Individual and Policy Responses to Occupational Decline

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DG ECFIN Annual Research Conference, 19 Nov 2018

Outline

250+ years of economic growth thanks to technology

Sustained growth in average living standards

- Not always shared equally within generations
- Not enjoyed by all generations equally

Structural changes (smooth?)

- Industry: decline of agriculture and manufacturing
- Occupation: decline of e.g. typists, human calculators, switchboard operators, textile machine operators

Individual experiences can be traumatic

- Plant closures

Policy responses

Market failures

- Missing insurance market: permanent shocks to specific human capital $\rightarrow$ re-training subsidies
  - If mainly general human capital, case is less strong
- Public good of forecasting occupational employment growth

Redistribution

- Skill-biased technological change $\rightarrow$ income tax
- Capital-biased technological change $\rightarrow$ wage subsidies, BIG, asset redistribution

Should governments act preemptively? (E.g. changes to school curriculum, fields of study capacity)

This presentation

1. New evidence on individual-level adjustment to **occupational decline**
   - Study Swedish workers who in 1985 started out in occupations that subsequently declined sharply
   - Earnings losses are mild on average, but substantial for low-wage (within-occupation) workers
   - Re-training programs mainly used by those with largest losses
2. Thoughts on **forecasting occupational employment growth**
   - "This time is different" type arguments hard to evaluate almost by construction
   - Existing approaches to forecasting
   - A suggestion for doing even better

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Occupational decline in Sweden

Work in progress with Edin, Evans, Hernnäs, & Michaels

Identify sharply declining occupations

Collect predictors of occupational employment growth, including from BLS $\rightarrow$ 'surprise' declines

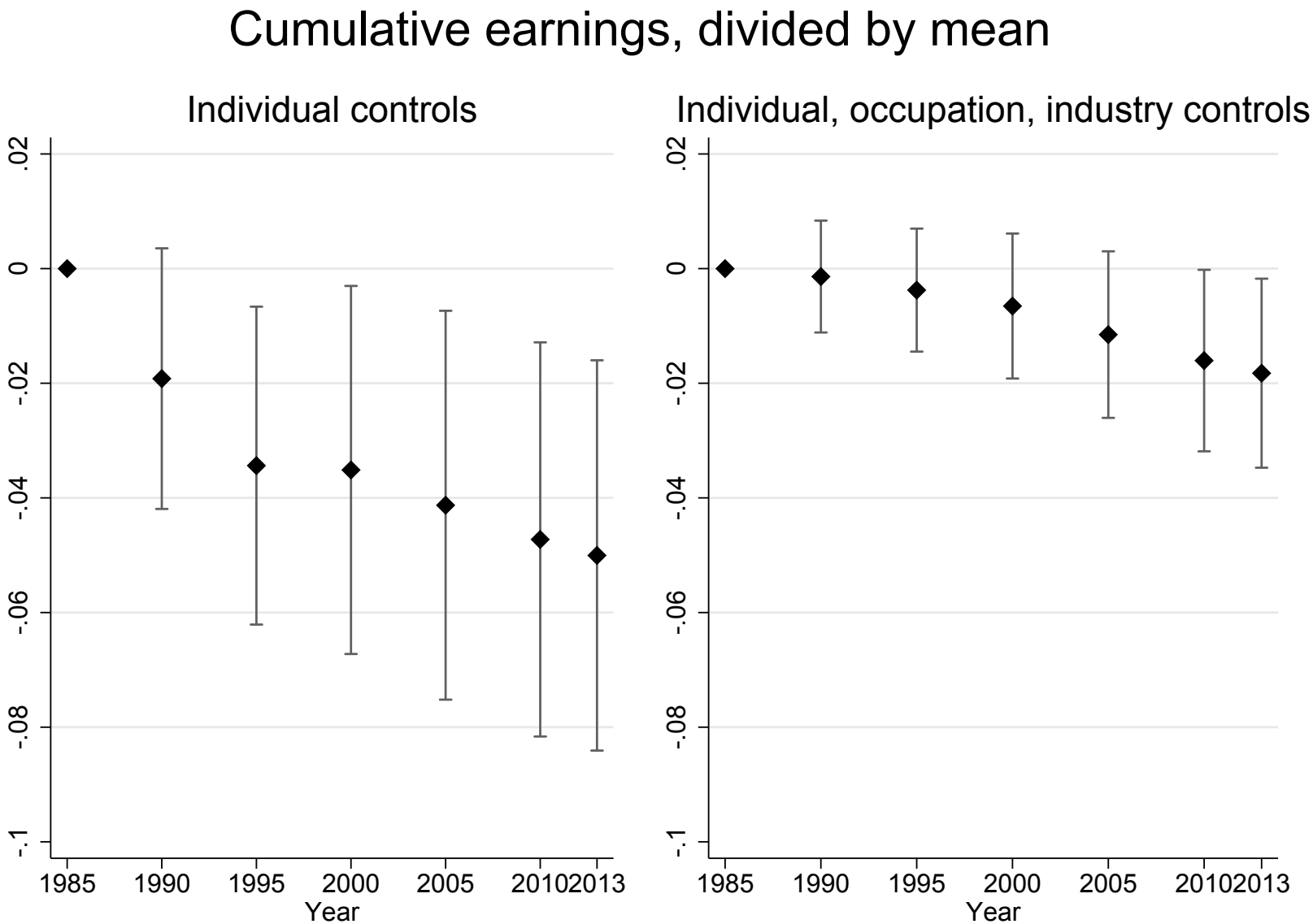
Follow population of Swedish workers 1985-2013

