BANK OF ENGLAND

The UK Labour Market

Society of Business Economists

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Outline

1. **Low wage growth and (very) low unemployment**
   - Aggregate Phillips curves
   - Micro-level wage data
2. **Matching in the labour market**
   - Introduce the idea of a matching function and its empirical properties
   - Explore the labour market flows data

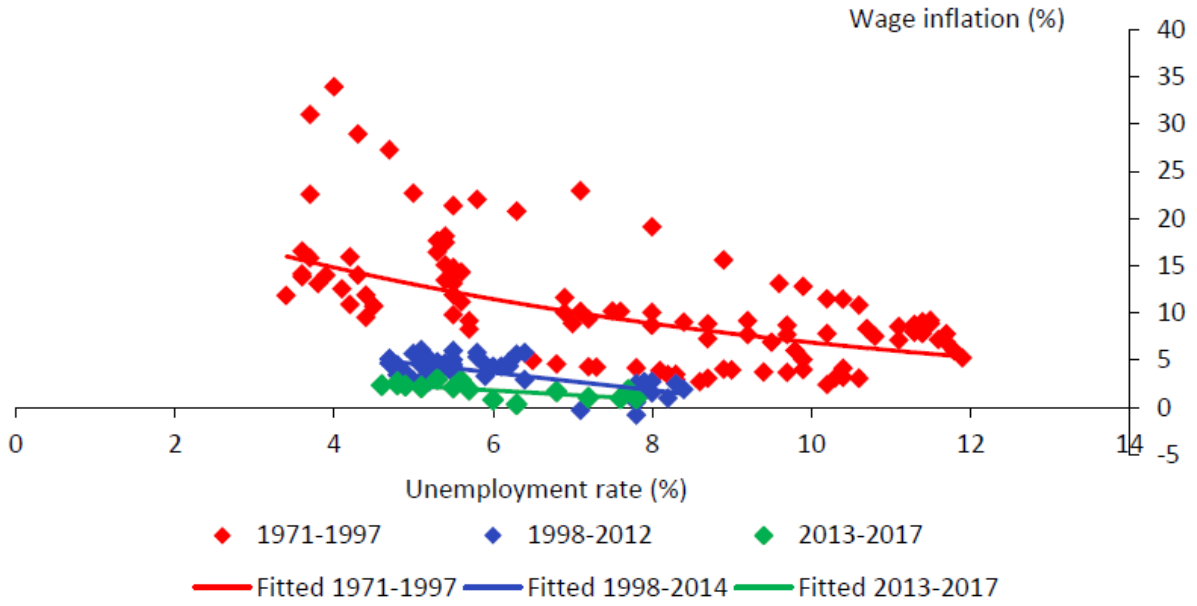
The Phillips curve

Fig.1. 1861 – 1913

Source: Phillips (1958)

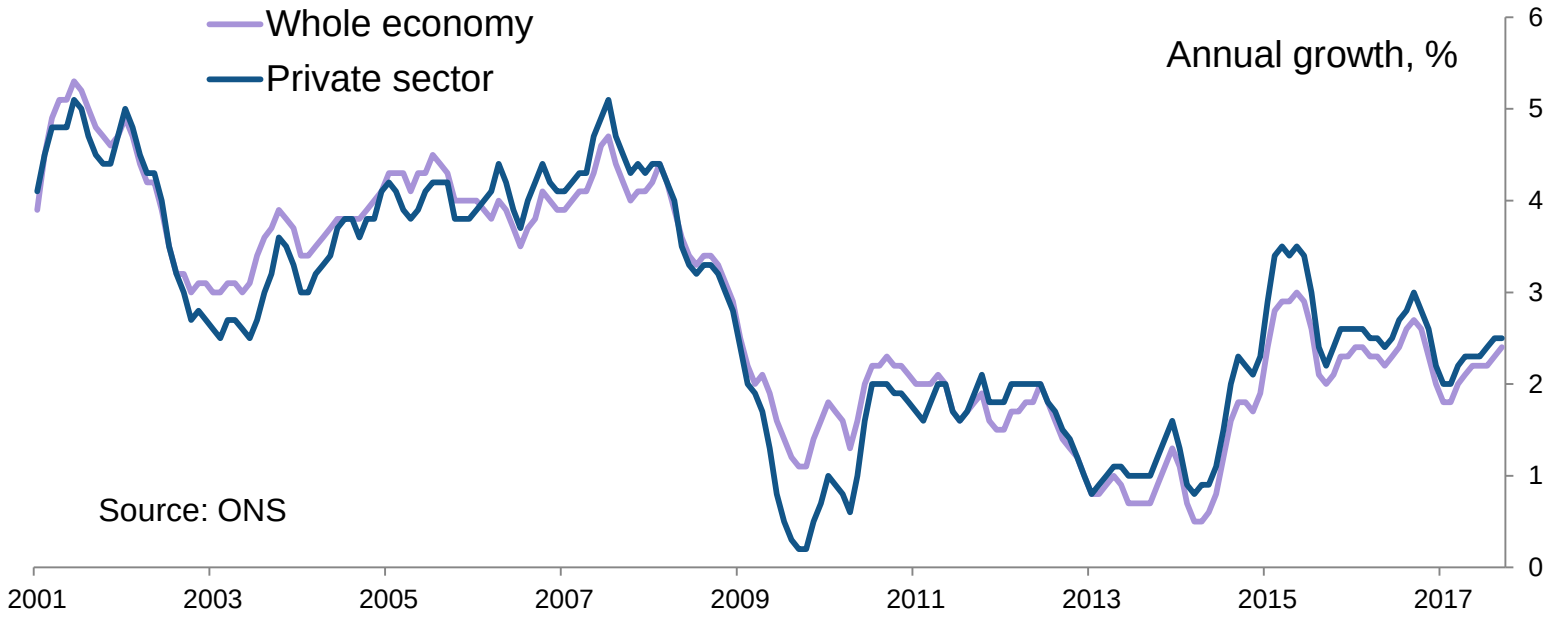
- Phillips (1958) curve related wage growth to unemployment.
- Nowadays “Phillips curve” refers to a generic relation between inflation and activity.
- Other aspects of original work de-emphasised in much of subsequent literature, e.g. non-linearity and ‘loops’.
- Original curve displayed more stability than subsequent data.

The Phillips curve over recent decades

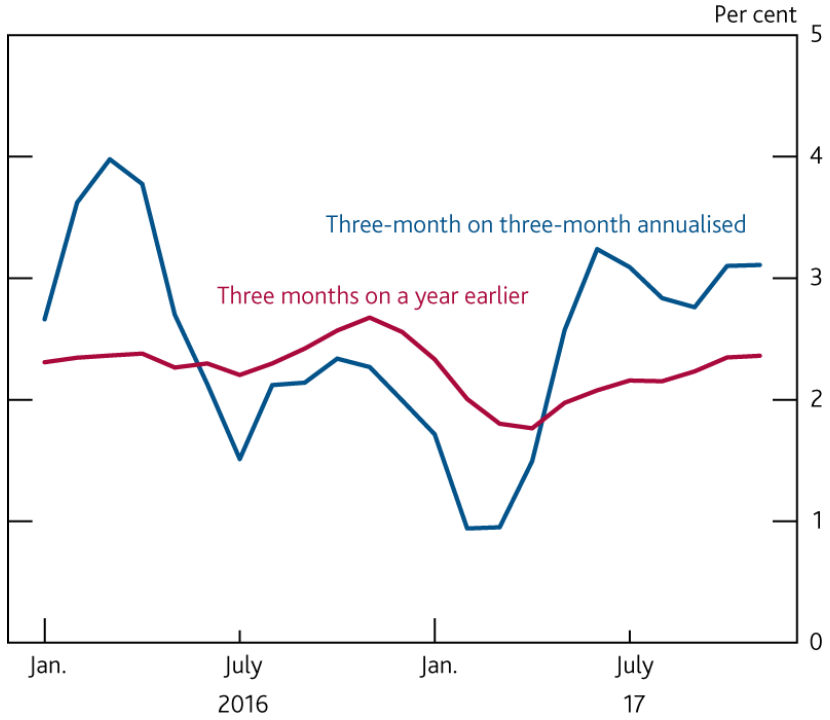


Source: Haldane (2017)

