Cultural Homophily and Collaboration in Superstar Teams

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Cultural Homophily and Collaboration in Superstar Teams

- Globalization - mix best global expertise in multinational teams
- Key aspect of multinationality is 'cultural diversity':
  - Benefits: talent, learning and innovation ('capabilities')
  - Costs: communication, empathy and trust ('collaboration')
- Is there a difference in collaboration (i.e. ability to work for a common purpose) intensity by 'homophily' (i.e. tendency to associate with similar others)
  - even in superstar teams?
- Hard nut to crack:
  - Collaboration not observed directly
  - Difference due to 'homophily' confounded

Induced vs. Choice Homophily

- Homophily = Opportunities ('induced') + Preferences ('choice')
- Opportunities vs. Preferences:
  - Distribution may mechanically determine probability of association
  - This confounds preference / choice
- Need to partial out 'induced' homophily to measure 'choice' homophily:
  - Option A: experiment with random team formation
    - Issue: Low external validity for highly skilled, lowly charged multinational workplace
  - Option B: observational data with adequate baseline
    - Issue: relevant (counterfactual) baseline

European Football as an allegory

- Teams: pro football clubs from the top-5 European leagues
  - Superstar team = global elite, top 5% of pro players
- New data: 5 countries, 11 million passes

- Collaboration: pass rate between player pairs
  - Team (squad) composition is exogenous to players
  - Collaboration is an individual choice
- Homophily = passer and receivers who share culture (nationality, history)

When I say Football, I mean Soccer

Related literature

- Cost and benefits of diversity in multicultural teams (seminal): Lazear (1999) Lang (1986)
- Cost and benefits of diversity in broader environments (cities, plants): Ottaviano and Peri (2006, 2005) Buchholz (2021)
- Cost and benefits of diversity in multicultural teams (recent developments):
  - Ethnic conflict: Hjort (2014), Laurentsyeva (2019),
  - Team formation: Calder-Wang et al. (2021)
  - Hockey: Kahane et al. (2013), Football: Nüesch and Haas (2013), Tovar (2020)
- Homophily in scientific publications: Freeman and Huang (2015), AlShebli et al. (2018)
- Homophily in friendship networks: Currarini et al. (2009, 2010)
- Literature review from psychology to management: (Lawrence and Shah, 2020; Ertug et al., 2021)

Data Collection and Definitions

Data: Overview

- 5 top leagues (France, Germany, Spain, Italy, England),
- 8 seasons (2011/12-2018/19) every teams play with every other twice
  - 20 (18) teams per league, 14,608 games in total
  - 730 passes/game

- Webscraped play-by-play (event) data linked with personal info on players
  - 154 teams, each with 25-30 strong squad, regular churning (twice a year)
  - 10.7 million passes ('events')
  - 7,000 players from 138 countries

Raw Data: Events

- Event data – 'play by play'
  - Structured text, events with features, qualifiers:
- Separately recorded with a timestamp
  - Pass between any two players
  - Web-scraped from a `whoscored.com` website
  - Events recorded by cameras+algorithms+humans.
- Pass events separated

Raw Data: Players

- Player characteristics:
  - Nationalities (possible multiple)
  - Position in team
  - Age, height
  - Player valuations – over time
  - Web-scraped from a `transfermarkt.com` website
- Entity resolutions / coreference (accents, middle names, nicknames):
  - Matching algorithm by motifs

Measuring Cultural Homophily

- Characterize cultural background ('culture') = set of cultural traits transmitted across generations:
  - Such as language, history, norms, values and attitudes learned at home
- We measure 'culture' with four proxies:
- Nationality, colonial legacy, federal legacy, language only
  - Alternative: linguistic similarity
  - Not alternative: Values (WVS)
- 'cultural homophily' = more intense collaboration between player pairs with same culture

