Moving on from OntoNotes: Coreference Resolution Model Transfer

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Background: # Coreference Resolution

Determine which spans of text refer to the same entity

Hong Kong Wetland Park, which is currently under construction, is also one of the designated new projects of the Hong Kong government for advancing the tourism industry.

This is a park intimately connected with nature, being built by the Hong Kong government for its people who live in a city of reinforced concrete.

Background: # Coreference Resolution

Determine which spans of text refer to the same entity

antecedent

Hong Kong Wetland Park, which is currently under construction, is also one of **the designated new projects of the Hong Kong government for advancing the tourism industry**.

mention span

This is **a park** intimately connected with nature, being built by **the Hong Kong government** for **its** people who live in **a city of reinforced concrete**.

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Background: # Dataset Differences

Annotation type:

- Singletons
- Entity types

And **Jo** shook the blue army sock till the needles rattled like castanets, and **her** ball bounded across the room.

Only coreferring mentions (OntoNotes)

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Annotation type:

- Singletons
- Entity types

And **Jo** shook **the blue army sock** till **the needles** rattled like **castanets**, and **her ball** bounded across **the room**.

All mentions, including singletons (ARRAU)

Background: # Dataset Differences

Annotation type:

- Singletons
- Entity types

And **Jo** shook the blue army sock till the needles rattled like castanets, and **her** ball bounded across **the room**.

Only certain ACE entity types (LitBank)

Background: Dataset Differences

- Domain

And **Jo** shook the blue army sock till the needles rattled like castanets, and **her** ball bounded across **the room**.

Literature

Background: Dataset Differences

Dataset Differences

- Domain

Literature	News
And Jo shook the blue army sock till the needles rattled like castanets, and **her** ball bounded across **the room**.	**Invisible Man** is **Ellison's best known work**, most likely because **it** was **the only novel** he ever published during his lifetime…

Background: # Dataset Differences

- Domain

And **Jo** shook the blue army sock till the needles rattled like castanets, and **her** ball bounded across **the room**.

Literature

Invisible Man is **Ellison's best known work**, most likely because **it** was **the only novel** he ever published during his lifetime…

News

(1) In general, The term **"employer"** means with respect to **any calendar year**, **any person** who -

Legal

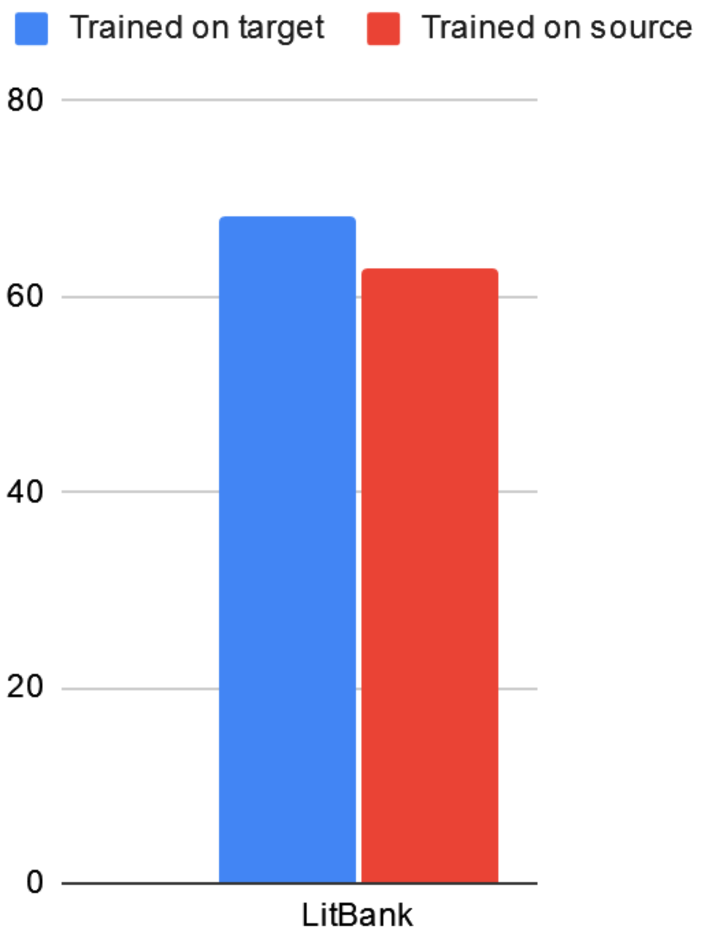
Background: # Dataset Differences

- Domain

And Jo shook the blue army sock till the needles rattled like castanets, and her ball bounded across the room.	Invisible Man is Ellison's best known work, most likely because it was the only novel he ever published during his lifetime…
Literature	News

- Language
  - Cross-lingual transfer of coreference resolution

Background: # Poor Transferability



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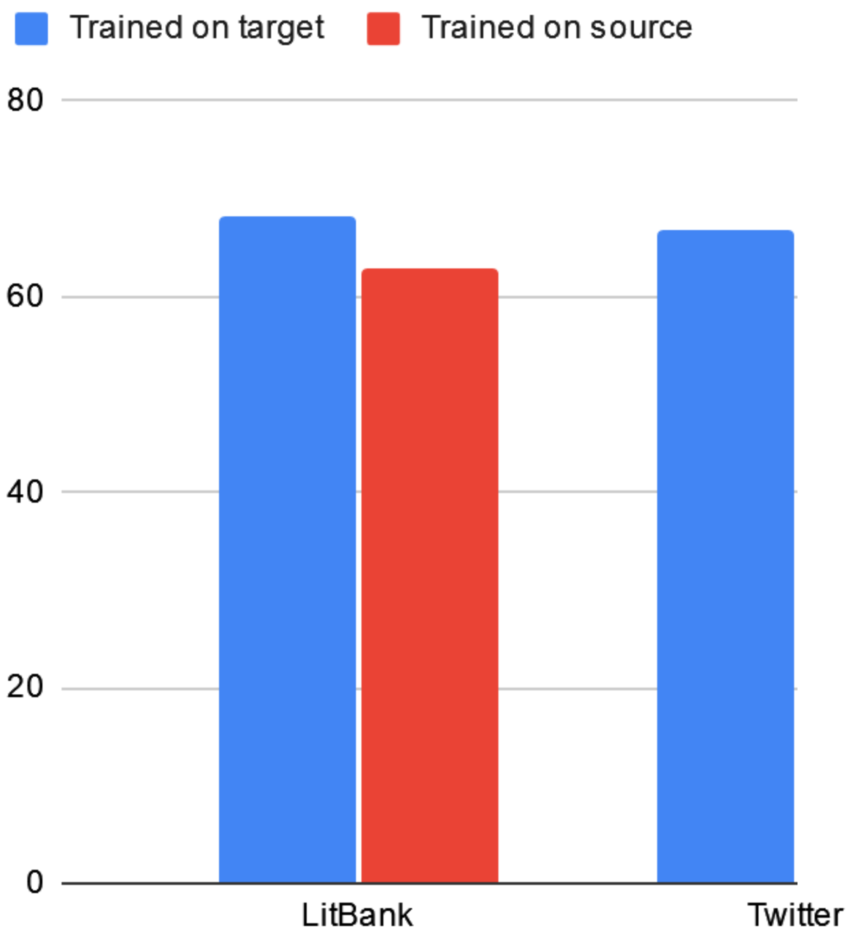

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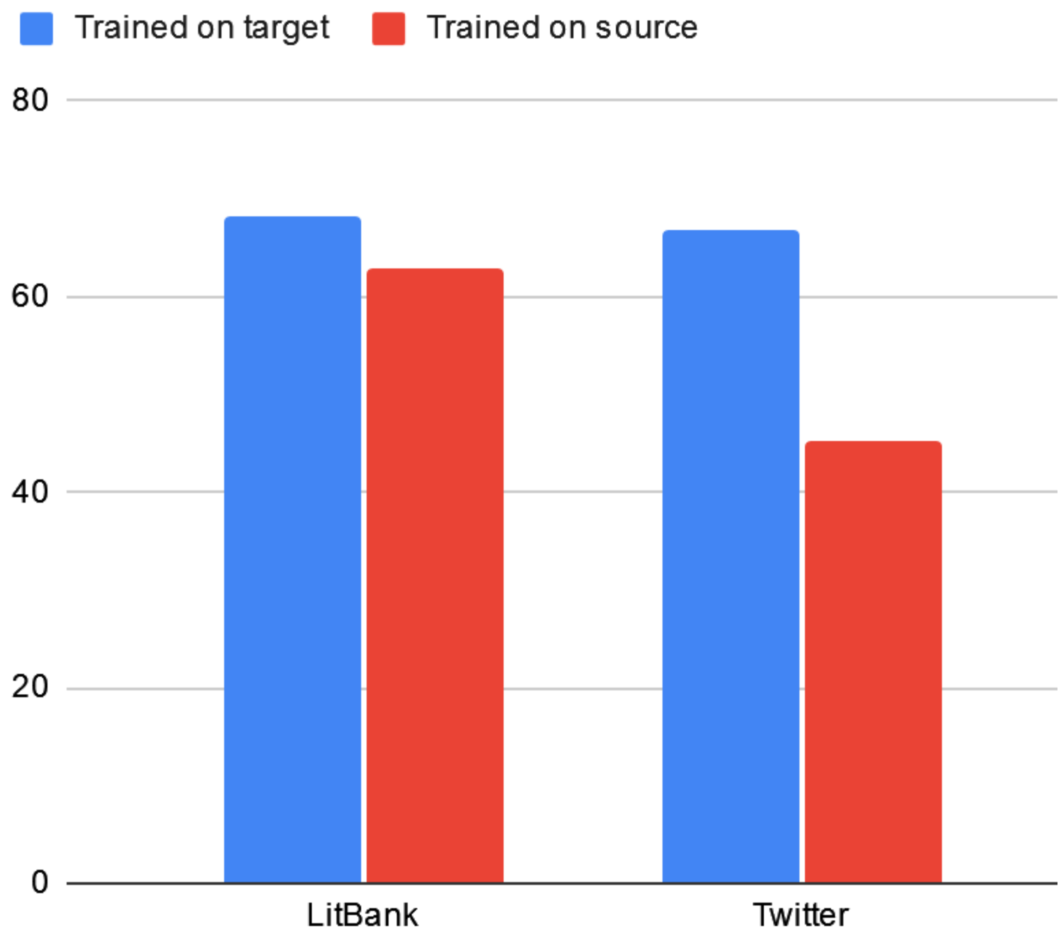