Nominal wage growth over the recession

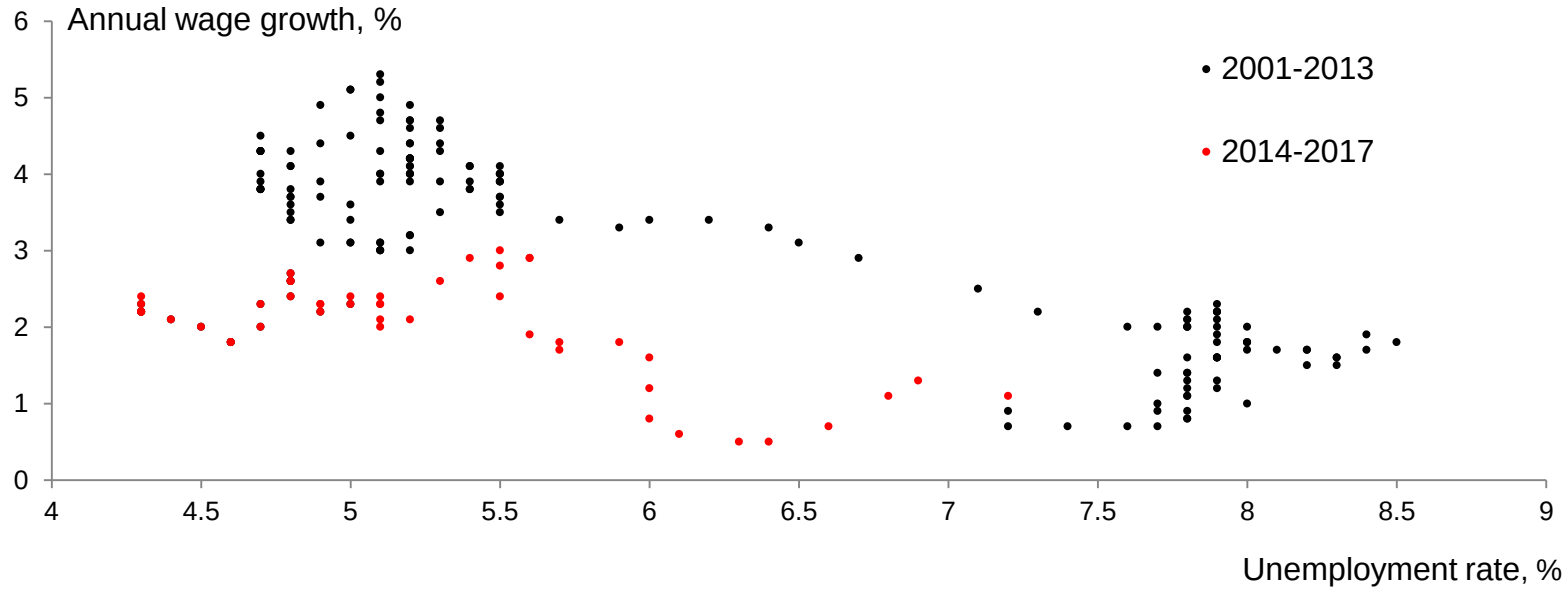


Pay growth has picked up in recent months, but not strongly



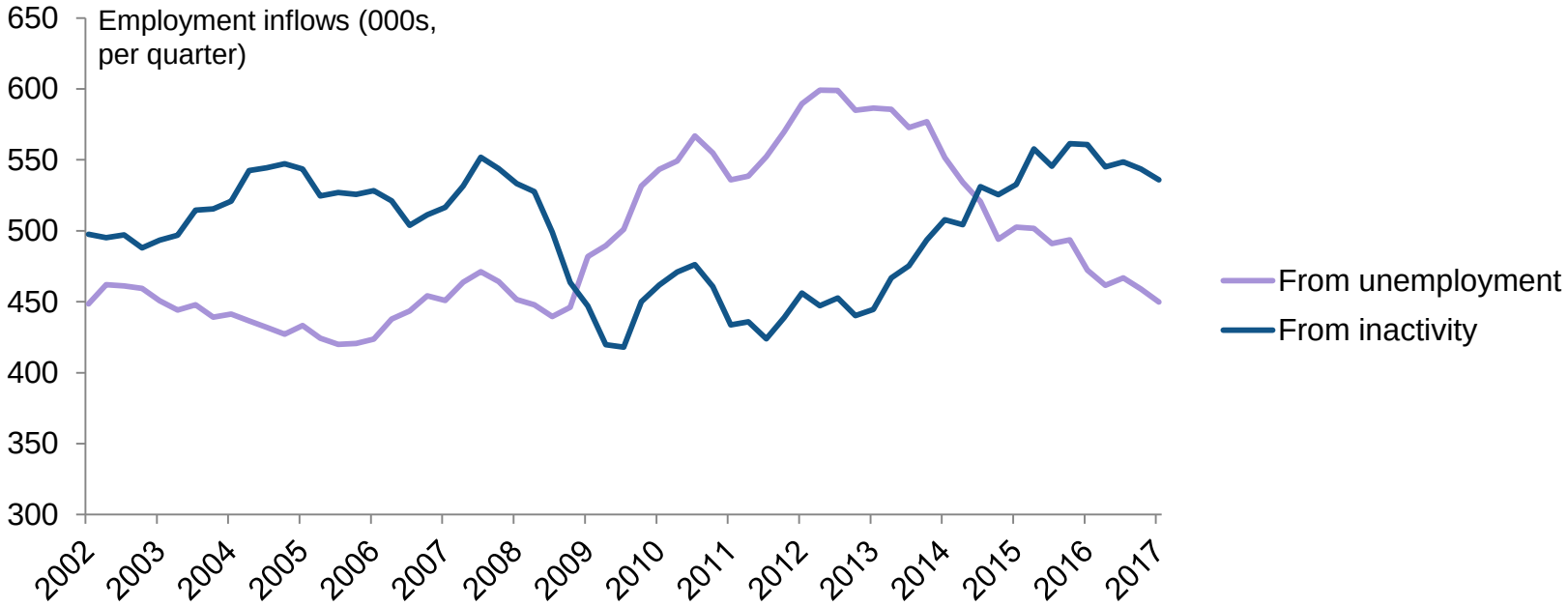
Source: BoE Inflation Report, Feb 2018

Low wage growth and low unemployment



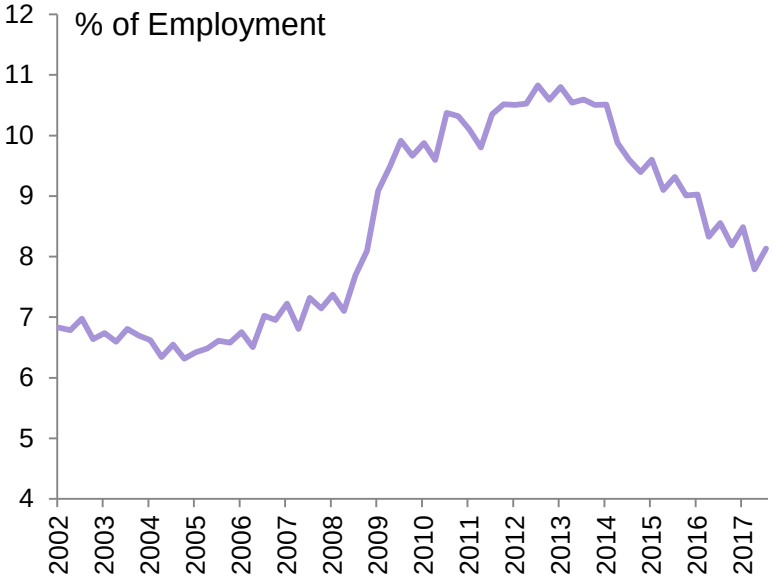
Source: ONS

Is unemployment the right measure of slack?



Broader measures of slack

Underemployment rate



Source: ONS

Marginal attachment ratio

Is the Phillips curve alive and well?

- Or does it "*escape observation, elude clear definition and jump around a lot*"?—Solow.
- Most recent debate on the 'missing disinflation' post 2008 in the US.
  - Conditional on observed labour market outturns, standard PC models predicted much lower inflation than actually happened.
- Popular explanations:
  (i) Better anchored inflation expectations (Bernanke, 2010) and
  (ii) Short-term unemployment more relevant (Krueger et al., 2014).
- Question for researchers: is the Phillips curve robust/stable *enough* to be useful for policy and understanding the labour market?

A parsimonious model

- Reduced form model of wage inflation based on '**triangle model**' of Gordon (1997).
  - Gordon (2013) argues that it is (remarkably) stable, no need for 'patchwork solutions'.
- Inflation is a function of its own inertia, demand and supply:

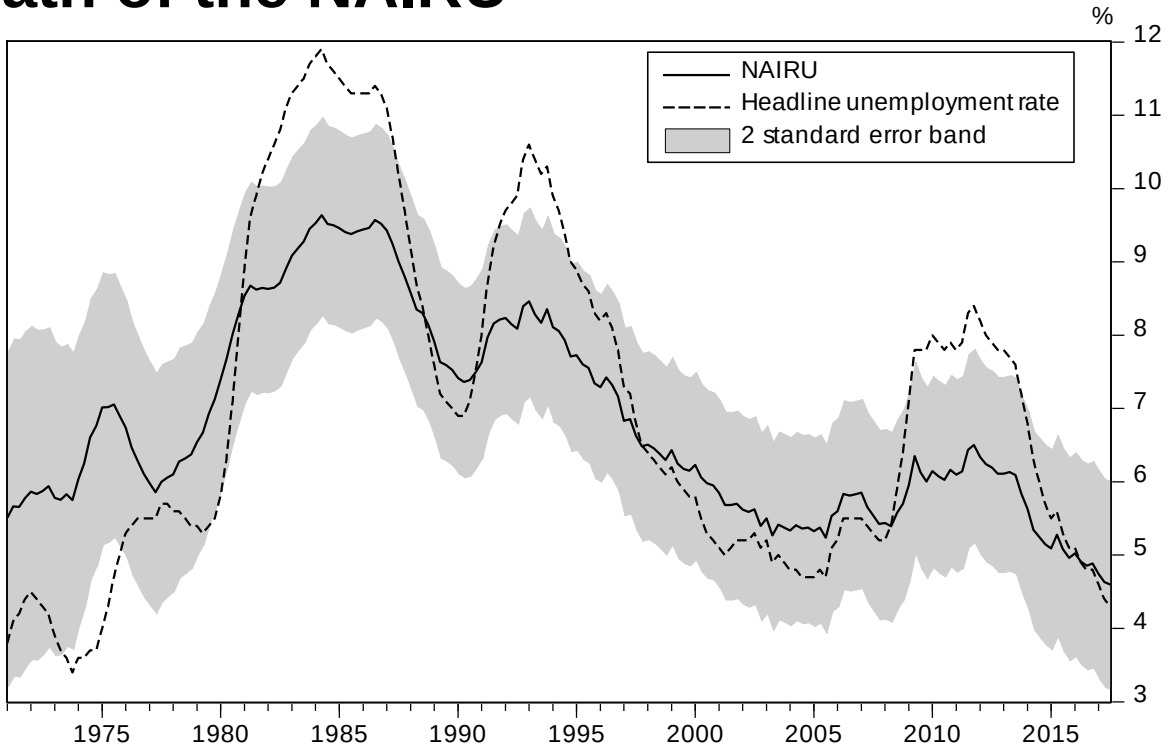
$$\pi_t = a(L)\pi_{t-1} + b(L)(u_t - \bar{u}_t) + c(L)z_t + \varepsilon_t$$

- π_t → inflation, $u_t - \bar{u}_t$ → unemployment gap and z_t → vector of supply controls; a, b and c are lag polynomials. ε_t is normally distributed.
- Constraining a to sum to 1, then $\bar{u}_t$ is the unobservable non-accelerating (wage) inflation rate of unemployment.

Estimating the NAIRU

- Standard application of Kalman filter to estimate $\bar{u}_t$.
- NAIRU law of motion typically approximated by a random walk: $\bar{u}_t = \bar{u}_{t-1} + \mu_t$, where μ_t is a Gaussian disturbance.
- Signal equation → $\pi_t = a(L)\pi_{t-1} + b(L)(u_t - \bar{u}_t) + c(L)z_t + \varepsilon_t$
- State equation → $\bar{u}_t = \bar{u}_{t-1} + \mu_t$
- Key challenge is to estimate the variance of the error term μ_t → "the smoothness problem"
- When the true variance of μ_t is low, ML estimates biased downwards (Stock and Watson, 1998 JASA).
- Practical solution? Calibrate according to a "smoothness prior" which rules out sharp quarter-on-quarter movements in the NAIRU (Gordon, 1997).

