A meaty discussion: quantitative analysis of the Slovenian meat-related news corpus

Matej Martinc (IJS)
Andreja Vezovnik (FDV)
Senja Pollak (IJS) senja.pollak@ijs.si

SIKDD, 9. 10. 2023

Motivation

- Interdisciplinary project CANDAS (computationally assisted news discourse analysis)

- Discourse on meat is becoming an important topic due to its connection to health and ecology in contemporary society.
  - Meat consumption as natural, necessary and enjoyable (Piazza et al., 2015)

    vs.

  - Meat production as heavy for environment and unhealthy for human consumption (International Agency for Research on Cancer (2015))

- Several studies on meat media narratives in English (Mroz and Painter, 2022; Hopkins, 2015; Masterman-Smith, 2014), incl. on veganism and meat alternatives

- Research gap: Slovene media coverage on the topic, quantitative, computational studies

Corpus

Sources:

- three daily newspapers with long tradition, published online and in print, **Delo, Večer** and **Dnevnik** and

- their weekly issues, **Sobotna priloga, Dnevnikov objektiv, Večer - V soboto** and **Večer v nedeljo**

- portals **24ur.com** and **Rtvslo.si**

Keywords:

- *meso* and *živinoreja*

Time span:

- 2008-2019, split into 5 temporal chunks of 2 years

Size: 14.892 articles

Methodology

- **Topic analysis** using BERTopic (Gootendorst, 2022)
  - Sentence Transformers (paraphrase-multilingual-MiniLM-L12-v2) and HDB-SCAN (Hierarchical density based clustering) and class-based TF-iDF for coherent topic extraction
  - Each document attributed to *one* or *none* topics
  - Default 156 topics reduced to 20 for better interpretability, further manually grouped to 5 categories
- **Temporal analysis**
  - **Topic and category distribution** in each temporal slice (relative importance of each topic in each time period) for determining the trends
  - **Temporal analysis using averaging of contextual embeddings for selected concepts per time slice** (Martinc et al., 2020) - CLASSLA for lemmatisation, SloBERTa embeddings

Results: topic analysis

Category	Translated topic	Count
economy	percentage, inflation, price increase, chicken, food	228
economy	euro, ljubljana, million, company	202
economy	bank, mip, euro, million, supervisory	125
economy	slovenian, food, quality, consumer, percentage	646
economy	slovenian, company, mercator, euro, million	204
culture	book, other, write, story, time	148
culture	show, theatre, director, festival, theatrical	207
culture	tourism, time, old, big, house	336
culture	restaurant, wine, kitchen, meat, culinary	745
ecology and health	vegan, child, animal, veganism	114
ecology and health	water, dioxide, greenhouse, carbon, energy	104
ecology and health	fat, cholesterol, diet, food, health	138
ecology and health	marine, whaling, dolphin, fish, allowed	114
agriculture	milk, agriculture, percentage, organic, Slovenian	239
agriculture	meat, kebab, horse, product, dioxin	319
other	other, can, life, time, world	429
other	coach, team, season, play, championship	346
other	oil, meat, minute, water, paprika	299
other	prison, police officer, prosecution, convicted, euro	201
other	election, president, agreement, government, political	383
not categorized	/	9335

Results: topic analysis

Category	Translated topic	Count
economy	percentage, inflation, price increase, chicken, food	228
economy	euro, ljubljana, million, company	202
economy	bank, mip, euro, million, supervisory	125
economy	slovenian, food, quality, consumer, percentage	646
economy	slovenian, company, mercator, euro, million	204
culture	book, other, write, story, time	148
culture	show, theatre, director, festival, theatrical	207
culture	tourism, time, old, big, house	336
culture	restaurant, wine, kitchen, meat, culinary	745
ecology and health	vegan, child, animal, veganism	114
ecology and health	water, dioxide, greenhouse, carbon, energy	104
ecology and health	fat, cholesterol, diet, food, health	138
ecology and health	marine, whaling, dolphin, fish, allowed	114
agriculture	milk, agriculture, percentage, organic, Slovenian	239
agriculture	meat, kebab, horse, product, dioxin	319
other	other, can, life, time, world	429
other	coach, team, season, play, championship	346
other	oil, meat, minute, water, paprika	299
other	prison, police officer, prosecution, convicted, euro	201
other	election, president, agreement, government, political	383
not categorized	/	9335