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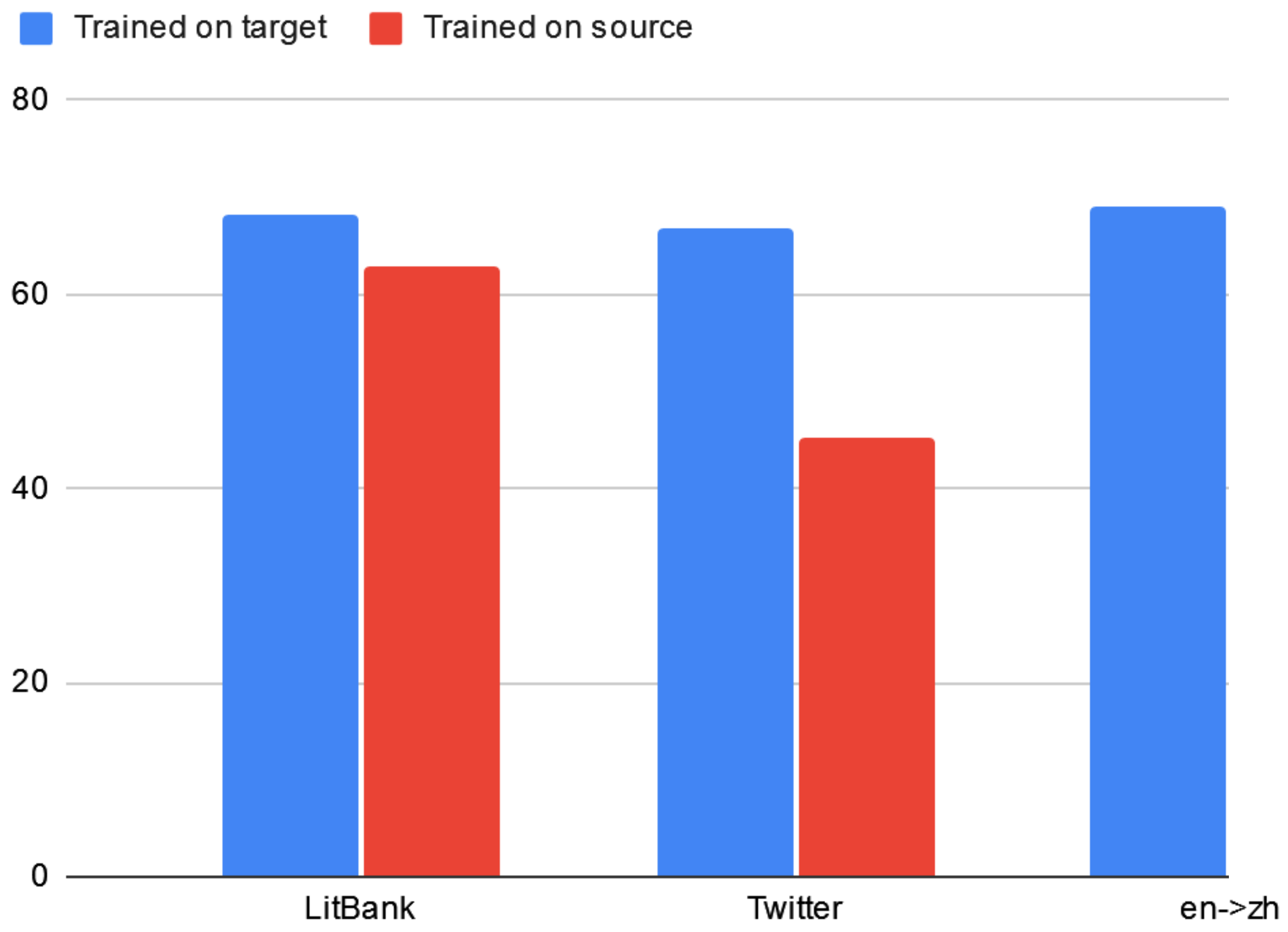

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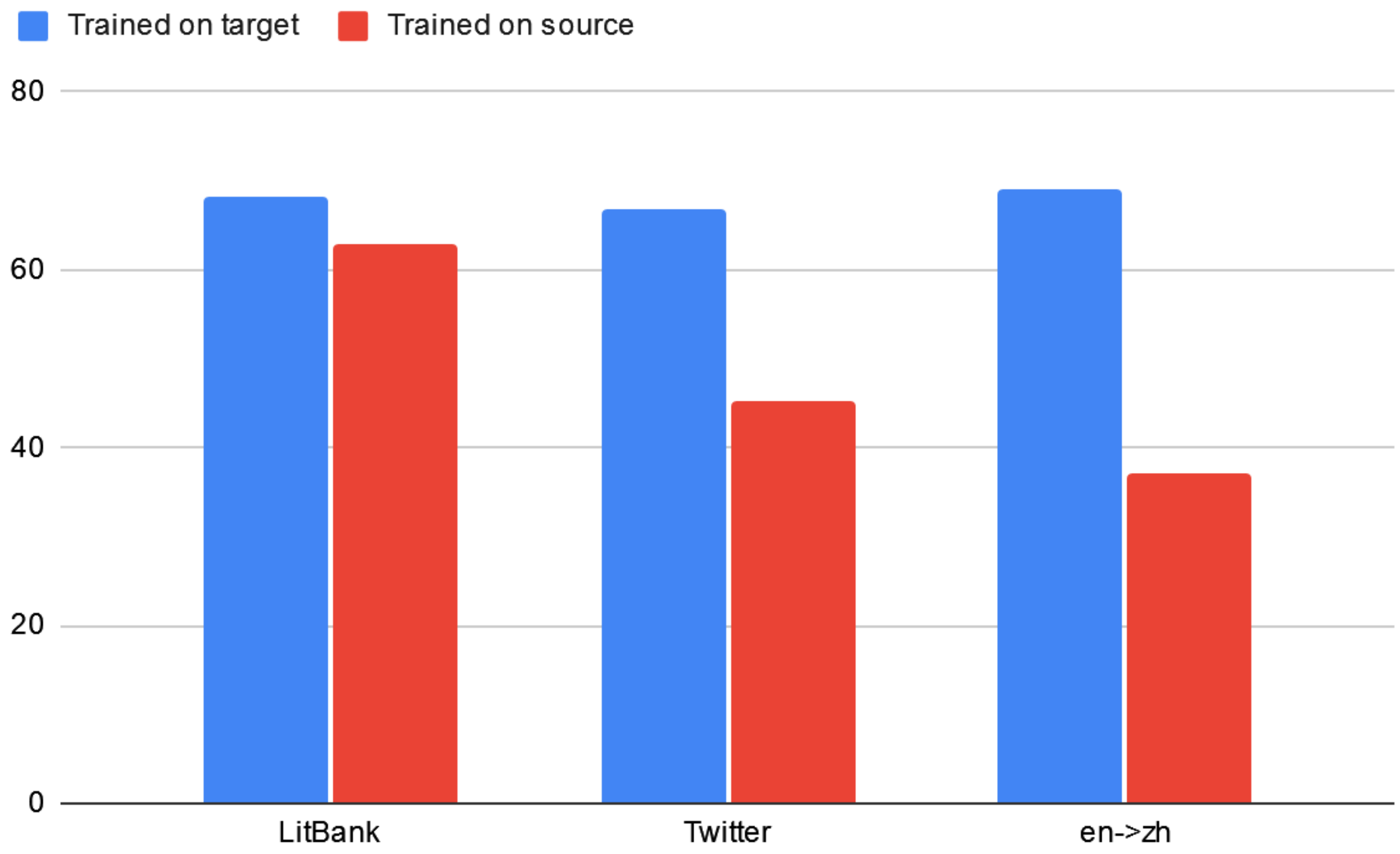

Research Questions

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Goal: reduce cost of creating a coref model on entirely new dataset

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Goal: reduce cost of creating a coref model on entirely new dataset

1. How effective is continued training for domain adaptation?
2. How to allocate annotated documents?
3. How much do source models forget?
4. Which encoder layers are important?

Methods: Source Models

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Memory-efficient coreference model

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Pretrained encoders only vs. fully-trained models

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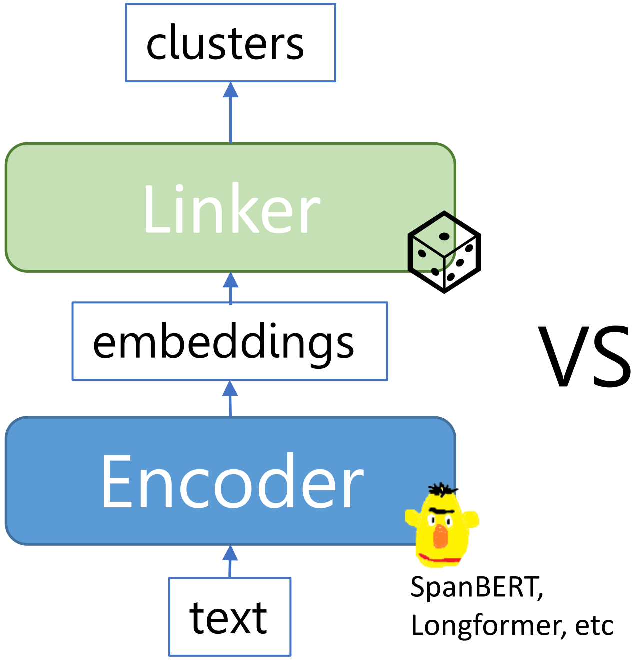
Memory-efficient coreference model

Pretrained encoders only vs. fully-trained models



VS.

Pretrained encoder only

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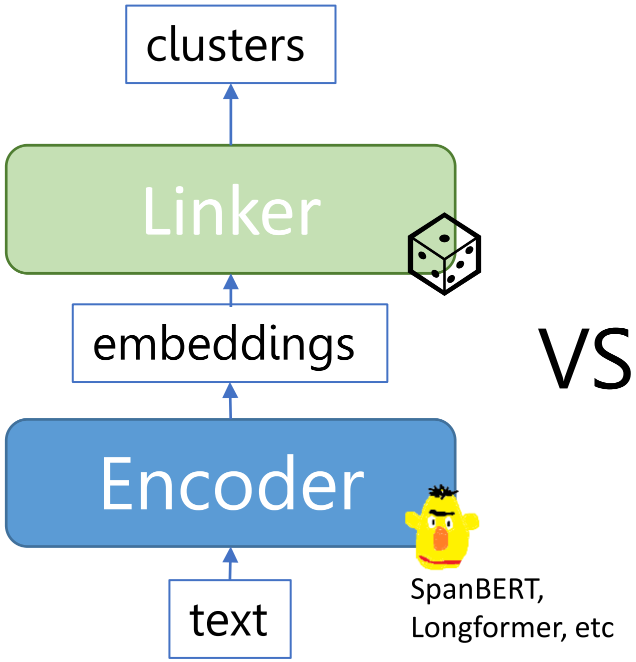

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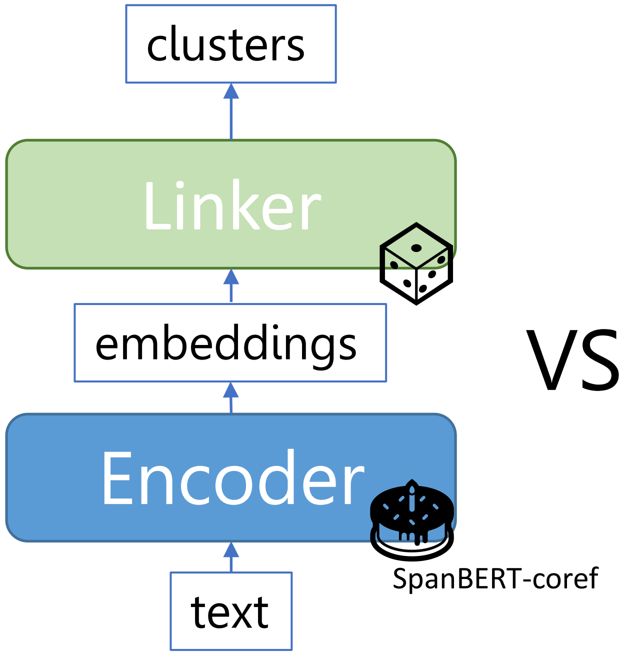