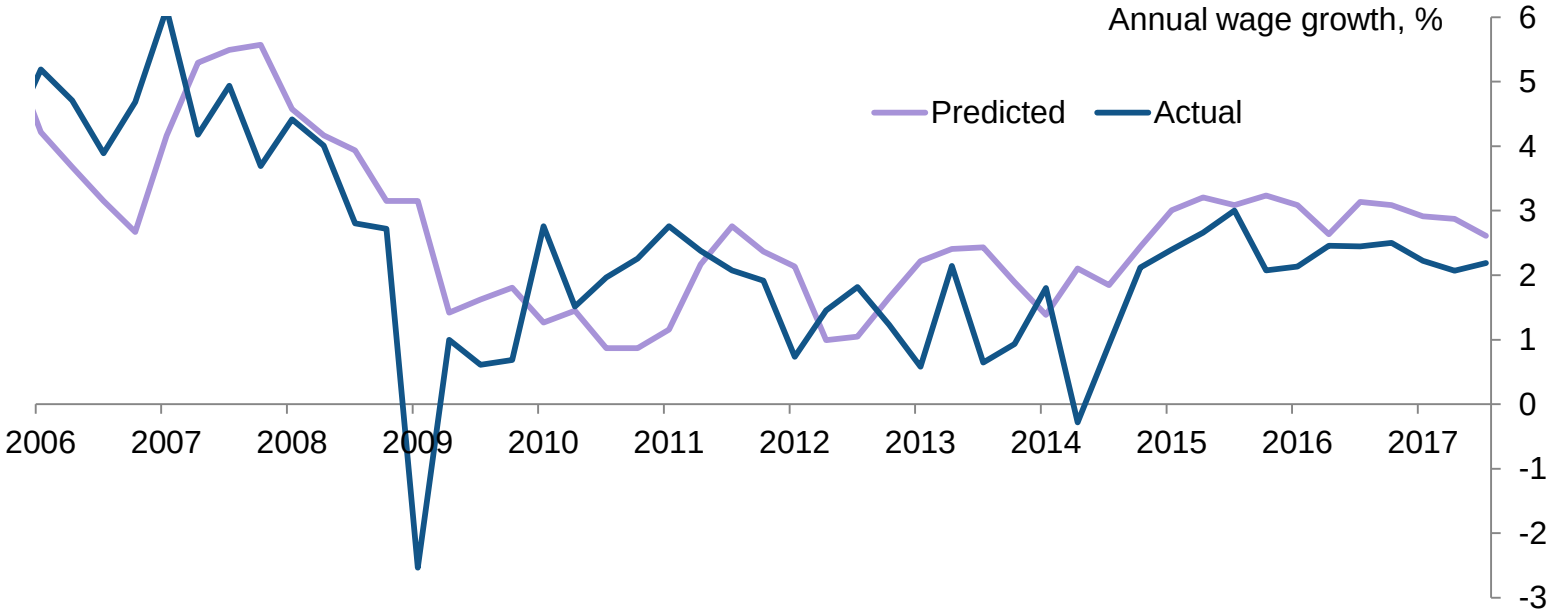
Time path of the NAIRU



Why might the NAIRU have fallen?

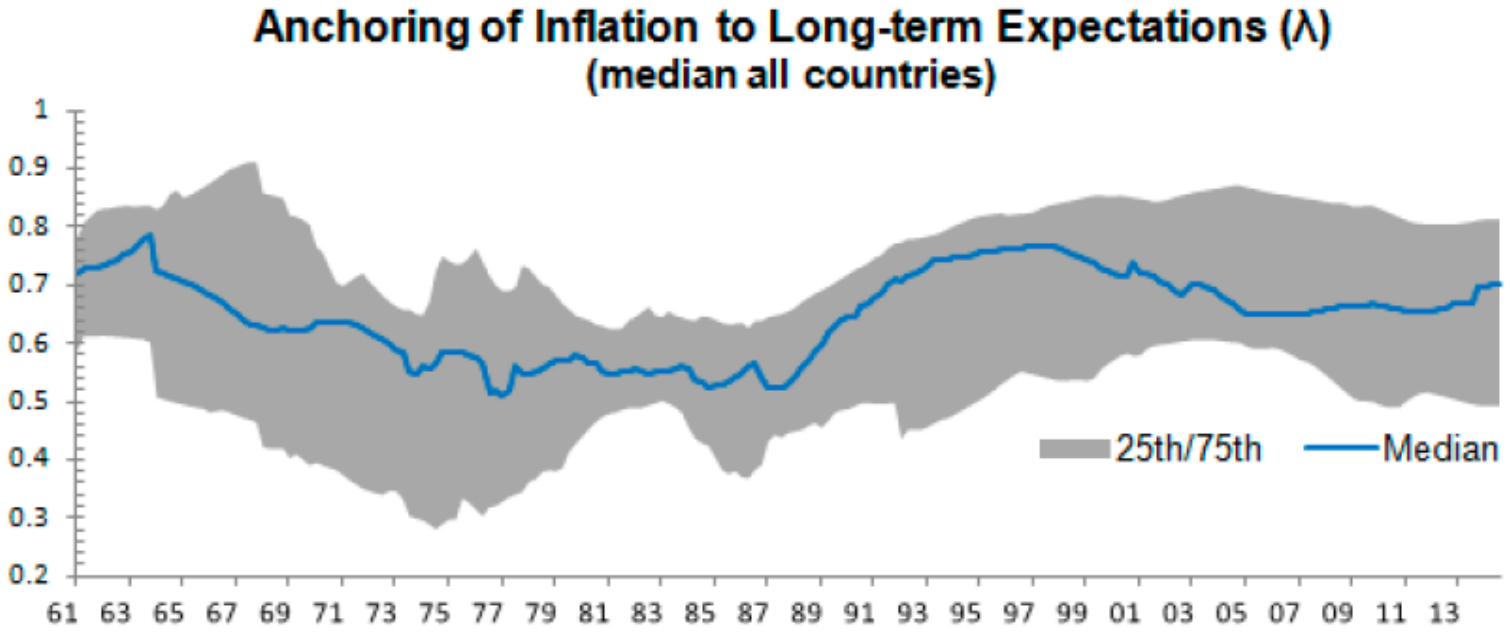
- Explanations commonly put forward:
  - Rises in unconventional work arrangements: a more fragmented labour force with weaker bargaining power
  - Increased educational attainment
  - More global labour market with foreign job seekers
  - Tighter job search requirements for benefit recipients
- Does the timing work? Fall in the NAIRU would have to be recent to explain failure of wages to respond since 2014.

Wage predictions

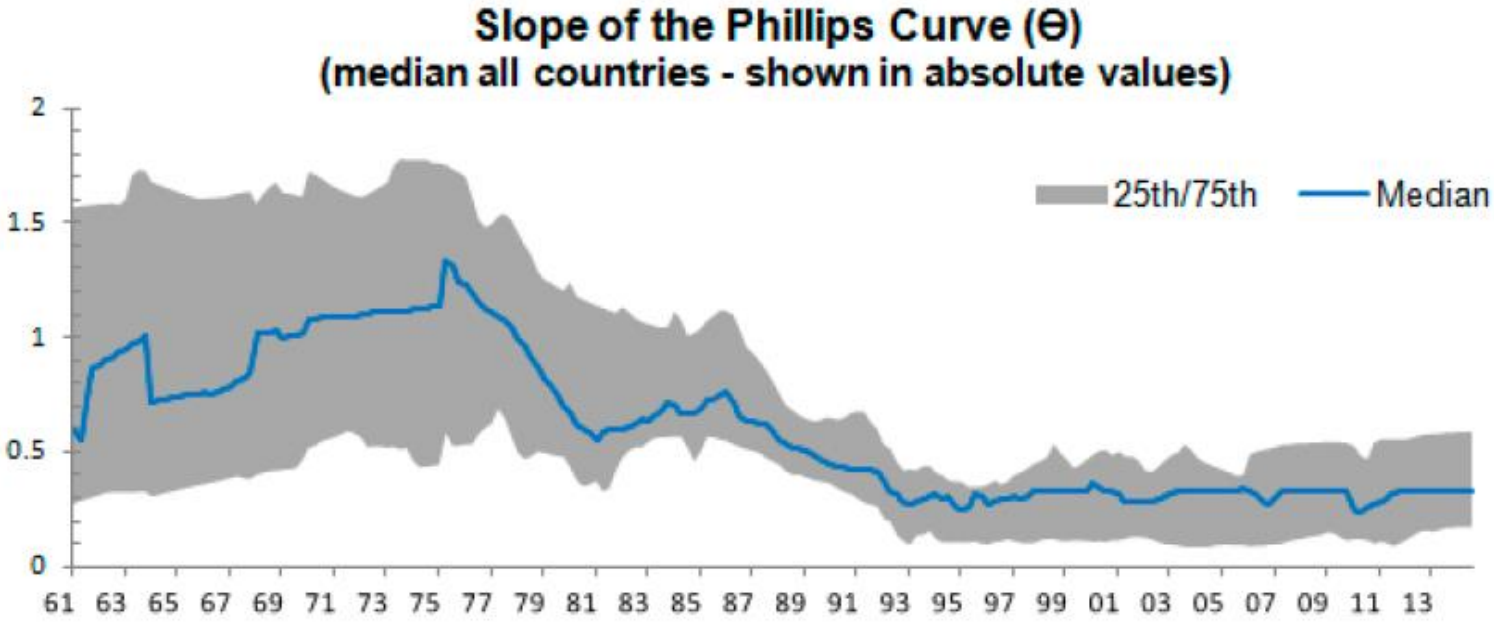


Limitations of standard TV coefficient models

- Not always easy to interpret movements in coefficients
- Ad hoc calibration of smoothness parameter.
- Confidence bounds are very large (Staiger, Stock and Watson, 1997). Some attempts at remedying:
  - Basistha and Startz (2002); multiple indicator/common cycle approach.
  - Dickens (2009); joint estimation of Beveridge and Phillips curves.
- Wider parameter instability
  - Poor identification: do the data contain enough information to identify multiple sources of structural change?
  - Blanchard et al. (2015) estimate model with much more flexible time-variation in the coefficients.



