The Changing Economics of Knowledge Production by S. Abis, L. Veldkamp

Discussion by E. McGrattan and J.C. Braxton

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Big Picture on Big Data

Big Picture on Big Data

- Goals: measure data and knowledge production
- Why data?
  - An endogenous source of productivity gains
  - Likely
    - — Innovation policy relevant
    - — Fiscal policy relevant

AV

- Measuring data (D_{it}) and knowledge production (f_{it})

$$Y_{it} = f_{it}(\{K_{it}^j\}, \{L_{it}^j\}, \{M_{it}^j\}, D_{it}, \ldots)$$

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XKCD Rendition of AV

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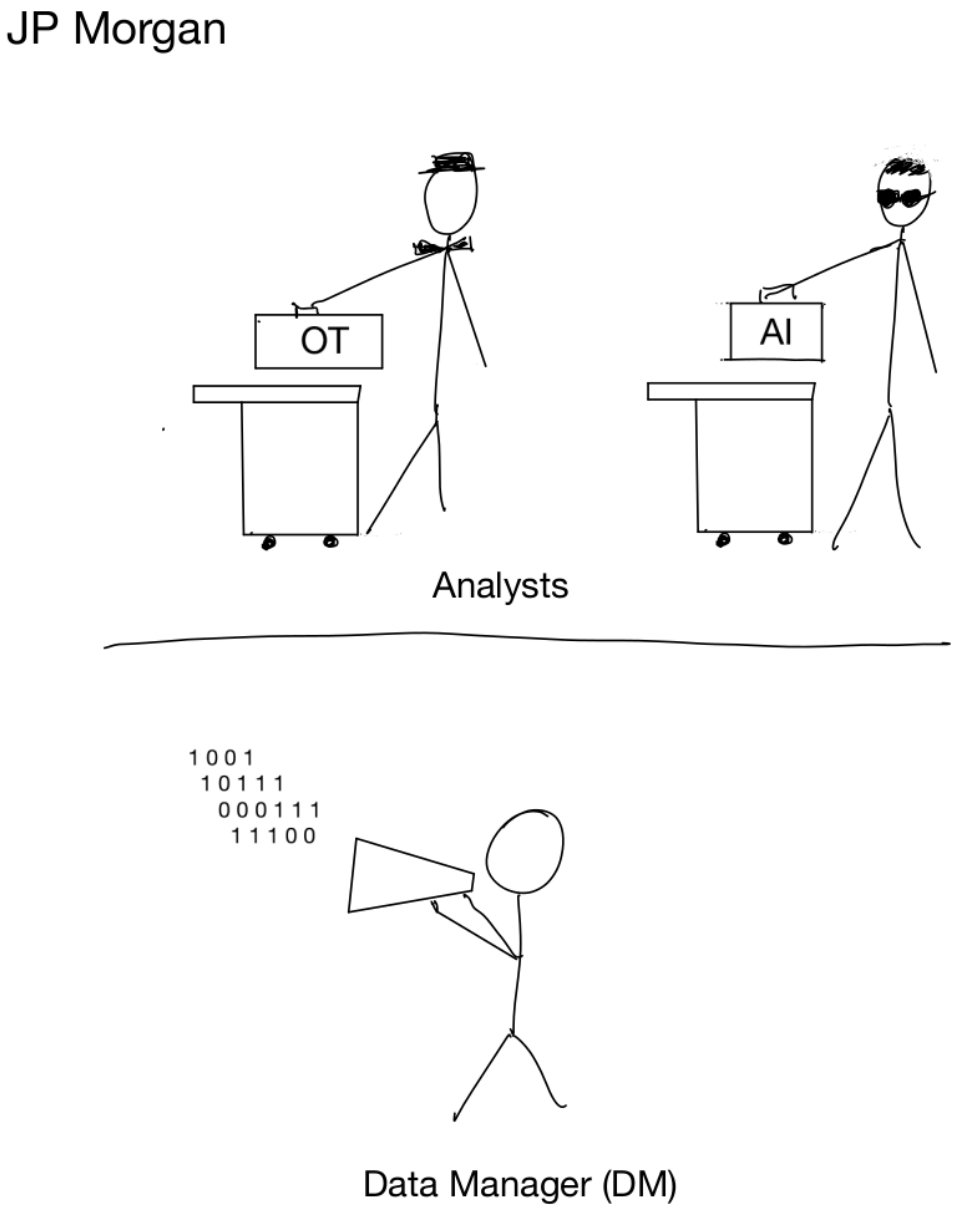
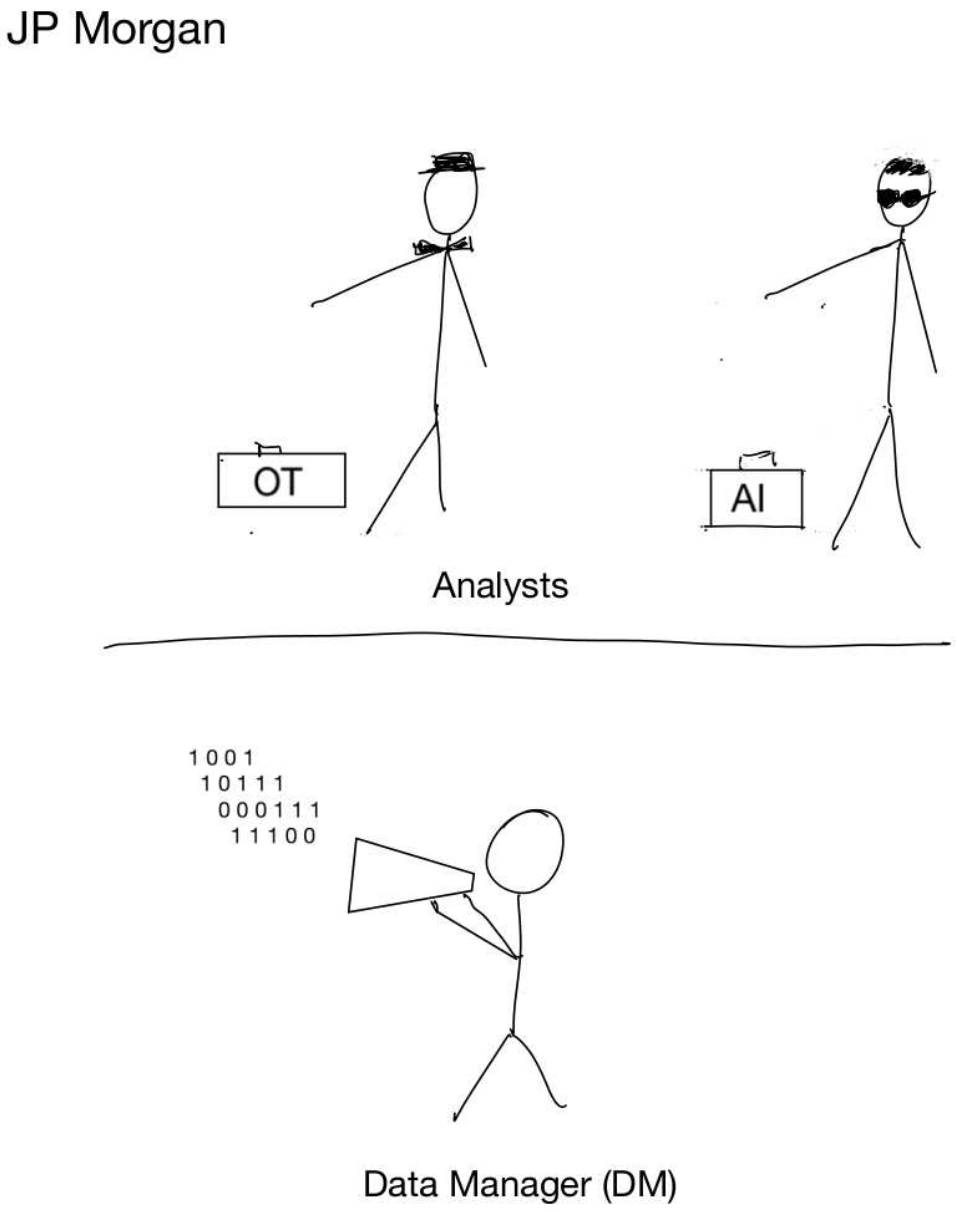