Same Culture Definition

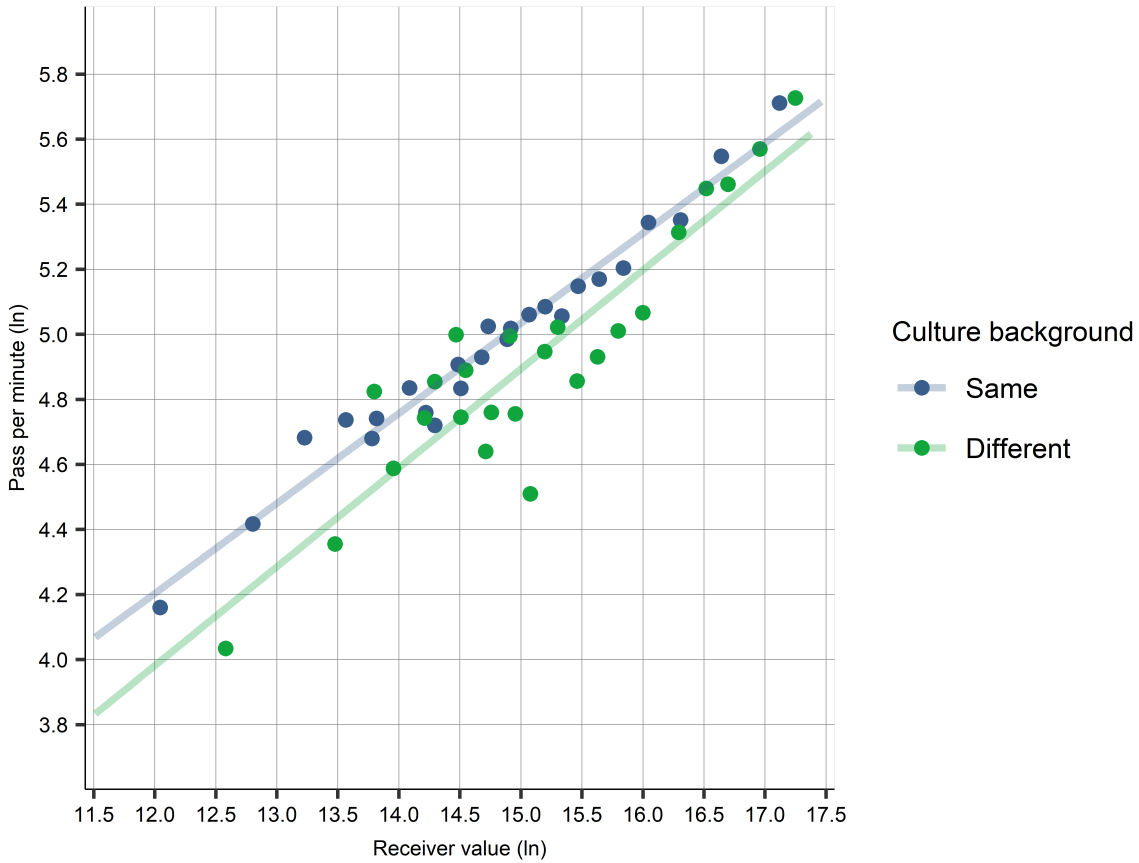
- Same nationality (citizenship)
- Same colonial legacy – different nationality
  - Argentina-Spain, England-Egypt (ruler and colony)
  - Uruguay-Argentina (colony siblings)
- Same federal legacy – different nationality
  - Russia-Georgia, Croatia-Serbia
  - Scotland, Northern Ireland, Ireland
- Same language – different nationality, colonial /federal legacy
  - Switzerland and Germany
  - DR Congo and France

Model (ideas)

Model: Purpose

- Model to disentangle choice from opportunity in an internally consistent way
- Model team's utility
- Player o's passing decision is determined by the comparison of team utilities across all potential receivers $d = 1, ..., N$.
  - Taking into account players characteristics and positions
- Homophily = shifter leading to more passes between player pairs of similar culture after controlling for variables based on the model.

Simple case = Pass rate = f(receiver value and homophily)



Passers = Spanish midfielders in La Liga, N=24,299.

