Estimating Matching Efficiency with Variable Search Effort: Tables and Figures*

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Abstract

This note includes the complete set of tables and figures for the augmented matching functions estimated in Hornstein and Kudlyak. 2016. Estimating Matching Efficiency with Variable Search Effort. Federal Reserve Bank of Richmond Working Paper No. 16-14.

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1.1. Tables

Table 1.A Unemployment by Duration for different samples and specifications with aggregate matching efficiency $\hat{\kappa}$

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$E[\hat{\kappa}_1]$	-2.401	-1.914	-2.548	-2.838	-2.749	-2.881
	(1.416)	(0.809)	(0.912)	(0.218)	(0.938)	(6.912)
c_2	-0.325	-0.572	-0.349	-0.314	-0.216	-0.212
	(0.245)	(0.008)	(0.051)	(0.039)	(0.417)	(0.415)
c_3	-0.587	-1.076	-0.682	-0.451	-0.423	-0.461
	(0.091)	(0.014)	(0.058)	(0.171)	(0.421)	(0.839)
ϕ_1	0.405	0.611	0.358	0.303	0.355	0.377
	(0.021)	(0.073)	(0.024)	(0.036)	(0.107)	(0.111)
ϕ_2	0.562	-	0.483	0.429	0.543	0.579
	(0.139)	-	(0.047)	(0.072)	(0.067)	(0.070)
ϕ_3	0.717	-	0.579	0.628	0.702	0.730
	(0.081)	-	(0.029)	(0.087)	(0.092)	(0.584)
$\sigma_{\varepsilon,1}$	0.048	0.065	0.045	0.045	0.049	0.050
	(0.009)	(0.006)	(0.003)	(0.003)	(0.006)	(0.006)
$\sigma_{\varepsilon,2}$	0.038	0.042	0.036	0.036	0.039	0.038
	(0.006)	(0.004)	(0.003)	(0.003)	(0.005)	(0.005)
$\sigma_{\varepsilon,3}$	0.088	0.110	0.086	0.079	0.085	0.091
	(0.017)	(0.009)	(0.005)	(0.006)	(0.010)	(0.009)
σ_{ς}	0.054	0.036	0.060	0.063	0.069	0.038
	(0.017)	(0.012)	(0.012)	(0.013)	(0.019)	(0.014)

Table 1.A continued

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$\lambda_{adj,1}$	-	-	0.156	0.154	-	-
	-	-	(0.025)	(0.027)	-	-
$\lambda_{adj,2}$	-	-	0.069	0.066	-	-
	-	-	(0.019)	(0.031)	-	-
$\lambda_{adj,3}$	-	-	0.055	0.050	-	-
	-	-	(0.031)	(0.050)	-	-
$\phi_{hU,1}$	-	-	-	0.017	-	-
	-	-	-	(0.009)	-	-
$\phi_{hU,2}$	-	-	-	0.015	-	-
	-	-	-	(0.012)	-	-
$\phi_{hU,3}$	-	-	-	-0.025	-	-
	-	-	-	(0.021)	-	-
Log Likehood	346.910	305.460	664.070	675.045	224.958	243.407
No Obs	84	84	156	156	56	59
No Par	10	8	13	16	10	10

Note: Parameter estimates for unemployment by duration where $i = 1$ denotes 1-4 weeks of unemployment, $i = 2$ denotes 5-26 weeks of unemployment, and $i = 3$ denotes more than 26 weeks of unemployment. $E[\hat{\kappa}_1]$ is the initial prior for the aggregate matching efficiency, c_i is the fixed type-specific effect, ϕ_i is the identified transition elasticity, $\sigma_{\varepsilon,i}$ is the standard deviation of the measurement error, and σ_ς is the standard error of the innovation to the aggregate matching efficiency. Columns (1a) through (3a) display parameter estimates for various samples and specifications of a model with a random walk for aggregate matching efficiency using the HWI as a measure of vacancies. Column (3b) displays the parameter estimates using the JOLTS vacancy measure. Column (1a) displays estimates for the sample period 1994-2015, and column (1b) imposes the restriction that ϕ_i is the same for all types. Column (2a) displays estimates for the sample period 1976-2015 with adjustment of the search pool data prior to the 1994 CPS revision based on Polivka and Miller (1998) and a fixed estimated structural change in measured transition rates $\lambda_{adj,i}$, and column (2b) introduces an unemployment rate contingent structural break for the identified transition elasticity, $\phi_{hU,i}$ as explained in the text. Column (3a) re-estimates the model from column (1a) for the sub-sample 2001-2015 with HWI for vacancies, and column (3b) does the same with vacancies from JOLTS. For the

Table 1.B Unemployment by Duration for different samples and specifications with type-specific matching efficiency z_i

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$E[z_{1,1}]$	-1.103	-1.167	-0.991	-0.950	-1.107	-1.143
	(0.291)	(0.316)	(0.557)	(0.382)	(0.134)	(0.088)
$E[z_{2,1}]$	-1.797	-1.687	-1.654	-1.634	-1.845	-1.938
	(0.504)	(0.577)	(0.376)	(1.045)	(0.518)	(0.284)
$E[z_{3,1}]$	-2.253	-2.135	-2.132	-2.122	-2.258	-2.356
	(0.390)	(0.942)	(0.760)	(0.686)	(0.409)	(0.545)
ϕ_1	0.488	0.557	0.392	0.337	0.516	0.437
	(0.057)	(0.049)	(0.311)	(0.105)	(0.055)	(0.061)
ϕ_2	0.650	-	0.529	0.507	0.685	0.621
	(0.066)	-	(0.046)	(0.214)	(0.051)	(0.079)
ϕ_3	0.657	-	0.512	0.508	0.621	0.577
	(0.107)	-	(0.223)	(0.135)	(0.085)	(0.101)
$\sigma_{\varepsilon,1}$	0.048	0.048	0.045	0.045	0.050	0.050
	(0.004)	(0.004)	(0.013)	(0.012)	(0.007)	(0.005)
$\sigma_{\varepsilon,2}$	0.042	0.041	0.039	0.039	0.045	0.040
	(0.004)	(0.004)	(0.005)	(0.006)	(0.006)	(0.004)
$\sigma_{\varepsilon,3}$	0.081	0.079	0.078	0.078	0.077	0.075
	(0.008)	(0.008)	(0.007)	(0.009)	(0.013)	(0.008)
$\sigma_{\xi,1}$	0.012	0.013	0.013	0.012	0.016	0.011
	(0.004)	(0.004)	(0.003)	(0.007)	(0.006)	(0.005)
$\sigma_{\xi,2}$	0.018	0.021	0.019	0.019	0.020	0.015
	(0.004)	(0.005)	(0.004)	(0.004)	(0.006)	(0.004)
$\sigma_{\xi,3}$	0.031	0.033	0.030	0.030	0.035	0.030
	(0.008)	(0.008)	(0.008)	(0.017)	(0.010)	(0.008)

Table 1.B continued

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$\lambda_{adj,1}$	-	-	0.114	0.103	-	-
	-	-	(0.126)	(0.207)	-	-
$\lambda_{adj,2}$	-	-	0.055	0.056	-	-
	-	-	(0.141)	(0.274)	-	-
$\lambda_{adj,3}$	-	-	0.057	0.063	-	-
	-	-	(0.120)	(0.100)	-	-
$\phi_{hU,1}$	-	-	-	-0.048	-	-
	-	-	-	(0.102)	-	-
$\phi_{hU,2}$	-	-	-	-0.018	-	-
	-	-	-	(0.023)	-	-
$\phi_{hU,3}$	-	-	-	-0.001	-	-
	-	-	-	(0.143)	-	-
Log Likehood	331.396	328.629	636.819	639.924	210.022	235.396
No Obs	84	84	156	156	56	59
No Par	12	10	15	18	12	12

Note: See the note for Table 1.A. In addition, $E\left[z_{i,0}\right]$ is the initial prior for a type-specific matching efficiency, and $\sigma_{\xi,i}$ is the standard deviation of the innovation for a type-specific efficiency.