oops.. no desks



Analysts

- Two technologies in firm i:

$$Y_{it}^{OT} = A_t^{OT} D_{it}^{\gamma} (L_{it}^{OT})^{1-\gamma}$$

$$Y_{it}^{AI} = A_t^{AI} D_{it}^{\alpha} (L_{it}^{AI})^{1-\alpha}$$

- Data manager's labor produces D_{it}

- *Note*: No other inputs or differences in TFPs

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- Data manager's labor produces D_{it}
- *Claim*: $\alpha > \gamma$ suggests AI is "transformative innovation"
- What do AV do to test this?

What do AV do?

- Use Burning Glass data:
  - Skill descriptions for analysts and data managers
  - Job postings $\Rightarrow L_{it}^{j}$, $j = OT, AI, DM$
  - Wage across postings $\Rightarrow w_t^j$ (same for all i!)
- Solve problem of financial firm
  - Allocate analysts and managers to maximize profits

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- How do AV identify α, γ?

Cross-Sectional Information Not Useful

- Implication of theory:
  - w_t^j = marginal product of labor$_{it}$

$$\frac{D_{it}}{L_{it}^k} = \frac{D_{jt}}{L_{jt}^k}, \quad \text{all } i, j; k = OT, AI$$

$\Rightarrow$ No variation in cross-section

$\Rightarrow$ **Cannot identify** both TFPs and shares

- If variation observed, need new theory

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- What about time dimension?