Model: Passer's Decision

Player o's passing decision is determined by the comparison of team utilities across all potential receivers $d = 1, ..., N$.

$$U^o + \beta \varphi^d U^d - \widetilde{c}^{o,d} + z^d$$

- U^o = team benefit from player o with the ball
- U^d = deterministic part by player d's characteristics
- z^d realization of its random part ('shock') due to match contingencies.
- φ^d = probability of successful pass to receiver d
- β = relative importance the team attaches to passing in general ('style')
- $\widetilde{c}^{o,d}$ = 'passing cost'

Model: Forward looking dynamic model

- Dynamic model
  - Passer takes into account future state of the ball

- 'pass rate' $p^{o,d}$ as the ratio number of passes from player o to teammate d over the total number of team passes.
  - Passer characteristics including team mates fielded with him
  - Receiver characteristics including team mates fielded with him
  - Position of players and passes
  - Time spent together when passer has the ball
- Passing cost ($\widetilde{c}^{o,d}$) includes a binary same culture indicator = measure of homophily
  - Also: distance between players, forwardness

Model: discrete choice as benchmark

$$\ln p^{o,d} = \ln \tau^{o,d} + \ln P^{o} \left(\Lambda^{o}\right)^{-\kappa} + \ln P^{d} \left(\Lambda^{d}\right)^{-\kappa} - \\ -\kappa\gamma \log g^{o,d} - \kappa\lambda \log l^{o,d} - \log P + \varepsilon^{o,d}$$

- $p^{o,d}$ = share of passes from o to d in team's total passes
- P_o, P_d = N passes made by player o /received by player d
- Λ^d, Λ^d = multilateral resistance for passer / receiver
- $\tau^{o,d}$ = share of passes made by o when d is also on pitch
- $g^{o,d}$ = frictions related to distance
- $l^{o,d}$ = frictions unrelated to distance (e.g. mental effort)
- P = total passes made by team

Estimation

- Aggregate probabilities to relative frequency
- Half-season level (16-20 games)

- 'pass rate' = number of passes from player o to teammate d as share of passes by o when d is on the pitch

- Estimation: Poisson (PPML) model of pass count
  - Offset time spent together

Poisson model with double player fixed effects

$$E(pcount_{o,d,t}|.) = exp(\delta SameCult_{o,d} + PassF_{o,d,t} + \ln tau_{o,d,t} + \upsilon_{o,t} + \upsilon_{d,t})$$

- Homophily: $SameCult_{o,d}$ as the same culture indicator (0/1).
- Offset time spent together (τ)
  - Decision of the manager
- $\upsilon_{o,t}$ FE: passer*half-season
- $\upsilon_{d,t}$ FE: receiver*half-season
  - Team* half-season dummies soaked up

$$PassF_{o,d,t} = \gamma_1 PassDist_{o,d,t} + \gamma_2 Forwardness_{o,d,t} + \eta Position_o Position_d$$

Estimation: role of fixed effects

- In estimation, use double player (*half-season) fixed effects
- Unobserved player characteristics
- Alternatives the passer faces in terms of receivers
  - Akin to multilateral resistance term in structural gravity

Results

Recap

- Data: 5 leagues, 98 team/season, 8 seasons
  - Aggregated at half-seasons (16-20 games)
  - N=669K
- Poisson models
  - Passer*half-season and receiver*half-season FE
    - FEs soak up team*half-season dummies
  - Exposure variable is time spent together
  - Includes pass frictions (distance, forwardness index)
  - Standard errors clustered P*h-s, R*h-s

Result discussion

- Core result: *choice* homophily premium: 2.4%
  - Consider a team in half-season. Partialling out pass frictions and receiver characteristics, a player will pass 2.4% more to a same culture peer.