Table 1.C. Unemployment by Duration for different samples and specifications with aggregate and type-specific matching efficiency $(\hat{\kappa}, z_i)$

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$E[\hat{\kappa}_1]$	-2.407	-1.978	-2.559	-2.880	-2.832	-2.867
	(0.549)	(1.325)	(0.420)	(0.498)	(0.555)	(0.649)
c_2	-0.329	-0.571	-0.338	-0.303	-0.237	-0.223
	(0.153)	(0.026)	(0.029)	(0.138)	(0.077)	(0.081)
c_3	-0.701	-1.087	-0.780	-0.433	-0.688	-0.719
	(0.058)	(0.055)	(0.058)	(0.206)	(0.167)	(0.150)
ϕ_1	0.402	0.556	0.354	0.294	0.351	0.385
	(0.036)	(0.088)	(0.024)	(0.067)	(0.064)	(0.039)
ϕ_2	0.555	-	0.484	0.421	0.526	0.586
	(0.058)	-	(0.035)	(0.057)	(0.088)	(0.068)
ϕ_3	0.644	-	0.525	0.617	0.567	0.609
	(0.059)	-	(0.039)	(0.084)	(0.144)	(0.083)
$\sigma_{\varepsilon,1}$	0.041	0.039	0.041	0.041	0.036	0.044
	(0.009)	(0.005)	(0.003)	(0.003)	(0.016)	(0.009)
$\sigma_{\varepsilon,2}$	0.036	0.037	0.034	0.034	0.036	0.037
	(0.005)	(0.004)	(0.003)	(0.006)	(0.006)	(0.005)
$\sigma_{\varepsilon,3}$	0.078	0.077	0.076	0.002	0.071	0.074
	(0.008)	(0.007)	(0.005)	(0.072)	(0.009)	(0.008)
σ_{ς}	0.060	0.060	0.066	0.072	0.085	0.043
	(0.014)	(0.018)	(0.016)	(0.014)	(0.024)	(0.016)
$\sigma_{\xi,1}$	0.018	0.025	0.009	0.009	0.031	0.020
	(0.014)	(0.007)	(0.003)	(0.004)	(0.019)	(0.018)
$\sigma_{\xi,2}$	0.000	0.000	0.001	0.006	0.001	0.002
	(0.040)	(0.019)	(0.025)	(0.040)	(0.030)	(0.044)
$\sigma_{\xi,3}$	0.016	0.018	0.015	0.081	0.016	0.017
	(0.007)	(0.007)	(0.005)	(0.006)	(0.008)	(0.007)
γ_1	0.690	0.898	0.887	0.897	0.383	0.401
	(0.188)	(0.066)	(0.042)	(0.066)	(0.154)	(0.342)
γ_2	0.031	0.136	0.337	0.350	-0.154	-0.405
	(0.342)	(41.215)	(0.149)	(0.454)	(0.452)	(2.974)
γ_3	0.951	0.967	0.949	0.038	0.970	0.974
	(0.067)	(0.034)	(0.028)	(0.067)	(0.039)	(0.032)

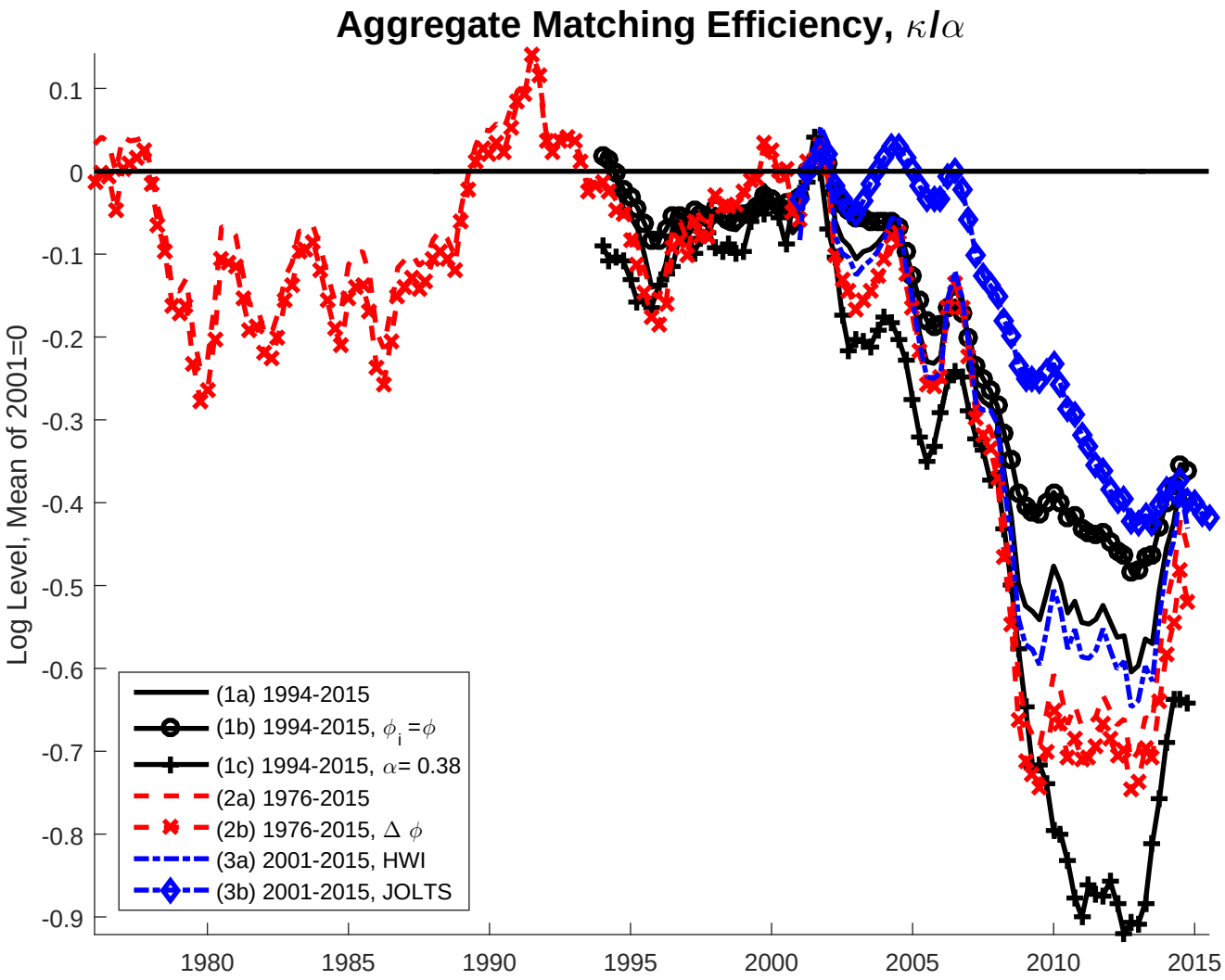
Table 1.C, continued

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$\lambda_{adj,1}$	-	-	0.157	0.152	-	-
	-	-	(0.017)	(0.024)	-	-
$\lambda_{adj,2}$	-	-	0.076	0.071	-	-
	-	-	(0.023)	(0.030)	-	-
$\lambda_{adj,3}$	-	-	0.045	0.059	-	-
	-	-	(0.030)	(0.043)	-	-
$\phi_{hU,1}$	-	-	-	0.015	-	-
	-	-	-	(0.009)	-	-
$\phi_{hU,2}$	-	-	-	0.015	-	-
	-	-	-	(0.009)	-	-
$\phi_{hU,3}$	-	-	-	-0.024	-	-
	-	-	-	(0.015)	-	-
Log Likelihood	352.894	343.648	675.361	680.491	230.156	250.664
No Obs	84	84	156	156	56	59
No Par	16	14	19	22	16	16

Note: See the notes for Tables 1.A&B. In addition, γ_i is the autocorrelation coefficient for the AR(1) process for type-specific matching efficiencies