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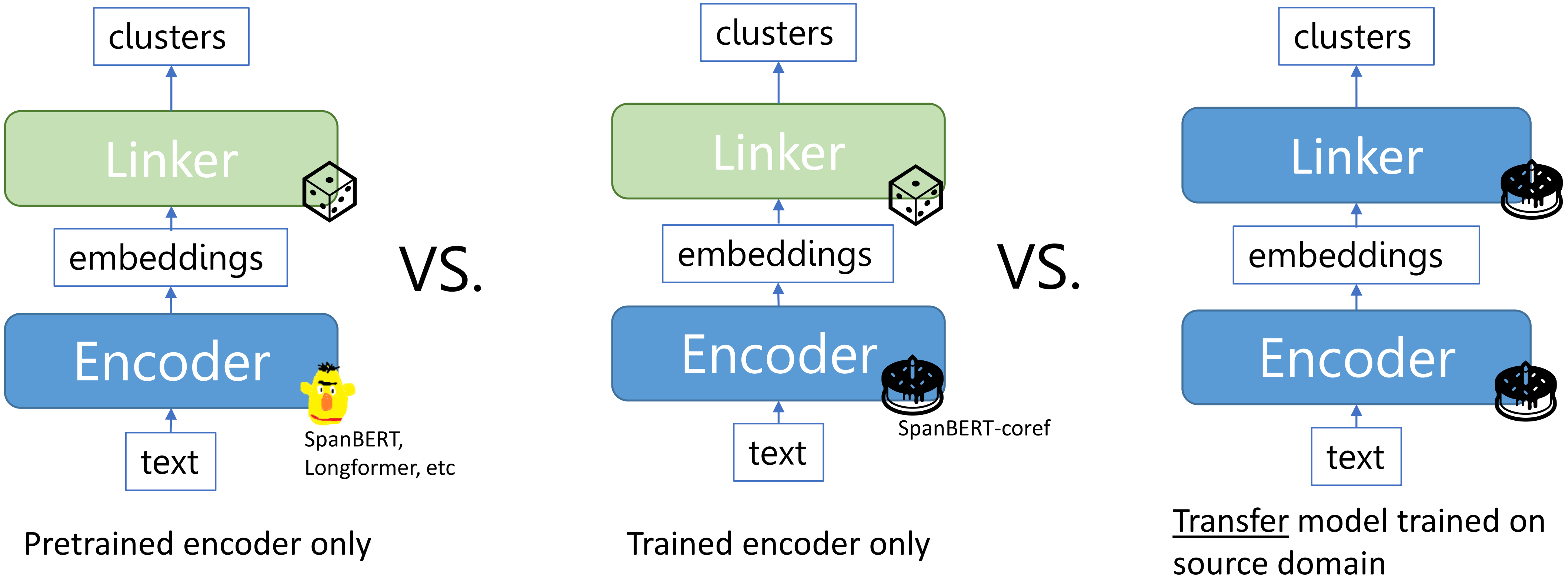

Methods: **Datasets**

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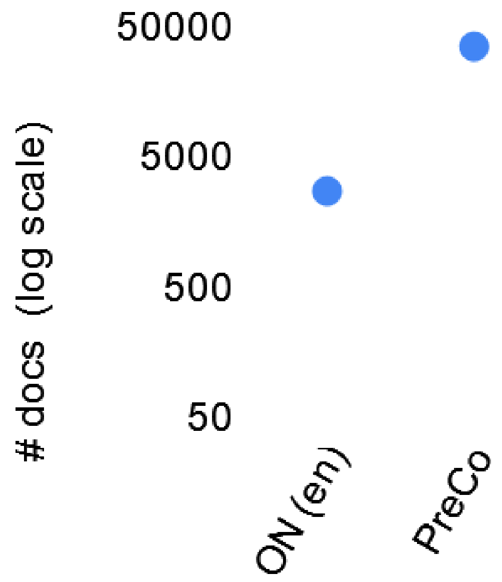
Source Datasets: OntoNotes, PreCo



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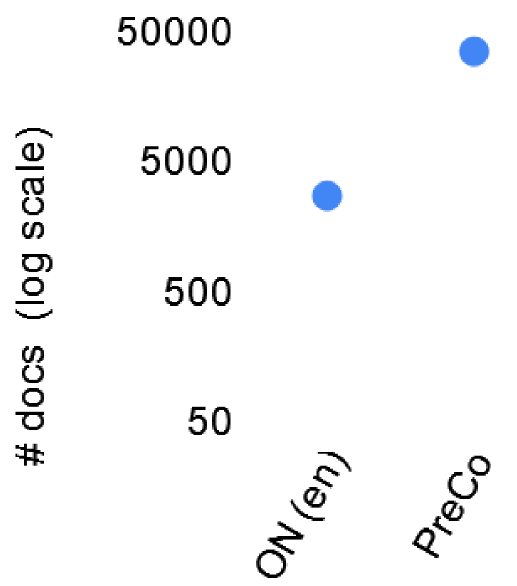
Single domains: ARRAU (news), LitBank (books), SARA (legal), QBCoref (quiz questions)



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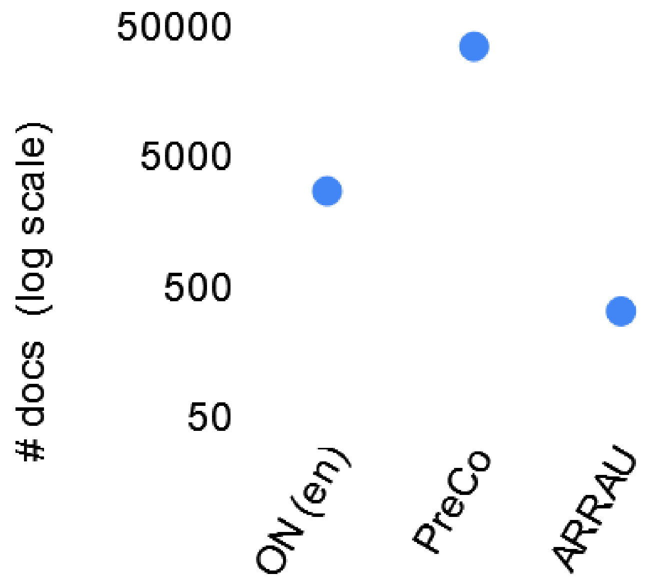

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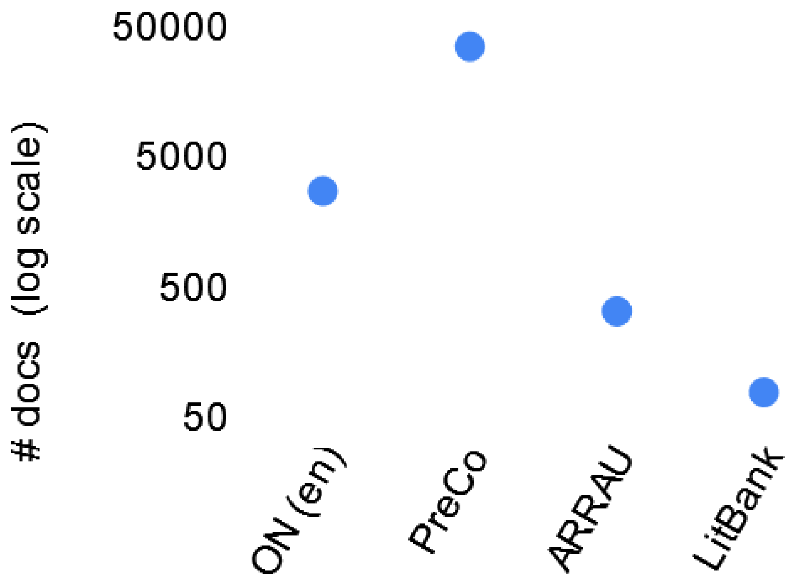

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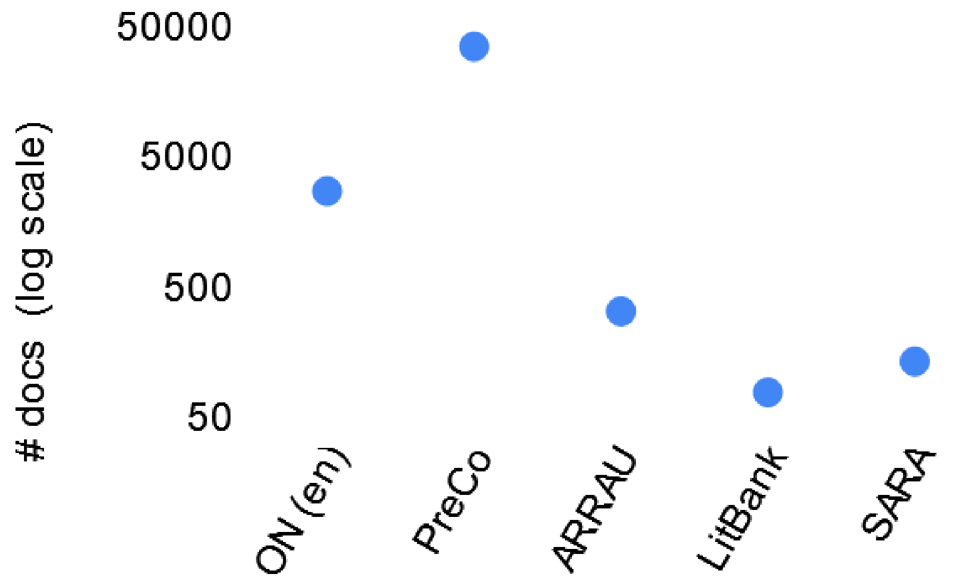

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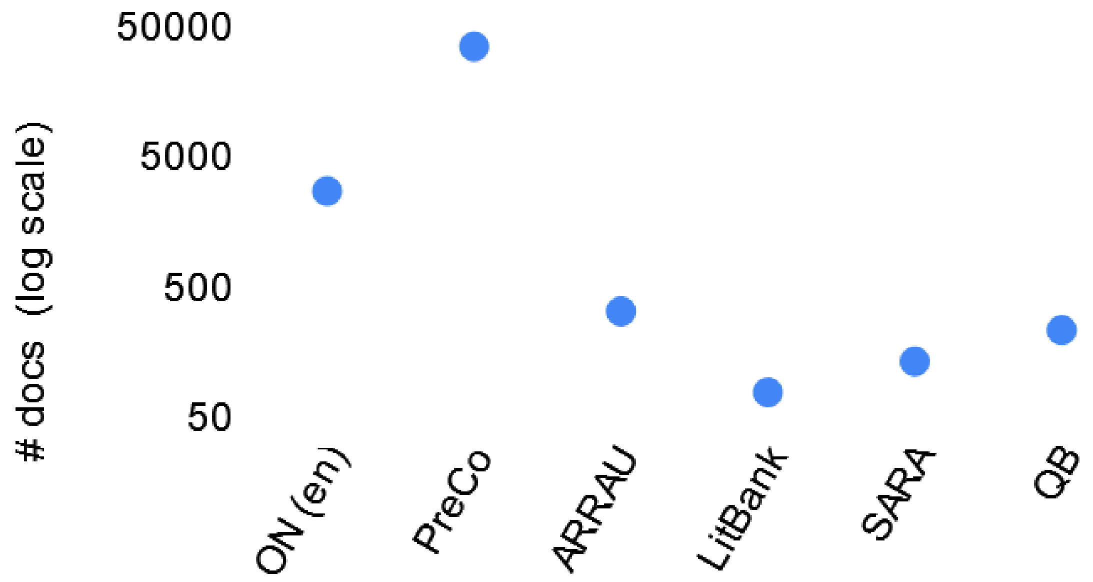

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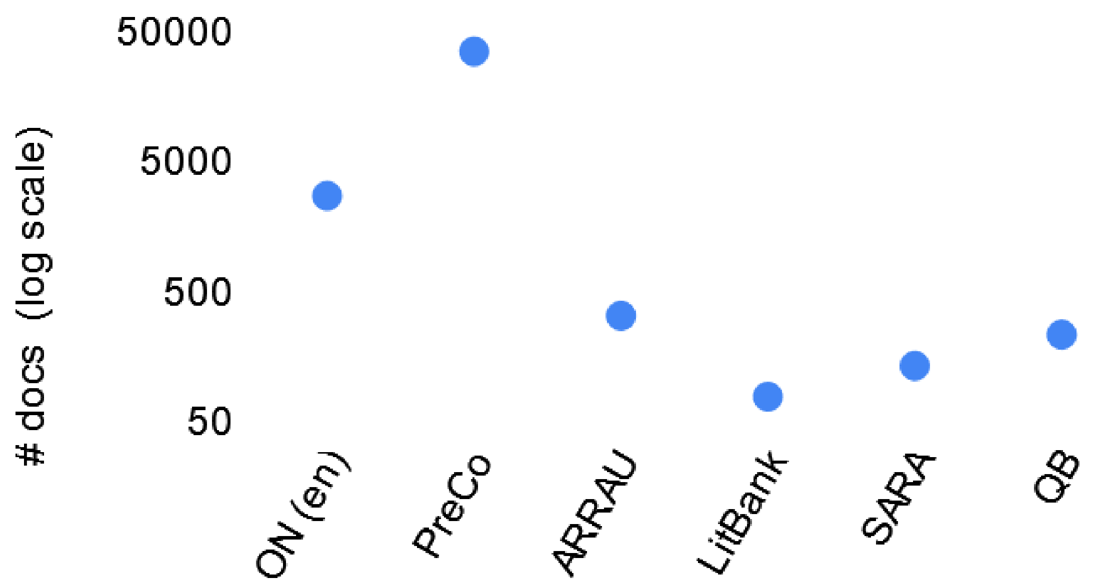

