Unemployment and Mismatch in the UK

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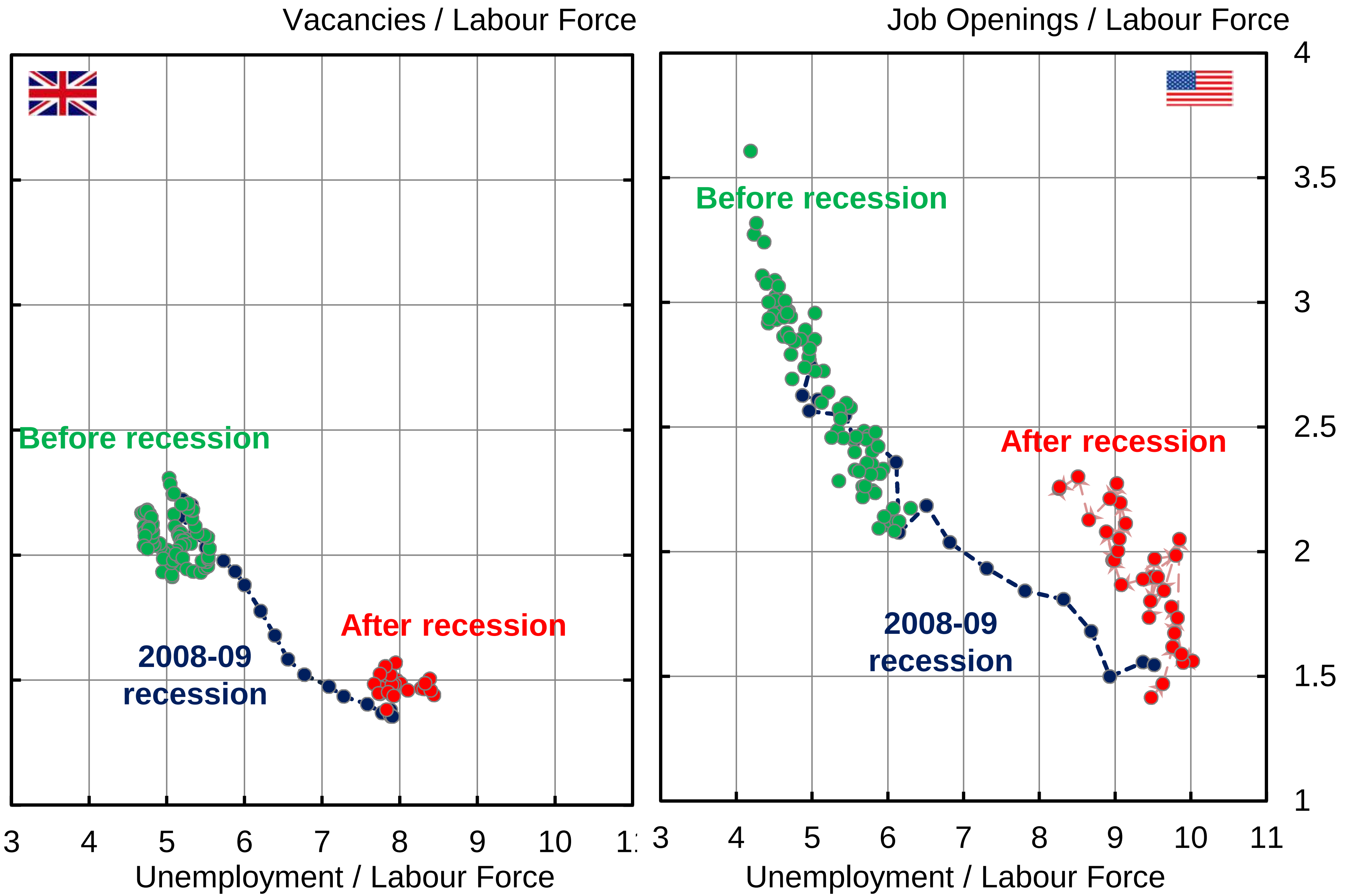
Beveridge Curves: UK and US



Sources: Author's calculations using ONS Vacancy Survey and ONS LFS and BLS JOLTS and CPS.

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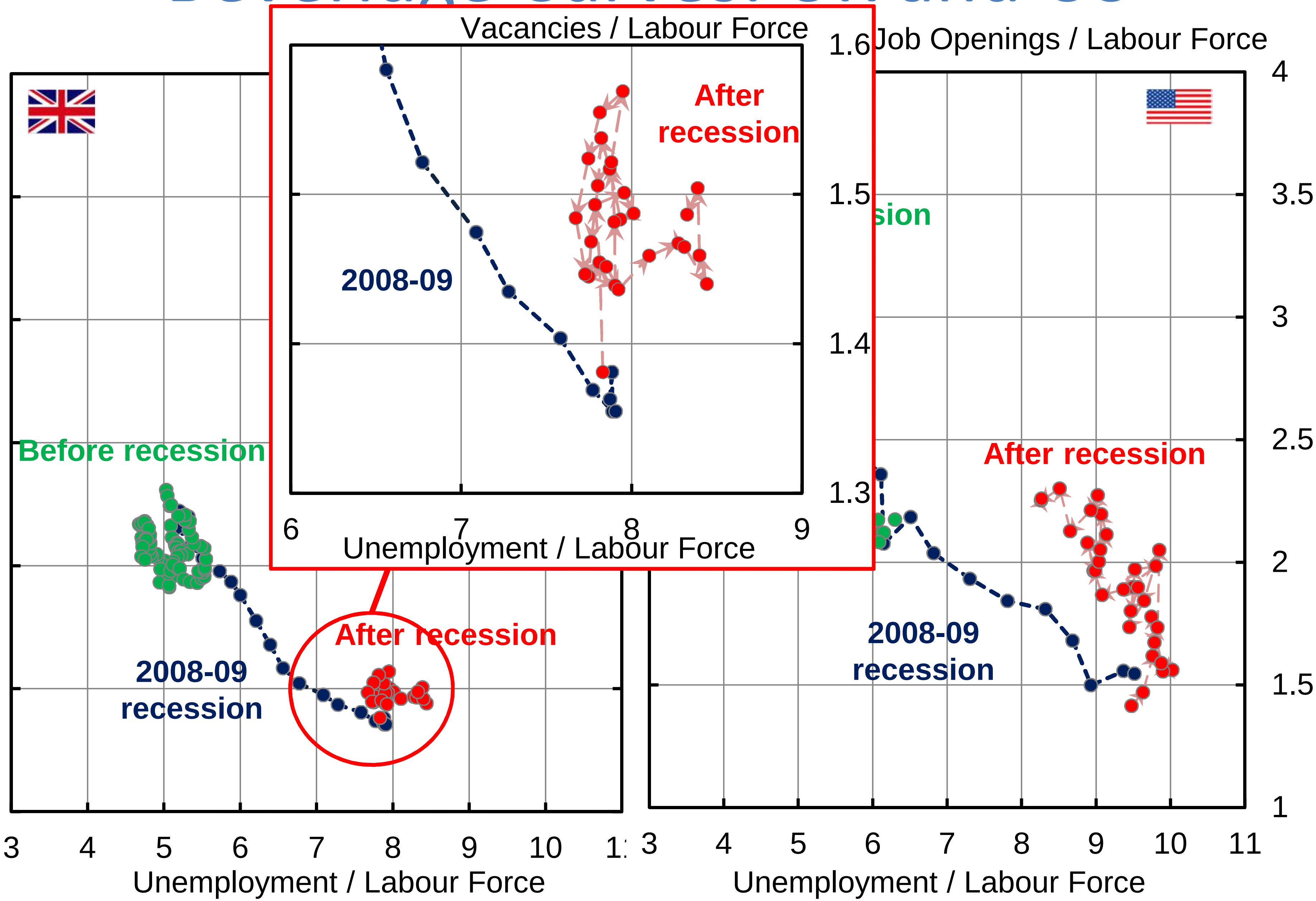

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Unemployment and Mismatch

Methodological contribution

Develop a method of measuring the contribution of mismatch to unemployment dynamics.