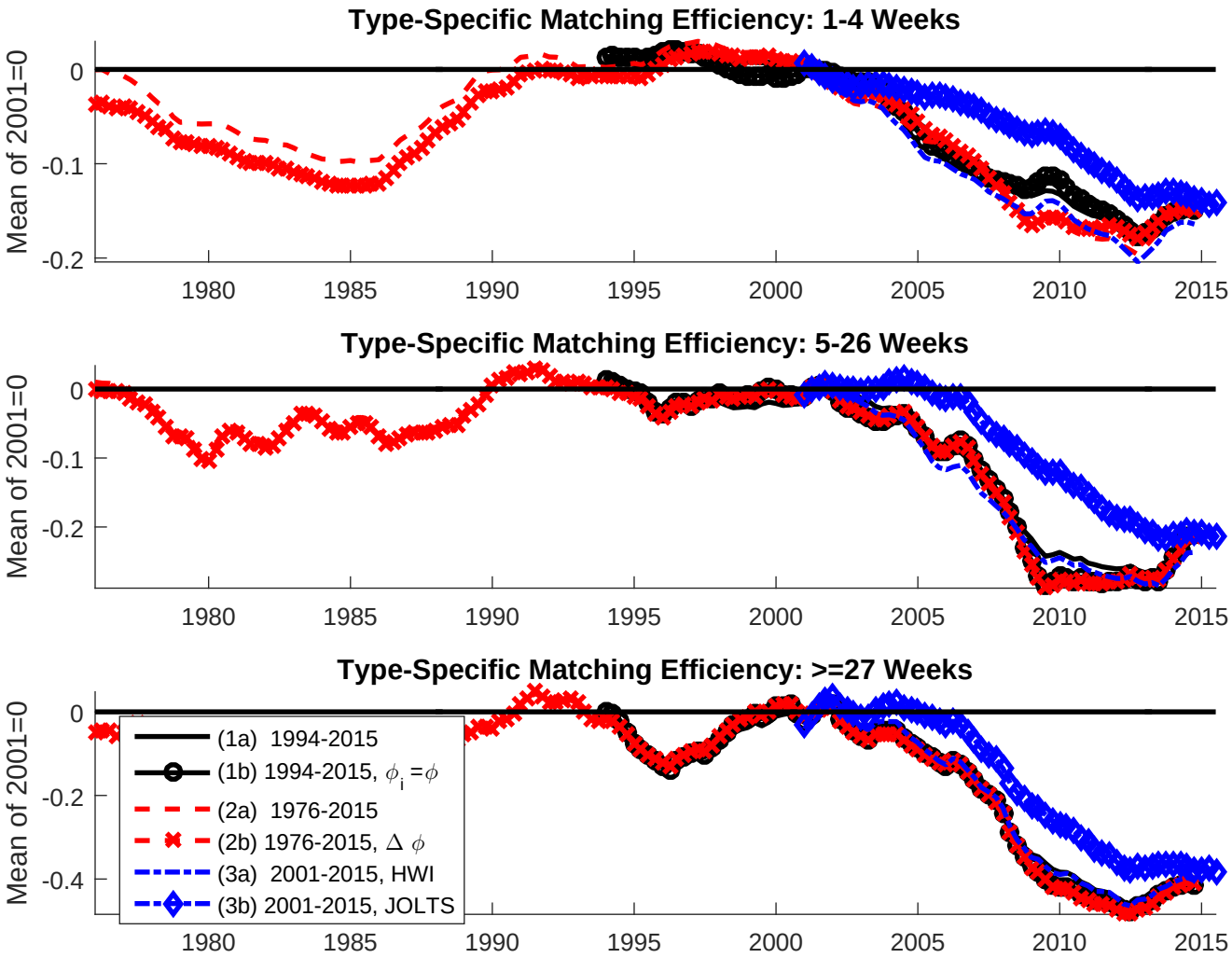
1.2. Estimated matching efficiencies

Figure 1.A Unemployment by duration: Aggregate matching efficiency only



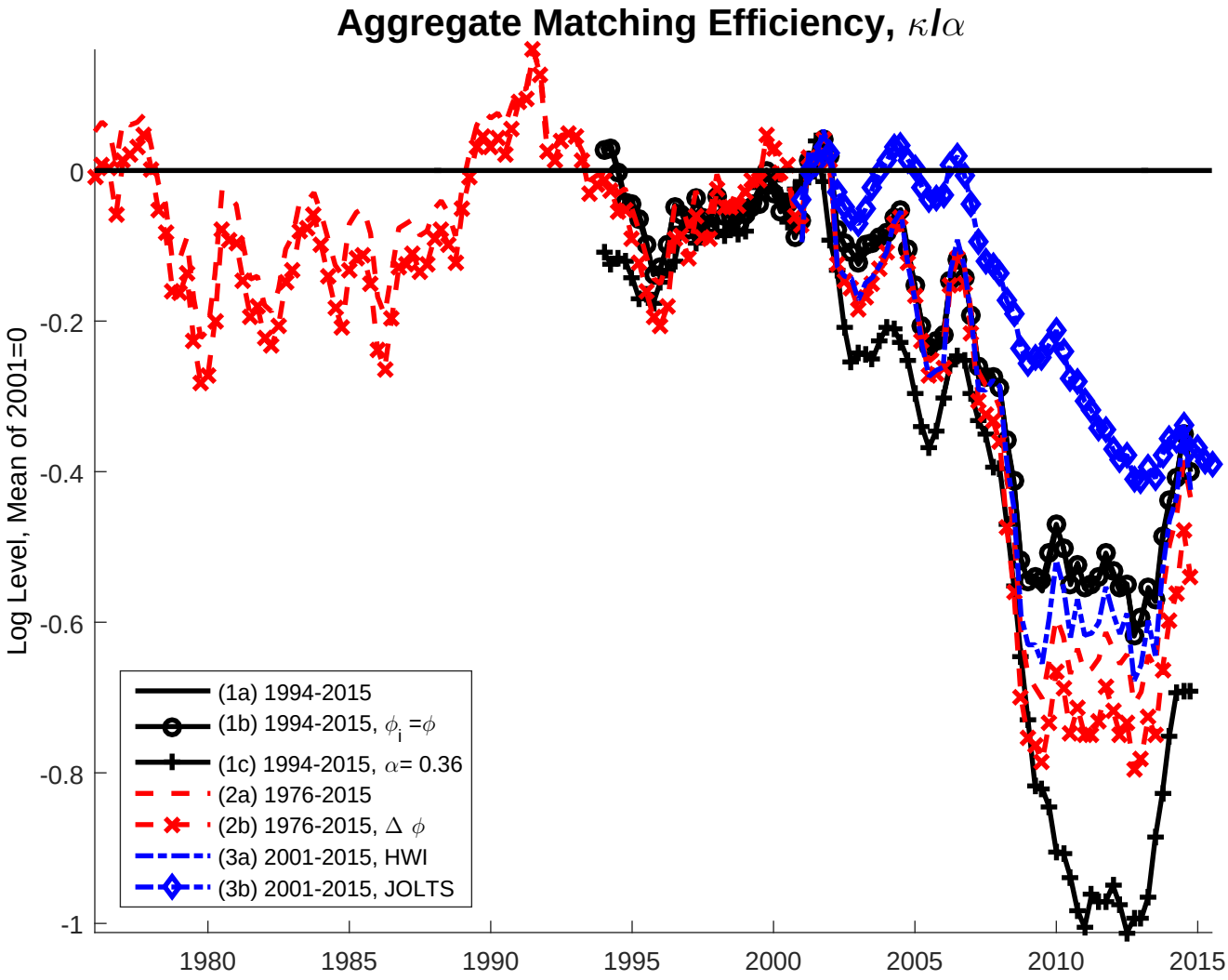
Note: Smoothed posterior estimate of the aggregate matching efficiency from a model with a random walk in aggregate matching efficiency. For the samples and model specifications refer to Table 1.A. All efficiencies are normalized to zero in 2001Q1.

Figure 1.B Unemployment by duration: Type-specific matching efficiencies only



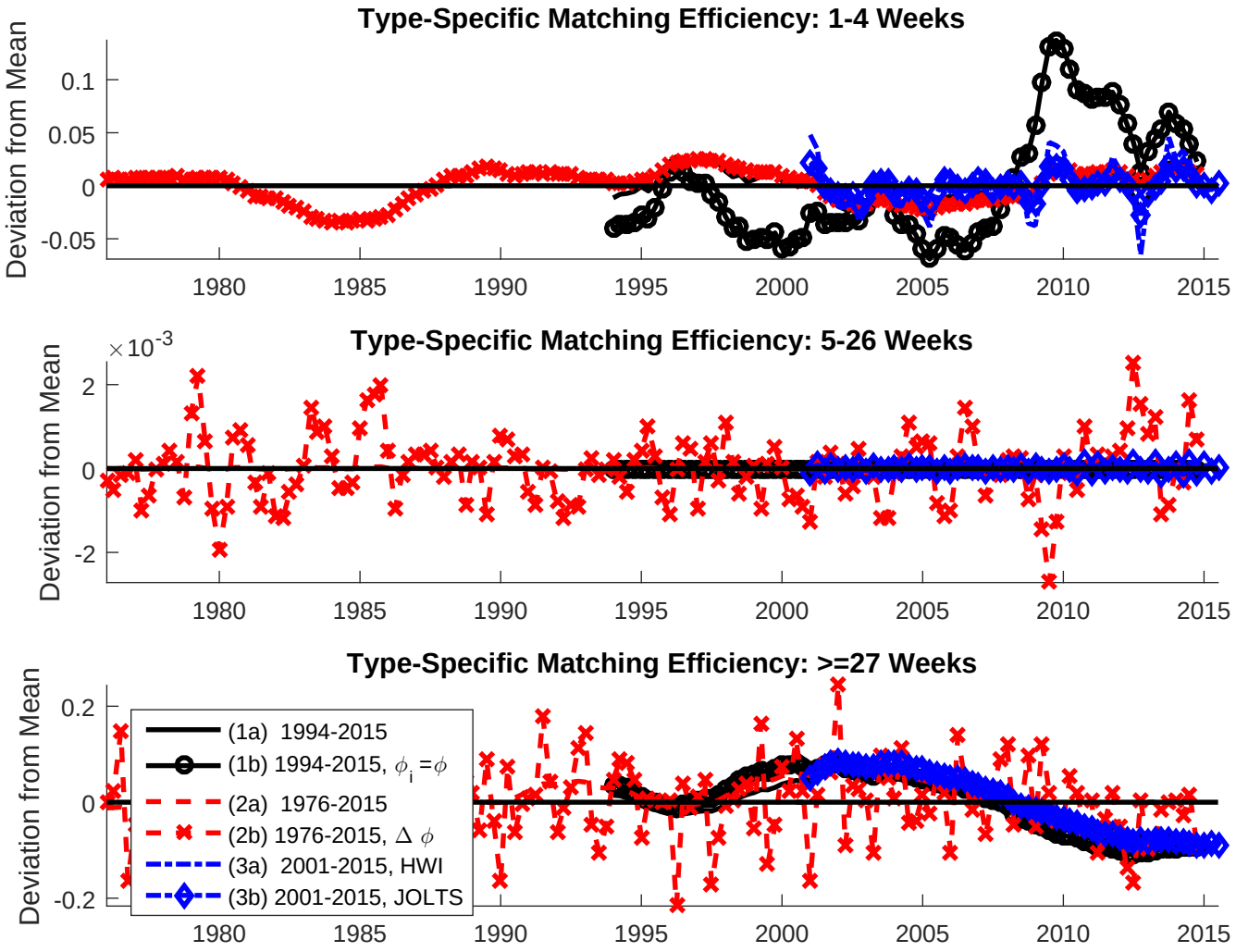
Note: Smoothed posterior estimate of type-specific matching efficiencies from a model with random walks in type-specific matching efficiencies. For the samples and model specifications refer to Table 1.B. All efficiencies are normalized to zero in 2001Q1.

