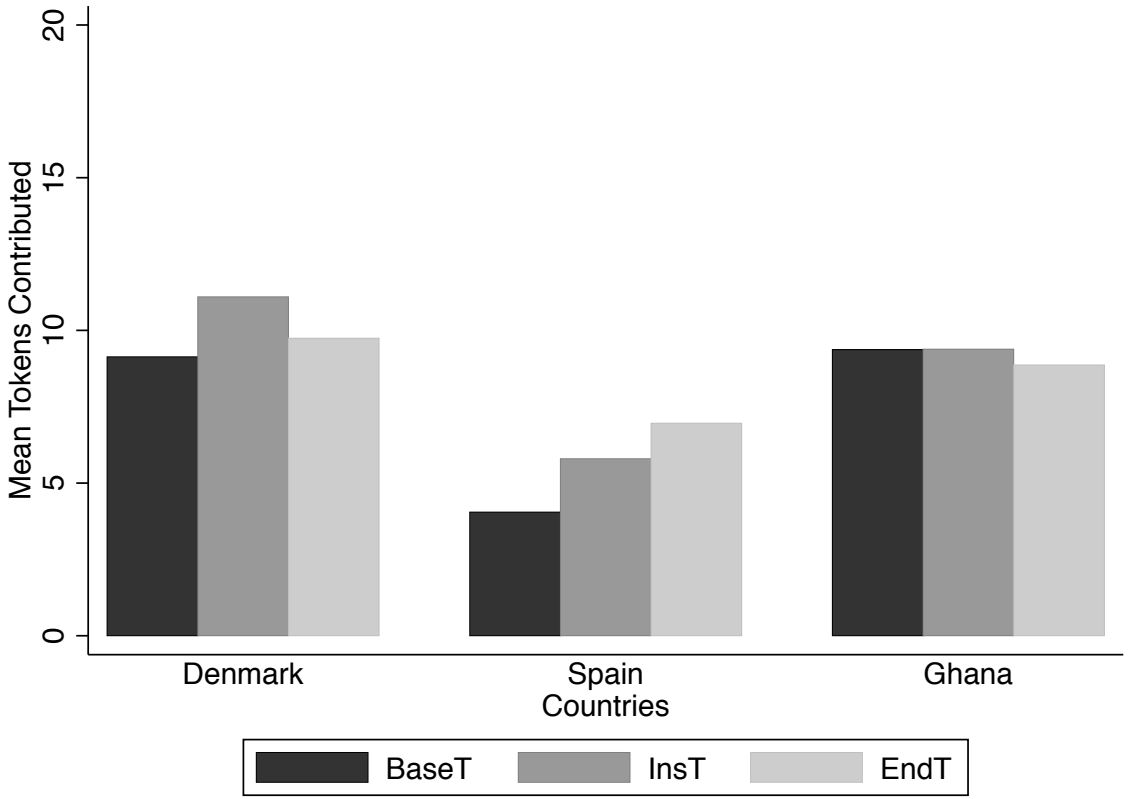
Intergenerational Results: National PGs

Dependent Variable: Tokens Contributed

	Denmark		Spain		Ghana	
	(1)	(2)	(3)	(4)	(5)	(6)
InsT	0.5552	0.7875	0.5977	0.7098	-0.1124	0.12
	(1.0843)	(1.0269)	(0.7375)	(0.8343)	(0.8244)	(0.8572)
EndT	-0.5546	-0.285	2.0055**	1.9659**	-0.3312	0.0632
	(1.0734)	(1.0815)	(0.8437)	(0.8231)	(0.7872)	(0.8131)
Constant	9.7444***	1.4735	4.0529***	5.0409**	8.7720***	-11.0055*
	(0.9014)	(3.6498)	(0.5459)	(2.5387)	(0.6910)	(5.6619)
Controls	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes
R-squared	0.01	0.24	0.03	0.11	0.01	0.14
N	702	681	700	675	708	600

Notes: *InsT* and *EndT* are a dummies that takes on the value of 1 if an observation belonged to InsT and EndT, 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 the decision sheets are given. OLS regressions run. Robust standard errors clustered on an individual level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Intergenerational Results: Transnational PGs



Intergenerational Results: Transnational PGs

Dependent Variable: Tokens Contributed

	Denmark		Spain		Ghana	
	(7)	(8)	(9)	(10)	(11)	(12)
InsT	1.6492	2.0470**	1.6916**	1.7704**	-0.1374	0.0655
	(1.0668)	(1.0167)	(0.7592)	(0.8425)	(0.8403)	(0.8629)
EndT	0.2932	0.5746	2.8629***	2.9932***	-0.6532	0.0028
	(1.0434)	(1.0795)	(0.7874)	(0.7708)	(0.7812)	(0.8324)
Constant	9.5348***	4.8627	4.3845***	4.5266*	9.6524***	-9.9158*
	(0.8567)	(3.6157)	(0.6225)	(2.5905)	(0.6439)	(5.1763)
Controls	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes
R-squared	0.02	0.21	0.03	0.11	0.01	0.11
N	702	681	700	675	708	600