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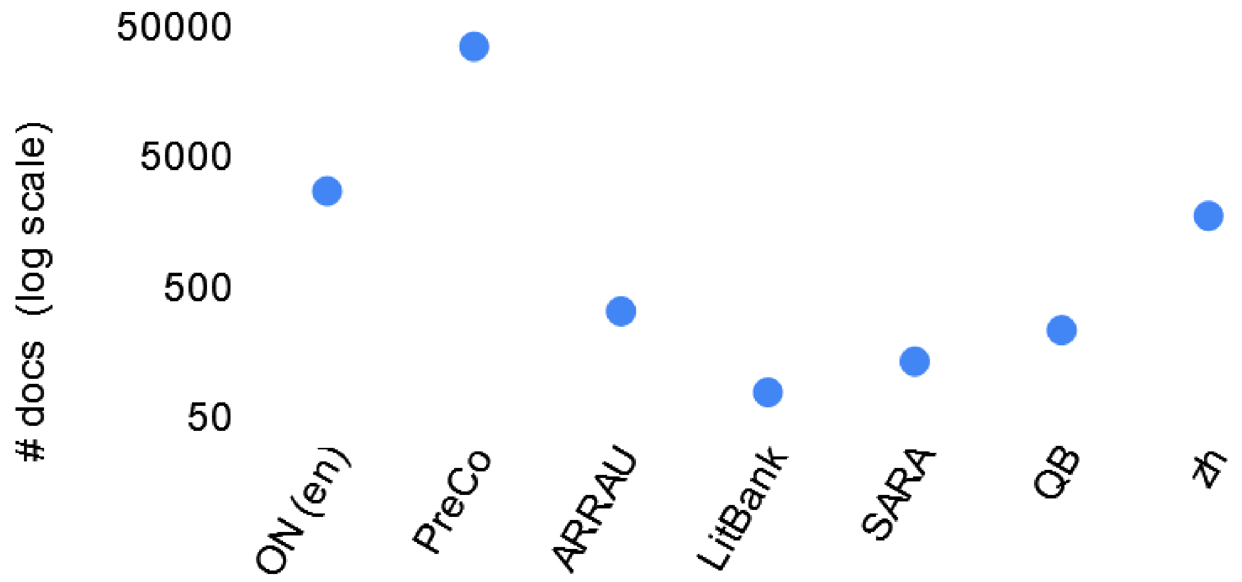

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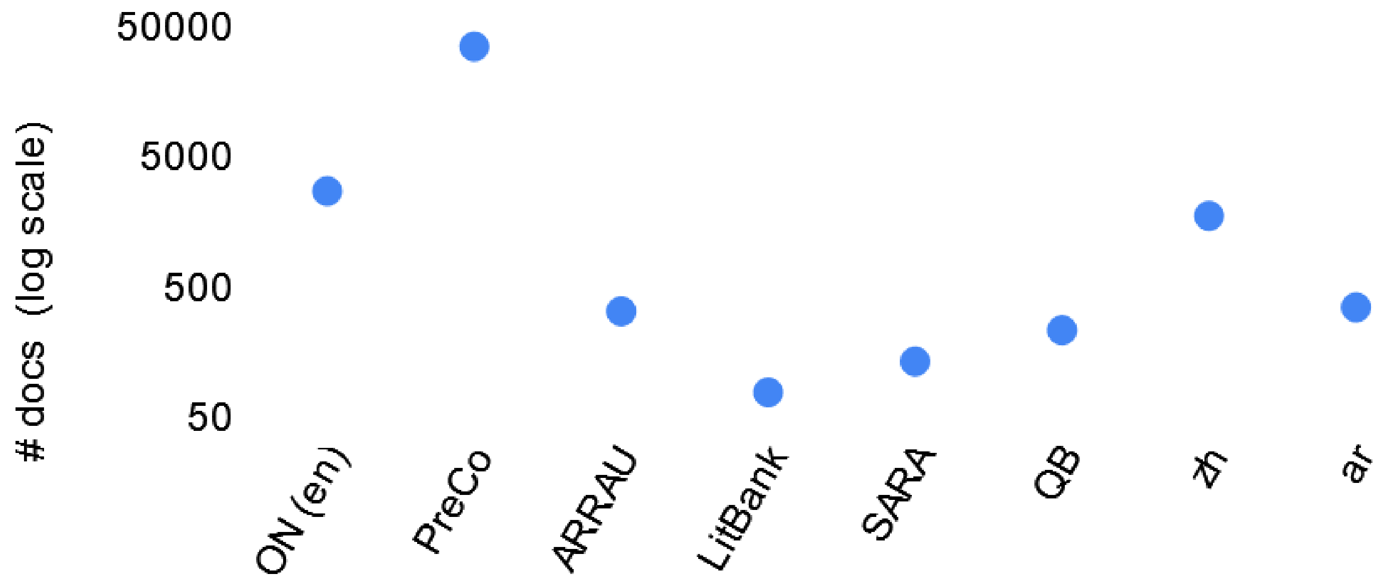

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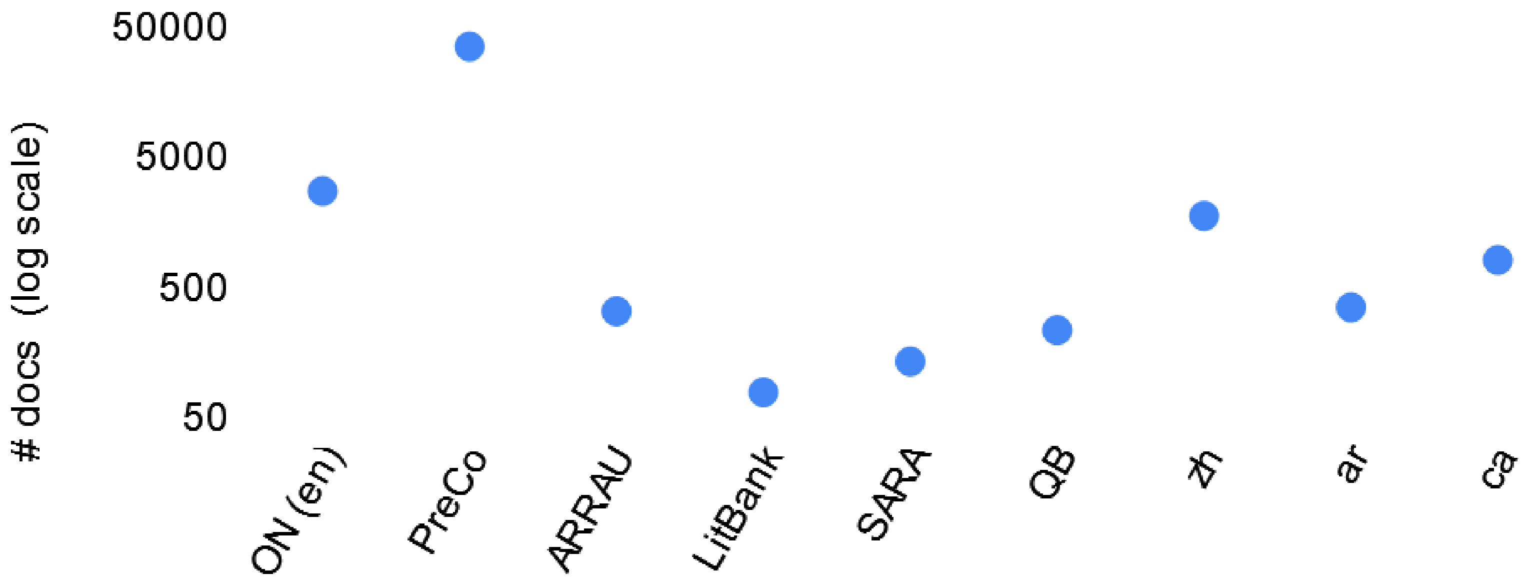

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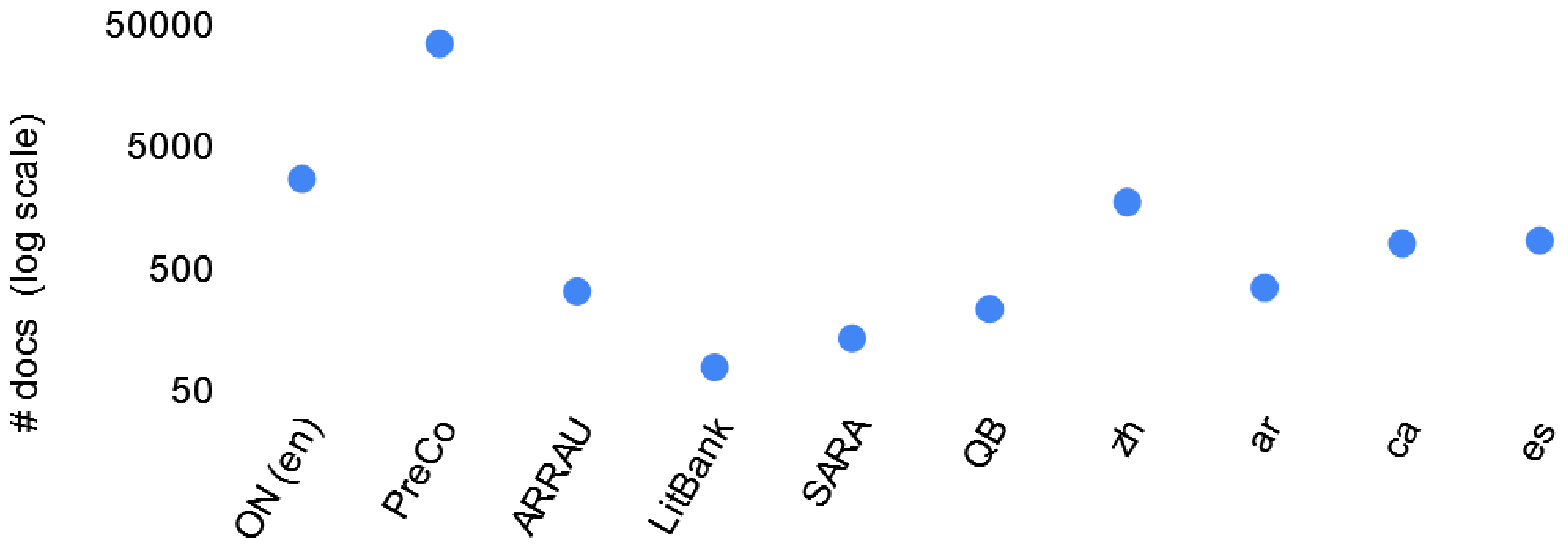