Source: Blanchard et al. (2015)

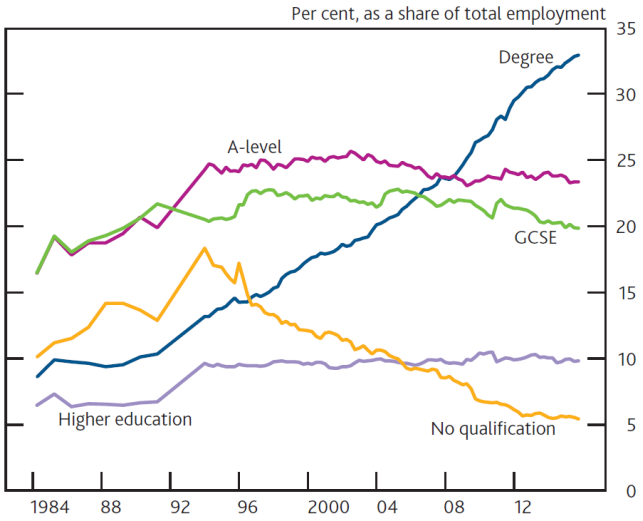


Source: Blanchard et al. (2015)

Micro-evidence

- Increasing use of micro-data in all areas of macro-labour
  - More heterogeneity being built into theoretical models informed by quick and easy access to large micro-data sources.
- What can we learn from the micro-data about aggregate pay?
- Micro-data can be used to quantify how aggregate pay is affected by;
  (i) Compositional changes in the characteristics of the typical worker over the business cycle
  (ii) Worker churn across jobs

Trends in educational attainment



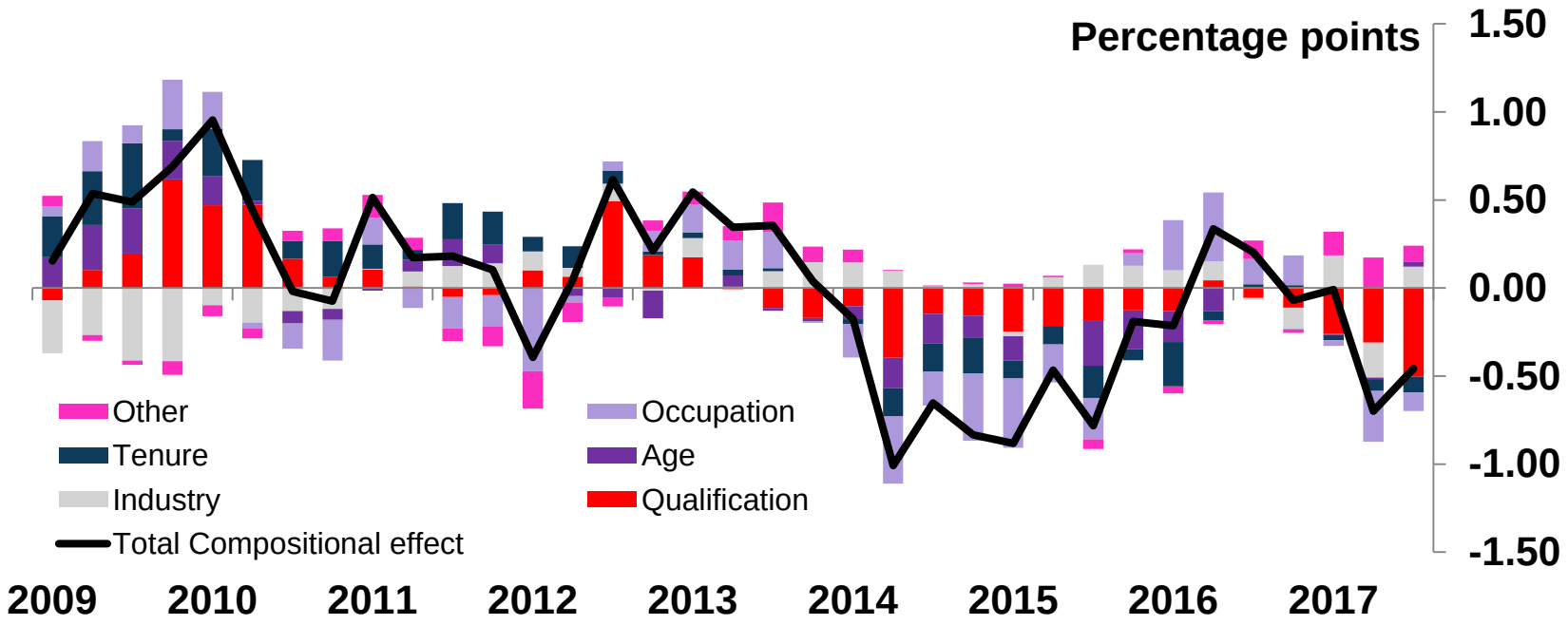
Sources: Labour Force Survey and Bank calculations.

- For further information see BoE Quarterly Bulletin 2016Q1; *Wages, productivity and the changing composition of the UK workforce.*

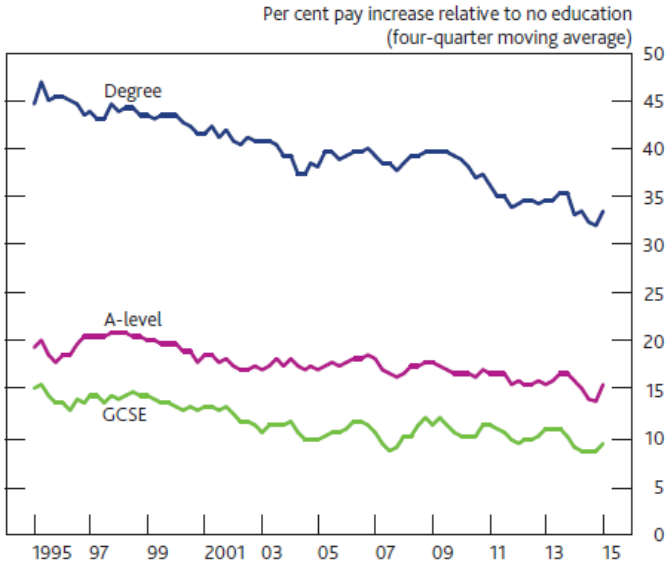
Cyclical compositional effects

- Use of aggregate data on mean wages implicitly assumes that work force composition remains constant (Bils, 1985)
- Higher unemployment volatility among lower productivity/efficiency workers (Elsby et al., 2010)
- Fluctuations in aggregate wages can be decomposed into two effects:
  - *wage growth effect*: “rising tide lifts all boats”
  - *compositional effect:* variation in worker composition across cycle
- Calculating compositional effects using Labour Force Survey data
  - Simple linear model $\boldsymbol{W_t = X_t B_t + e_t}$
  - Compositional effect given by $\boldsymbol{(X_{t+1} - X_t) B_t}$.

Compositional effects over the recession



Changing pay premium



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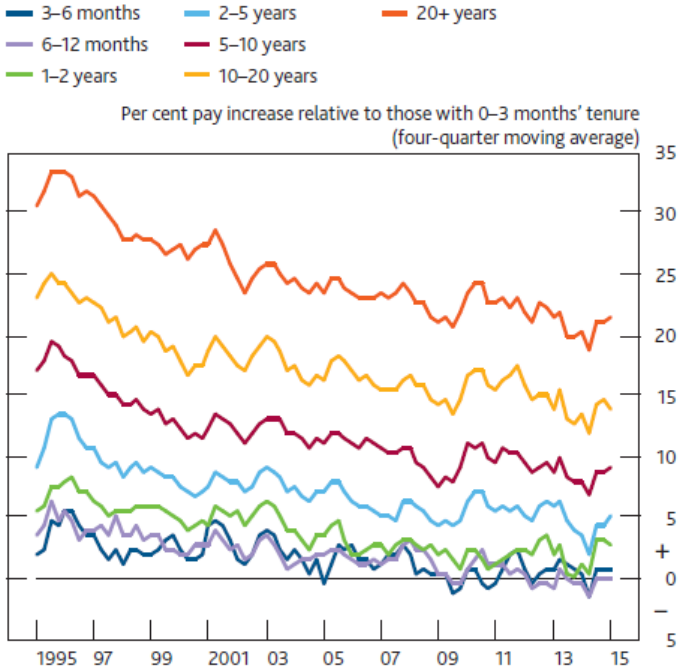
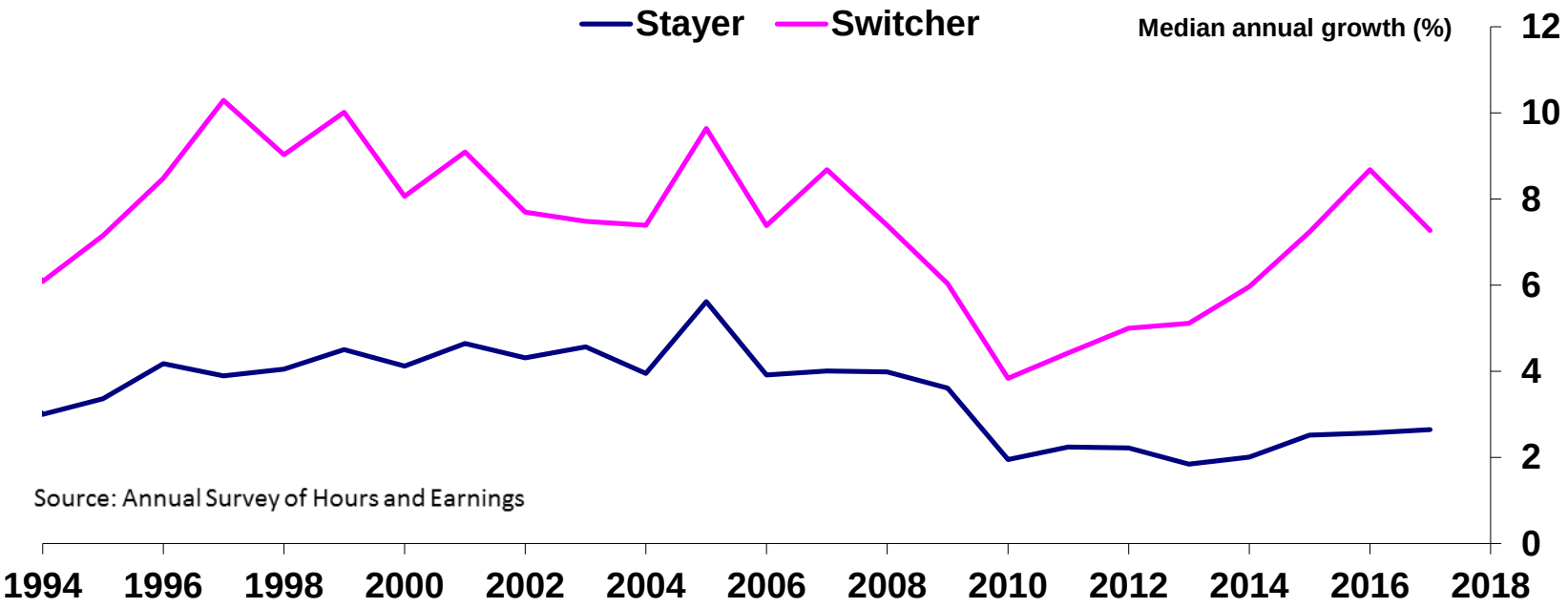
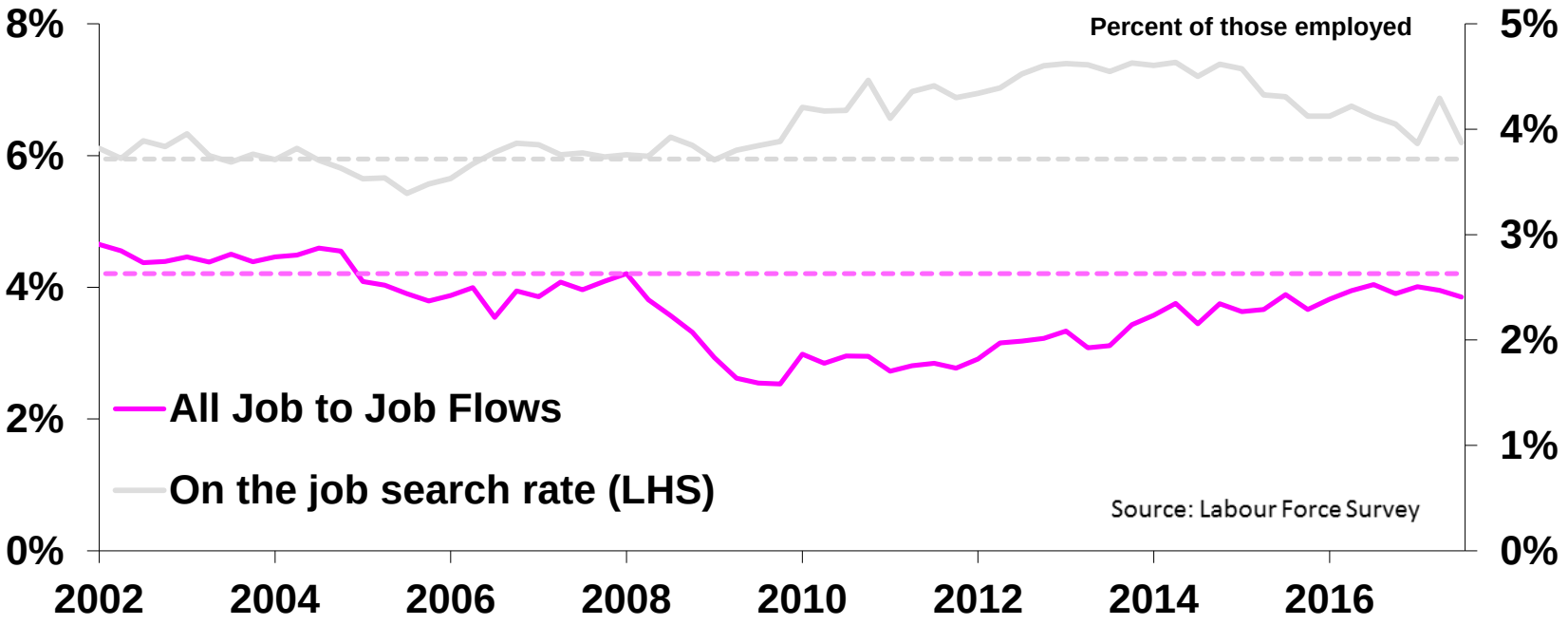