Research question How do the careers of workers starting out (1985) in a subsequently declining occupation differ from those of similar workers in non-declining occupations?

Occupational decline in Sweden: findings

1. When comparing similar workers, find moderate losses—**5 percent of mean cumulative earnings**
2. When comparing observationally similar workers in similar occupations, see small losses—**2 percent of mean cumulative earnings**
3. Workers in declining occupations are less likely to remain
4. Middle-aged workers (in 1985) in declining occupations retire slightly earlier (zero difference for older workers)
5. **Heterogeneity:** workers in bottom third (within occupation) do suffer—lose **8 percent of mean earnings**
6. Higher incidence of unemployment & re-training for low-rank workers

Diverging earnings of workers starting out in subsequently declining occupations



Occupational decline in Sweden: adjustment mechanisms

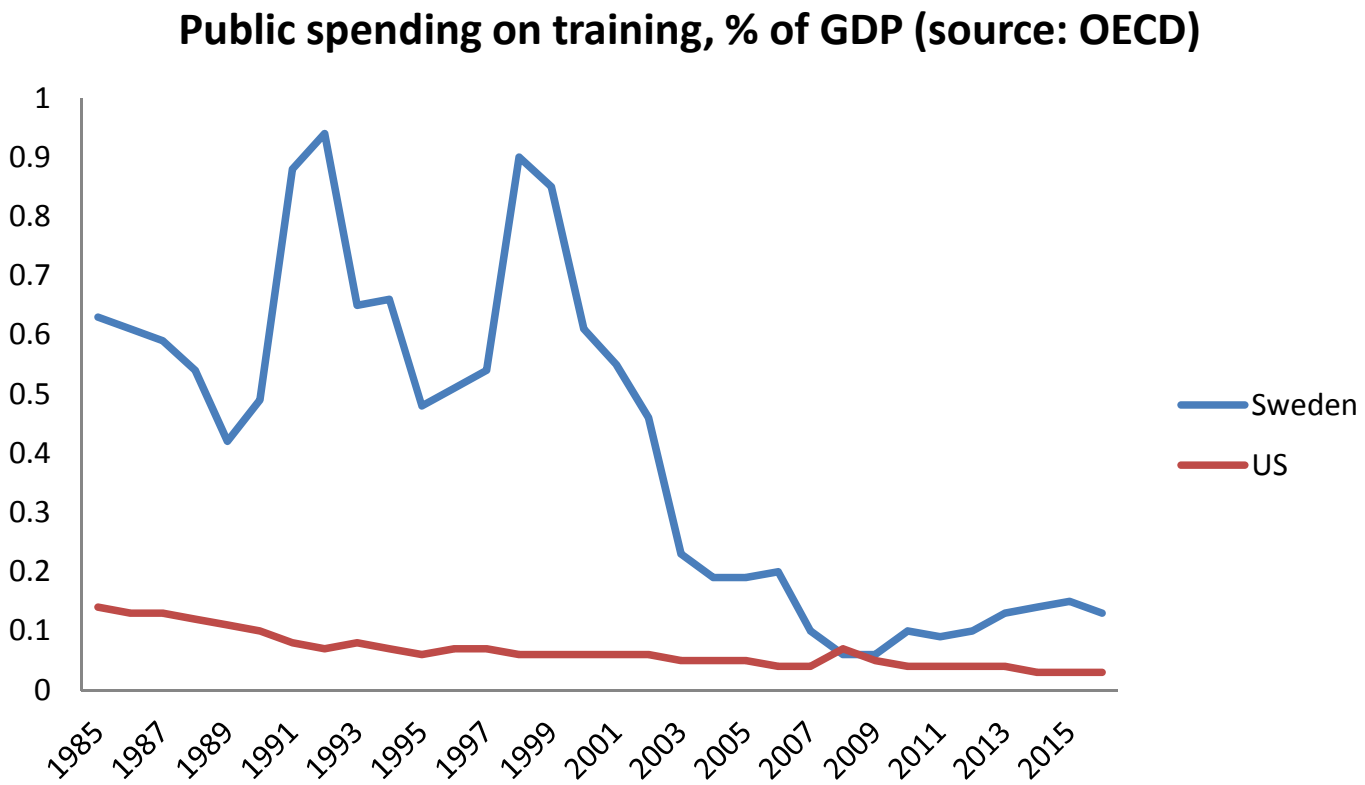
We identify a large occupational demand shock—occupations that declined by 25 percent or more

Reduced likelihood of staying in the initial occupation is one particular adjustment mechanism—but notice that mobility is high across all occupations, anyway

Reduced inflow into declining occupations also important—as is common with gradual changes

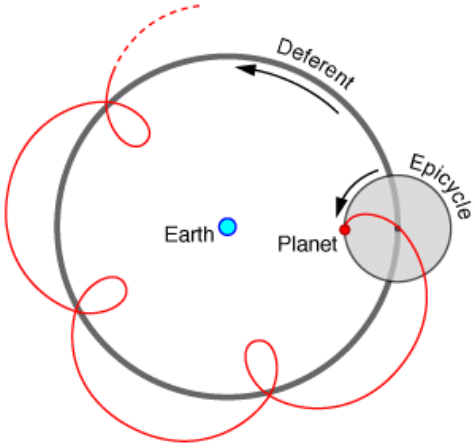
Public spending on training was high in the 1990s and early 2000s, but that does not explain that losses are mild on average