Figure 1.C.a Unemployment by duration: Aggregate and type-specific efficiencies
Aggregate matching efficiency



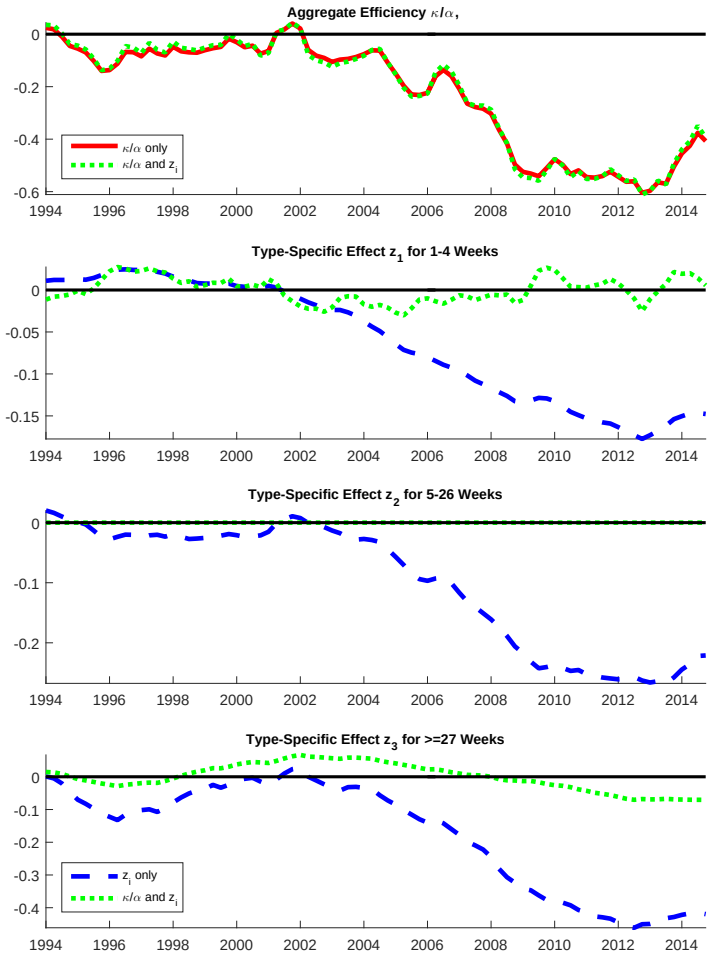
Note: Smoothed posterior estimate of the aggregate matching efficiency from a model with random walk in aggregate efficiency and AR(1)'s for type-specific matching efficiencies. For the samples and model specifications refer to Table 1.C. All efficiencies are normalized to zero in 2001Q1.

Figure 1.C.b Unemployment by duration: aggregate and type-specific efficiencies
Type-specific matching efficiencies



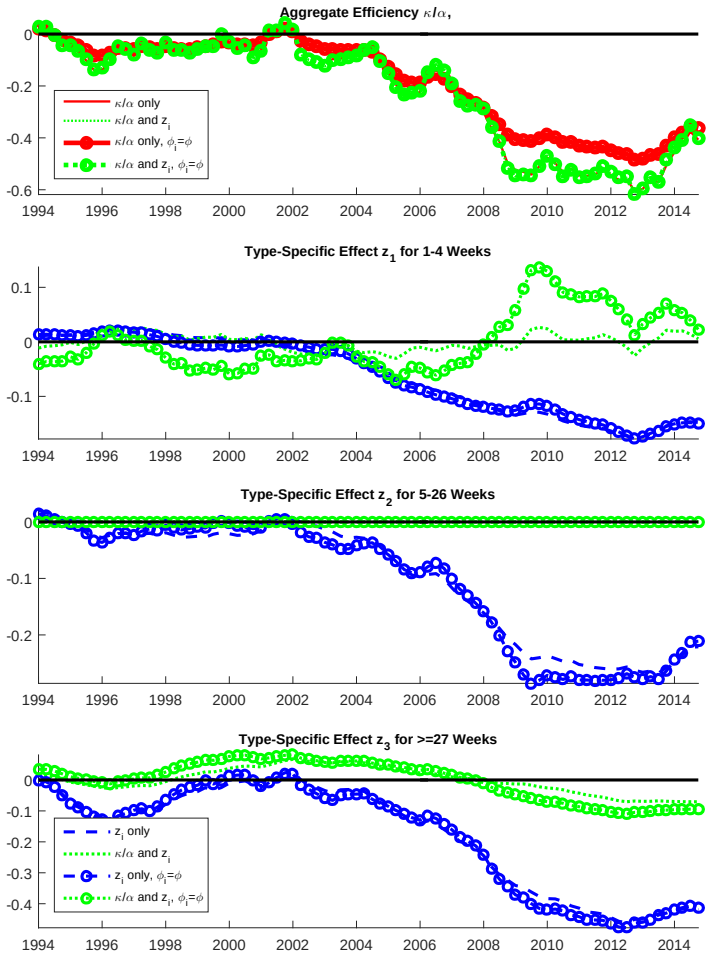
Note: Smoothed posterior estimates of type-specific matching efficiencies from a model with random walk in aggregate efficiency and AR(1)'s for type-specific matching efficiencies. For the samples and model specifications refer to Table 2.B. All efficiencies are normalized to zero in 2001Q1.

Figure 1.D.a Unemployment by duration: aggregate and type-specific efficiencies,



Note: Smoothed posterior estimates of the aggregate and type-specific efficiencies for the sample 1994-2016, cf. columns (1a) in Tables 1.A-C. All efficiencies are normalized to zero in 2001Q1.

Figure 1.D.b Unemployment by duration: aggregate and type-specific efficiencies



Note: Smoothed posterior estimates of the aggregate and type-specific efficiencies for the sample 1994-2016, cf. columns (1b) in Tables 1.A-C. All efficiencies are normalized to zero in 2001Q1.

1.3. Matching function elasticity and search effort cyclicality

Note: Results in Figure 1.E.a-d are based on sample and model specification with aggregate matching efficiency only represented by column (1a) in Table 1.A. All variables normalized to zero in 1994Q1.

Figure 1.E a Components of the average transition rate to employment: tightness, effort, and efficiency