Need Variation Over Time

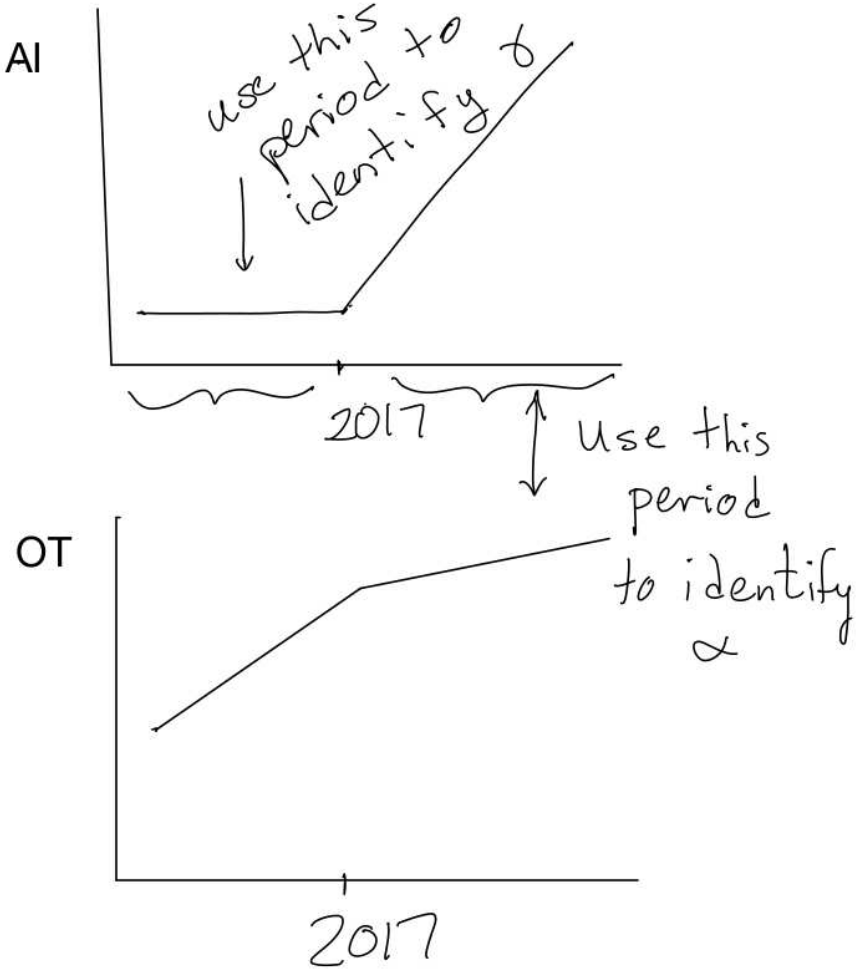
- Implication of theory:
  - Shadow price of data = marginal product of data
  - Manipulate this condition to get:

$$\Delta g(D_{it}, D_{it+1}) = \frac{\alpha}{1-\alpha}\Delta w_t^{AI} L_{it}^{AI} + \frac{\gamma}{1-\gamma}\Delta w_t^{OT} L_{it}^{OT}$$