→ **Slovene gastronomy** (restaurant, wine, kitchen, meat, culinary — 745)

Results: topic analysis

Category	Translated topic	Count
economy	percentage, inflation, price increase, chicken, food	228
economy	euro, ljubljana, million, company	202
economy	bank, mip, euro, million, supervisory	125
economy	slovenian, food, quality, consumer, percentage	646
economy	slovenian, company, mercator, euro, million	204
culture	book, other, write, story, time	148
culture	show, theatre, director, festival, theatrical	207
culture	tourism, time, old, big, house	336
culture	restaurant, wine, kitchen, meat, culinary	745
ecology and health	vegan, child, animal, veganism	114
ecology and health	water, dioxide, greenhouse, carbon, energy	104
ecology and health	fat, cholesterol, diet, food, health	138
ecology and health	marine, whaling, dolphin, fish, allowed	114
agriculture	milk, agriculture, percentage, organic, Slovenian	239
agriculture	meat, kebab, horse, product, dioxin	319
other	other, can, life, time, world	429
other	coach, team, season, play, championship	346
other	oil, meat, minute, water, paprika	299
other	prison, police officer, prosecution, convicted, euro	201
other	election, president, agreement, government, political	383
not categorized	/	9335

→ **food quality and market prices**

→ **Slovene gastronomy**

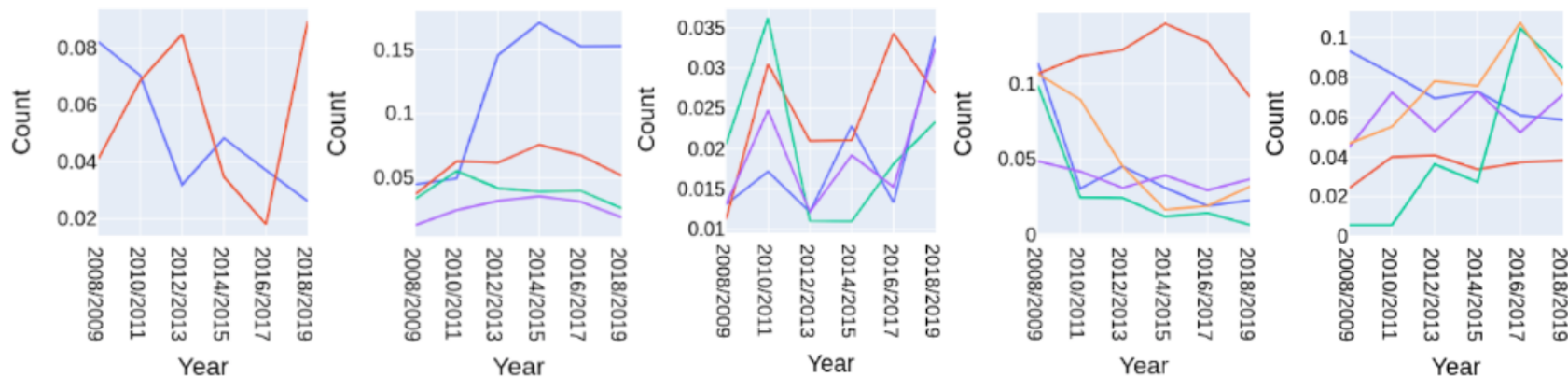→ **smallest clusters on topics on the veganism and the influence of meat industry on the environment, public health**

Results: topic analysis

Category	Translated topic	Count
economy	percentage, inflation, price increase, chicken, food	228
economy	euro, ljubljana, million, company	202
economy	bank, mip, euro, million, supervisory	125
economy	slovenian, food, quality, consumer, percentage	646
economy	slovenian, company, mercator, euro, million	204
culture	book, other, write, story, time	148
culture	show, theatre, director, festival, theatrical	207
culture	tourism, time, old, big, house	336
culture	restaurant, wine, kitchen, meat, culinary	745
ecology and health	vegan, child, animal, veganism	114
ecology and health	water, dioxide, greenhouse, carbon, energy	104
ecology and health	fat, cholesterol, diet, food, health	138
ecology and health	marine, whaling, dolphin, fish, allowed	114
agriculture	milk, agriculture, percentage, organic, Slovenian	239
agriculture	meat, kebab, horse, product, dioxin	319
other	other, can, life, time, world	429
other	coach, team, season, play, championship	346
other	oil, meat, minute, water, paprika	299
other	prison, police officer, prosecution, convicted, euro	201
other	election, president, agreement, government, political	383
not categorized	/	9335