Sources: Labour Force Survey and Bank calculations.

Pay growth for job switchers and stayers



Job to job flows



Churn and wage growth

- Two channels through which churn can affect aggregate pay;
  - Direct effect of moving to a better job with higher pay
  - Competition effect whereby employers pay more to retain staff
- First effect seems to be working. But although churn in the labour market has normalised, it has not led to spill-over effects more broadly.
- In sum; aggregate wage growth is weak not because reward from switching jobs has fallen or proportion of switchers remains low, but because pay growth of stayers is depressed.

The wage curve

- Micro-econometric relation between the *level* of pay and regional unemployment (Blanchflower and Oswald, 1995)
- Doubling of local unemployment rate reduces wages by ~10%.

$$\log w = -0.1 \log u + \text{other terms}$$

- Theoretical challenge: does unemployment influence the growth of pay or its level?
- Wage curve consistent with non-competitive theories of wage determination
- Wages adjust quickly, very little persistence (contrast to disequilibrium adjustment inherent in Phillips curve)

Not just a Phillips curve with the axis mislabelled!

Anyone tempted to argue that there is little difference between pay and pay inflation might ponder how they would feel as an astronaut being shot up at the moon by a group of physicists who had confused, in their technical calculations, the concepts of velocity and acceleration.

– Blanchflower and Oswald, 1995

Matching

- Diamond-Mortensen-Pissarides (DMP) model of equilibrium unemployment (Pissarides, 2000), based on an analysis of (large) flows underlying movements in the aggregate stocks.
  - Gross *quarterly* employment inflow ~1 million.
  - Unemployment exists in equilibrium because of matching frictions
- With increasing availability of longitudinal data, flows approach to labour market dynamics has become dominant paradigm.
- What do the labour market flows data tell us about unemployment over the recession?
  - Overview of ‘matching function’ and the Beveridge curve
  - Job destruction

The matching function

- Central idea of matching theory is that trade in the labour market is decentralised/uncoordinated, time consuming and costly for both workers and firms. No Walrasian auctioneer or spot market for labour.
  - Heterogeneity, frictions and information imperfections make matching difficult.
  - Can we quantify these frictions?
- Job formation process is assumed to be well approximated by an aggregate 'matching function'
  - Vacancies and unemployed workers are inputs → flow of newly formed jobs (or 'matches').
  - 'Black box'

Empirical specification

- Functional form:

$$M_t = mV_t^{\gamma} U_t^{1-\gamma}$$

- Properties; increasing in both of its arguments and constant returns to scale (important for balanced growth).
- Parameters
  - Scale parameter (m) → matching efficiency
  - Elasticity parameter (γ) → congestion effects
- Widespread empirical support (Petrongolo and Pissarides, 2001)
  - Plausible range: $0.3 < \gamma < 0.5$.

Job finding probability

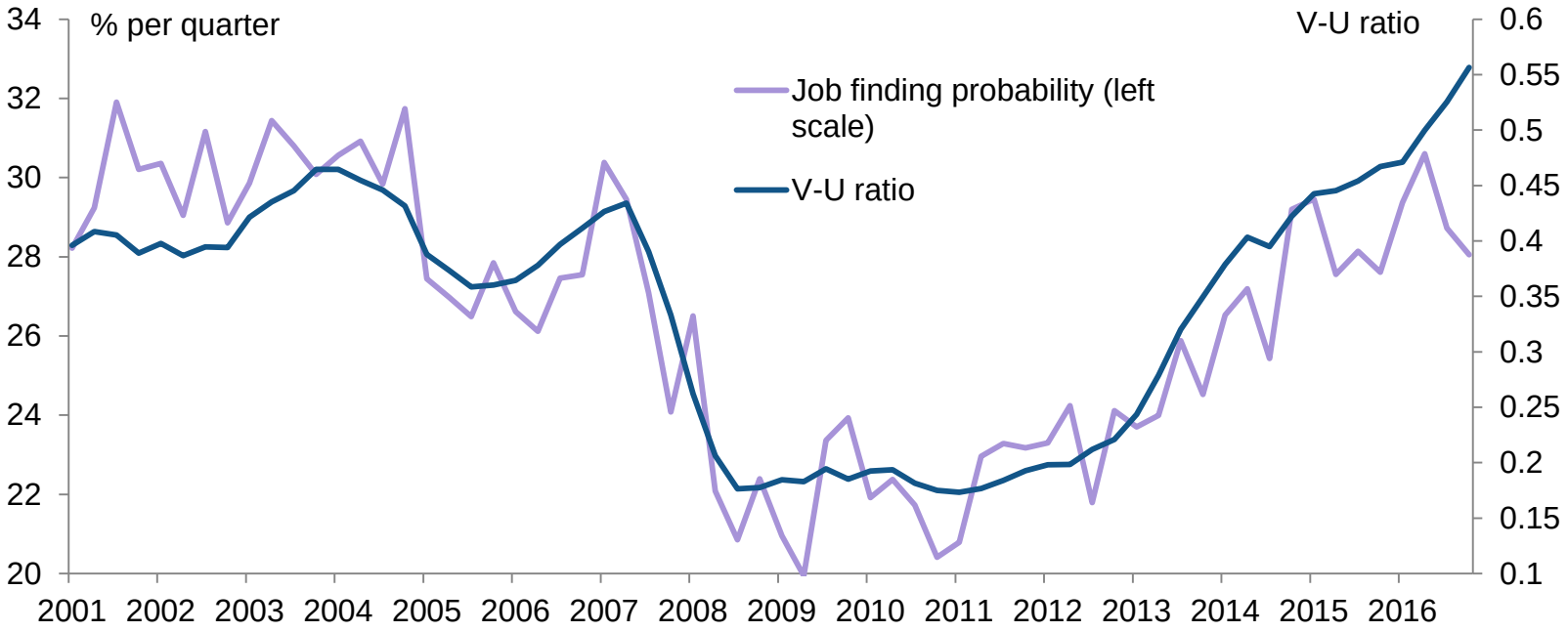
- Assume that matching is ‘random’
  - Vacancies and job seekers are matched at random from the sets V and U.
- Probability an unemployed person finds a job:

$$P_t = \frac{M_t}{U_t} = m\left(\frac{V_t}{U_t}\right)^{\gamma} = m(\theta_t)^{\gamma}$$

where θ_t → *labour market tightness.*

- P_t is increasing in vacancies and decreasing in unemployment.

Job finding rates not that high given tightness



Estimating matching efficiency

- Measured matching efficiency tends to *decline* over time
  - Earlier studies focused on the rise in long-term unemployment in earlier decades but still found significant negative time trends (Petrongolo and Pissarides, 2001)
  - Result still persists (Hall and Schulhofer-Wohl, 2015).
- Estimable version of the job finding function

$$\log P_t = m_t + \gamma \log \theta_t + e_t$$

- Where matching efficiency is an unobserved, time-varying state variable.