Public spending on training: Sweden and US

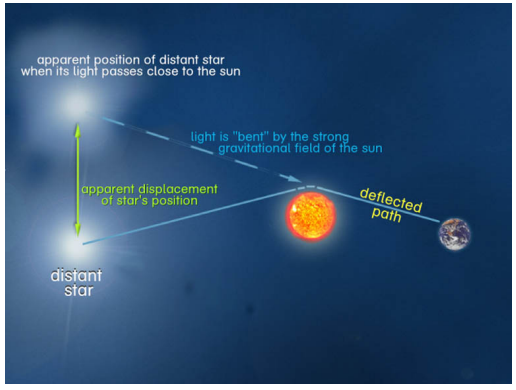


Outline

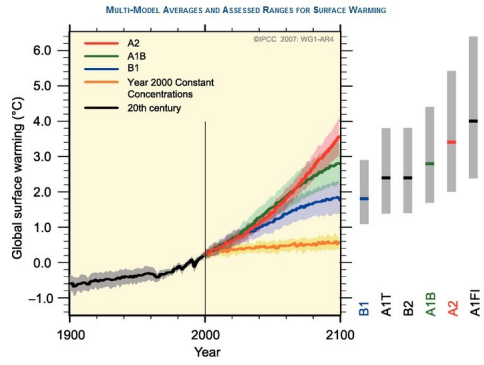
Different types of forecasting problems



Accurate predictions despite wrong theory



Accurate predictions only because of theory



Somewhat accurate predictions, tough challenges to theory (feedback, non-linearity)

Forecasting occupational employment growth may yet be a different problem

Forecasting technological change

Amara's law

We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run.

Unknown (?)

Human-level AI is always about 20 years away.

[A convenient prediction to make—work on something that is relevant, not likely to soon be proven false]

Predictions about human-level AI

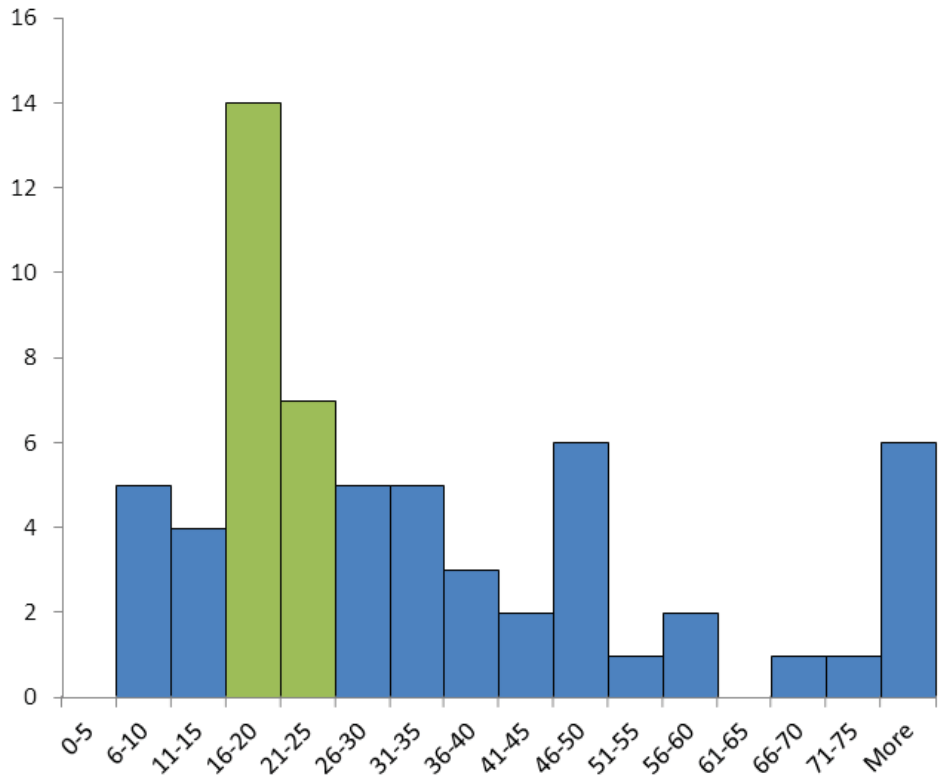


Figure 3: Time between the arrival of AI and the date the prediction was made, for expert predictors.

Source: Armstrong & Sotala, 2012

Existing approaches to forecasting occupational employment growth

BLS outlook

- Produced every two years for hundreds of occupations
- Tries to take into account demographics, consumer demand, input-output, trade, technology
- Much predictive power even at longer horizons

Frey & Osborne (2017), and followers

- Consulted engineers to identify frontier of automation, bottlenecks
- Feasibility of automation does not imply an occupation's decline, but methodology can be adapted (Arntz et al. 2017)

Any guidance from economic theory?