- Suppose $D \propto$ wages for data managers

  $\Rightarrow$ Differential AI, OT earnings growth identifies α, γ

Idea Behind Identification



$$\Rightarrow \alpha > \gamma$$

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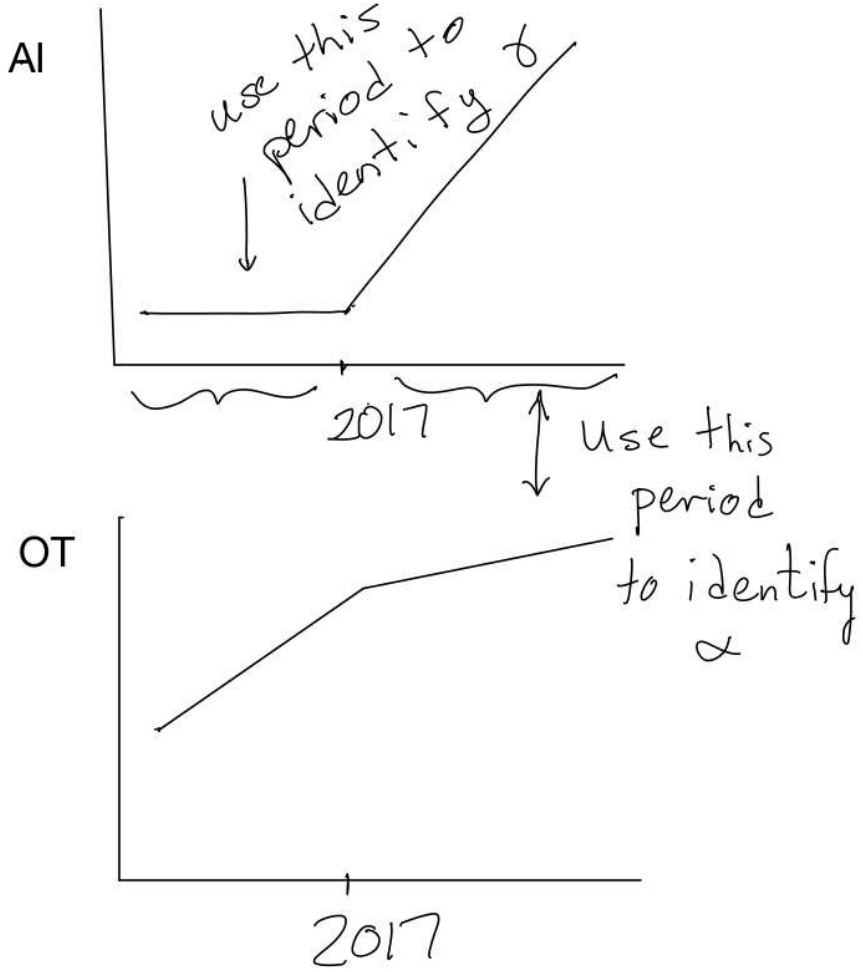
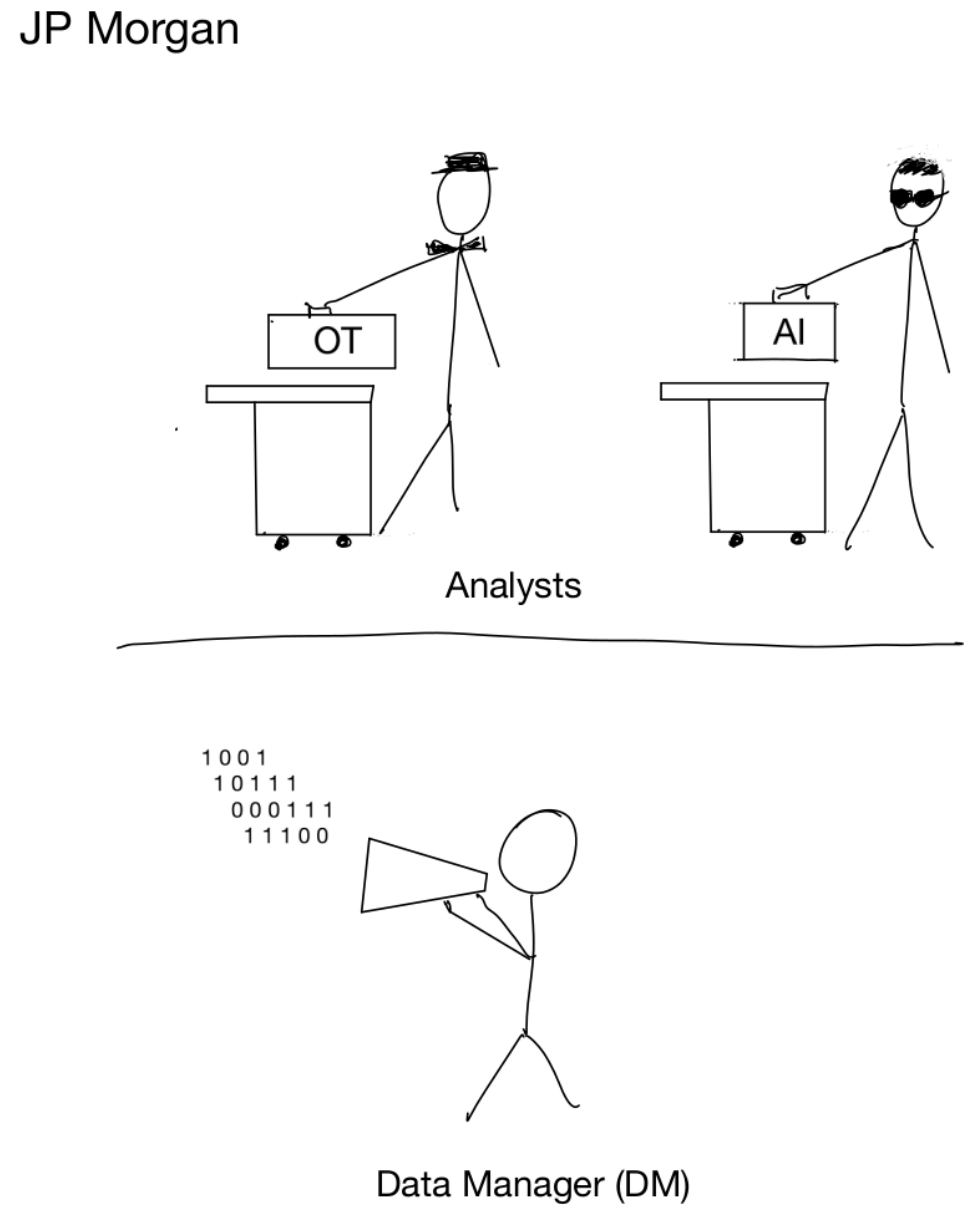