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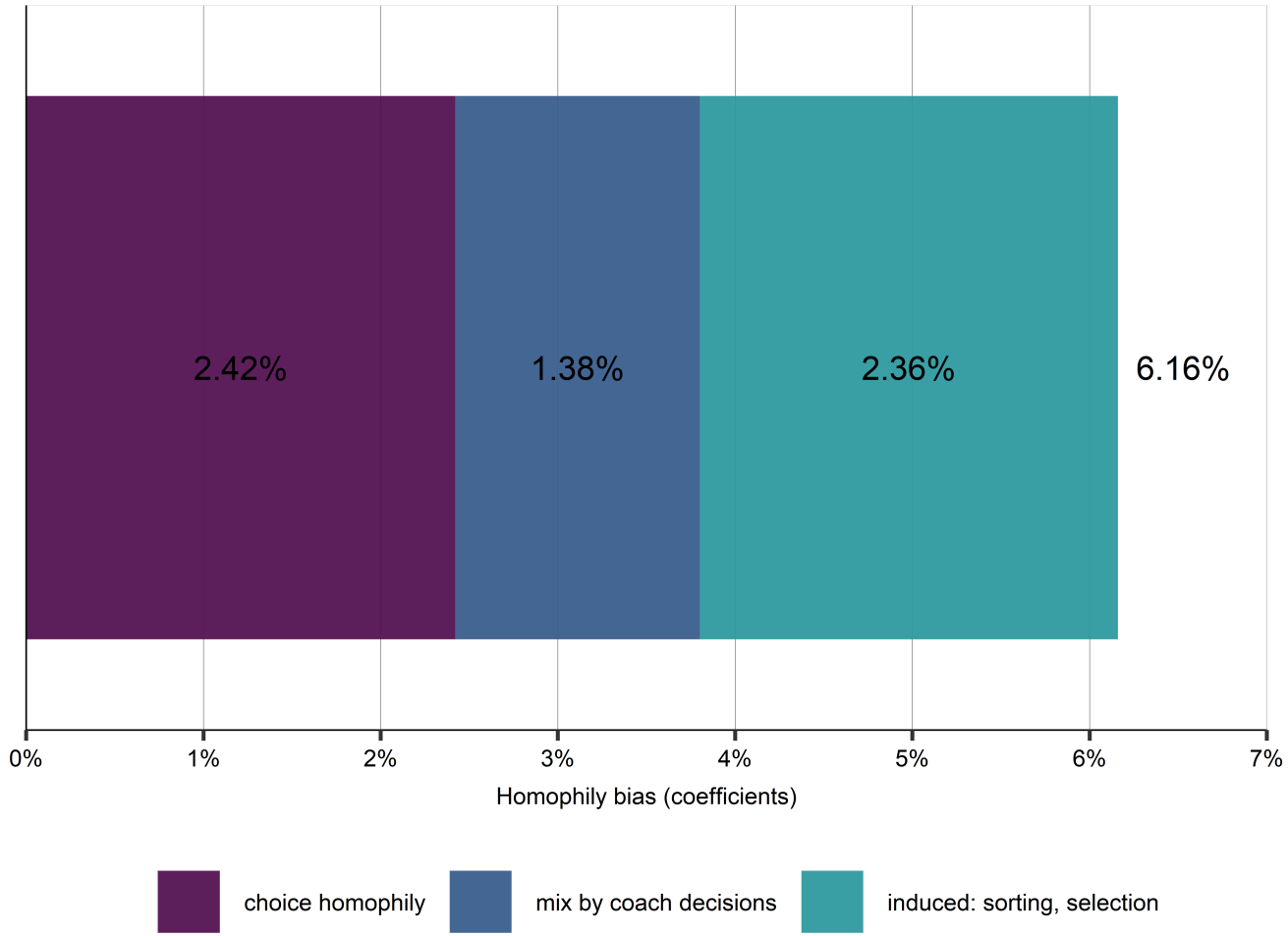
  - Consider a team in half-season. Partialling out pass frictions and receiver characteristics, a player will pass 2.4% more to a same culture peer.
- Passing to a same culture receiver is equally likely as passing to a different culture player valued a 10.5% more.
  - using transfer price estimations

Dissecting total homophily



Core results + robustness

- Core result: *choice* homophily premium: 2.4%
- Taking into account managers decision to field players: 3.8%
- (Unconditional) Same culture players tend to pass 6.2% more compared to different culture players