Discover some fundamental mechanism $\rightarrow$ not only match past data, but also obtain accurate out-of-sample predictions

Very hard (impossible?) in the social sciences, but give it a try anyway. Models of task-biased technological change

- Economic mechanism to explain balanced long-run growth in the presence of automation
- Economic mechanism to explain decline in middle-wage jobs

Economic model of automation and balanced growth

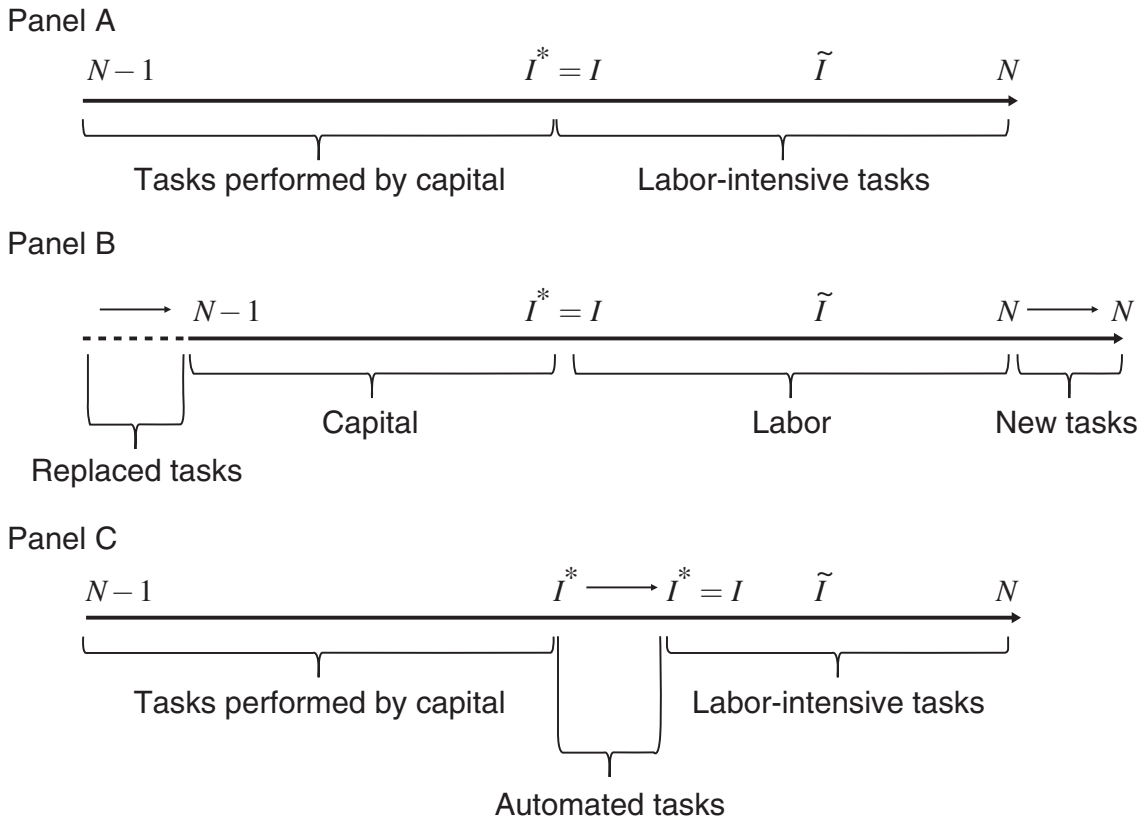
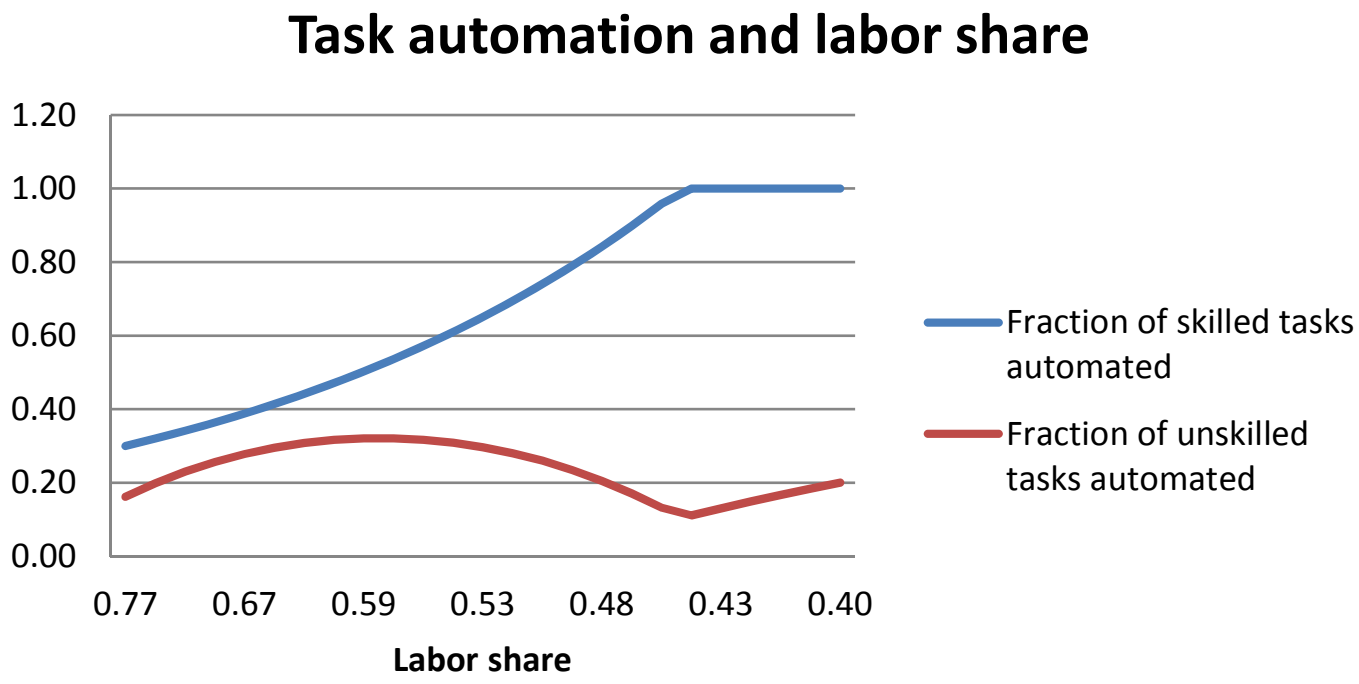