- An extension of previous work
  - Smith (2011); Elsby, Hobijn and Sahin (forthcoming); Elsby, Michaels and Solon (2009); Fujita and Ramey (2009).
- Based on decompositions of unemployment dynamics (steady state or actual).
  - Previously used to examine the influence of inflows and outflows on unemployment.

Unemployment and Mismatch

Methodological contribution

Develop method of measuring the contribution of mismatch to unemployment dynamics.

- Mismatch affects the unemployment outflow rate:
  - makes it harder for searchers to match with available vacancies.
- If we could measure the extent to which mismatch lowers the job finding rate, we could use decomposition methods estimate the impact of mismatch on unemployment dynamics.
  - It turns out that mismatch also contributes to unemployment dynamics via the separation rate, and this impact can also be estimated.

Unemployment and Mismatch

- Herz and van Rens (2011)
  - Focus on dynamics: Mismatch unemployment as cyclical as overall unemployment.
  - Path involves wage setting, not worker or job mobility.
- Sahin, Song, Topa and Violante (2012)
  - Mismatch 'hump' in Great Recession.
  - Mismatch accounts for at most 1/3 overall unemployment increase.
- Barnichon and Figura (2011)
  - Changes in matching efficiency can explain a part of unemployment dynamics – around 1.5 pp during the Great Recession.

A Starting Point

The steady state unemployment rate does not capture all the dynamics of interest, especially for a country like the UK where flow transition rates are relatively low.

But it’s a useful place to start…

Unemployment Dynamics and Labour Market Flows

- *Law of Motion for Unemployment:*

$$\Delta U_{t+1} = s_t E_t - f_t U_t$$

  Change in unemployment = inflows – outflows.

- Write in terms of unemployment *rate*:

$$\Delta u_{t+1} = s_t \left(1 - u_t\right) - f_t u_t$$

- In steady state,

$$\bar{u}_t = \frac{s_t}{f_t + s_t}$$

Mismatch and Dynamics of the Steady State Unemployment Rate

$$\bar{u}_t = \frac{s_t}{f_t + s_t}$$

Greater mismatch raises $\bar{u}_t$ directly

- by reducing f_t.

Mismatch and Dynamics of the Steady State Unemployment Rate

$$\bar{u}_t = \frac{s_t}{f_t + s_t}$$

Greater mismatch also has an indirect effect on $\bar{u}_t$

- working through s_t:
  - ↑mismatch $\rightarrow \downarrow f_t \rightarrow \uparrow U_t$ shrinking the denominator of $s_t = EU_t/(1 - U_{t-1})$, thus raising s_t for given EU_t.
  - $\frac{\partial^2 \bar{u}_t}{\partial s_t \partial f_t} = \frac{s_t - f_t}{(f_t + s_t)^3} < 0 \text{ since } f_t \gg s_t$

Mismatch and Dynamics of the Steady State Unemployment Rate

- Aim:
  Decompose changes in the log unemployment rate, based on a recursive model involving steady state unemployment, into parts:

$$\Delta \ln \bar{u}_t \approx \bar{C}_t^{M} + \bar{C}_t^{NM}$$

$$\Delta \ln \bar{u}_t \approx \bar{C}_t^{fM} + \bar{C}_t^{fNM} + \bar{C}_t^{sM} + \bar{C}_t^{sNM}$$

Mismatch and Dynamics of the Steady State Unemployment Rate

Imagine we have:

- an estimate of the counterfactual unemployment rate in the absence of mismatch u^*
- and an estimate of the no-mismatch job finding rate f^*.

These estimates can be obtained, under various assumptions,

- using data on hires, unemployment and vacancies
- and estimated matching functions.

I use UK micro QLFS and Vacancy Survey data at industry (18-sector) level.

Mismatch and Dynamics of the Steady State Unemployment Rate

Simple fact: The steady state unemployment rate can be decomposed into a part reflecting mismatch, and a part reflecting non-mismatch shocks.

$$\bar{u}_t = \left(\bar{u}_t - \bar{u}_t^*\right) + \bar{u}_t^*$$

Take log differences:

$$\Delta \ln \bar{u}_t \approx \frac{\left(\bar{u}_t - \bar{u}_t^*\right)}{\bar{u}_t} \Delta \ln\left(\bar{u}_t - \bar{u}_t^*\right) + \frac{\bar{u}_t^*}{\bar{u}_t} \Delta \ln \bar{u}_t^*$$

$$\Delta \ln \bar{u}_t \approx \bar{C}_t^M + \bar{C}_t^{NM}$$

Mismatch and Dynamics of the Steady State Unemployment Rate

Can dig deeper to distinguish the roles of inflow and outflow rates:

$$\Delta \ln \bar{u}_t \approx \bar{C}_t^{fM} + \bar{C}_t^{fNM} + \bar{C}_t^{sM} + \bar{C}_t^{sNM}$$

Mismatch and Dynamics of the Steady State Unemployment Rate

Can dig deeper to distinguish the roles of inflow and outflow rates:

Consider first the influence of mismatch on unemployment working via the outflow rate.

The overall outflow rate can be written

$$f_t = (f_t - f_t^*) + f_t^*.$$

where:

$(f_t - f_t^*)$ is the effect of mismatch on the outflow rate (which is negative).

f_t^* is the outflow rate in the absence of mismatch.