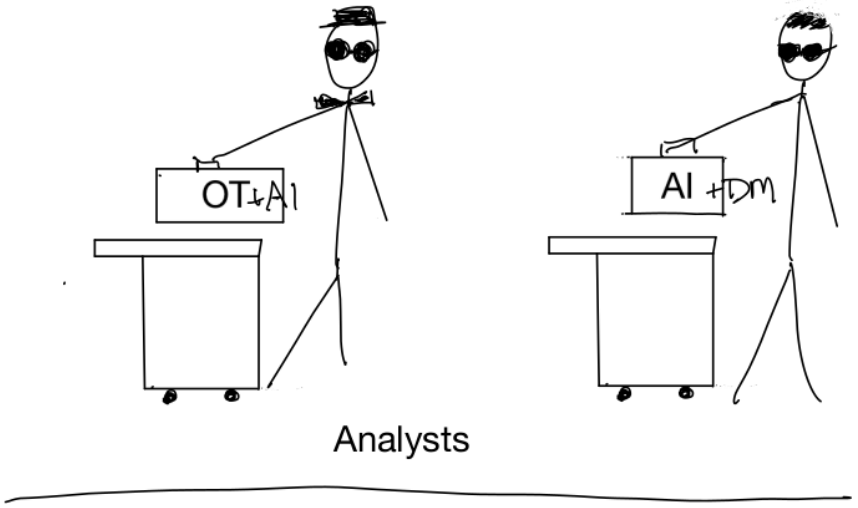
There are at least two problems here..

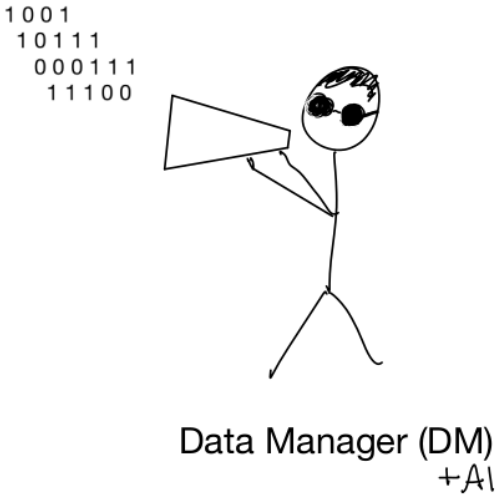
Back to XKCD


JP Morgan
OT
AI
Analysts
1001
10111
000111
11100
Data Manager (DM)