Notes: *InsT* and *EndT* are a dummies that takes on the value of 1 if an observation belonged to InsT and EndT, 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 the decision sheets are given. OLS regressions run. Robust standard errors clustered on an individual level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

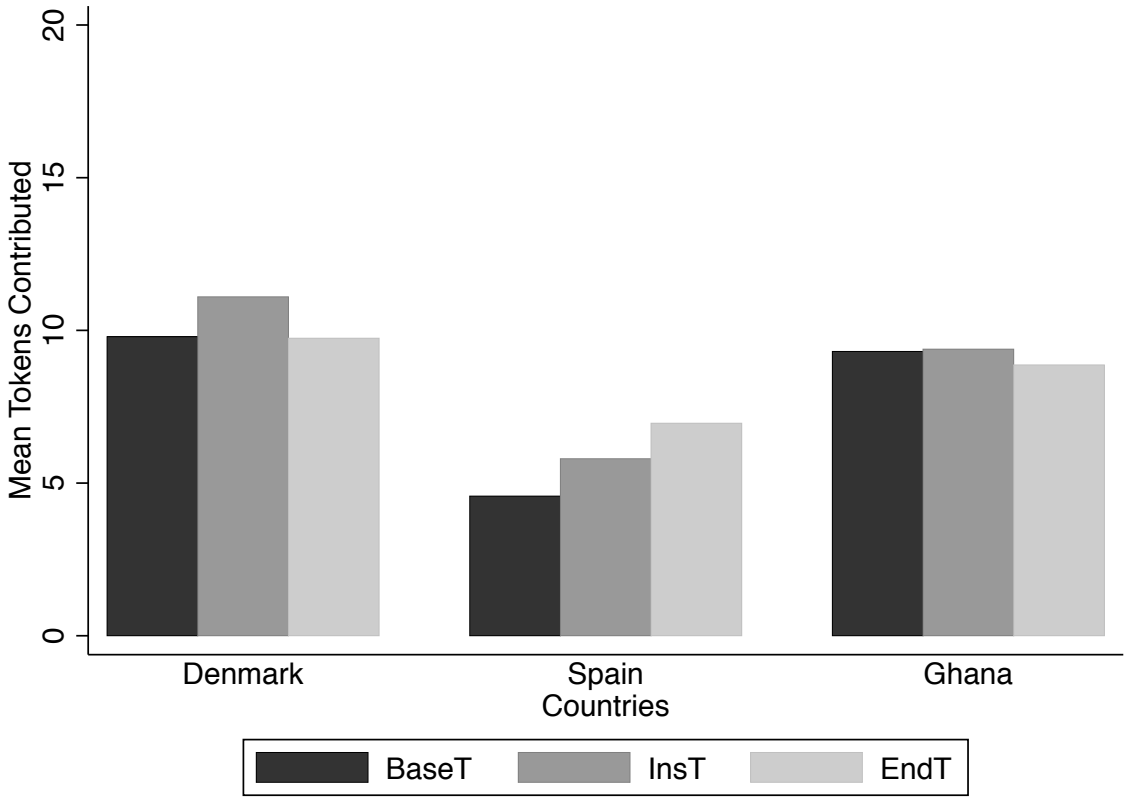
Intergenerational Results: Transnational PGs

Dependent Variable: Tokens Contributed

	Denmark		Spain		Ghana	
	(7)	(8)	(9)	(10)	(11)	(12)
InsT	1.6492	2.0470**	1.6916**	1.7704**	-0.1374	0.0655
	(1.0668)	(1.0167)	(0.7592)	(0.8425)	(0.8403)	(0.8629)
EndT	0.2932	0.5746	2.8629***	2.9932***	-0.6532	0.0028
	(1.0434)	(1.0795)	(0.7874)	(0.7708)	(0.7812)	(0.8324)
Constant	9.5348***	4.8627	4.3845***	4.5266*	9.6524***	-9.9158*
	(0.8567)	(3.6157)	(0.6225)	(2.5905)	(0.6439)	(5.1763)
Controls	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes
R-squared	0.02	0.21	0.03	0.11	0.01	0.11
N	702	681	700	675	708	600

Notes: *InsT* and *EndT* are a dummies that takes on the value of 1 if an observation belonged to InsT and EndT, 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 the decision sheets are given. 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