Categories inspired by
Vezovnik and Kamin, 2020

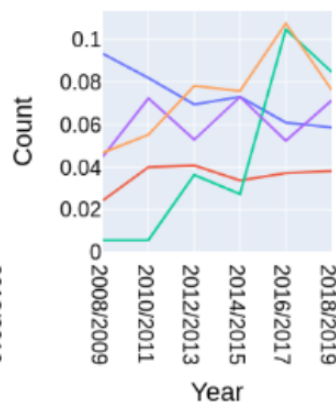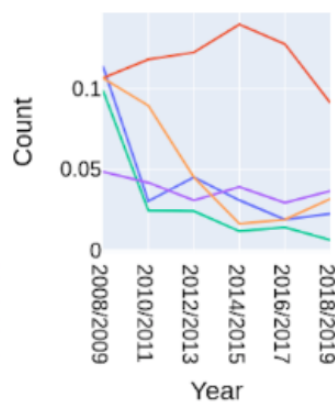# Results: categories across time
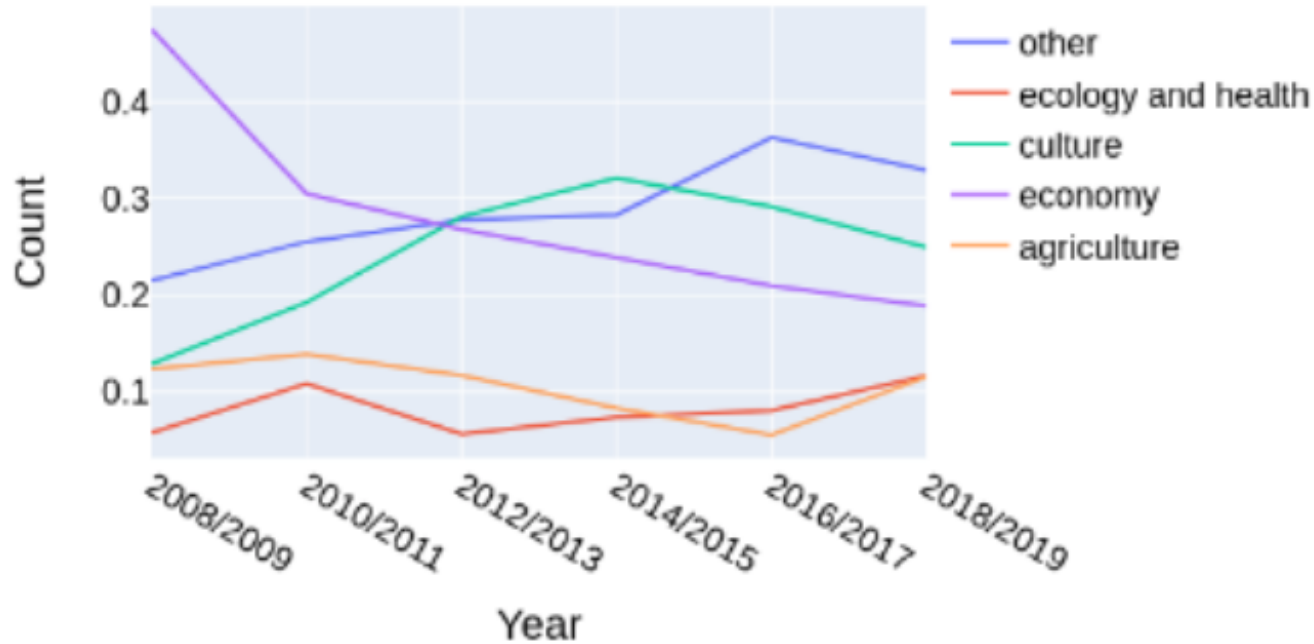
Results: topics across time