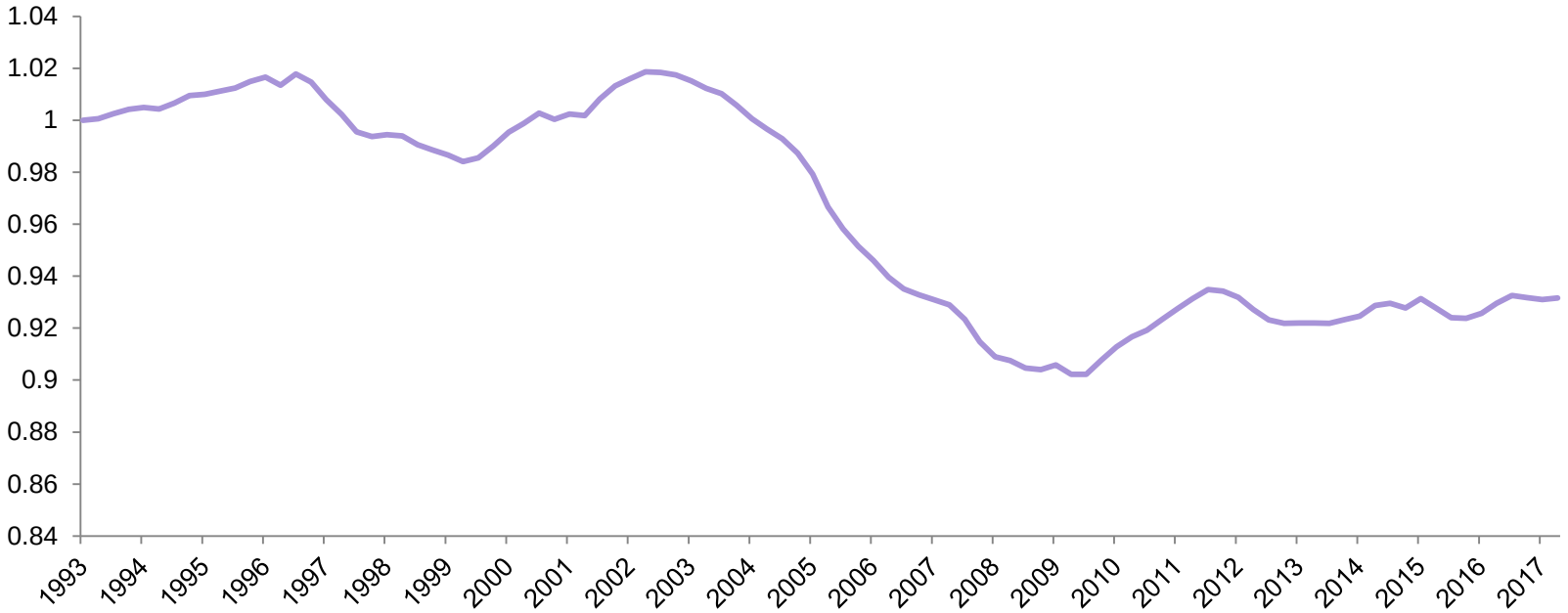
Heterogeneity

- The ‘quality’ of job searchers will affect aggregate outflows from unemployment
- Straightforward to incorporate a wider definition of tightness
- Let the measure of job seekers be denoted as

$$S_t = U_t^{<6} + \beta^{6+} U_t^{6+} + \beta^i I_t$$

- Where β denotes relative search effectiveness.
  - Sedlacek (2016) → failing to control for non-unemployed job seekers biases estimates of matching efficiency during recessions
- Matching function then becomes $M_t = m V_t^{\gamma} S_t^{1-\gamma}$
- Can have broader set of controls (Pizzinelli and Speigner, 2016)

Estimated matching efficiency



Unemployment dynamics and the Beveridge curve

- Evolution of unemployment given by the difference between inflows and outflows:

$$U_t = \delta(1 - U_{t-1}) - P_t U_{t-1}$$

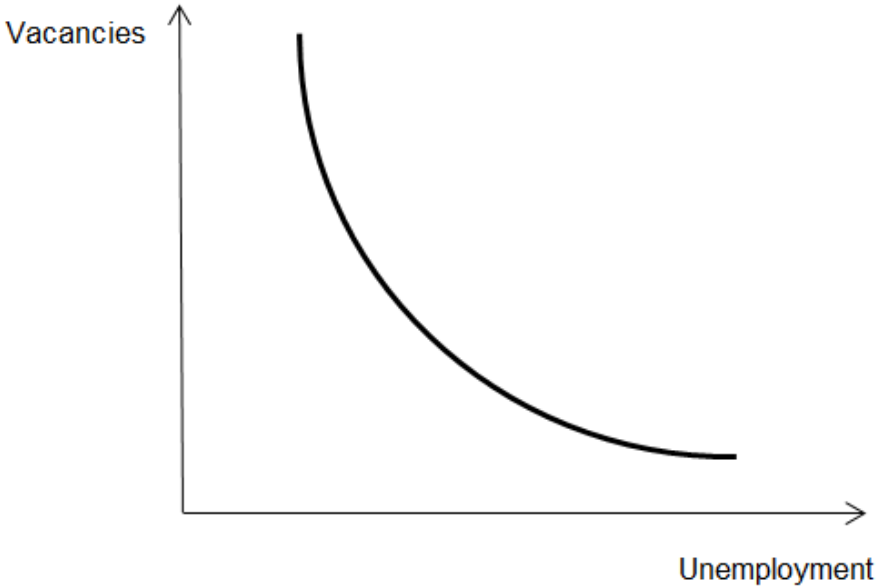
  where δ is the job destruction rate.

- Steady state unemployment is given by:

$$U = \frac{\delta}{\delta + P(\frac{V}{U})}$$

- For given V, can solve for U to obtain the Beveridge curve.

Stylised Beveridge curve



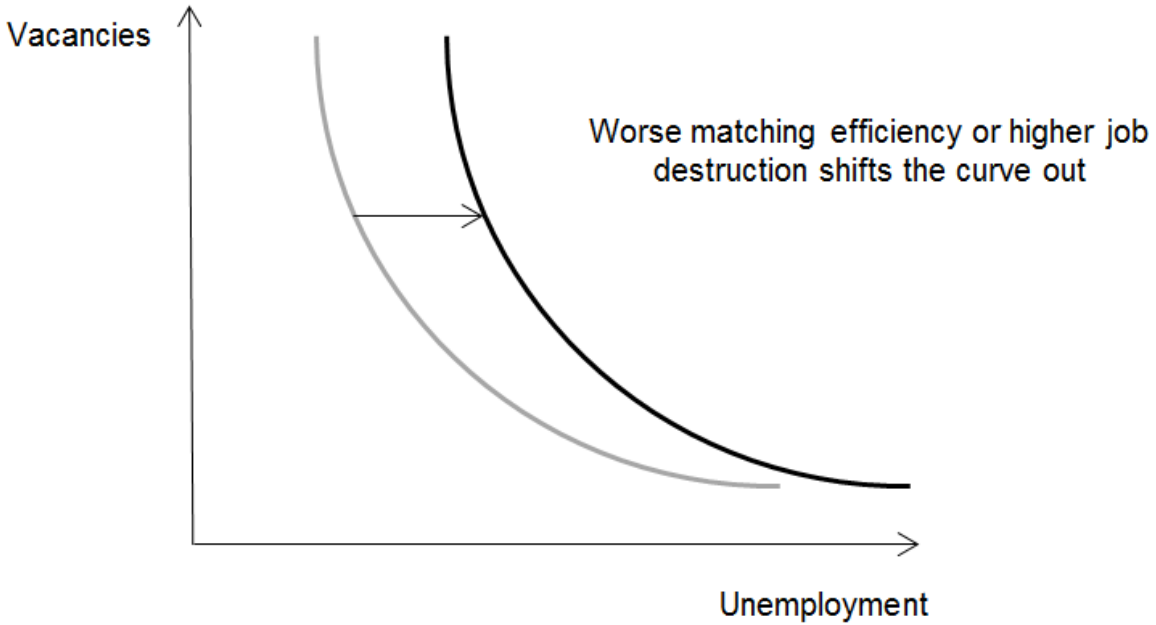
The Beveridge curve and the business cycle

Stylised facts

1. At the business cycle frequency, vacancies and unemployment *tend* to move in opposite directions, but…

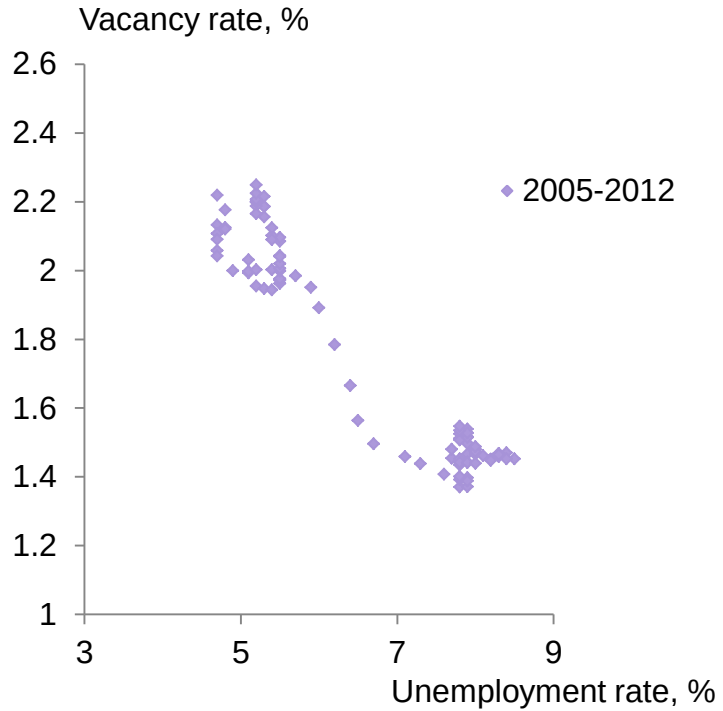
2. The position of the curve also tends to shift.

Beveridge curve shifts



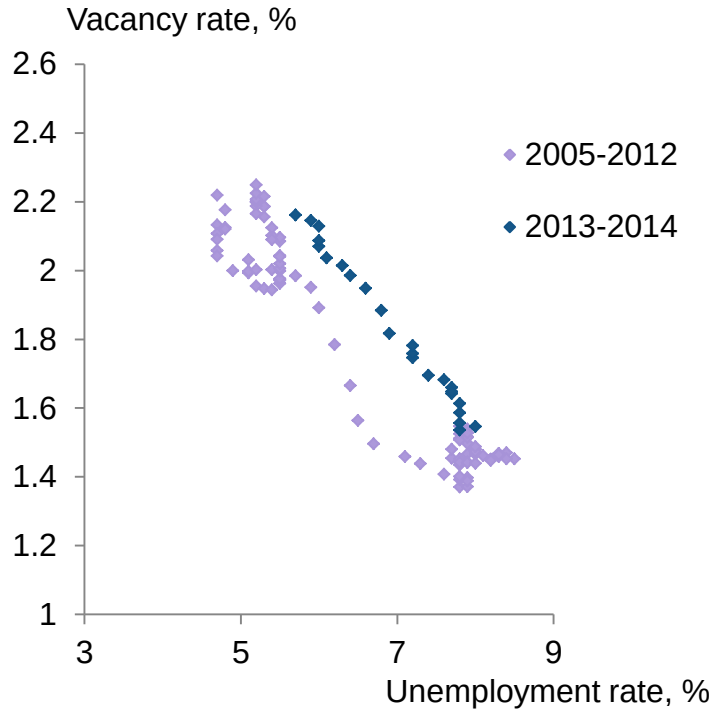
The Beveridge curve over the recession

- At the onset, large drop in vacancies and rise in unemployment.