Mismatch and Dynamics of the Steady State Unemployment Rate

$$f_t = (f_t - f_t^*) + f_t^*$$

The steady state unemployment rate can be written:

$$\bar{u}_t = \frac{s_t}{f_t + s_t} = \frac{s_t}{\left(\left[f_t - f_t^*\right] + f_t^*\right) + s_t}$$

Decomposition of steady state unemployment (Elsby, Michaels and Solon, 2009):

$$\Delta \ln \bar{u}_t \approx \left(1 - \bar{u}_t\right)\left\{\Delta \ln s_t - \Delta \ln f_t\right\}$$

Mismatch and Dynamics of the Steady State Unemployment Rate

$$f_t = (f_t - f_t^*) + f_t^*$$

The steady state unemployment rate can be written:

$$\bar{u}_t = \frac{s_t}{f_t + s_t} = \frac{s_t}{\left(\left[f_t - f_t^*\right] + f_t^*\right) + s_t}$$

So the formula breaking down steady state unemployment dynamics into inflow and outflow influences is:

$$\Delta \ln \bar{u}_t \approx (1 - \bar{u}_t)\left\{\Delta \ln s_t - \Delta \ln\left(\left[f_t - f_t^*\right] + f_t^*\right)\right\}$$

Mismatch and Dynamics of the Steady State Unemployment Rate

$$\Delta \ln \bar{u}_t \approx (1-\bar{u}_t)\left\{\Delta \ln s_t - \Delta \ln\left(\left[f_t - f_t^*\right] + f_t^*\right)\right\}$$

- To estimate, rearrange final outflow rate term:

$$\Delta \ln\left(\left[f_t - f_t^*\right] + f_t^*\right) \approx \frac{\left(f_t - f_t^*\right)}{f_t}\left[\frac{f_t}{\left(f_t - f_t^*\right)}\Delta \ln f_t - \frac{f_t^*}{\left(f_t - f_t^*\right)}\Delta \ln f_t^*\right]$$

$$+\frac{f_t^*}{f_t}\Delta \ln f_t^*$$

Mismatch and Dynamics of the Steady State Unemployment Rate

- Changes in the steady state unemployment rate can then be decomposed into 4 parts:

$$\Delta \ln \bar{u}_t \approx \bar{C}_t^{fM} + \bar{C}_t^{fNM} + \bar{C}_t^{sM} + \bar{C}_t^{sNM}$$

$$\bar{C}_t^{fM} =$$

$$-(1-\bar{u}_t)\frac{\left(f_t - f_t^*\right)}{f_t}\left[\frac{f_t}{\left(f_t - f_t^*\right)}\Delta \ln f_t - \frac{f_t^*}{\left(f_t - f_t^*\right)}\Delta \ln f_t^*\right]$$

Mismatch and Dynamics of the Steady State Unemployment Rate

- Changes in the steady state unemployment rate can then be decomposed into 4 parts:

$$\Delta \ln \bar{u}_t \approx \bar{C}_t^{fM} + \bar{C}_t^{fNM} + \bar{C}_t^{sM} + \bar{C}_t^{sNM}$$

$$\bar{C}_t^{fNM} = -(1-\bar{u}_t)\left(\frac{f_t^*}{f_t}\right)\Delta \ln f_t^*$$

Mismatch and Dynamics of the Steady State Unemployment Rate

- Changes in the steady state unemployment rate can then be decomposed into 4 parts:

$$\Delta \ln \bar{u}_t \approx \bar{C}_t^{fM} + \bar{C}_t^{fNM} + \bar{C}_t^{sM} + \bar{C}_t^{sNM}$$

$$\bar{C}_t^{s} \equiv \bar{C}_t^{sM} + \bar{C}_t^{sNM} = \left(1 - \bar{u}_t\right) \Delta \ln s_t$$

- $\bar{C}_t^{M}$, $\bar{C}_t^{NM}$, $\bar{C}_t^{s}$, $\bar{C}_t^{fM}$ and $\bar{C}_t^{fNM}$ can be directly estimated.
- How can $\bar{C}_t^{s}$ be split into $\bar{C}_t^{sM}$ and $\bar{C}_t^{sNM}$?

$$\bar{C}_t^{sM} = \bar{C}_t^{M} - \bar{C}_t^{fM}$$

Mismatch and Dynamics of the Steady State Unemployment Rate

- Changes in the steady state unemployment rate can then be decomposed into 4 parts:

$$\Delta \ln \bar{u}_t \approx \bar{C}_t^{fM} + \bar{C}_t^{fNM} + \bar{C}_t^{sM} + \bar{C}_t^{sNM}$$

- Then either analyse the relative contributions period- by-period, graphically,
- Or calculate 'beta' variance contributions:

$$\beta^{fM} = \frac{\operatorname{cov}\left(\bar{C}_t^{fM}, \Delta \ln \bar{u}_t\right)}{\operatorname{var}\left(\Delta \ln \bar{u}_t\right)}$$

Mismatch

Measuring mismatch

I use an index of mismatch

- developed by Sahin, Song, Topa and Violante (2012)

based on a very intuitive idea:

- The *efficient* distribution of unemployed searchers across sectors should vary in proportion to the sectoral distribution of job openings.
  - And if there is *heterogeneity* in matching efficiency across sectors, there should be more unemployed searchers in sectors with higher matching efficiency ("generalised Jackman-Roper condition").

Mismatch

Measuring mismatch

I use an index of mismatch

– developed by Sahin, Song, Topa and Violante (2011)

based on a very intuitive idea:

- The *efficient* distribution of unemployed searchers across sectors should vary in proportion to the sectoral distribution of job openings.
- The mismatch index calculates the extent to which hires are lowered by deviation of the actual distribution of unemployment and vacancies across sectors deviates from the efficient distribution.

An Index of Mismatch

- Index of mismatch $\mathcal{M}_t$ captures the proportion by which actual hires h_t fall below the efficient level h_t^*.

$$\mathcal{M}_t = \frac{h_t^* - h_t}{h_t^*}$$

An Index of Mismatch

- Assume a Cobb-Douglas CRS matching function in each sector i:

$$h_{it} = \Phi_t \phi_i v_{it}^{\alpha} u_{it}^{1-\alpha}$$

where h_{it}, v_{it}, and u_{it} are hires, vacancies and unemployment, respectively, in sector i at time t.

Φ_t captures changes in matching efficiency common to all sectors.

ϕ_i represent sector-specific matching efficiencies.

α is the vacancy share.

An Index of Mismatch

Constrained-optimal hires: $h_t^* = \Phi_t \bar{\phi} v_t^{\alpha} u_t^{1-\alpha}$

Actual hires: $h_t = \Phi_t v_t^{\alpha} u_t^{1-\alpha} \left[\sum_{i=1}^{I} \phi_i \left(\frac{v_{it}}{v_t} \right)^{\alpha} \left(\frac{u_{it}}{u_t} \right)^{1-\alpha} \right]$

- Planner allocates unemployed across sectors in proportion to exogenous vacancies and sectoral matching efficiency.

$\bar{\phi} = \left[\sum_{i=1}^{I} \phi_i^{\frac{1}{\alpha}} \left(\frac{v_{it}}{v_t} \right) \right]^{\alpha}$ is a CES aggregator of sector matching efficiencies, weighted by their vacancy shares

An Index of Mismatch

Constrained-optimal hires: $h_t^* = \Phi_t \bar{\phi} v_t^{\alpha} u_t^{1-\alpha}$

Actual hires: $h_t = \Phi_t v_t^{\alpha} u_t^{1-\alpha} \left[\sum_{i=1}^{I} \phi_i \left(\frac{v_{it}}{v_t} \right)^{\alpha} \left(\frac{u_{it}}{u_t} \right)^{1-\alpha} \right]$

- In reality, unemployment will not be efficiently allocated, so hires will be lower than optimal.