	BaseT vs. InsT					
	Denmark		Spain		Ghana	
	(1)	(2)	(3)	(4)	(5)	(6)
Transnational	-0.6675**	-0.6808**	-0.5238**	-0.4845**	0.0595	0.0963
	(0.3150)	(0.3229)	(0.2177)	(0.2295)	(0.3811)	(0.4220)
Intergenerational	0.5972	1.7233*	0.5295	0.5945	-0.1577	-0.1838
	(1.0949)	(1.0246)	(0.7355)	(0.7905)	(0.8170)	(0.8732)
Trans * Inter	0.9979**	1.0192**	1.2255***	1.1845***	0.0536	0.0201
	(0.4447)	(0.4585)	(0.3195)	(0.3351)	(0.4532)	(0.4621)
Constant	9.9819***	-3.4997	4.5424***	4.0123	9.2024***	-14.2992**
	(0.7979)	(3.8952)	(0.4945)	(3.2540)	(0.5751)	(6.5279)
Controls	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes
R-squared	0.01	0.38	0.01	0.05	0	0.12
N	836	818	832	798	840	736

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. Control variables include gender, age, belief, risk, trust, cooperativeness, wealth, and care. *Order* is an ordinal variable that specifies the order at which the decision sheets are given. 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)

Dependent Variable: Tokens Contributed

	BaseT vs. InsT					
	Denmark		Spain		Ghana	
	(1)	(2)	(3)	(4)	(5)	(6)
Transnational	-0.6675**	-0.6808**	-0.5238**	-0.4845**	0.0595	0.0963
	(0.3150)	(0.3229)	(0.2177)	(0.2295)	(0.3811)	(0.4220)
Intergenerational	0.5972	1.7233*	0.5295	0.5945	-0.1577	-0.1838
	(1.0949)	(1.0246)	(0.7355)	(0.7905)	(0.8170)	(0.8732)
Trans * Inter	0.9979**	1.0192**	1.2255***	1.1845***	0.0536	0.0201
	(0.4447)	(0.4585)	(0.3195)	(0.3351)	(0.4532)	(0.4621)
Constant	9.9819***	-3.4997	4.5424***	4.0123	9.2024***	-14.2992**
	(0.7979)	(3.8952)	(0.4945)	(3.2540)	(0.5751)	(6.5279)
Controls	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes
R-squared	0.01	0.38	0.01	0.05	0	0.12
N	836	818	832	798	840	736

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. Control variables include gender, age, belief, risk, trust, cooperativeness, wealth, and care. *Order* is an ordinal variable that specifies the order at which the decision sheets are given. 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

	BaseT vs. EndT					
	Denmark		Spain		Ghana	
	(7)	(8)	(9)	(10)	(11)	(12)
Transnational	-0.6678**	-0.6813**	-0.5238**	-0.4910**	0.0595	0.0946
	(0.3155)	(0.3239)	(0.2187)	(0.2315)	(0.3790)	(0.4235)
Intergenerational	-0.5089	-0.5625	1.9429**	1.9334**	-0.3633	0.1165
	(1.0872)	(1.0725)	(0.8550)	(0.7772)	(0.7804)	(0.7752)
Trans * Inter	0.7530*	0.7631	0.9880***	0.9883***	-0.2436	-0.1209
	(0.4515)	(0.4694)	(0.3550)	(0.3703)	(0.4441)	(0.5030)
Constant	9.9877***	10.2836**	4.4374***	6.3182	9.3031***	-5.3246
	(0.7960)	(4.7479)	(0.4965)	(3.9660)	(0.5721)	(7.5358)
Controls	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes
R-squared	0.00	0.17	0.04	0.22	0.00	0.13
N	732	706	736	710	744	608

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. Control variables include gender, age, belief, risk, trust, cooperativeness, wealth, and care. *Order* is an ordinal variable that specifies the order at which the decision sheets are given. 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

	BaseT vs. EndT					
	Denmark		Spain		Ghana	
	(7)	(8)	(9)	(10)	(11)	(12)
Transnational	-0.6678**	-0.6813**	-0.5238**	-0.4910**	0.0595	0.0946
	(0.3155)	(0.3239)	(0.2187)	(0.2315)	(0.3790)	(0.4235)
Intergenerational	-0.5089	-0.5625	1.9429**	1.9334**	-0.3633	0.1165
	(1.0872)	(1.0725)	(0.8550)	(0.7772)	(0.7804)	(0.7752)
Trans * Inter	0.7530*	0.7631	0.9880***	0.9883***	-0.2436	-0.1209
	(0.4515)	(0.4694)	(0.3550)	(0.3703)	(0.4441)	(0.5030)
Constant	9.9877***	10.2836**	4.4374***	6.3182	9.3031***	-5.3246
	(0.7960)	(4.7479)	(0.4965)	(3.9660)	(0.5721)	(7.5358)
Controls	no	yes	no	yes	no	yes
Order	yes	yes	yes	yes	yes	yes
R-squared	0.00	0.17	0.04	0.22	0.00	0.13
N	732	706	736	710	744	608

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. Control variables include gender, age, belief, risk, trust, cooperativeness, wealth, and care. *Order* is an ordinal variable that specifies the order at which the decision sheets are given. 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

Questions?