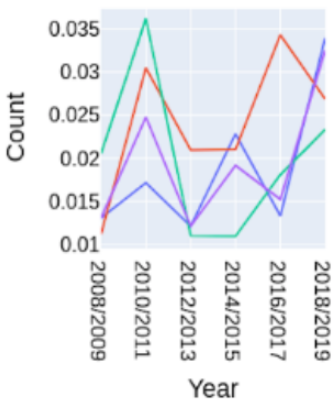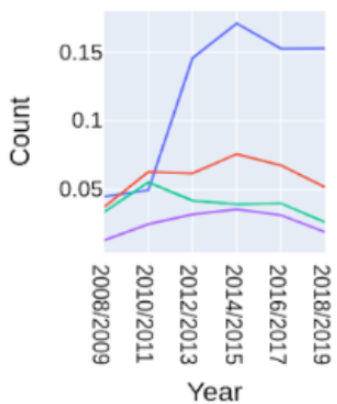| #	Agriculture topics
🟥	meat, kebab, horse, product, dioxin
🟦	milk, agriculture, percentage, organic, Slovenian

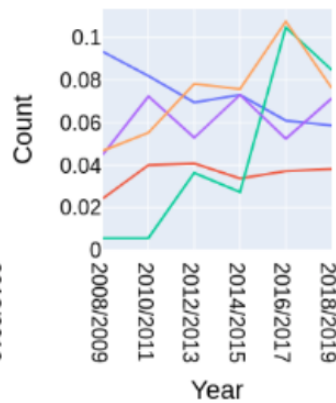| #	Culture topics
🟪	book, other, write, story, time
🟩	show, theatre, director, festival, theatrical
🟥	tourism, time, old, big, house
🟦	restaurant, wine, kitchen, meat, culinary

#	Ecology and health topics
🟪	vegan, child, animal, veganism
🟩	water, dioxide, greenhouse, carbon, energy
🟥	fat, cholesterol, diet, food, health
🟦	marine, whaling, dolphin, fish, allowed

#	Economy topics
🟧	percentage, inflation, price increase, chicken, food
🟪	euro, ljubljana, million, company
🟩	bank, mip, euro, million, supervisory
🟥	slovenian, food, quality, consumer, percentage
🟦	slovenian, company, mercator, euro, million

#	Other topics
🟧	other, can, life, time, world
🟪	coach, team, season, play, championship
🟩	oil, meat, minute, water, paprika
🟥	prison, police officer, prosecution, convicted, euro
🟦	election, president, agreement, government, political

#	Agriculture topics
🟥	meat, kebab, horse, product, dioxin
🟦	milk, agriculture, percentage, organic, Slovenian

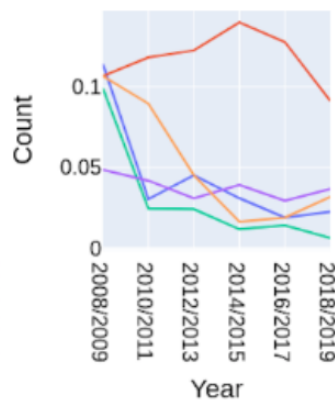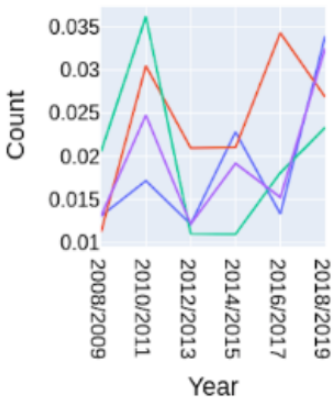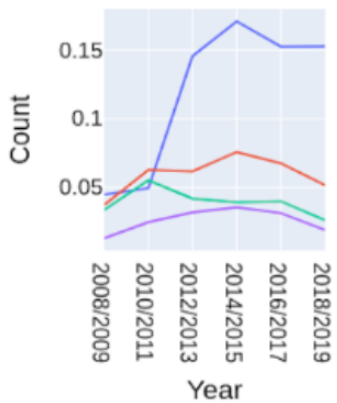| #	Culture topics
🟪	book, other, write, story, time
🟩	show, theatre, director, festival, theatrical
🟥	tourism, time, old, big, house
🟦	restaurant, wine, kitchen, meat, culinary