An Index of Mismatch

Constrained-optimal hires: $h_t^* = \Phi_t \bar{\phi} v_t^{\alpha} u_t^{1-\alpha}$

Actual hires: $h_t = \Phi_t v_t^{\alpha} u_t^{1-\alpha} \left[\sum_{i=1}^{I} \phi_i \left(\frac{v_{it}}{v_t} \right)^{\alpha} \left(\frac{u_{it}}{u_t} \right)^{1-\alpha} \right]$

- Measure of mismatch:

$$\mathcal{M}_t = \frac{h_t^* - h_t}{h_t^*} = 1 - \sum_{i=1}^{I} \left(\frac{\phi_i}{\bar{\phi}} \right) \left(\frac{v_{it}}{v_t} \right)^{\alpha} \left(\frac{u_{it}}{u_t} \right)^{1-\alpha}$$

The Job Finding Rate in the Absence of Mismatch

- The aggregate job finding rate is defined as

$$f_t = \frac{h_t}{u_t}$$

- The counterfactual job finding rate in the absence of mismatch would be

$$f_t^* = \frac{h_t^*}{u_t^*} = f_t \frac{1}{1-\mathcal{M}_t}\left(\frac{u_t}{u_t^*}\right)^{\alpha}$$

The Unemployment Rate in the Absence of Mismatch

- The counterfactual job finding rate in the absence of mismatch would be

$$f_t^* = \frac{h_t^*}{u_t^*} = f_t \frac{1}{1-\mathcal{M}_t}\left(\frac{u_t}{u_t^*}\right)^{\alpha}$$

- f_t^* and u_t^* can be calculated simultaneously, using the Law of Motion for u_t^* and assuming initial condition $u_0^* = \bar{u}_0^*$.

$$u_{t+1}^* = s_t + \left(1 - s_t - f_t^*\right) u_t^*$$

Estimating Mismatch

- To calculate the mismatch index:

$$\mathcal{M}_t = 1 - \sum_{i=1}^{I} \left(\frac{\phi_i}{\bar{\phi}}\right)\left(\frac{v_{it}}{v_t}\right)^{\alpha}\left(\frac{u_{it}}{u_t}\right)^{1-\alpha}$$

  requires estimates of vacancy share α and industry-specific match efficiencies ϕ_i.

- To obtain these, estimate a matching function:

$$\ln\left(\frac{h_{it}}{u_{it}}\right) = \ln\Phi_t + \ln\phi_i + \alpha\ln\left(\frac{v_{it}}{u_{it}}\right) + \varepsilon_{it}$$

Estimates of Vacancy Share α

	(1)
α	0.632***
	(0.0251)
Fixed effects	yes
Quadratic time trend	yes
Seasonal dummies	yes
R^2	0.720
Observations	756
Industries	18
Sample period	2001q3-2001 1q4

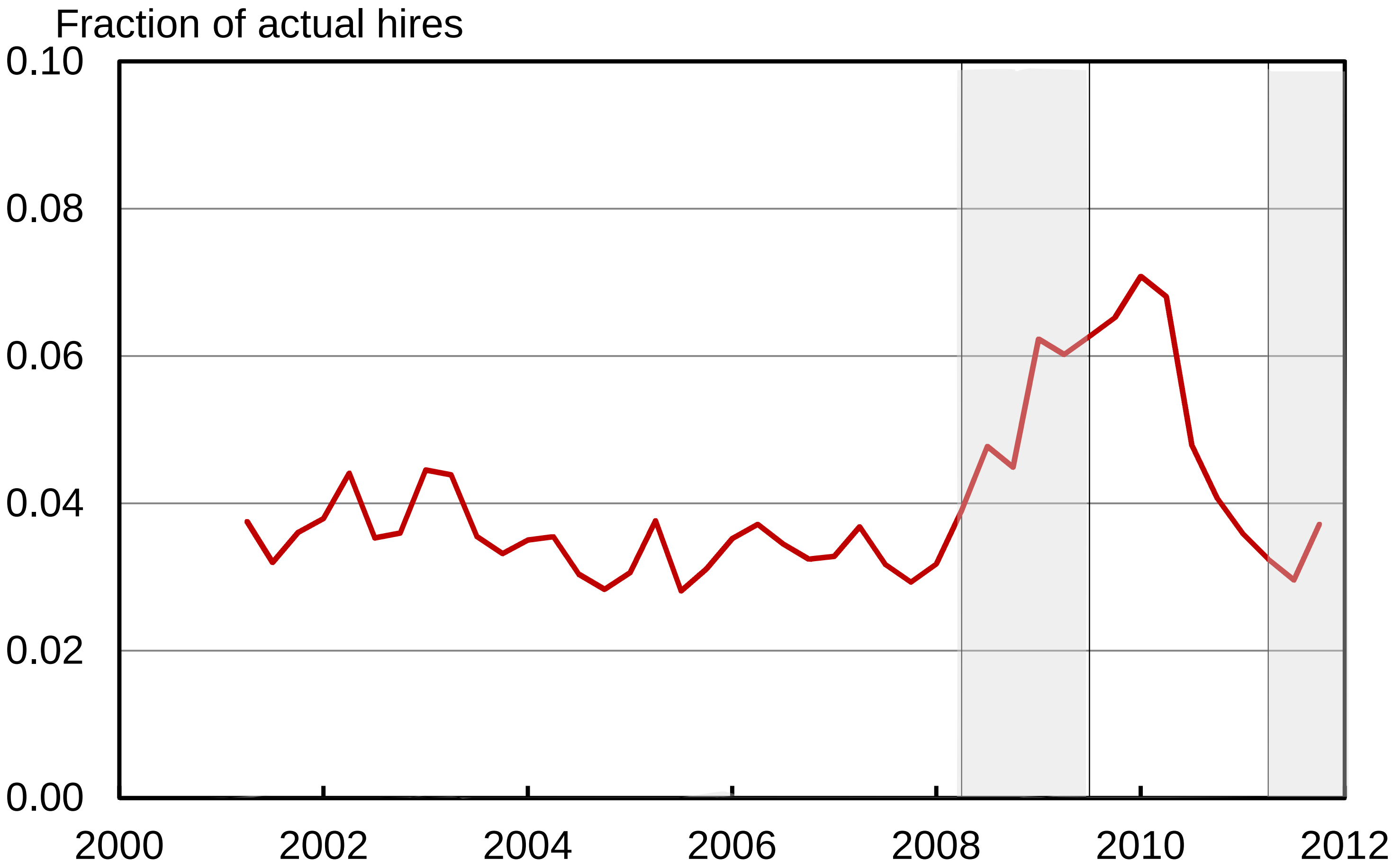
Estimates of Vacancy Share α

	(1)	(2) No time trend	(3) Pre-2008q2	(4) OLS
α	0.632***	0.800***	0.750***	0.522***
	(0.0251)	(0.0213)	(0.0371)	(0.0181)
Fixed effects	yes	yes	yes	no
Quadratic time trend	yes	no	yes	yes
Seasonal dummies	yes	yes	yes	yes
R^2	0.720	0.762	0.752	0.686
Observations	756	756	486	756
Industries	18	18	18	18
Sample period	2001q3-2011q4	2001q3-2011q4	2001q3-2008q1	2001q3-2011q4