FIGURE 2. THE TASK SPACE AND A REPRESENTATION OF THE EFFECT OF INTRODUCING NEW TASKS (*Panel B*) AND AUTOMATING EXISTING TASKS (*Panel C*)

Source: Acemoglu & Restrepo, 2018

Economic model of automation and job polarization



Based on Feng & Graetz, 2018

Is this time different?

If so, some existing methods will fail (BLS predicts taxi drivers' employment will grow as fast as average over next ten years—no mention of driverless cars)

Frey & Osborne approach more robust? Correlation with BLS forecast is 0.46

Economic theory emphasizes adoption incentives and new tasks, not a break with past patterns

If want to argue this time is different, would be helpful to provide model, and make explicit auxiliary predictions with shorter horizon (e.g. business dynamism seems to be declining)

A new source of forecasts: prediction markets

Take a contract that pays 1 Euro if some specified event E occurs. Under risk neutrality, price reveals market expectation of probability of E. For instance

- "Employment of bartenders grows by 2 percent 2016-2026" (BLS prediction)

With family of contracts, can trace out distribution (alternative contract types: index, spread)

Many practical issues to be specified (data authority, merging of occupation codes...), may be addressed by auxiliary contracts

Prediction markets—strengths & limitations

Strengths

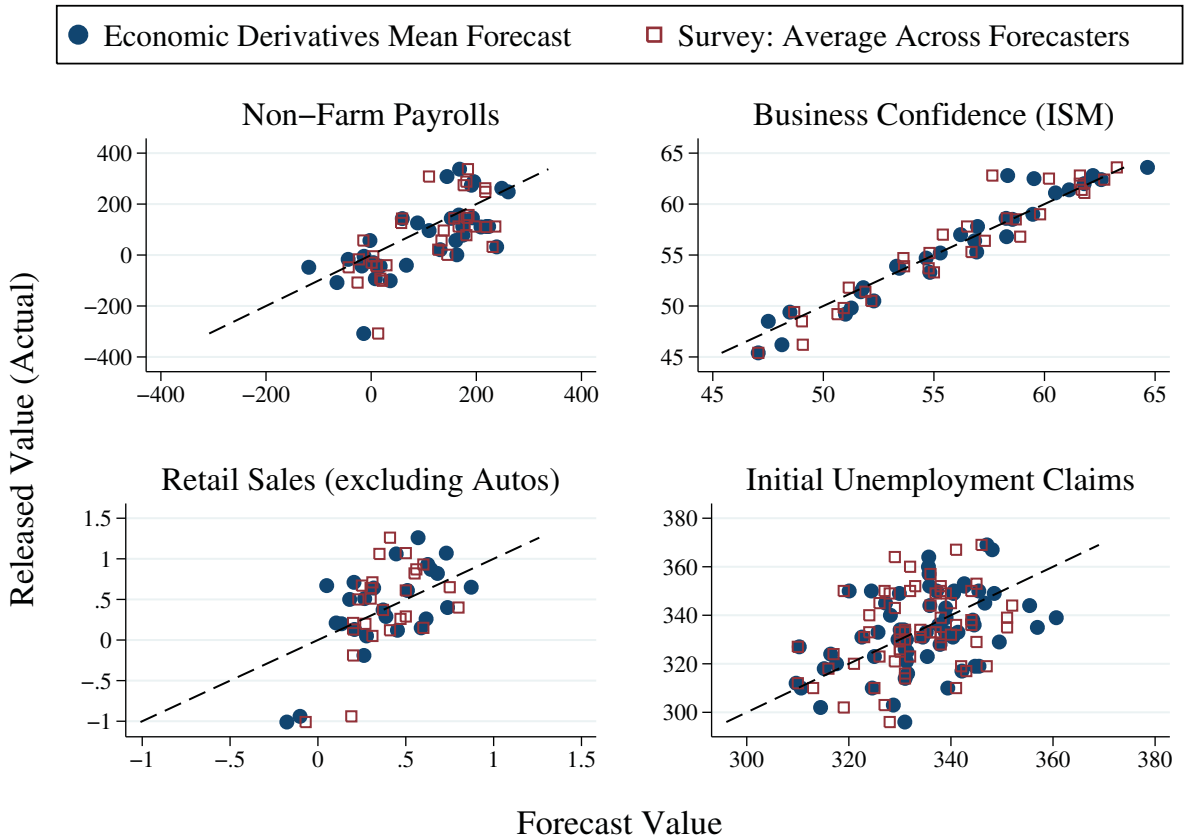
- They aggregate information—not so clear how to do this otherwise (different sources, methods: BLS, FO, theory)
- Incentives for truthful revelation of beliefs
- In practice broadly efficient, hard to manipulate

Limitations

- Can be insufficiently liquid (how to attract traders, especially for long-term contracts?)
- Contracts may be hard to understand, markets may be dominated by insiders (not major issues here)
- If prediction markets are so great, why not more common?

Example of a successful prediction market

Figure 5: Macro derivatives are weakly more accurate than survey forecasts.



Source: Snowberg, Wolfers, & Zitzewitz, 2012

Conclusion

Technological change in the past has not benefitted everyone

- Swedish evidence: Losses appear to be modest for those worst-affected by occupational decline (welfare state?)
- Adjustment mechanisms often decentralized (occupation switching)

Is this time different and is much preemptive action therefore required?

- Hard to say
- Prediction markets can help, and governments can encourage their creation