#	Ecology and health topics
🟧	vegan, child, animal, veganism
🟪	
🟩	water, dioxide, greenhouse, carbon, energy
🟥	fat, cholesterol, diet, food, health
🟦	marine, whaling, dolphin, fish, allowed

#	Economy topics
🟧	percentage, inflation, price increase, chicken, food
🟪	euro, ljubljana, million, company
🟩	bank, mip, euro, million, supervisory
🟥	slovenian, food, quality, consumer, percentage
🟦	slovenian, company, mercator, euro, million

#	Other topics
🟧	other, can, life, time, world
🟪	coach, team, season, play, championship
🟩	oil, meat, minute, water, paprika
🟥	prison, police officer, prosecution, convicted, euro
🟦	election, president, agreement, government, political

Increase in Slovene gastronomy

Increase in recipes

#	Agriculture topics
■	meat, kebab, horse, product, dioxin
■	milk, agriculture, percentage, organic, Slovenian

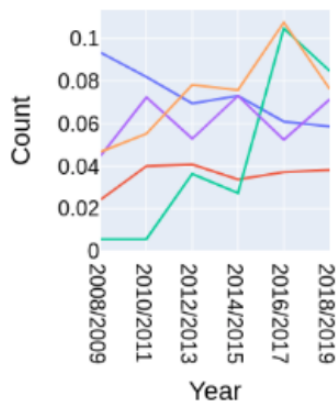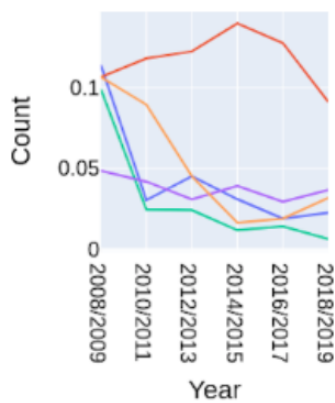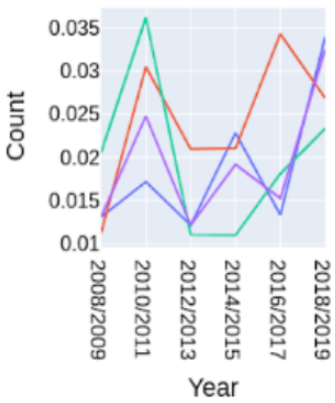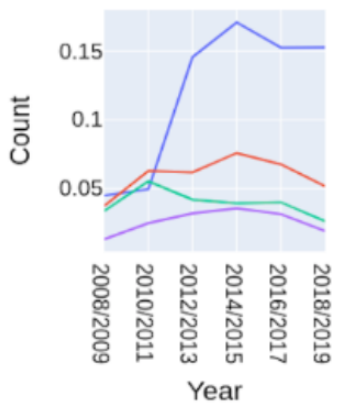| #	Culture topics
■	book, other, write, story, time
■	show, theatre, director, festival, theatrical
■	tourism, time, old, big, house
■	restaurant, wine, kitchen, meat, culinary

#	Ecology and health topics
■	vegan, child, animal, veganism
■	water, dioxide, greenhouse, carbon, energy
■	fat, cholesterol, diet, food, health
■	marine, whaling, dolphin, fish, allowed

#	Economy topics
■	percentage, inflation, price increase, chicken, food
■	euro, ljubljana, million, company
■	bank, mip, euro, million, supervisory
■	slovenian, food, quality, consumer, percentage
■	slovenian, company, mercator, euro, million

#	Other topics
■	other, can, life, time, world
■	coach, team, season, play, championship
■	oil, meat, minute, water, paprika
■	prison, police officer, prosecution, convicted, euro
■	election, president, agreement, government, political

- Increased trend in topics of *veganism* and *over-fishing*
- less clear trend but also health benefits and drawbacks increases
- environmental topics related to global warming decreased from the peak in 2010/2011

#	Agriculture topics
🟥	meat, kebab, horse, product, dioxin
🟦	milk, agriculture, percentage, organic, Slovenian

| #	Culture topics
🟪	book, other, write, story, time
🟩	show, theatre, director, festival, theatrical
🟥	tourism, time, old, big, house
🟦	restaurant, wine, kitchen, meat, culinary

#	Ecology and health topics
🟪	vegan, child, animal, veganism
🟩	water, dioxide, greenhouse, carbon, energy
🟥	fat, cholesterol, diet, food, health
🟦	marine, whaling, dolphin, fish, allowed