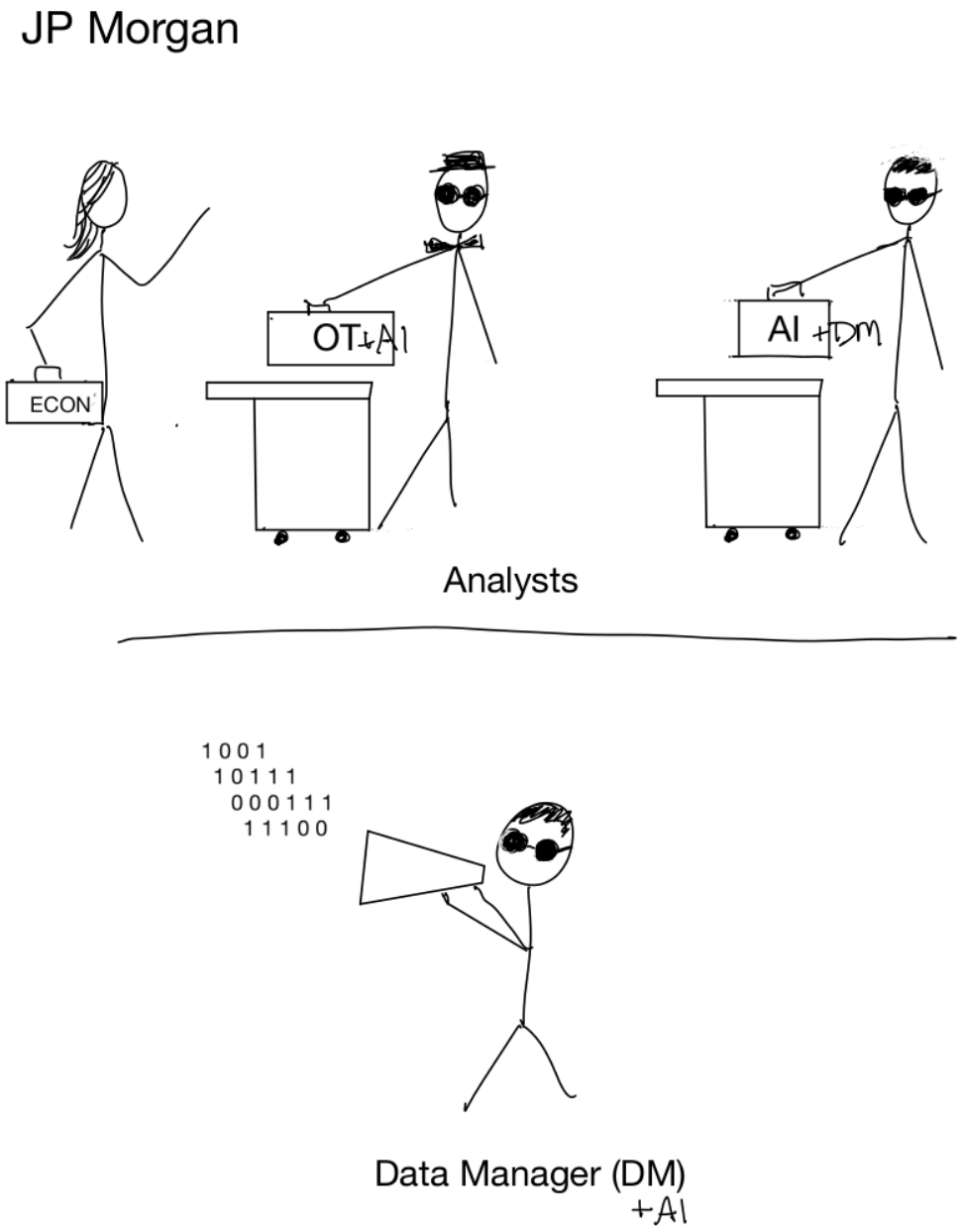
Significant Overlap of Skills

JP Morgan





Most Analysts are Neither OT nor AI



Under the Hood of Burning Glass

- Using AV's criteria for 2017, we found
  - 110+ SOC codes for OT,AI,DM
  - 92% of analysts are neither OT nor AI

$\Rightarrow$ Not obvious that distinct technologies being used

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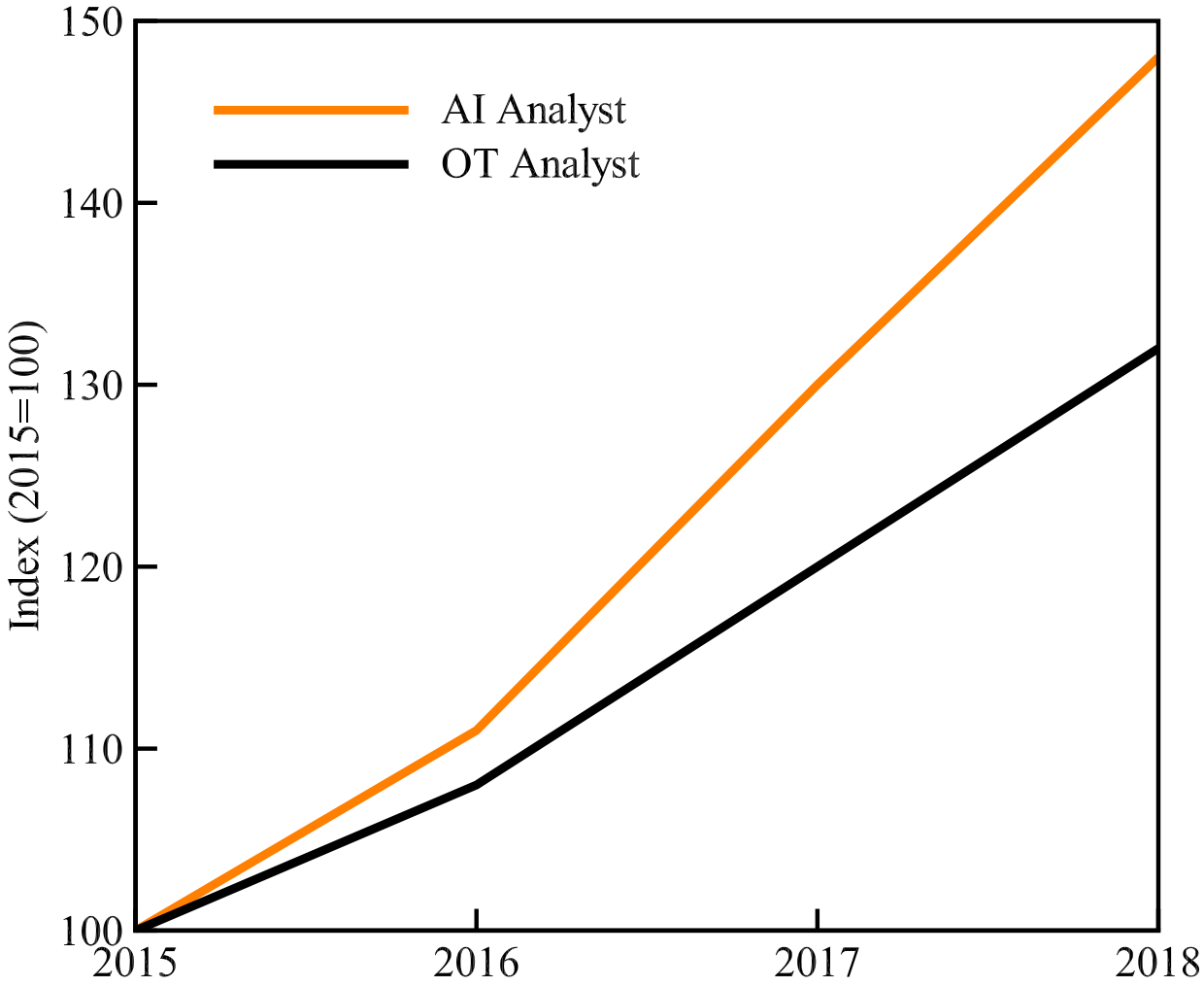
- What can we learn from BLS aggregates?