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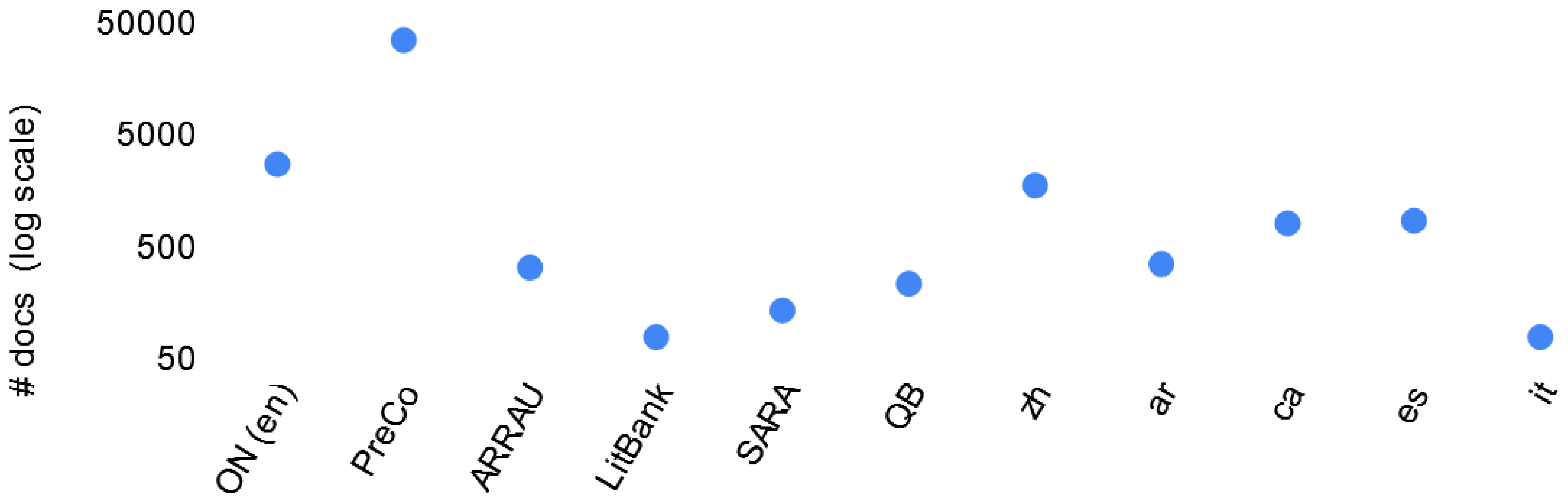

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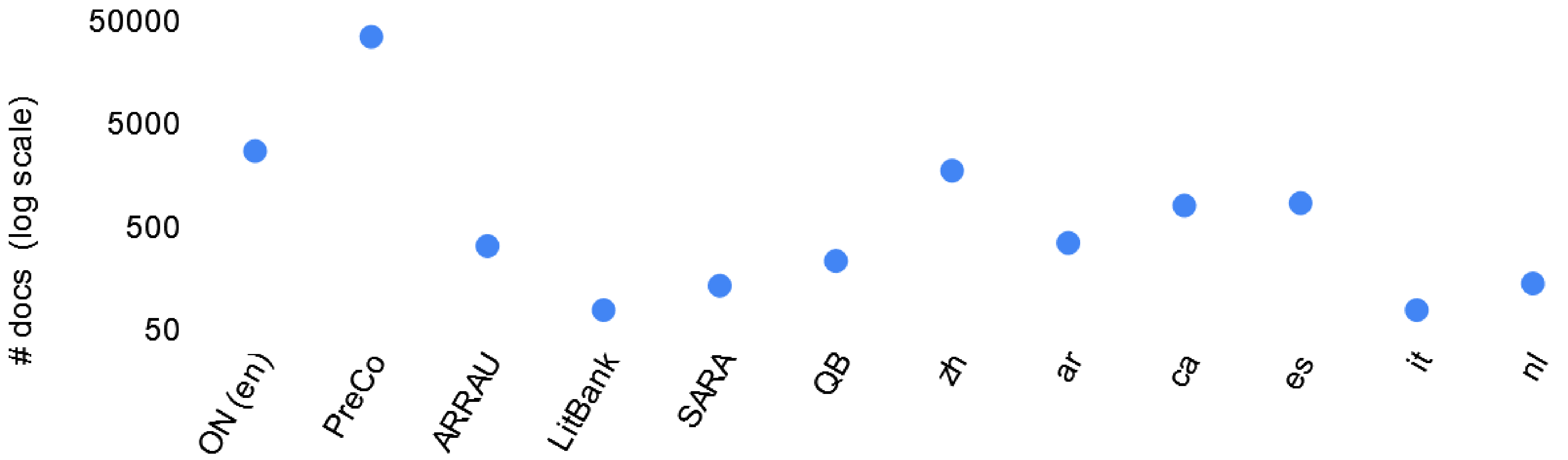

Methods:

Training

Use standard train/dev splits

Sample a subset of training set to simulate lower-data setting

Research Question:

How effective is continued training for domain adaptation in coref?

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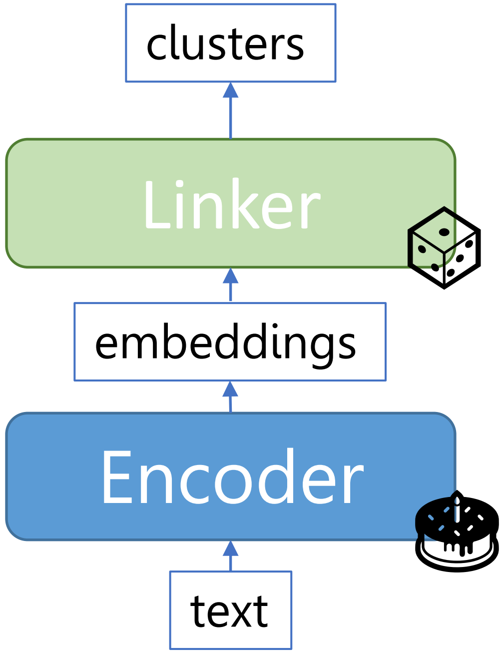

Off-the-shelf trained encoder only

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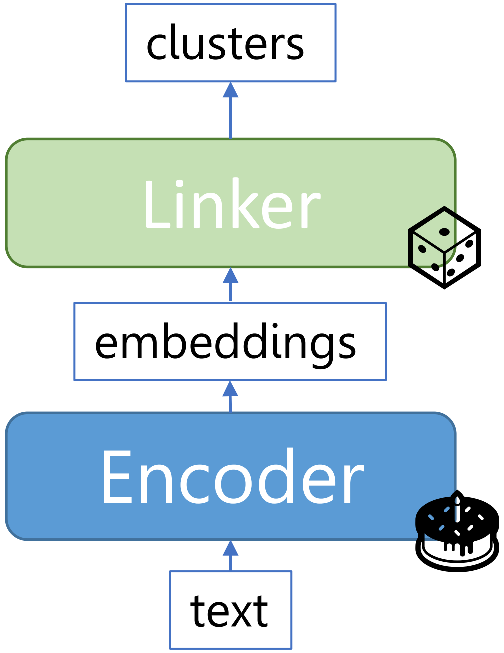

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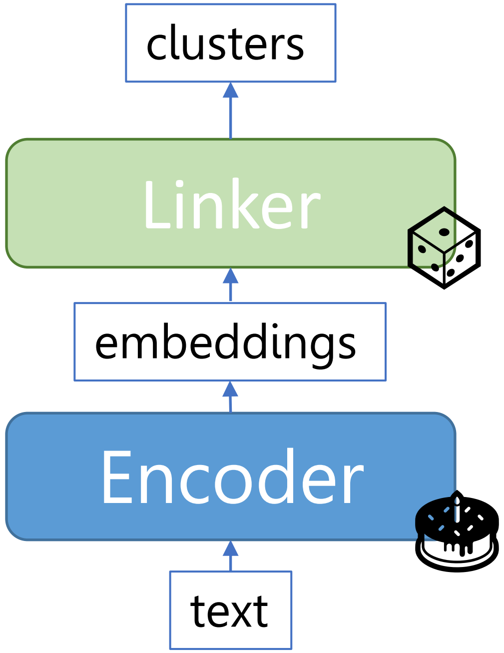

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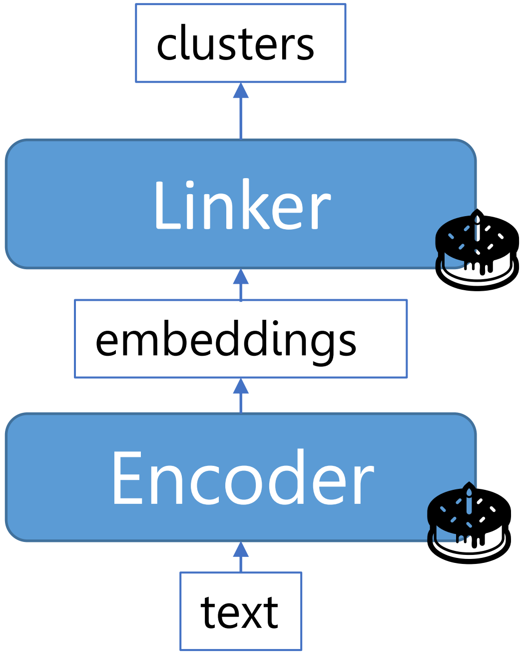

Transfer model trained on source domain

RQ1: Continued training for domain adaptation

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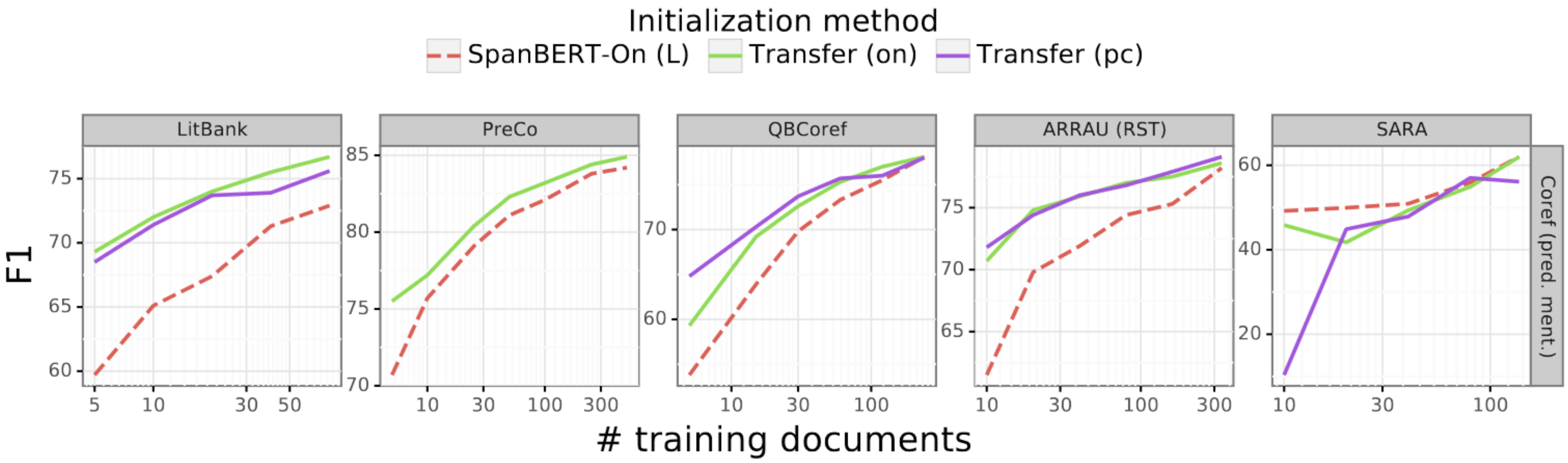
- Transfer models usually outperform randomly initialized models