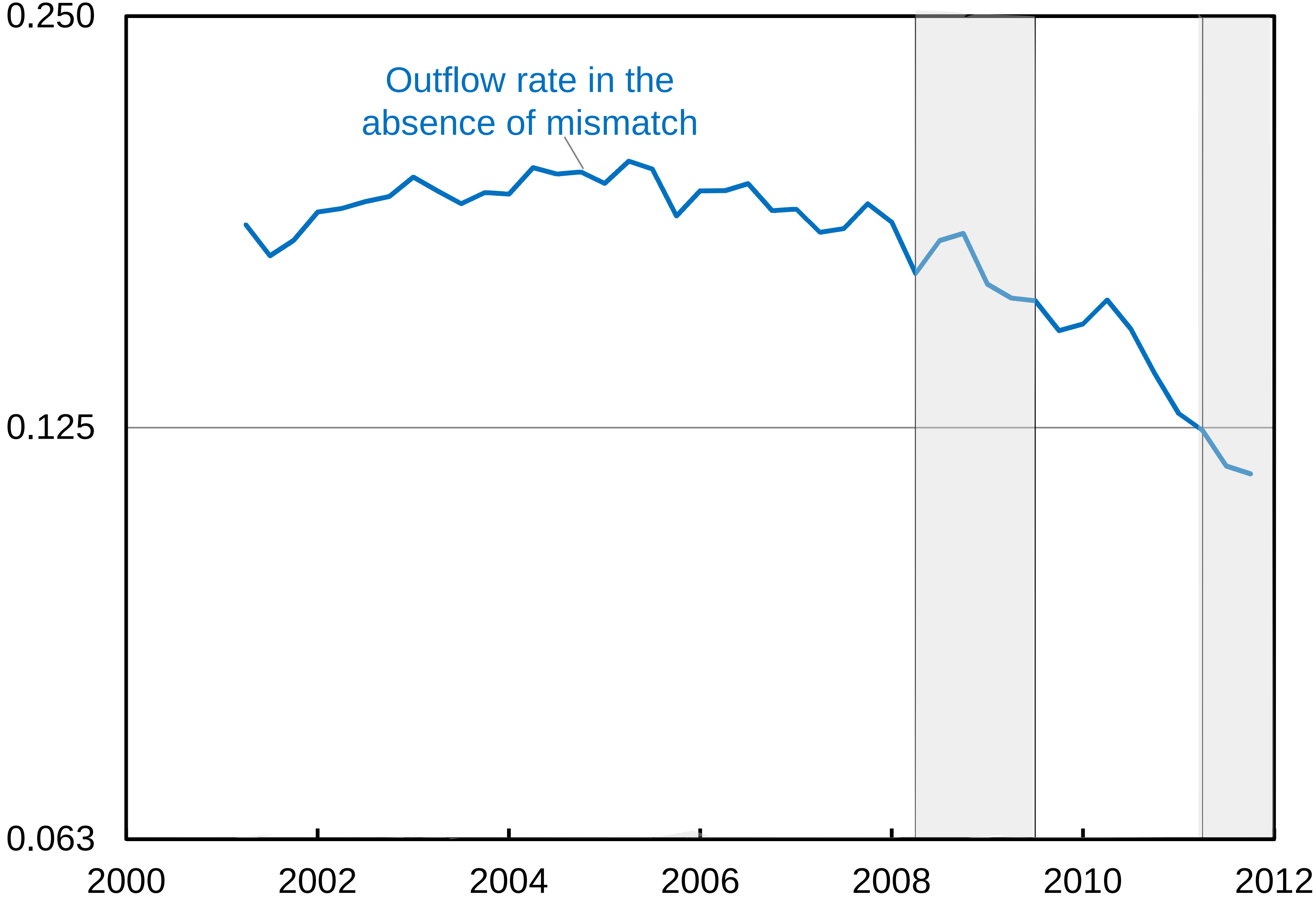
The Mismatch Index

Proportionate increase in actual hires that would occur if mismatch were eliminated:

$$\frac{\mathcal{M}_t}{1-\mathcal{M}_t}$$



The Impact of Mismatch on the Outflow Rate



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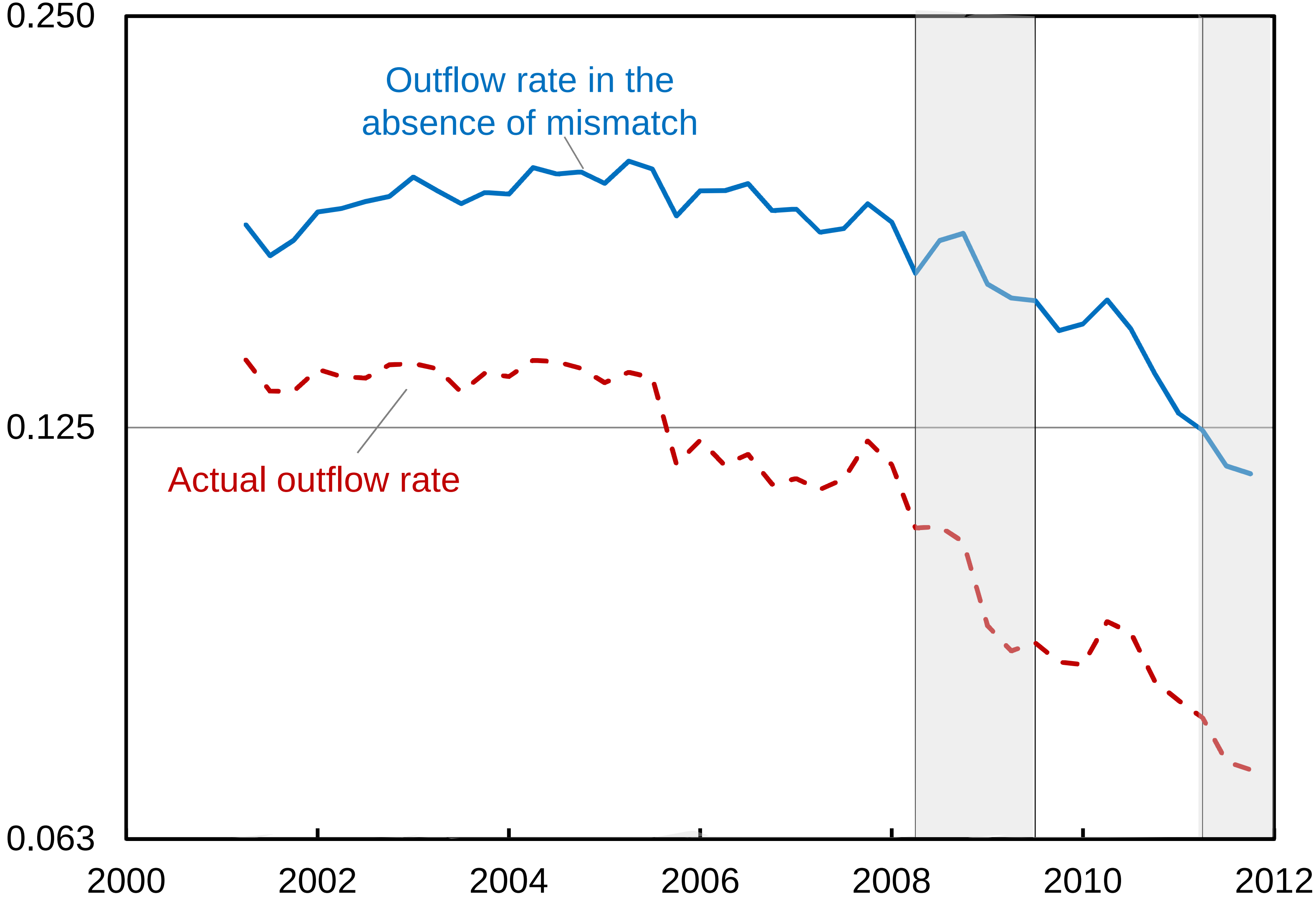
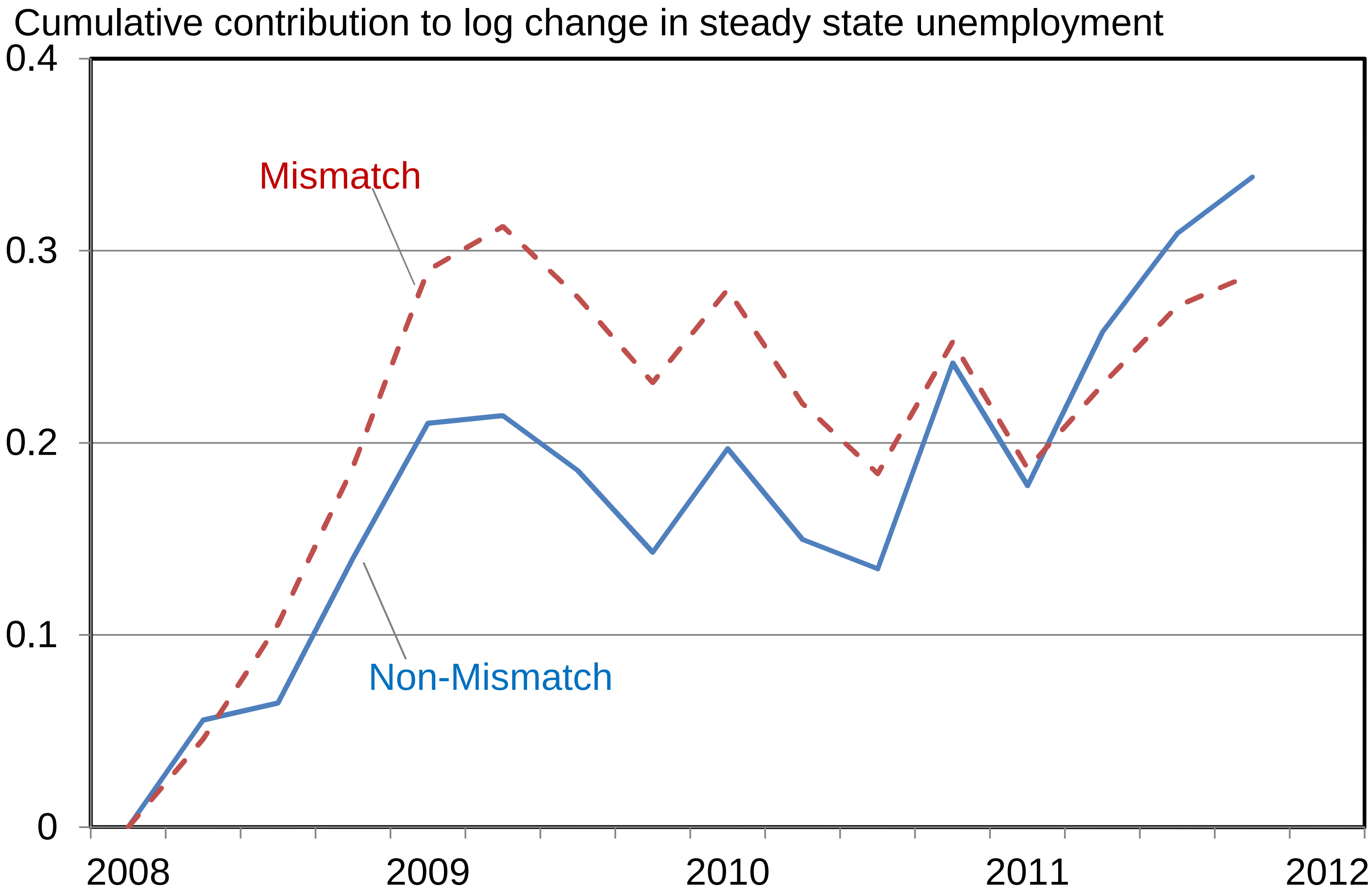


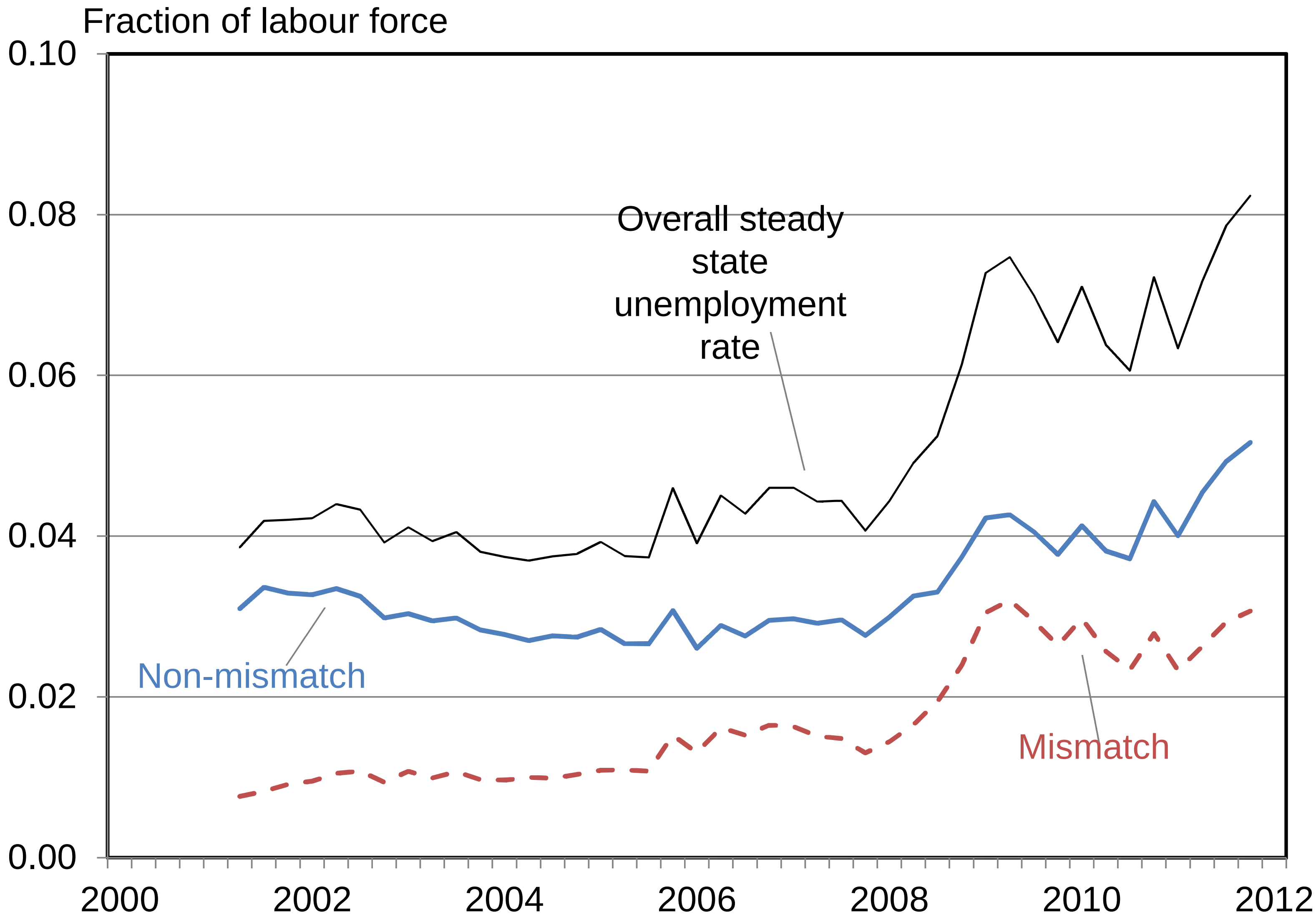
Mismatch Contribution to Steady State Unemployment Dynamics