BLS Aggregates with AV Sample Weights

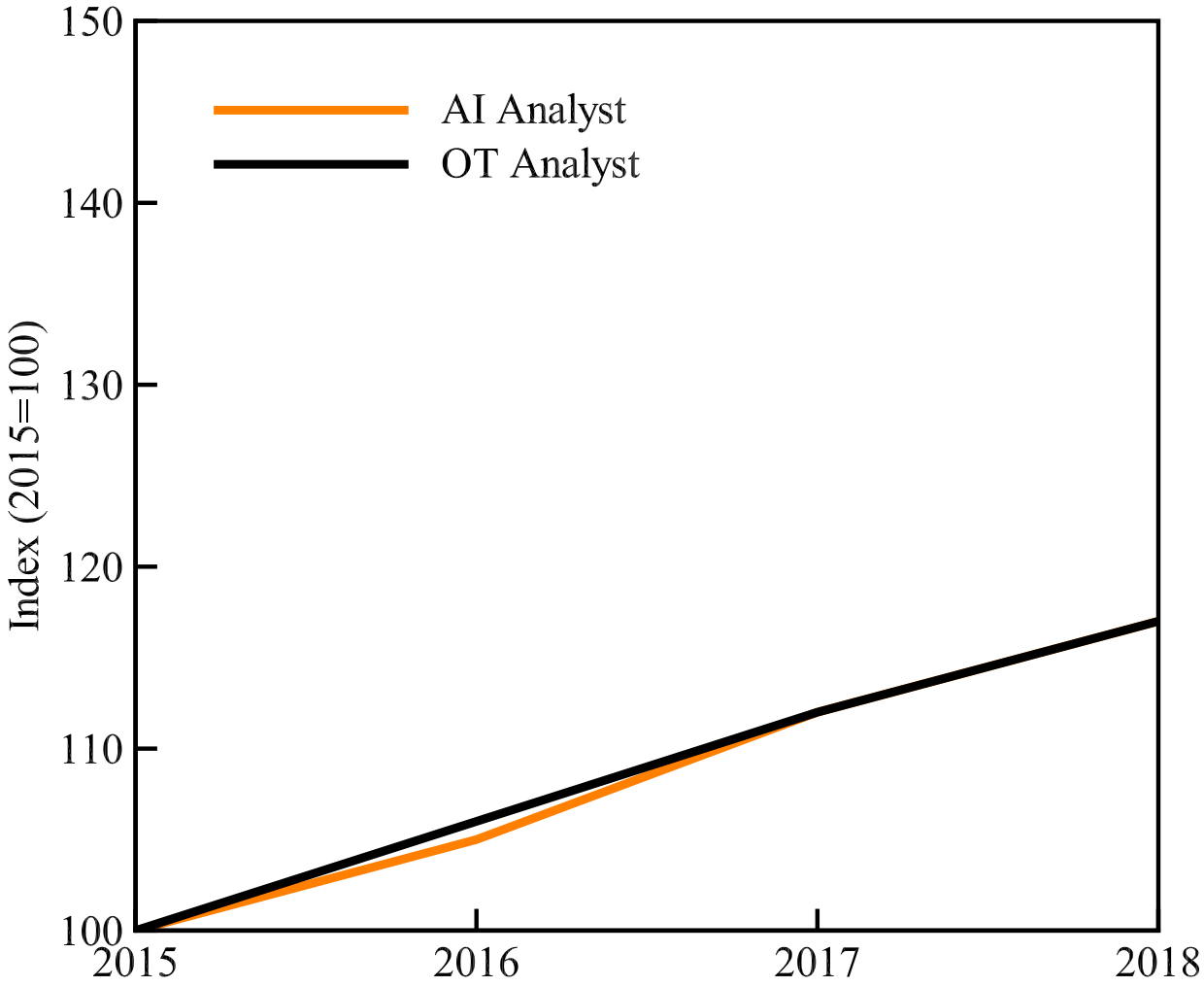
- Compute BLS earnings growth with AV
  - Industries
  - Occupation weights from Burning Glass
- With and without:
  - SOC 15-1199, Computer Occuptions, All Other