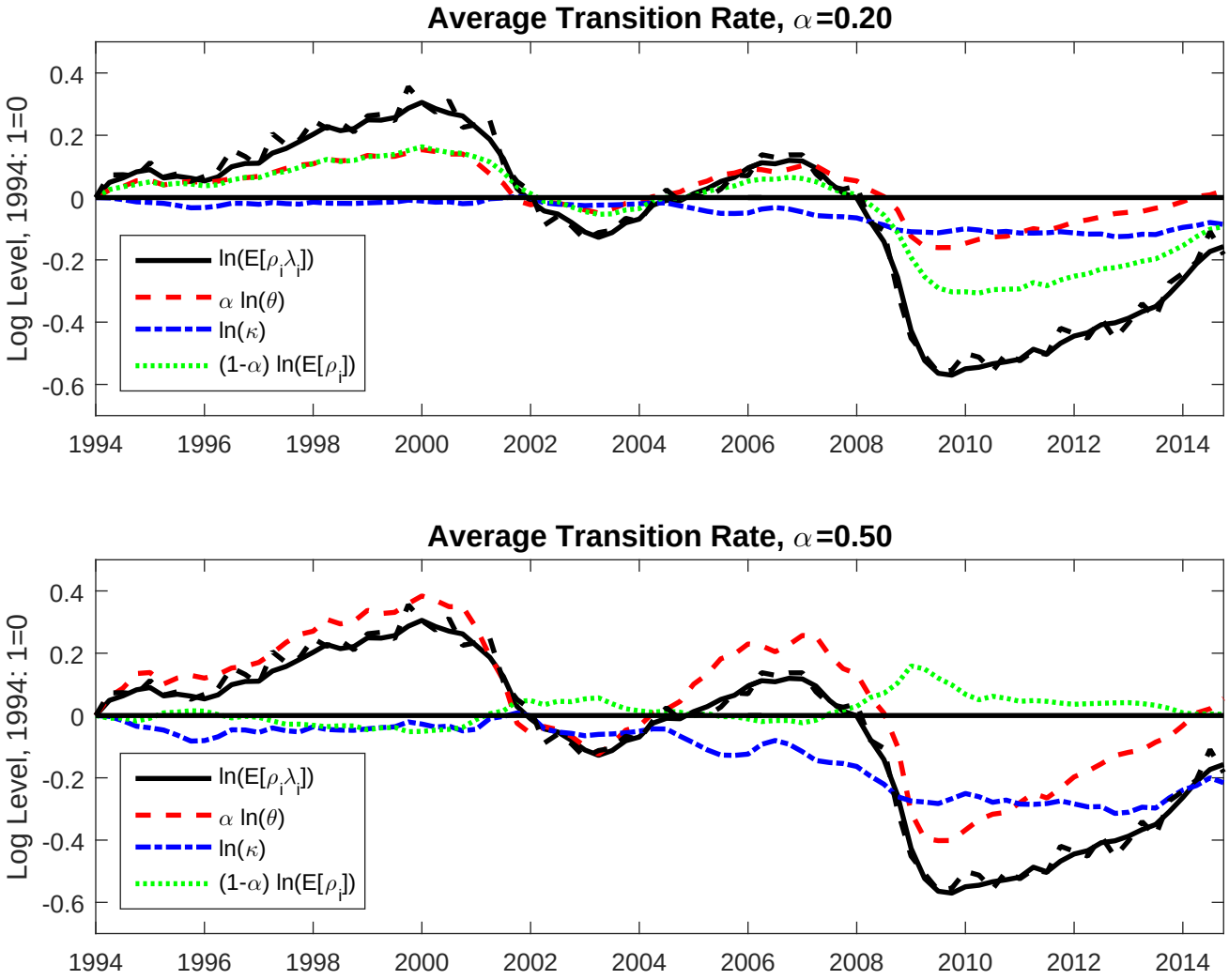


Figure 1.E b Components of average search effort: composition and variable search effort

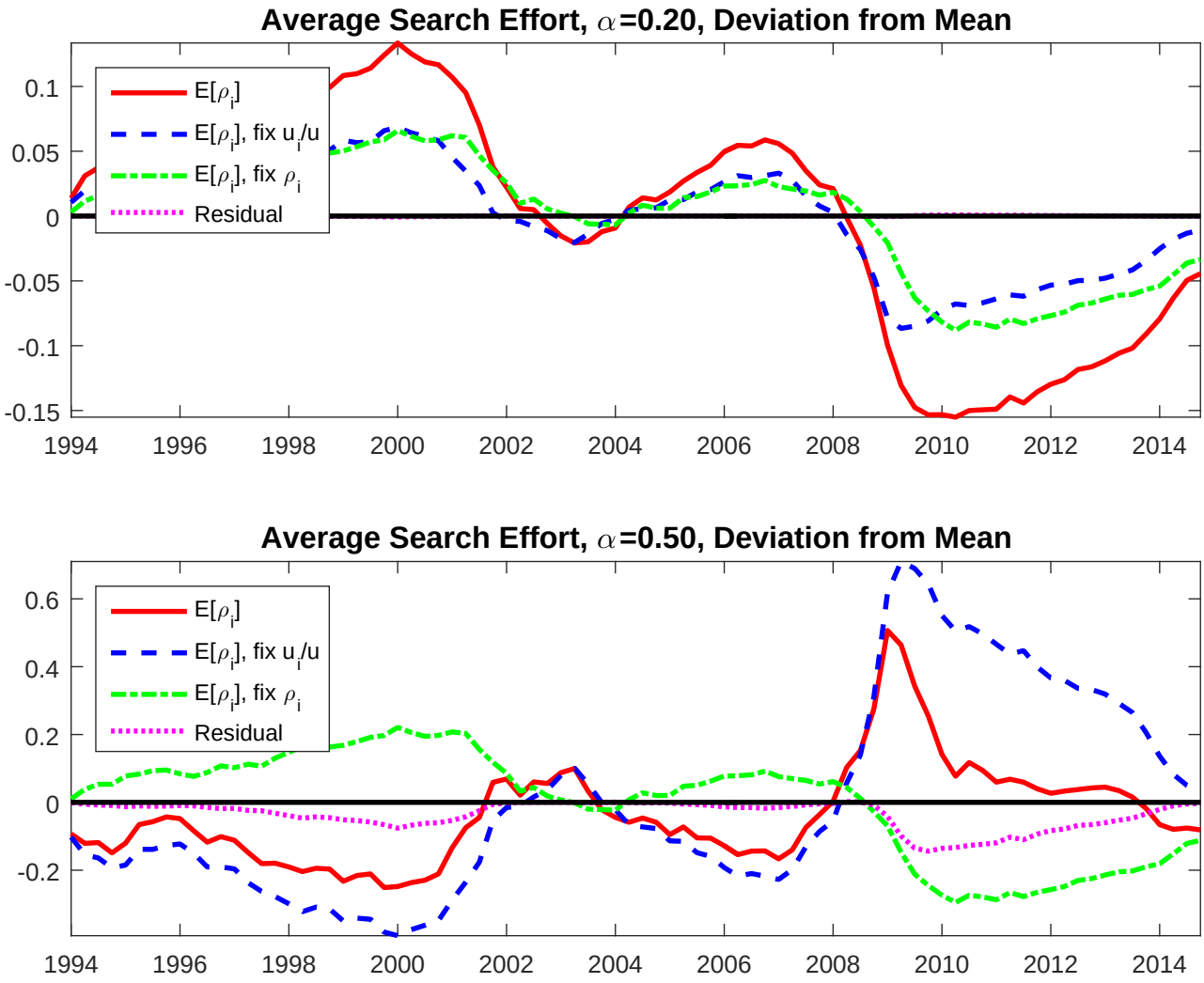


Figure 1.E.c Decomposition of average transition rate for $\alpha = 0.2$: pro-cyclical search effort

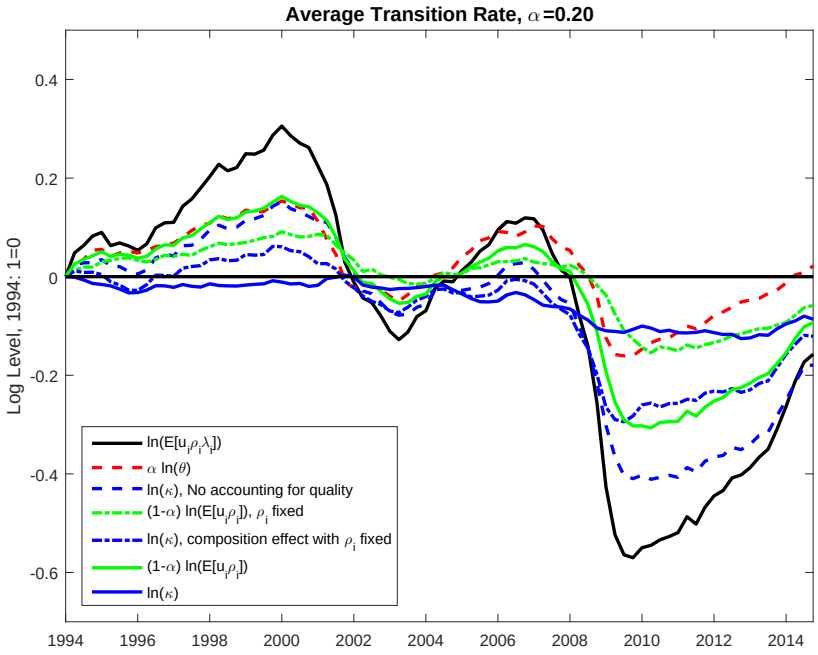
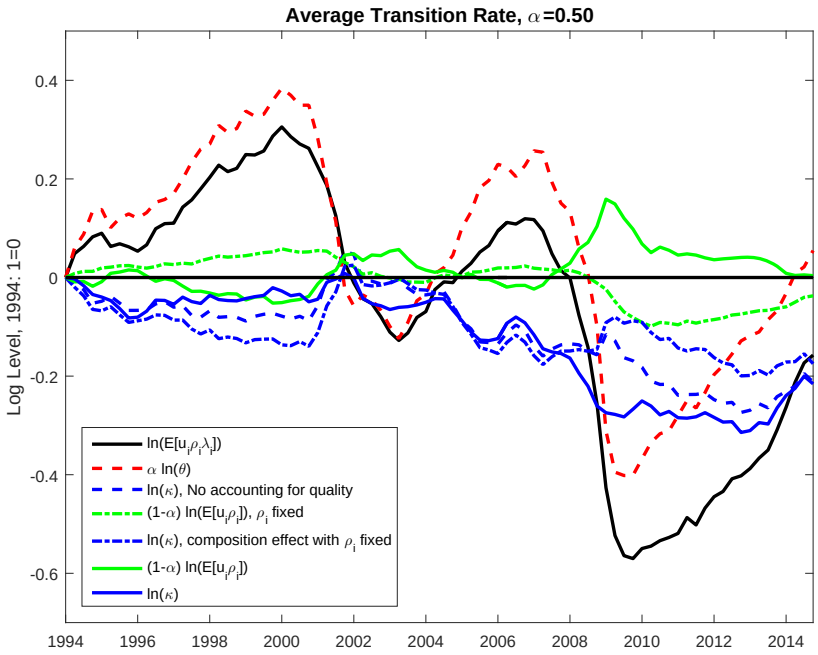


Figure 1.E d Decomposition of average transition rate for $\alpha = 0.5$: counter-cyclical search effort



2. Unemployment by reason

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2.1. Tables

Table 2.A Unemployment by Reason for different samples and specifications with aggregate matching efficiency $\hat{\kappa}$