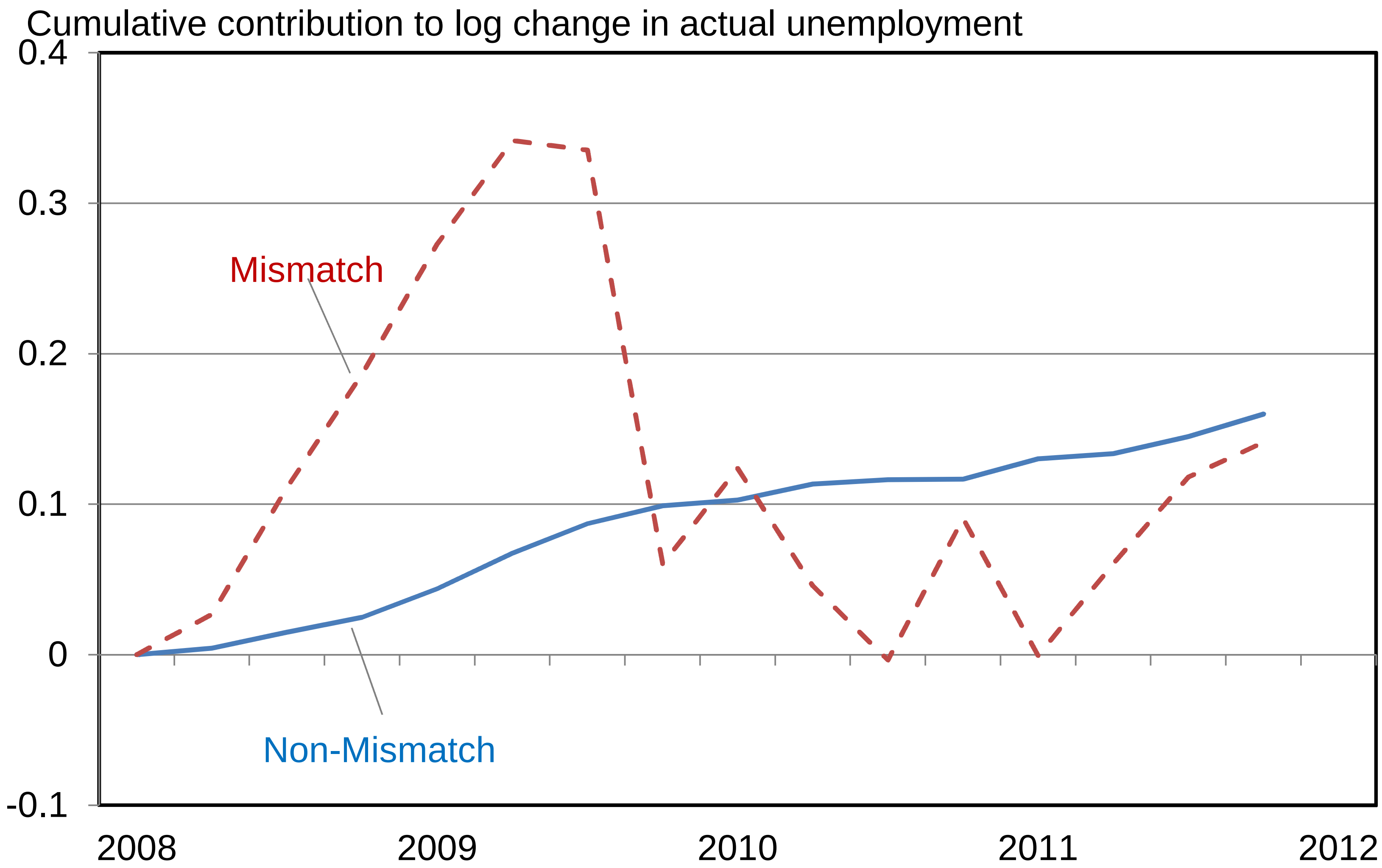
Mismatch Contribution to Steady State Unemployment Dynamics

		Mismatch	Non-mismatch
Pre-recession	2001q3-2008q1	0.44	0.57
Recession	2008q2-2009q3	**0.54**	**0.46**
Post-recession	2009q4-2011q4	0.46	0.54
Full sample	2001q3-2011q4	0.47	0.54