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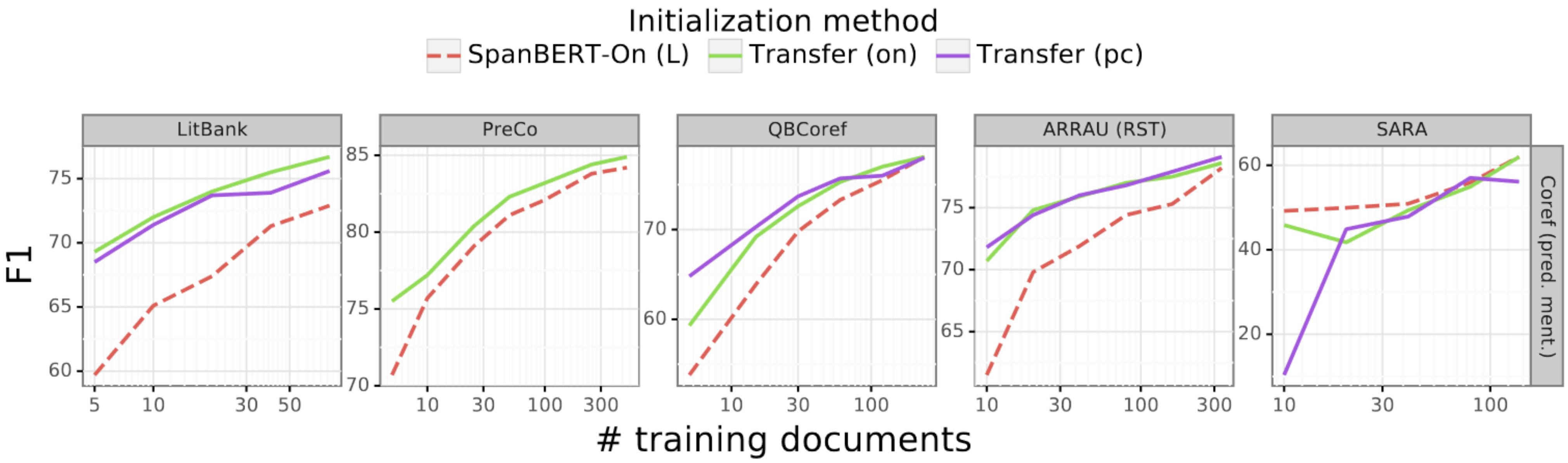
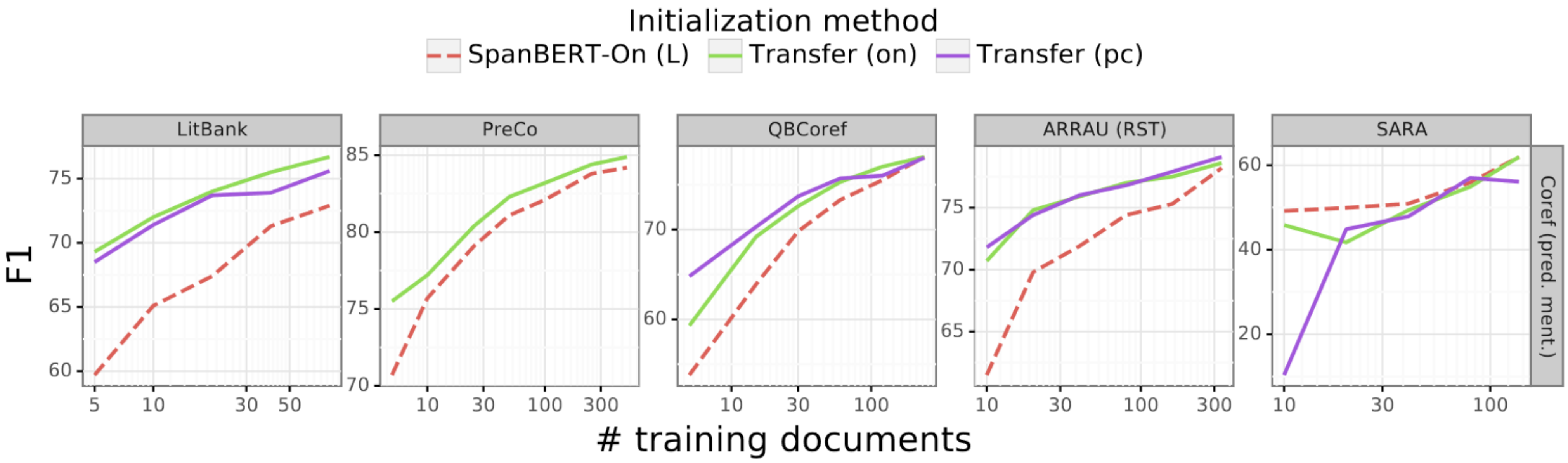


RQ1: Continued training for domain adaptation

- Transfer models usually outperform randomly initialized models
- PreCo is as effective as OntoNotes
- PreCo is better with gold mention boundaries



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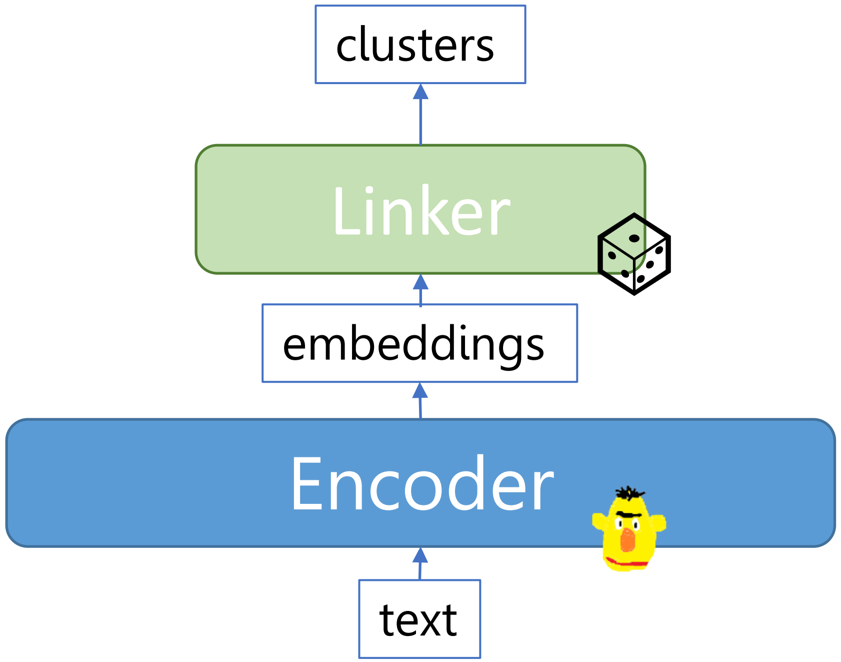

Untrained large encoder

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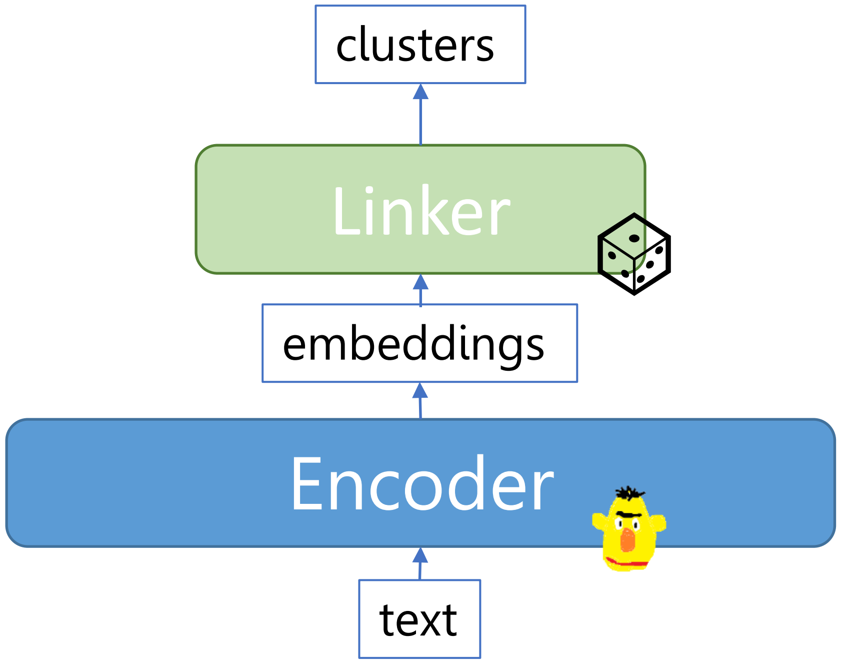

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VS.

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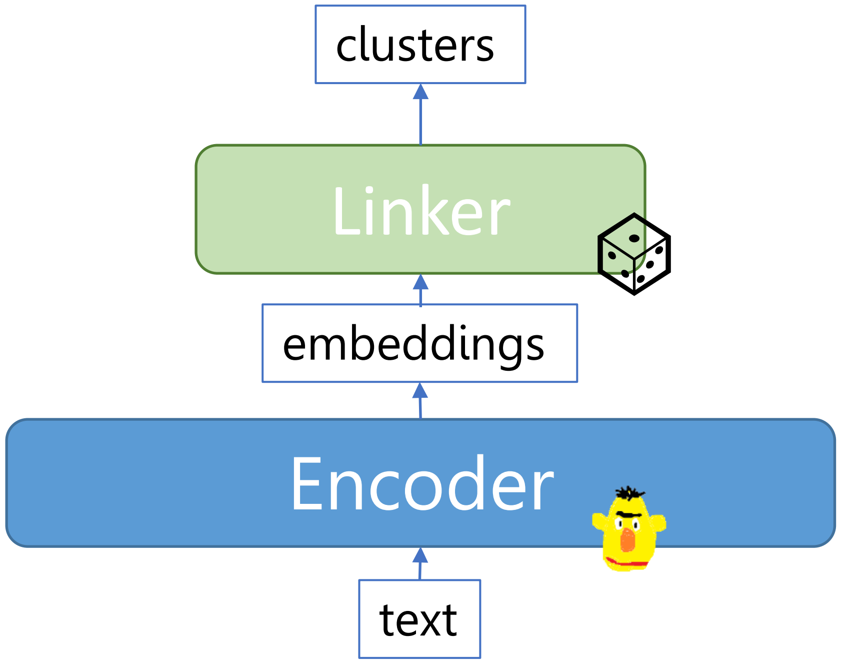

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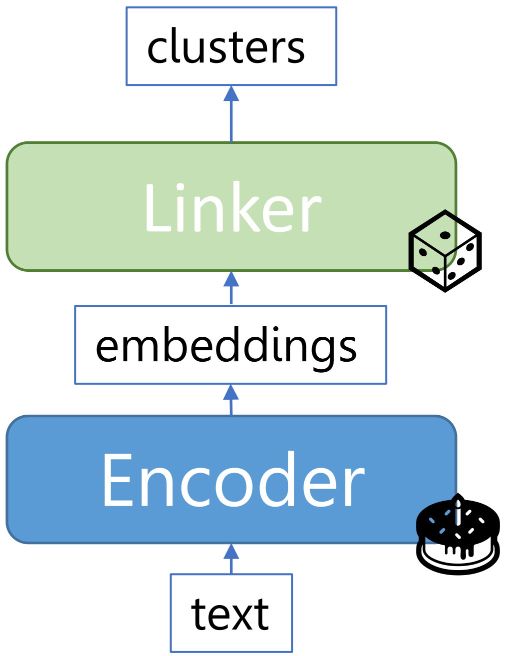

Off-the-shelf trained small encoder

RQ1: Pretraining and model size

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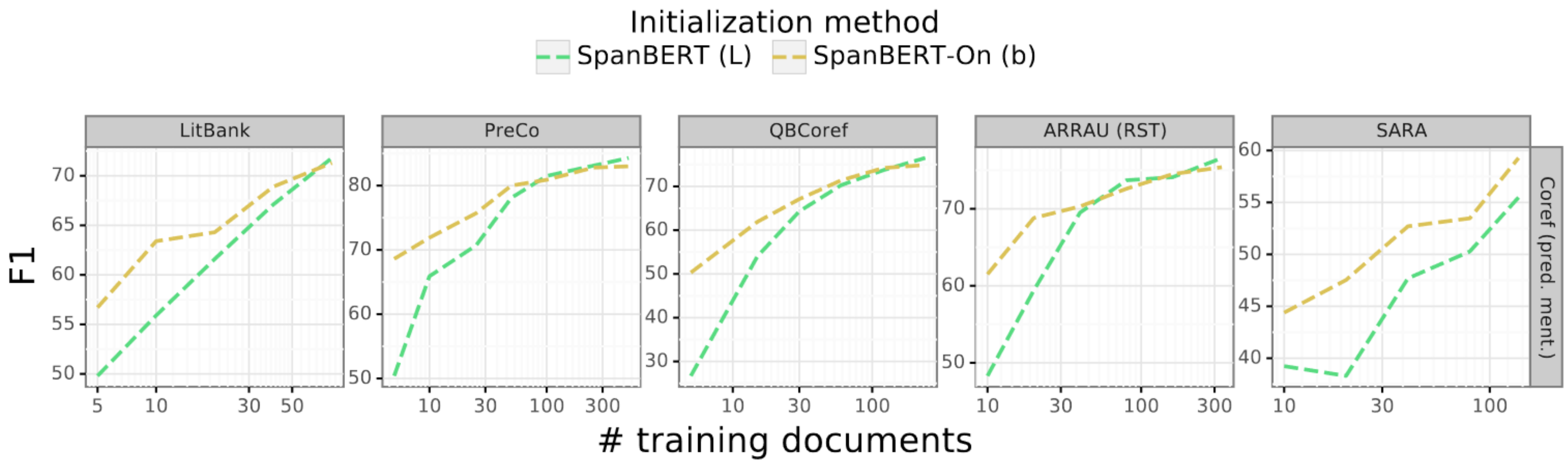
- Compare
  - **SpanBERT (L):** large unspecialized model (🐤 + 🎲)
  - **SpanBERT-On (b):** small specialized model (🎂 + 🎲)