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$E[\hat{\kappa}_1]$	-2.374	-1.215	-2.046	-3.193	-2.280	-2.528
	(1.090)	(1.018)	(1.870)	(0.912)	(1.089)	(0.617)
c_2	-0.169	-1.010	-0.536	-0.154	-0.171	-0.225
	(0.127)	(0.024)	(0.067)	(0.140)	(0.159)	(0.149)
c_3	0.205	-0.670	-0.193	0.309	0.167	0.104
	(0.132)	(0.024)	(0.064)	(0.150)	(0.157)	(0.162)
c_4	-0.156	-0.926	-0.523	0.013	-0.152	-0.196
	(0.120)	(0.024)	(0.056)	(0.152)	(0.140)	(0.148)
ϕ_1	0.200	0.822	0.230	0.108	0.208	0.202
	(0.035)	(0.120)	(0.017)	(0.018)	(0.049)	(0.036)
ϕ_2	0.743	-	0.579	0.458	0.769	0.728
	(0.098)	-	(0.037)	(0.055)	(0.126)	(0.094)
ϕ_3	0.764	-	0.581	0.520	0.773	0.729
	(0.101)	-	(0.033)	(0.062)	(0.125)	(0.100)
ϕ_4	0.697	-	0.527	0.512	0.724	0.690
	(0.092)	-	(0.031)	(0.061)	(0.126)	(0.092)
$\sigma_{\varepsilon,1}$	0.073	0.210	0.099	0.096	0.079	0.082
	(0.006)	(0.017)	(0.006)	(0.006)	(0.008)	(0.008)
$\sigma_{\varepsilon,2}$	0.054	0.058	0.051	0.050	0.057	0.057
	(0.005)	(0.006)	(0.004)	(0.004)	(0.007)	(0.007)
$\sigma_{\varepsilon,3}$	0.067	0.070	0.062	0.061	0.069	0.071
	(0.006)	(0.006)	(0.004)	(0.004)	(0.007)	(0.007)
$\sigma_{\varepsilon,4}$	0.061	0.059	0.065	0.059	0.065	0.062
	(0.006)	(0.006)	(0.005)	(0.004)	(0.008)	(0.007)
σ_{ς}	0.049	0.046	0.060	0.065	0.055	0.043
	(0.012)	(0.011)	(0.010)	(0.011)	(0.016)	(0.011)

Table 2.A continued

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$\lambda_{adj,1}$	-	-	0.422	0.409	-	-
	-	-	(0.043)	(0.018)	-	-
$\lambda_{adj,2}$	-	-	0.032	0.006	-	-
	-	-	(0.130)	(0.039)	-	-
$\lambda_{adj,3}$	-	-	0.015	-0.011	-	-
	-	-	(0.127)	(0.043)	-	-
$\lambda_{adj,4}$	-	-	0.023	-0.000	-	-
	-	-	(0.114)	(0.042)	-	-
$\phi_{hU,1}$	-	-	-	0.040	-	-
	-	-	-	(0.008)	-	-
$\phi_{hU,2}$	-	-	-	0.034	-	-
	-	-	-	(0.010)	-	-
$\phi_{hU,3}$	-	-	-	0.009	-	-
	-	-	-	(0.011)	-	-
$\phi_{hU,4}$	-	-	-	-0.008	-	-
	-	-	-	(0.011)	-	-
Log Likelihood	421.483	328.095	743.210	766.834	264.487	282.941
No Obs	84	84	156	156	56	59
No Par	13	10	17	21	13	13

Note: Parameter estimates for unemployment by reason where $i = 1$ denotes 'temporary layoff,' $i = 2$ denotes 'permanent layoff,' $i = 3$ denotes 'quit a job,' and $i = 4$ denotes 'previously been out of the labor force.' For the definitions of parameters and specifications see Table 1A.

Table 2.B Unemployment by Reason for different samples and specifications with type-specific matching efficiency z_i

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$E[z_{1,1}]$	-0.818	-0.894	-0.858	-0.855	-0.855	-0.822
	(0.105)	(0.045)	(0.078)	(0.121)	(0.088)	(0.043)
$E[z_{2,1}]$	-2.311	-2.029	-1.780	-1.755	-2.157	-2.217
	(5.406)	(1.137)	(0.208)	(0.275)	(0.263)	(0.465)
$E[z_{3,1}]$	-1.762	-1.391	-1.547	-1.523	-1.744	-1.790
	(1.198)	(1.152)	(0.173)	(0.228)	(0.370)	(0.525)
$E[z_{4,1}]$	-1.515	-1.533	-1.540	-1.527	-1.700	-1.833
	(2.558)	(0.905)	(0.148)	(0.214)	(0.328)	(0.336)
ϕ_1	0.467	0.537	0.519	0.523	0.498	0.408
	(0.093)	(0.041)	(0.047)	(0.054)	(0.048)	(0.036)
ϕ_2	0.903	-	0.677	0.635	0.954	0.823
	(0.160)	-	(0.072)	(0.049)	(0.120)	(0.088)
ϕ_3	0.858	-	0.641	0.601	0.901	0.768
	(0.139)	-	(0.057)	(0.056)	(0.114)	(0.092)
ϕ_4	0.653	-	0.442	0.420	0.668	0.643
	(0.284)	-	(0.049)	(0.055)	(0.101)	(0.084)
$\sigma_{\varepsilon,1}$	0.058	0.061	0.060	0.060	0.056	0.055
	(0.005)	(0.005)	(0.004)	(0.004)	(0.006)	(0.005)
$\sigma_{\varepsilon,2}$	0.053	0.045	0.047	0.048	0.056	0.052
	(0.006)	(0.006)	(0.004)	(0.004)	(0.007)	(0.006)
$\sigma_{\varepsilon,3}$	0.068	0.066	0.060	0.060	0.072	0.071
	(0.009)	(0.007)	(0.004)	(0.005)	(0.008)	(0.008)
$\sigma_{\varepsilon,4}$	0.051	0.050	0.046	0.047	0.052	0.048
	(0.007)	(0.005)	(0.004)	(0.004)	(0.008)	(0.006)
σ_{ς}	0.000	0.000	0.019	0.018	0.000	0.000
	(0.000)	(0.000)	(0.005)	(0.005)	(0.000)	(0.000)
$\sigma_{\xi,1}$	0.027	0.044	0.030	0.029	0.031	0.029
	(0.007)	(0.007)	(0.005)	(0.005)	(0.008)	(0.007)
$\sigma_{\xi,2}$	0.028	0.039	0.028	0.027	0.032	0.029
	(0.007)	(0.008)	(0.005)	(0.005)	(0.008)	(0.007)
$\sigma_{\xi,3}$	0.029	0.032	0.030	0.029	0.033	0.029
	(0.007)	(0.006)	(0.004)	(0.004)	(0.007)	(0.006)

Table 2.B continued

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$\lambda_{adj,1}$	-	-	0.346	0.353	-	-
	-	-	(0.049)	(0.041)	-	-
$\lambda_{adj,2}$	-	-	0.068	0.059	-	-
	-	-	(0.065)	(0.051)	-	-
$\lambda_{adj,3}$	-	-	0.001	-0.008	-	-
	-	-	(0.043)	(0.050)	-	-
$\lambda_{adj,4}$	-	-	-0.070	-0.074	-	-
	-	-	(0.050)	(0.048)	-	-
$\phi_{hU,1}$	-	-	-	0.005	-	-
	-	-	-	(0.027)	-	-
$\phi_{hU,2}$	-	-	-	-0.043	-	-
	-	-	-	(0.027)	-	-
$\phi_{hU,3}$	-	-	-	-0.038	-	-
	-	-	-	(0.029)	-	-
$\phi_{hU,4}$	-	-	-	-0.024	-	-
	-	-	-	(0.024)	-	-
Log Likelihood	421.645	408.961	794.949	797.118	271.048	297.937
No Obs	84	84	156	156	56	59
No Par	16	13	20	24	16	16

Note: For the definitions of parameters and columns see Table 2A and 1.B.