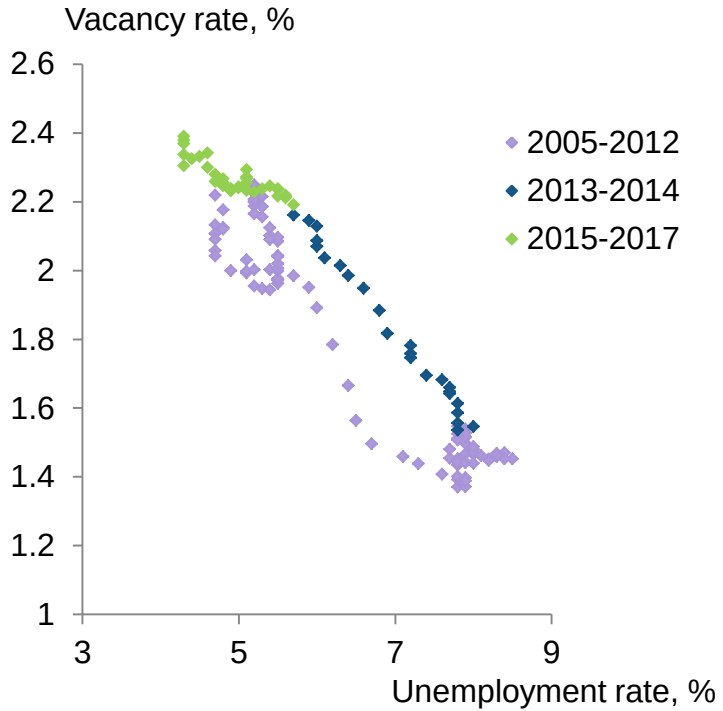
The Beveridge curve over the recession

- At the onset, large drop in vacancies and rise in unemployment.
- Outward shift during the recovery phase? Similar concerns in the US (Barnichon et al. 2012).

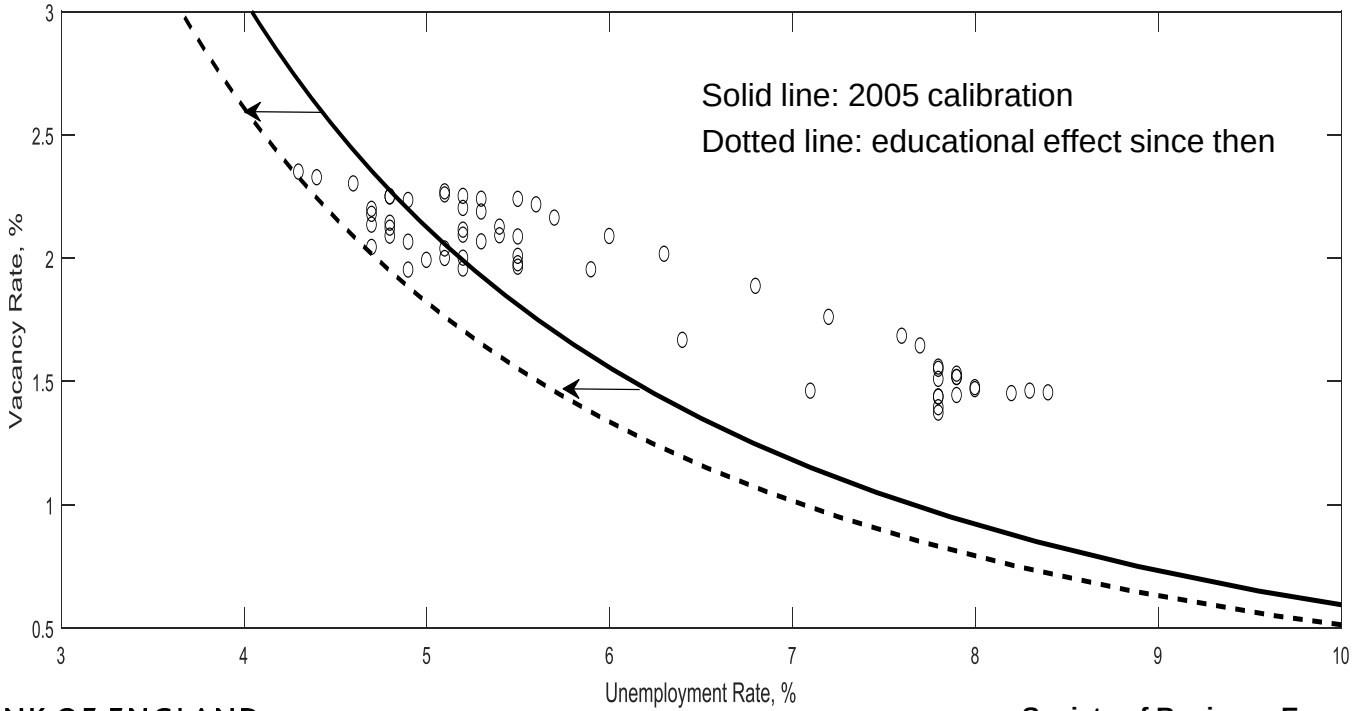


The Beverdige curve over the recession

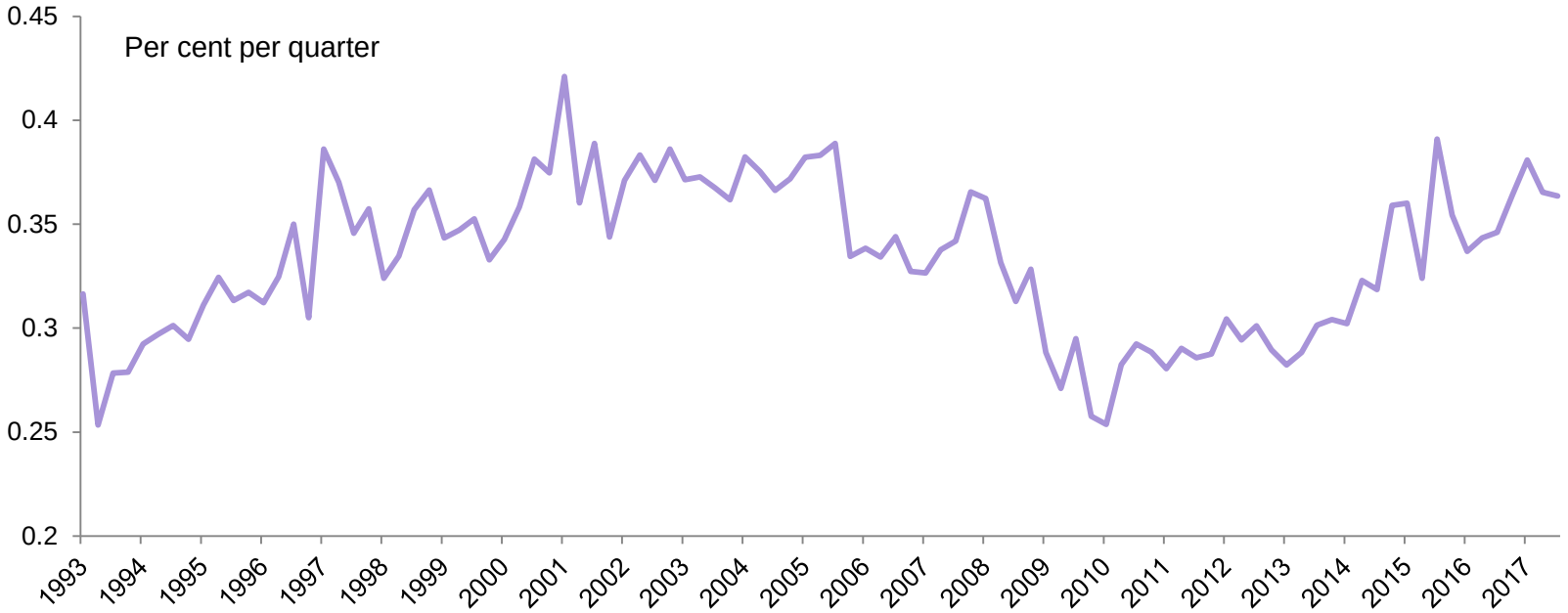
- At the onset, large drop in vacancies and rise in unemployment.
- Outward shift during the recovery phase? Similar concerns in the US (Barnichon et al. 2012).
  - Temporary outward shifts not uncommon during recoveries (Diamond and Sahin, 2014).
  - Factors other than mismatch at play.
- 'Looping' behaviour standard prediction of theory.
- Has the BC shifted inwards?