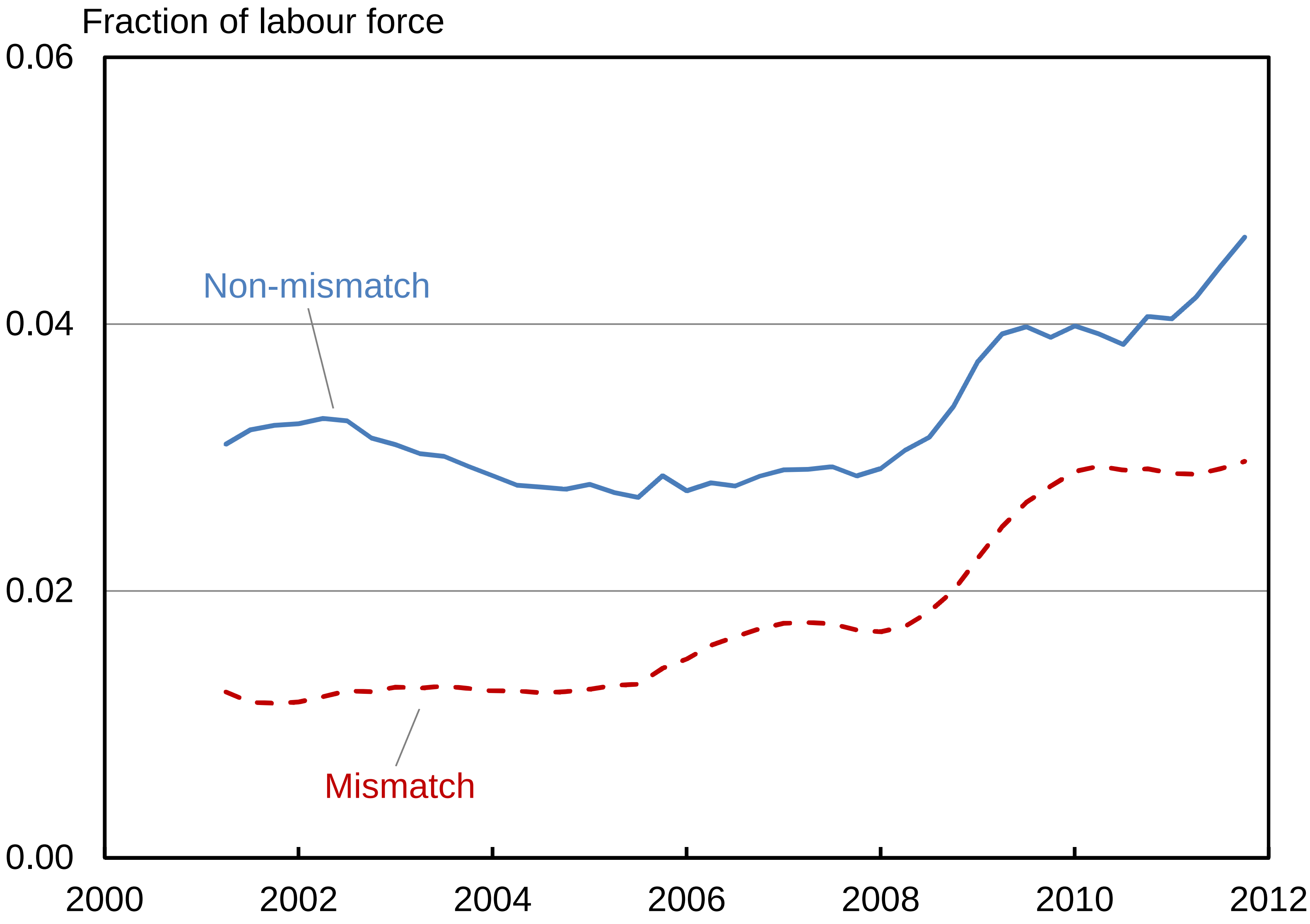
Steady State Unemployment Due to Mismatch and Other Influences



Mismatch Contribution to Actual Unemployment Dynamics



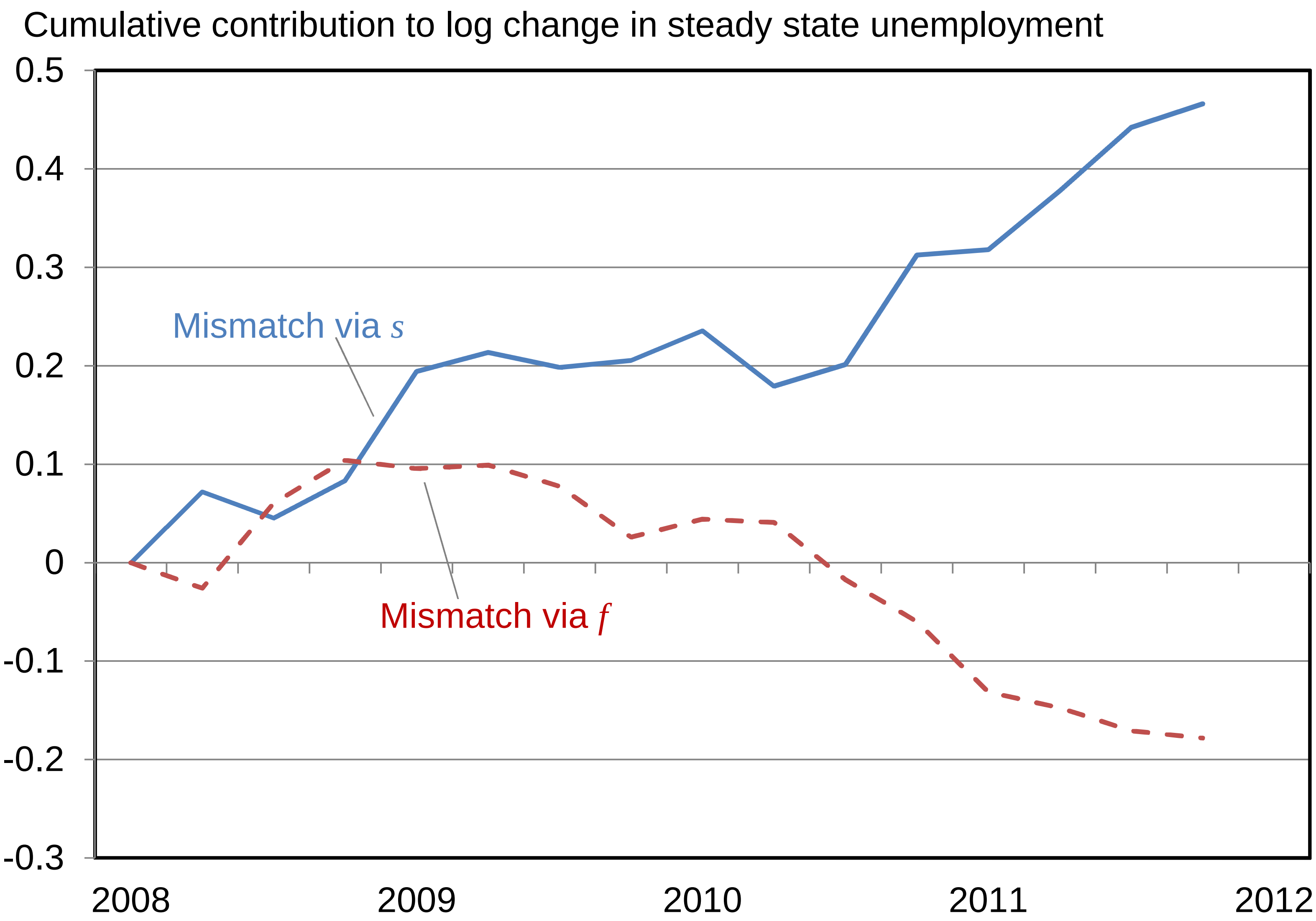
Actual Unemployment Due to Mismatch and Other Influences



Flow Transition Rate Contributions to Steady State Unemployment Dynamics

Beta		Overall *f*	Overall *s*
Pre-recession	2001q3-2008q1	44%	56%
Recession	2008q2-2009q3	44%	57%
Post-recession	2009q4-2011q4	20%	80%
Full sample	2001q3-2011q4	37%	63%

Mismatch Paths



Mismatch Paths

Beta		Mismatch		Non-mismatch	
		f	s	f	s
Pre-recession	2001q3-2008q1	6%	39%	38%	17%
Recession	2008q2-2009q3	11%	44%	33%	13%
Post-recession	2009q4-2011q4	12%	35%	8%	46%
Full sample	2001q3-2011q4	8%	38%	29%	25%

Conclusions

- Mismatch does appear to have played a role in UK unemployment dynamics.
- The indirect effect of mismatch, which raises the impact of inflow rate increases, seems to play an important part.