RQ1: Pretraining and model size

- Compare
  - **SpanBERT (L):** large unspecialized model (+)
  - **SpanBERT-On (b):** small specialized model (+)
- Continued training of small (publicly available) encoders is effective with low # training docs



Additional Findings

RQ1: Continued training also improves cross-lingual transfer

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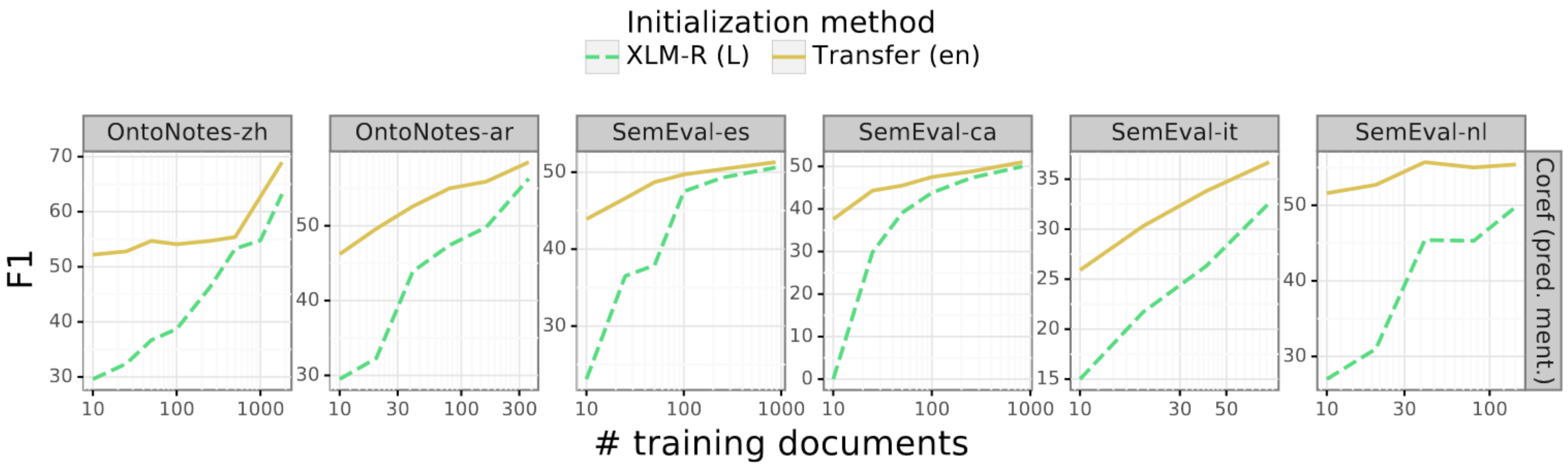
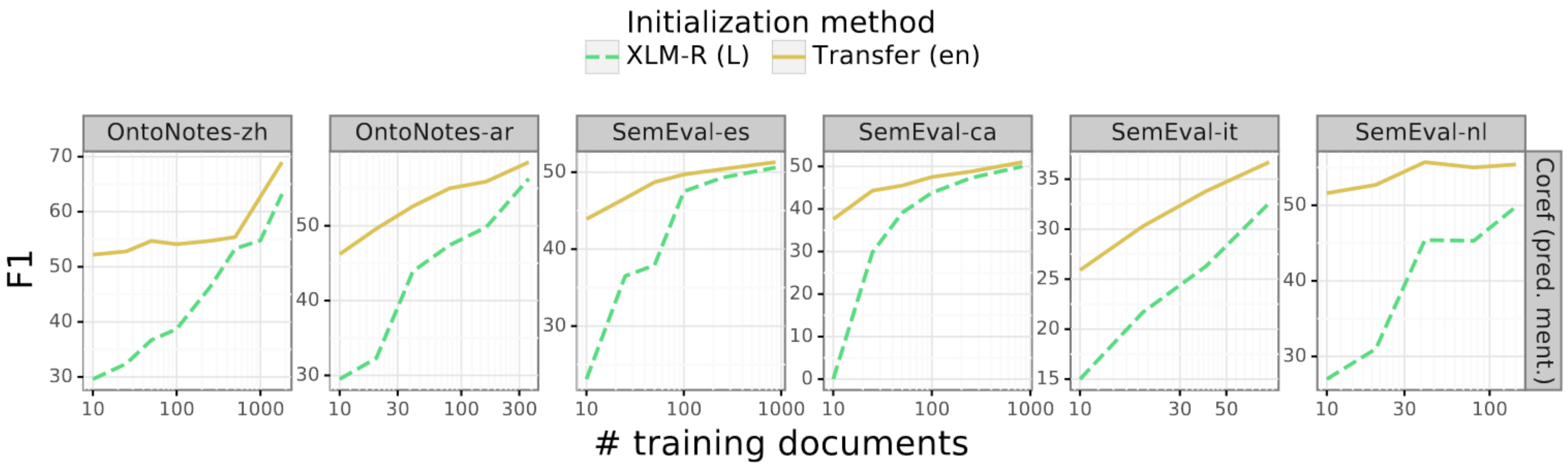
- Transfer model (🎂 + 🎂) outperforms XLM-R (+ 🎲)



RQ1: Continued training also improves cross-lingual transfer

- Transfer model (🎂 + 🎂) outperforms XLM-R (🐤 + 🎲)
- Improves SOTA performance on cross-lingual coreference



RQ2: How many documents should be in the dev set?

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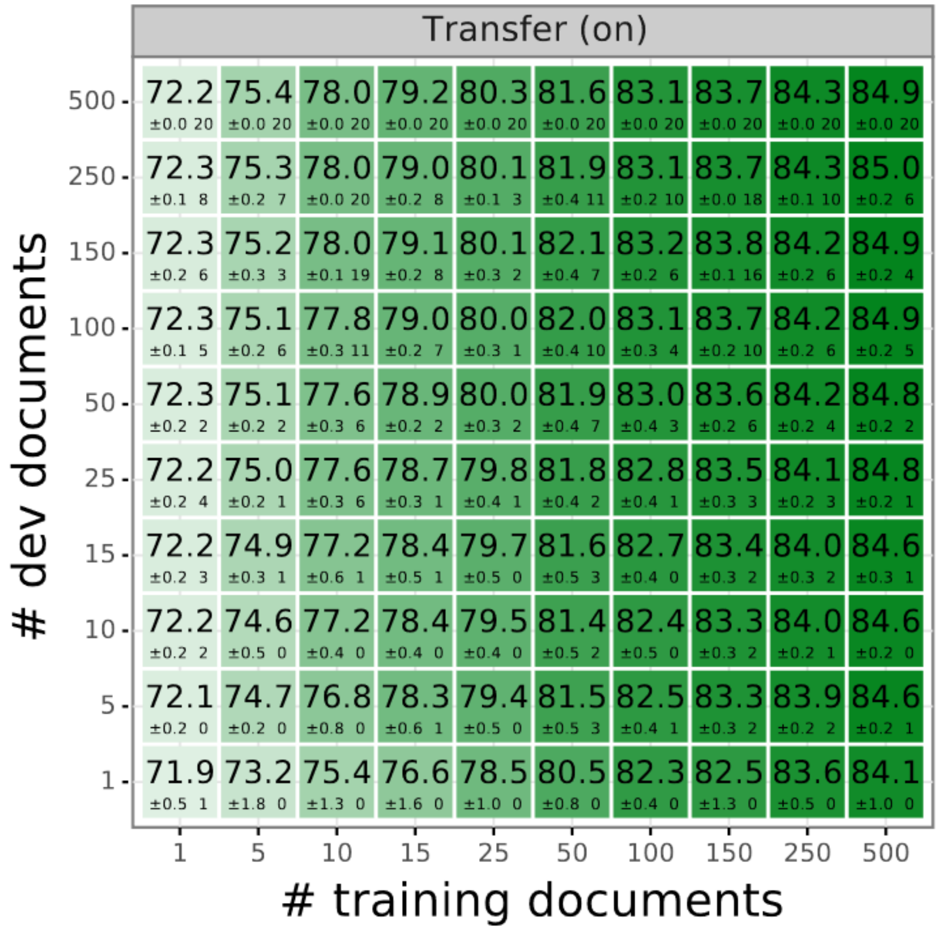
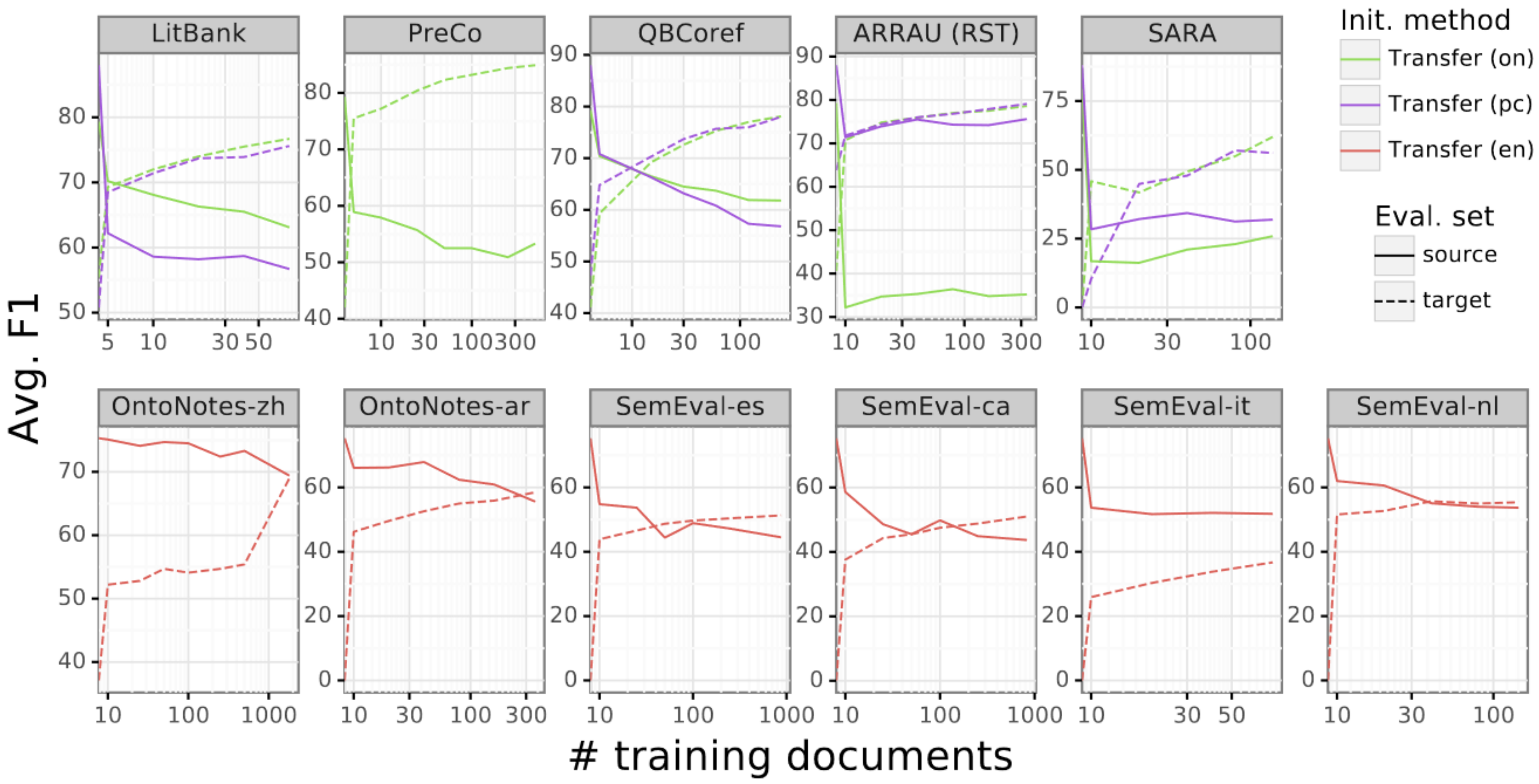
Answer: Increasing dev set from 5 to 500 documents only gains 0.3 F1