Table 2.C Unemployment by Reason for different samples and specifications with aggregate and type-specific matching efficiency $(\hat{\kappa}, z_i)$

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$E[\hat{\kappa}_1]$	-1.652	-1.210	-1.527	-1.593	-1.563	-1.812
	(2.979)	(4.914)	(2.351)	(0.317)	(0.225)	(0.386)
c_2	-0.667	-1.043	-0.823	-0.849	-0.649	-0.674
	(0.578)	(1.741)	(0.339)	(0.115)	(0.112)	(0.225)
c_3	-0.359	-0.704	-0.532	-0.520	-0.358	-0.379
	(0.606)	(1.845)	(0.213)	(0.110)	(0.316)	(0.212)
c_4	-0.720	-0.963	-0.917	-0.916	-0.710	-0.673
	(0.836)	(1.824)	(0.204)	(0.092)	(0.187)	(0.190)
ϕ_1	0.324	0.637	0.398	0.377	0.315	0.342
	(0.108)	(0.474)	(0.083)	(0.075)	(0.223)	(0.070)
ϕ_2	0.741	-	0.605	0.530	0.706	0.743
	(0.895)	-	(0.135)	(0.069)	(0.146)	(0.112)
ϕ_3	0.705	-	0.563	0.549	0.668	0.708
	(0.692)	-	(0.072)	(0.076)	(0.102)	(0.103)
ϕ_4	0.595	-	0.433	0.407	0.561	0.646
	(0.541)	-	(0.075)	(0.066)	(0.081)	(0.095)
$\sigma_{\varepsilon,1}$	0.047	0.038	0.051	0.051	0.049	0.049
	(0.007)	(0.179)	(0.005)	(0.005)	(0.007)	(0.006)
$\sigma_{\varepsilon,2}$	0.045	0.043	0.041	0.042	0.041	0.046
	(0.021)	(0.081)	(0.004)	(0.004)	(0.016)	(0.006)
$\sigma_{\varepsilon,3}$	0.063	0.067	0.044	0.047	0.001	0.032
	(0.142)	(0.389)	(0.030)	(0.032)	(0.182)	(0.092)
$\sigma_{\varepsilon,4}$	0.048	0.047	0.044	0.044	0.046	0.046
	(0.010)	(0.025)	(0.004)	(0.004)	(0.006)	(0.006)
σ_{ς}	0.064	0.069	0.077	0.076	0.086	0.053
	(0.031)	(0.400)	(0.019)	(0.014)	(0.039)	(0.016)
$\sigma_{\xi,1}$	0.020	0.044	0.033	0.032	0.019	0.018
	(0.010)	(0.143)	(0.006)	(0.006)	(0.008)	(0.006)
$\sigma_{\xi,2}$	0.012	0.024	0.010	0.008	0.014	0.015
	(0.049)	(0.173)	(0.004)	(0.004)	(0.019)	(0.008)
$\sigma_{\xi,3}$	0.018	0.000	0.038	0.035	0.070	0.064
	(0.519)	(0.290)	(0.038)	(0.046)	(0.010)	(0.049)

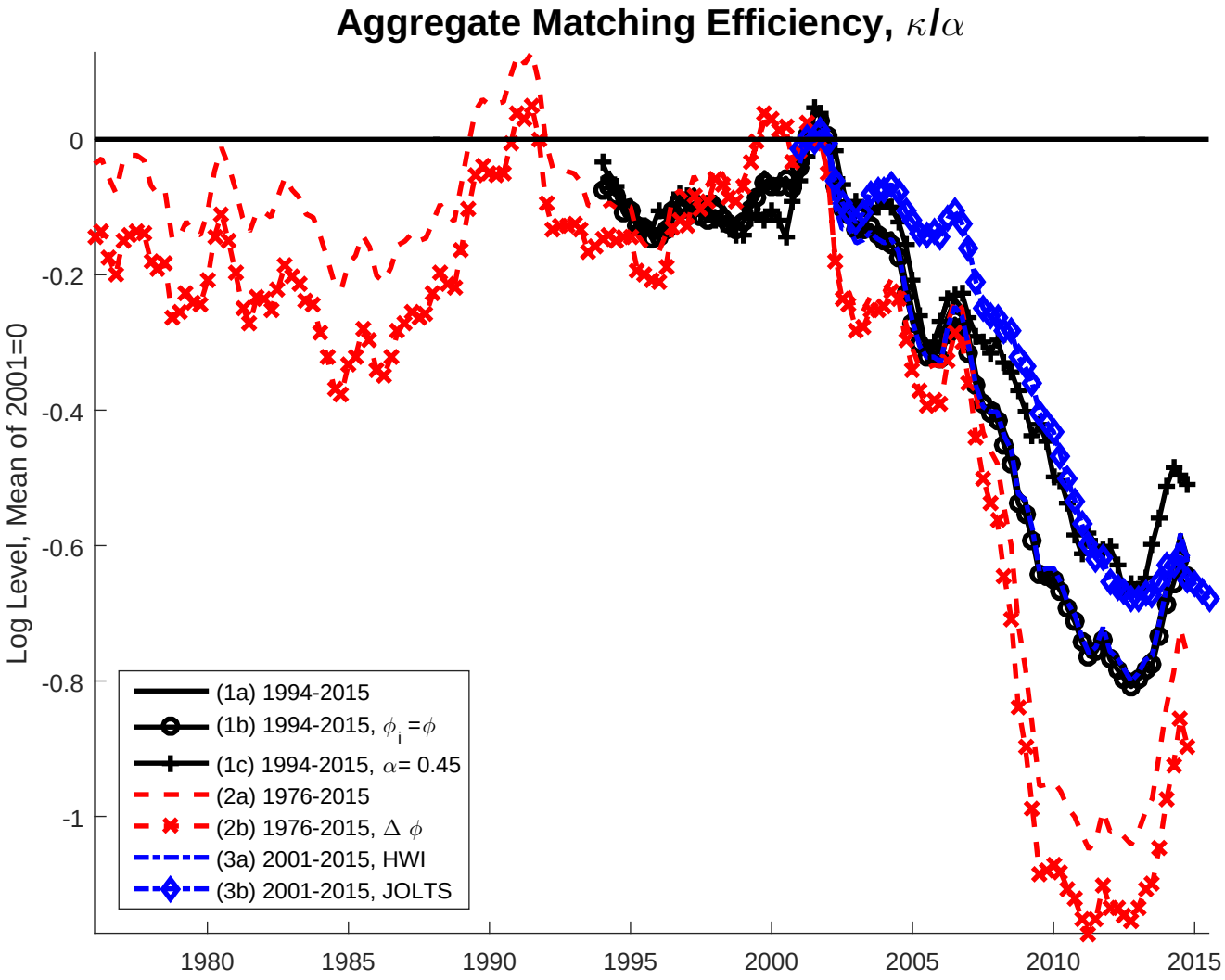
Table 2.C continued

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$\sigma_{\xi,4}$	0.014	0.016	0.019	0.020	0.015	0.020
	(0.008)	(0.222)	(0.004)	(0.004)	(0.018)	(0.010)
γ_1	0.972	0.975	0.962	0.962	0.984	0.986
	(0.239)	(0.033)	(0.028)	(0.028)	(0.026)	(0.020)
γ_2	0.958	0.838	0.971	0.964	0.939	0.928
	(0.194)	(2.254)	(0.028)	(0.040)	(0.107)	(0.101)
γ_3	-0.115	0.115	0.115	0.125	-0.093	-0.132
	(6.356)	(447.259)	(0.390)	(0.332)	(0.309)	(0.186)
γ_4	0.941	0.874	0.959	0.959	0.962	0.856
	(0.115)	(0.638)	(0.028)	(0.029)	(0.111)	(0.159)
$\lambda_{adj,1}$	-	-	0.427	0.426	-	-
	-	-	(0.054)	(0.058)	-	-
$\lambda_{adj,2}$	-	-	0.062	0.054	-	-
	-	-	(0.052)	(0.041)	-	-
$\lambda_{adj,3}$	-	-	0.031	0.033	-	-
	-	-	(0.074)	(0.042)	-	-
$\lambda_{adj,4}$	-	-	-0.046	-0.047	-	-
	-	-	(0.057)	(0.040)	-	-
$\phi_{hU,1}$	-	-	-	0.014	-	-
	-	-	-	(0.029)	-	-
$\phi_{hU,2}$	-	-	-	0.049	-	-
	-	-	-	(0.031)	-	-
$\phi_{hU,3}$	-	-	-	0.010	-	-
	-	-	-	(0.030)	-	-
$\phi_{hU,4}$	-	-	-	0.016	-	-
	-	-	-	(0.027)	-	-
Log Likelihood	450.257	435.892	841.766	843.542	290.773	311.836
No Obs	84	84	156	156	56	59
No Par	21	18	25	29	21	21

Note: See Table 2.A&B and 1.C.