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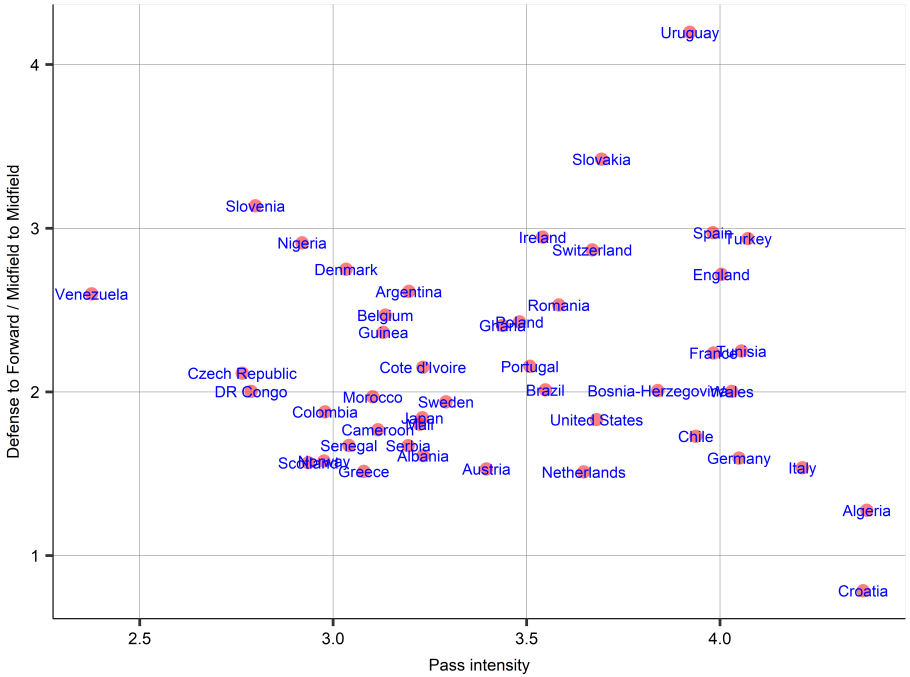
- Robust to a variety of specifications, partialling out
  - Physical differences
  - Assortative matching
  - Experience with club
  - Prior experience in youth club, other teams
  - Nationality specific passing style

  - Functional form specifications, such as ln(count)

Homophily is not common knowledge

- Players from different countries do pass differently
  - French players trained in French "national football style"



- Style, captured by nation specific cross-position dummies not a confounder

About the nature of homophily and collaboration

- Homophily is more important for complex collaboration
  - Look at pass sequences only, homophily premium is 4.8% vs 2% for single passes.
- Homophily is present for shared nationality as well as colonial links
  - It is negative for federal legacy (ie USSR, Yugoslavia)
- Alternative measure of culture: shared language, similar language works but weaker
- Shared values (World Value Survey) no correlation at all

Dissecting culture

Dep. var: pass count	(1)	(2)	(3)	(4)
Same nationality (0/1)	0.0284***	0.0302***	0.0315***	0.0186***
	(0.0030)	(0.0031)	(0.0031)	(0.0035)
Same colonial legacy (0/1)	0.0284***			
	(0.0041)			
Same federal legacy (0/1)	-0.0223**			
	(0.0106)			
Just shared language (0/1)	-0.0046			
	(0.0070)			
LC: diff country, same language (0/1)		0.0156***	0.0140***	
		(0.0039)	(0.0040)	
LC: diff country, similar language (0/1)		0.0111**	0.0094*	
		(0.0044)	(0.0045)	
Geographical proximity (neighbors) (0/1)			0.0064*	
			(0.0031)	
WVS: similar values (0/1)				-0.0064**
				(0.0029)
Observations	668,105	668,105	668,105	668,105
Pseudo R^2	0.76078	0.76077	0.76077	0.76076
passer-half_season fixed effects	✓	✓	✓	✓
receiver-half_season fixed effects	✓	✓	✓	✓
Cross position dummies	✓	✓	✓	✓

Heterogeneity

- We see more of a homophily premium
  - Young players
  - Passers in larger culture groups
- No difference
  - Receiver quality

Heterogeneity by age, group size, receiver quality

Dep.var: Pass count	(1)	(2)	(3)
Same culture (any) (0/1)	0.0319***	0.0174***	0.0236***
	(0.0045)	(0.0043)	(0.0027)
Same culture (any) (0/1) × Passer age (0/1, 1=Experienced)	-0.0096**		
	(0.0048)		
Same culture (any) (0/1) × Passer group size (1/1, 1 when N>=4)		0.0146***	
		(0.0059)	
Same culture (any) (0/1) × Receiver quality (0/1, 1= top 2)			0.0044
			(0.0057)
Passer group size (1/1, 1 when N>=4)		-0.0444***	
		(0.0075)	
Receiver quality (0/1, 1= top 2)			0.0129
			(0.0081)
Observations	668,105	668,105	668,105
Pseudo R^2	0.75930	0.74510	0.76077
passer-half_season fixed effects	✓	✓	✓
receiver-half_season fixed effects	✓	✓	✓
passer * receiver position dummies	✓	✓	✓