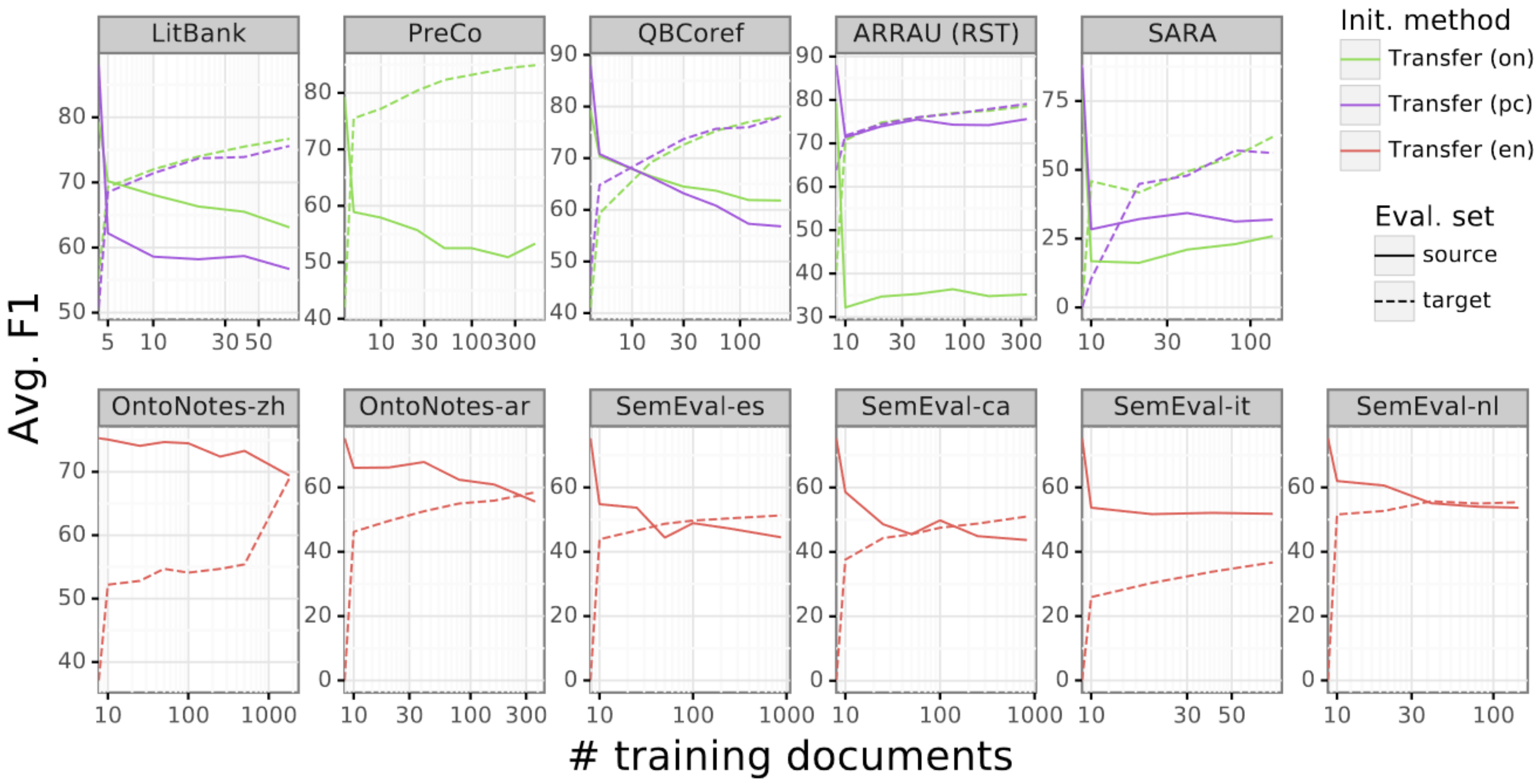
RQ3: How much do the models forget?



How much do the models forget?

Largest drops:

- Annotation guideline changes



RQ3: # How much do the models forget?

Largest drops:

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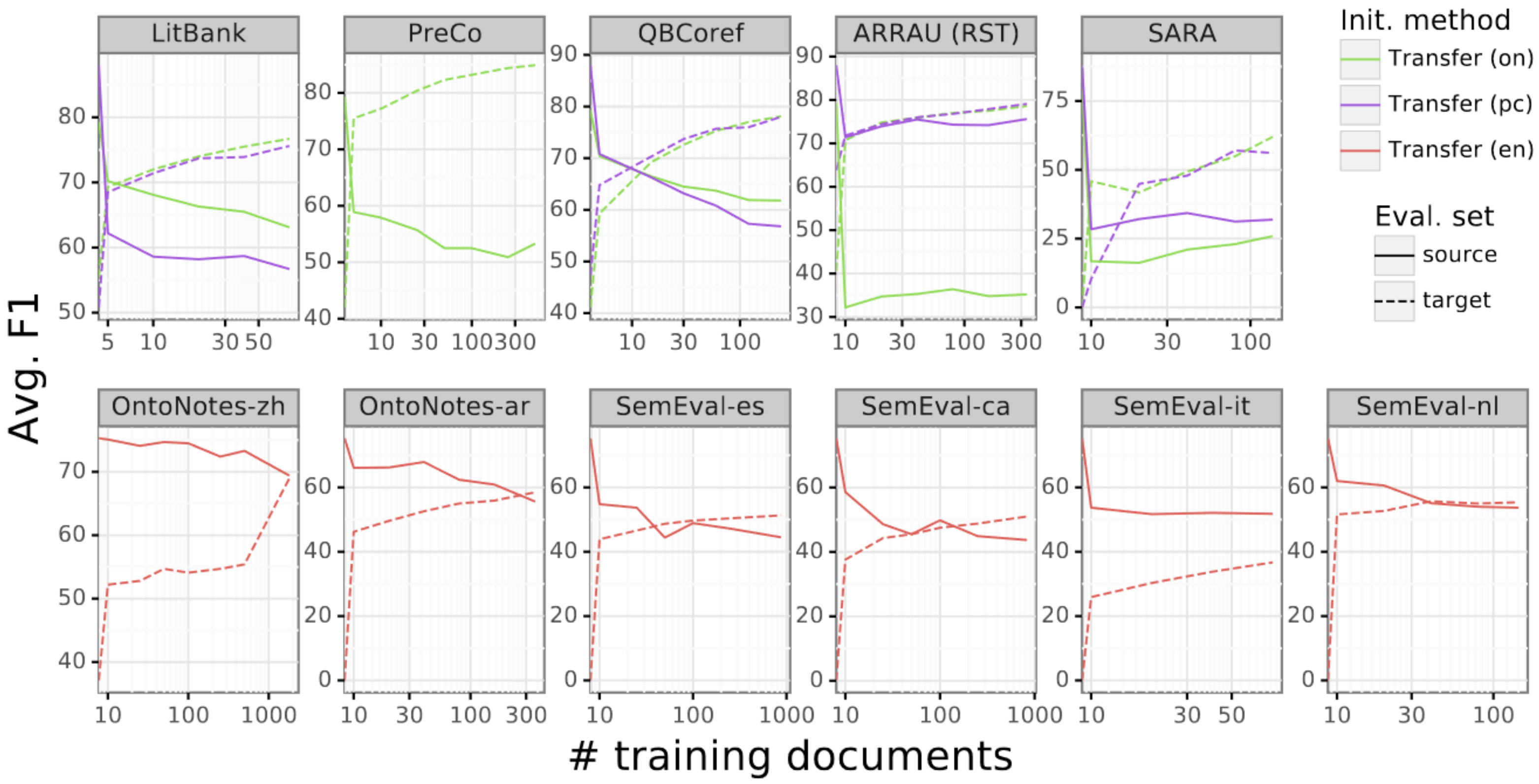
Small(er) drops:

- Cross-domain
- Cross-lingual



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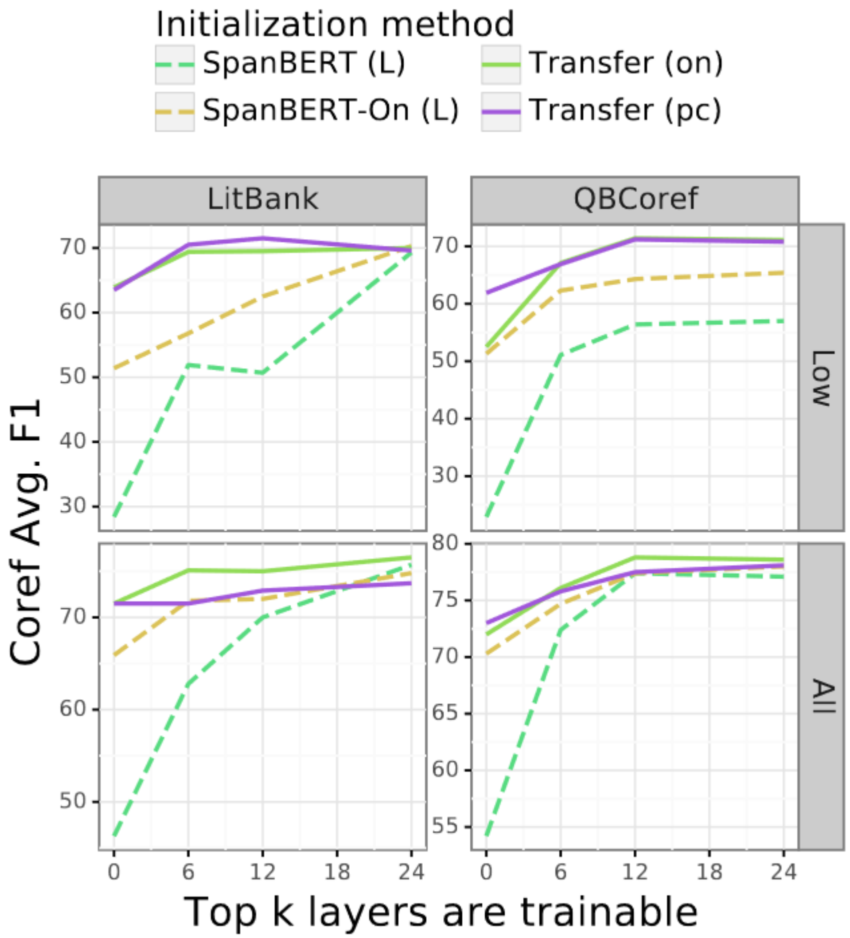
Answer:

- For transfer (🎂 + 🎂) models, top 6-12 layers is probably enough
- Not always true for other models



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  - Cheaper training of new model
- PreCo is as good as OntoNotes
  - OntoNotes requires a license
- For coreference, use annotated documents for training
- Fresh benchmarks on a wide set of datasets across domains and languages

Questions?
Come to poster session

Or email paxia@jhu.edu

Code/pretrained models at: https://nlp.jhu.edu/coref-transfer/