#	Economy topics
🟧	percentage, inflation, price increase, chicken, food
🟪	euro, ljubljana, million, company
🟩	bank, mip, euro, million, supervisory
🟥	slovenian, food, quality, consumer, percentage
🟦	slovenian, company, mercator, euro, million

| #	Other topics
🟧	other, can, life, time, world
🟪	coach, team, season, play, championship
🟩	oil, meat, minute, water, paprika
🟥	prison, police officer, prosecution, convicted, euro
🟦	election, president, agreement, government, political

- All decreasing trends but Slovenian food quality and quality/price ratio

Results: contextual embeddings-based similarity analysis for selected concepts

Word "meat"
- laboratory
- substitute
- artificial
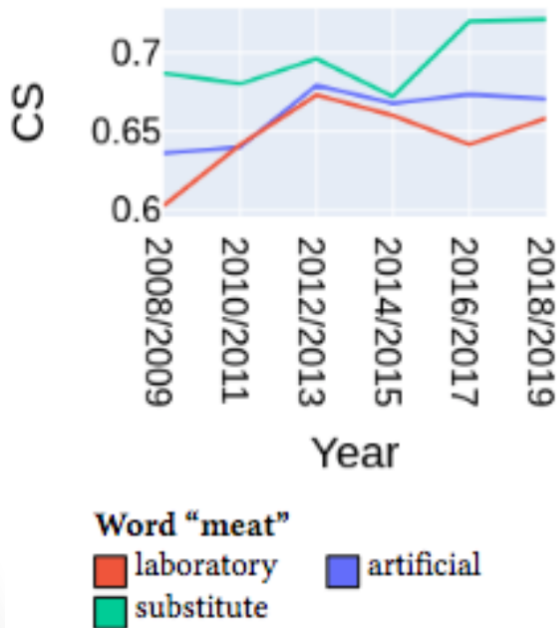
- Motivated by relation of *meat* and *cultured meat* and plant based meat analogues
- The CS between "meat" and all related concepts **peaks in 2012/2013**, which coincides with the development of cultured meat and plant-based meat analogues (1st tasting of cultured burger in 2013 in London)
- After 2012/13, only the CS between "substitute" and "meat" keeps increasing,
- Stagnation/gradual decrease in CS for the other two concepts.
- **Slovenian news media is not significantly expanding the coverage of production of the artificial meat in recent years**

Results: contextual embeddings-based similarity analysis for selected concepts

Word "vegan"
- environment
- organic
- healthy
- climate change
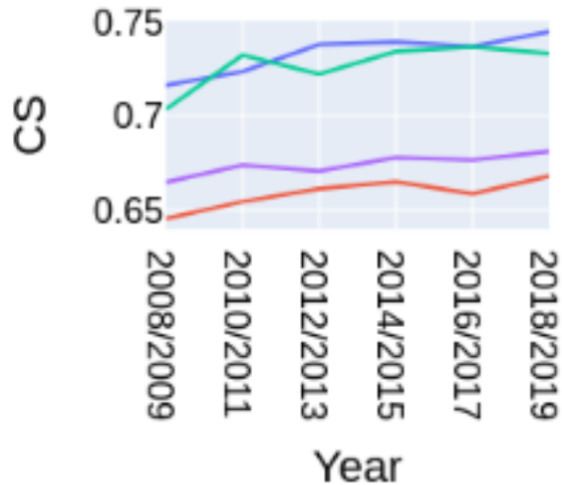
- CS of word *vegan* and selected other words
- Hypothesis that the news media is more and more connecting veganism to ecological and health related issues
- Light but stable increasing trend

Conclusion and further work

- A quantitative analysis of the meat related news in Slovenian news media

- The topics related to the meat **economy** are **decreasing**, but the **increase** in **cultural** (especially culinary), but also slightly in ecological and health topics is noticed.

- On the other hand, agricultural topics are not gaining/loosing news coverage across time

- The topic of **artificial meat is not yet extensively covered in Slovenian media** and since the initial increase in coverage in 2012/2013 has not been gaining further traction.

- There is semantic relation between the words vegan, healthy, and ecological, which is also slowly increasing over time.