Investigating the mechanism

Mechanisms 1 – Cost vs bias

- Till now: agnostic re what choice homophily represents
  - an efficient outcome promoting team performance
  - inefficient in-group favoritism detrimental to team.
- No silver bullet but two arguments to support efficiency
  - Performance vs diversity = noisy 0, problematic measure

- Two suggestive evidence against favoritism
- Beyond homophily, when players pass to other players of different culture, they tend to pass more to players belonging to large culture groups
- No show of lower homophily premium when under pressure

Mechanisms 1 – Cost vs bias 1

- Let's focus on passes to different culture players
- Divide receivers into small (<3) or large (>3) groups

- Group size premium (different culture passes)
  - Homophily premium here is 3.6%

	to small	to large
from small	0	2.8%*
from large	-0.6%	1.8%*

- Beyond homophily, players tend pass more to large same culture groups
  - Account for future benefits
  - Supports efficiency argument (not favoritism)

Mechanisms 1 – Cost vs bias 2

- Do players exhibit less homophily under pressure?
- Consider key passes – 2-3 passes before shot on goal
  - Really important passes
  - Under pressure from defenders
  - Sample is different = forwards and midfielders
- Homophily is unchanged

Mechanisms 2 – Motivation of players

- **What** makes same-culture players find it easier to work together?
- Players of the same culture being able to
  - co-operate better
  - understand each other better,
  - see each other better on the pitch
- If so, does it go away once they get to know each other?

Mechanisms 2 – Motivation of players

- Look at the evolution of homophily premium **over time**
  - Divide receivers into newbie vs experienced groups
  - Cutoff: median time of 7 months
  - Compare homophily premium across groups

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  - Compare homophily premium across groups
- Homophily premium by receivers type
  - 1.7% among newbie receivers
  - 2.8% among experienced (=higher after time)
- Same culture players bond outside work – help collaborate better

Homophily over time: shared experience

	pass_count				
	(1)	(2)	(3)	(4)	(5)
Same culture (any) (0/1)	**0.0166*****	0.0163***	0.2325	0.0131*	0.0206***
	(0.0053)	(0.0053)	(0.2156)	(0.0078)	(0.0050)
Same culture (any) (0/1) × Experience	**0.0117****	0.0127**	-0.1372	0.0191**	
	(0.0059)	(0.0060)	(0.1924)	(0.0088)	
Same culture (any) (0/1) × Experience long					0.0073
					(0.0059)
Observations	457,838	443,641	13,530	219,178	384,818
Pseudo R^2	0.76317	0.76431	0.83248	0.76578	0.76699
Early experience w other team	Include	Exclude	Only	Include	Include
Time with team capped	No	No	No	Yes	No
passer-half_season fixed effects	✓	✓	✓	✓	✓
receiver-half_season fixed effects	✓	✓	✓	✓	✓
Cross position D	✓	✓	✓	✓	✓

Contribution

1. Focus on everyday workplace collaboration - high skilled, lowly charged context
2. Very large, global sample - external validity
3. Well defined measure of collaboration at individual level
4. Model of baseline, both theory and empirics *L argedataset – richmeasuresofi*

Summary

- Isolated choice homophily for shared culture
  - Even in superstar teams
  - Especially when complex tasks
  - Shared nationality + colonial history
- Spending time – higher homophily premium
- Shared culture (language) –> lower transaction cost – more likely mechanism than favoritism

- Homophily is pervasive even in teams of
  - very high-skill individuals
  - with clear common objectives and aligned incentives
  - and involved in well-defined tasks
  - activities are not particularly language-intensive.

It's hard to talk about football when Ukraine is under attack

Oleksandr Zinchenko, May 2022

Help via Kyiv School of Economics at kse.ua/support/donation

Thanks for the attention