Total Earnings Growth, with 15-1199



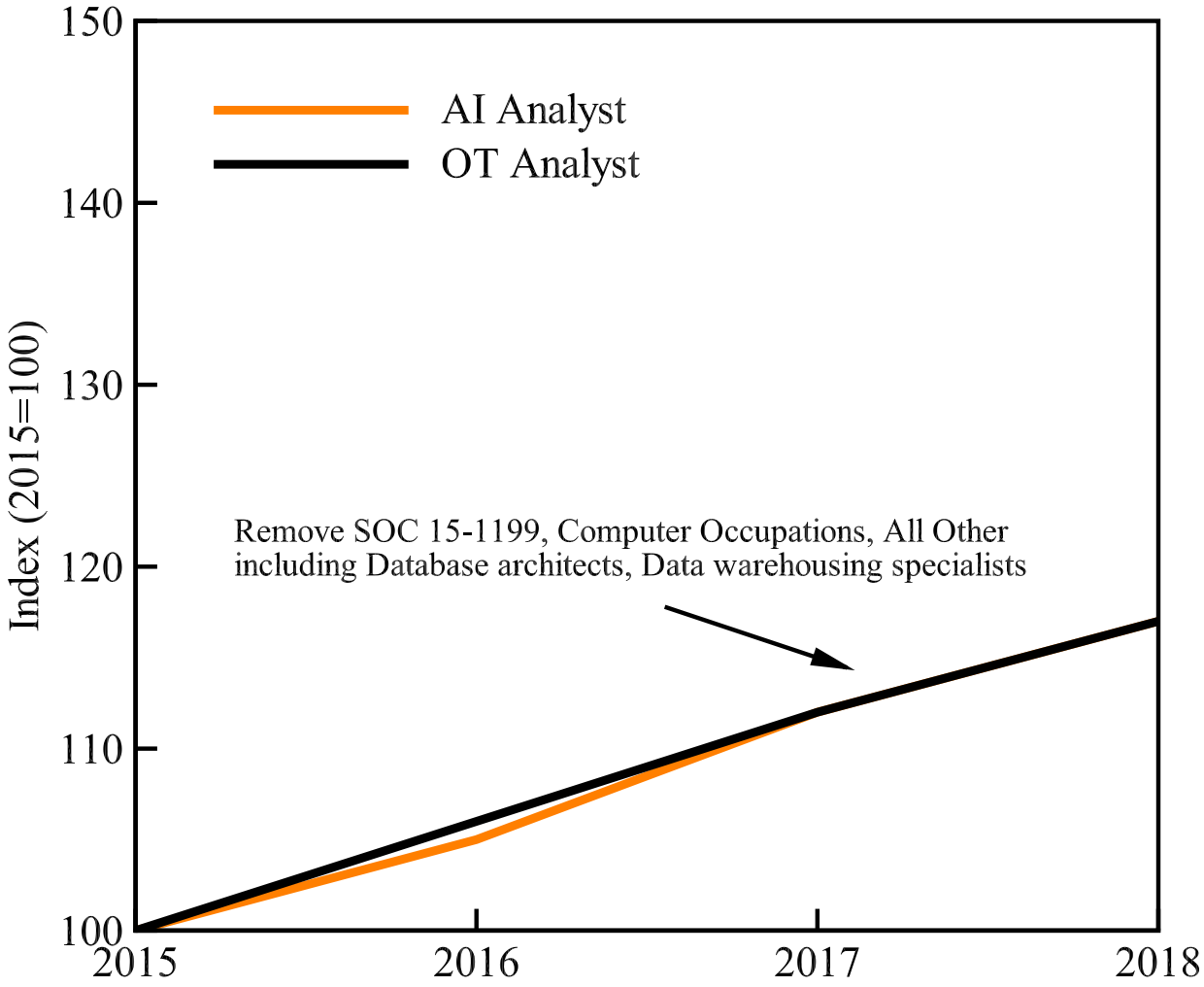
Punchline: $\alpha > \gamma$ possible

Total Earnings Growth, without 15-1199



Punchline: Results sensitive to groupings

Total Earnings Growth, without 15-1199



Punchline: AI group includes DM types

Back to Big Picture

- Good data measurement important for policy
- Need:
  - Broader scope (beyond financial services)
  - More information on production
  - Surveys like the NSF for R&D