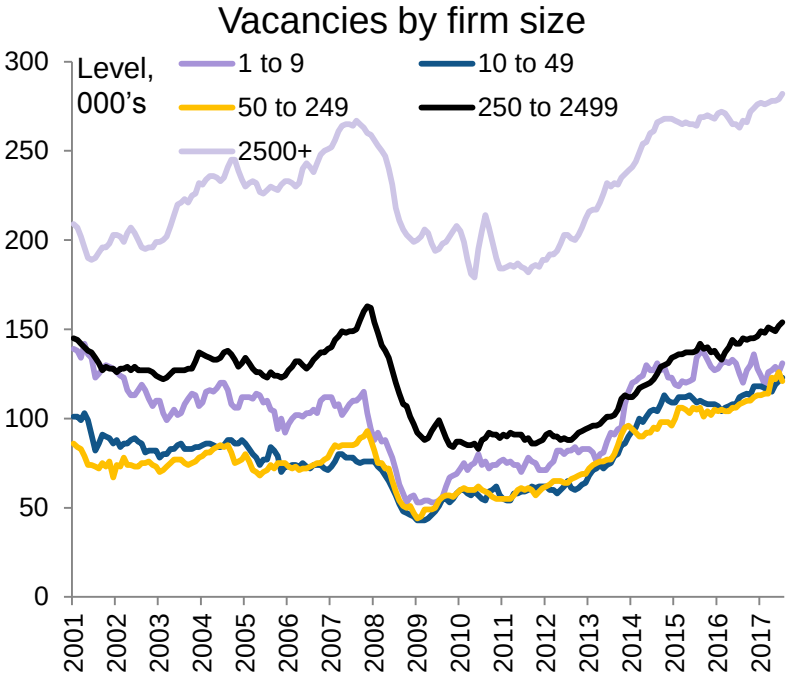
Demographics and the Beveridge curve



Job finding probability, unemployed <6 months

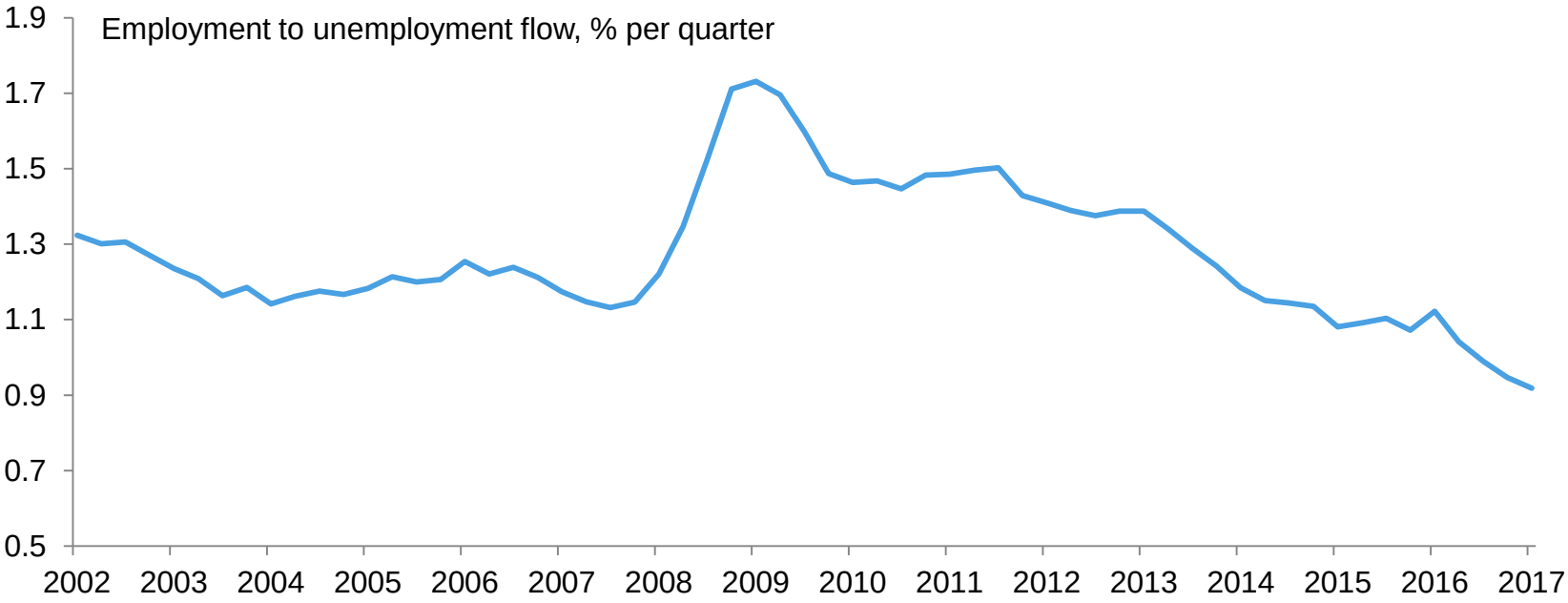


Recruitment effort



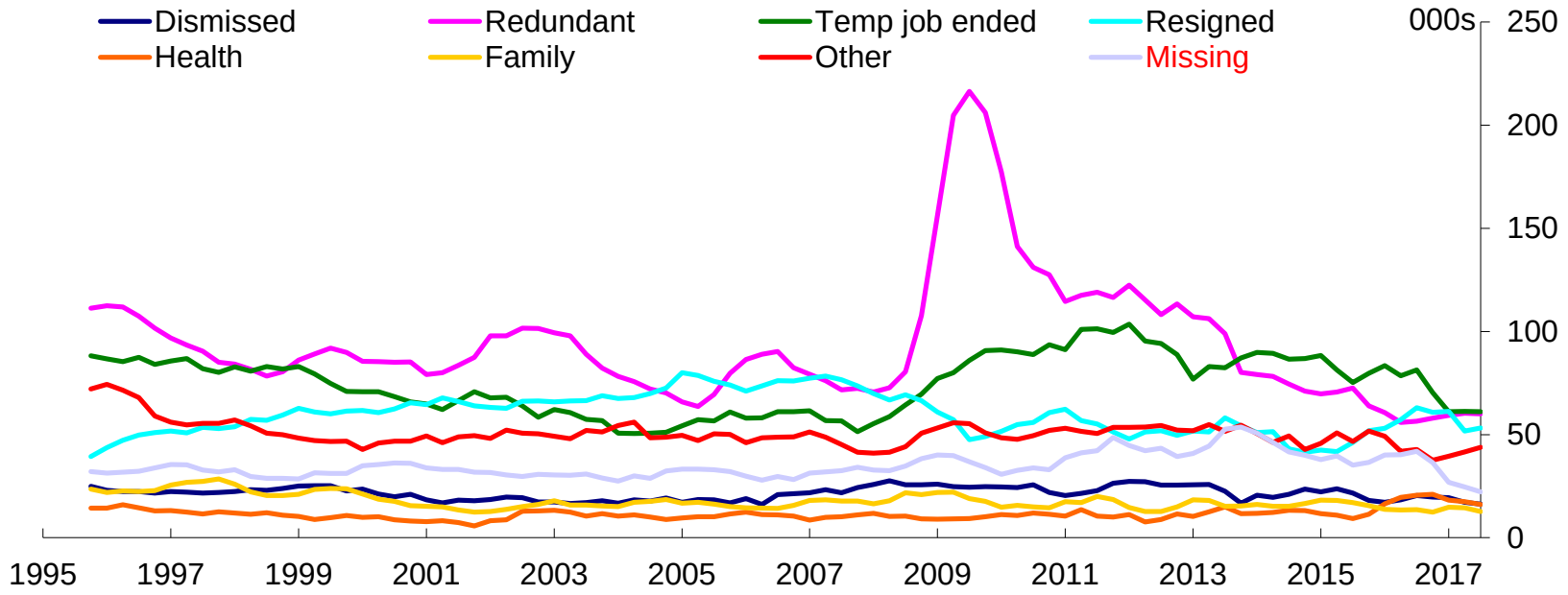
- Observable characteristics of job seekers is only half the story in two-sided labour market
- Composition of vacancies might matter for unemployment exit rate
- Small, fast growing firms tend to fill vacancies quicker (Davis et al., 2010).
- A compositional shift might affect vacancy yields: not clear in UK data.
- Lack data on vacancy flows → cannot identify recruiting intensity.

Job separation rate lower than previous norm



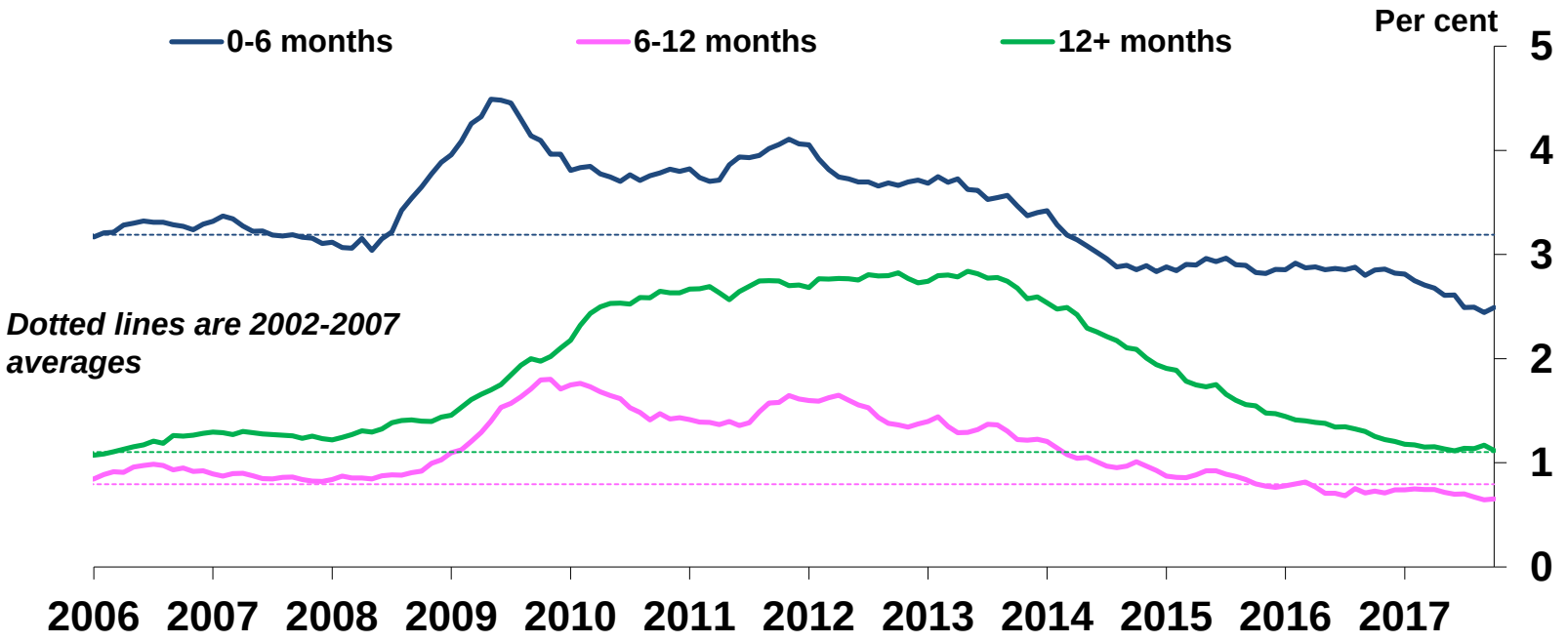
Source: ONS

Employment outflows by reason



Source: Labour force survey

Duration distribution of unemployment



Source: ONS

Summary of matching approach

- Matching theory provides a structural approach to modelling labour market flows
  - Focused mainly on job finding rates, but there is now a large body of work on endogenous job destruction.
- Empirically, despite very tight labour market, job finding rates are not that high.
  - Matching efficiency is relatively low, but this is not due to the crisis.
- Recent fall in unemployment due to low job destruction.

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