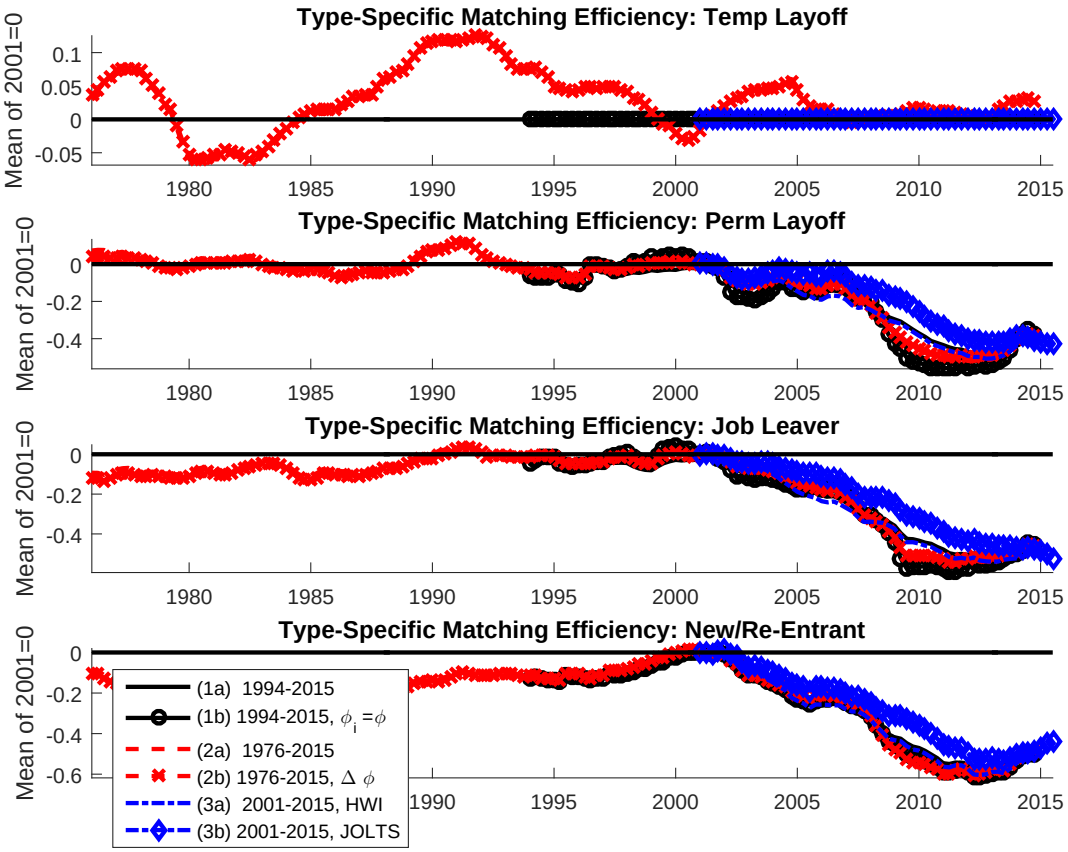
2.2. Estimated matching efficiencies

Figure 2.A Unemployment by reason: Aggregate matching efficiency only



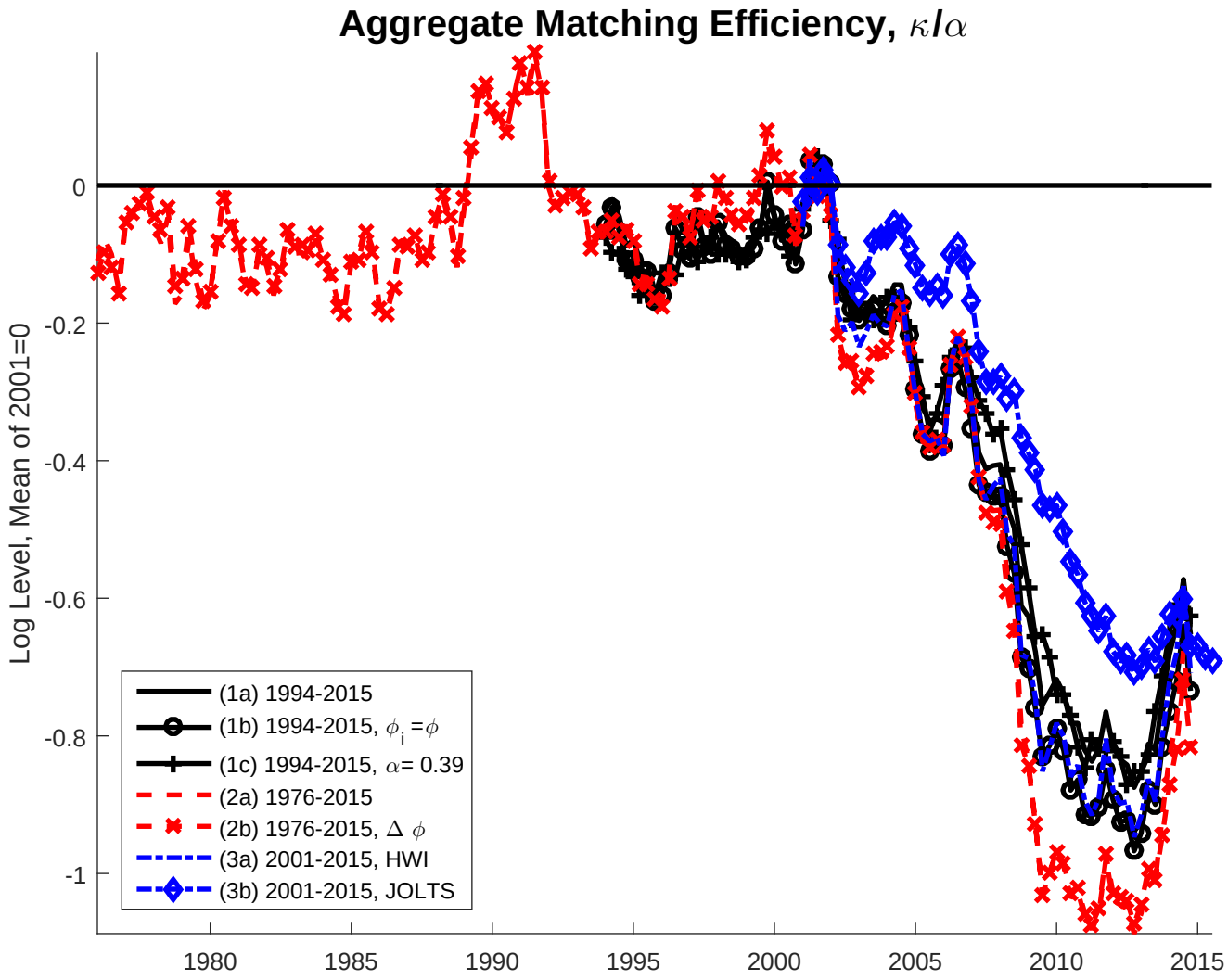
Note: Smoothed posterior estimate of the aggregate matching efficiency from a model with a random walk in aggregate matching efficiency. For the samples and model specifications refer to Table 2.A. All efficiencies are normalized to zero in 2001Q1.

Figure 2.B Unemployment by reason: Type-specific matching efficiencies only



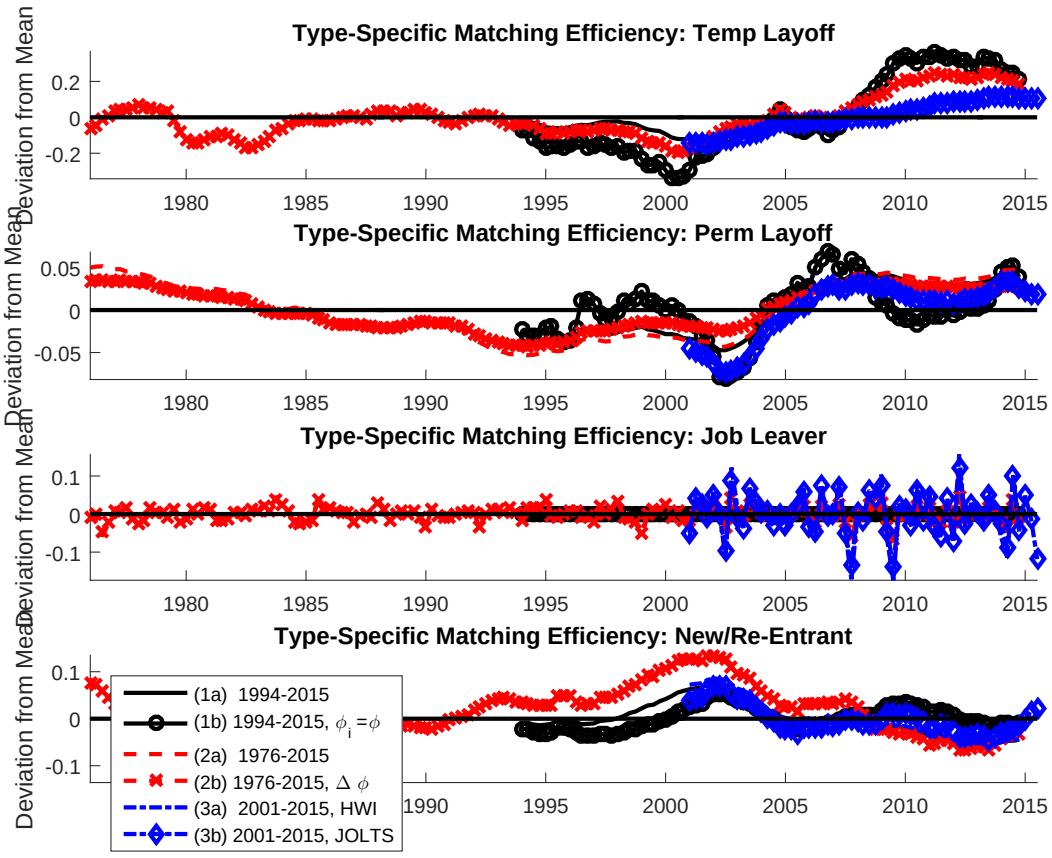
Note: Smoothed posterior estimates of type-specific matching efficiencies from a model with random walks in type-specific matching efficiencies. For the samples and model specifications refer to Table 2.B. All efficiencies are normalized to zero in 2001Q1.

Figure 2.C.a Unemployment by reason: Aggregate and type-specific efficiencies
Aggregate matching efficiency



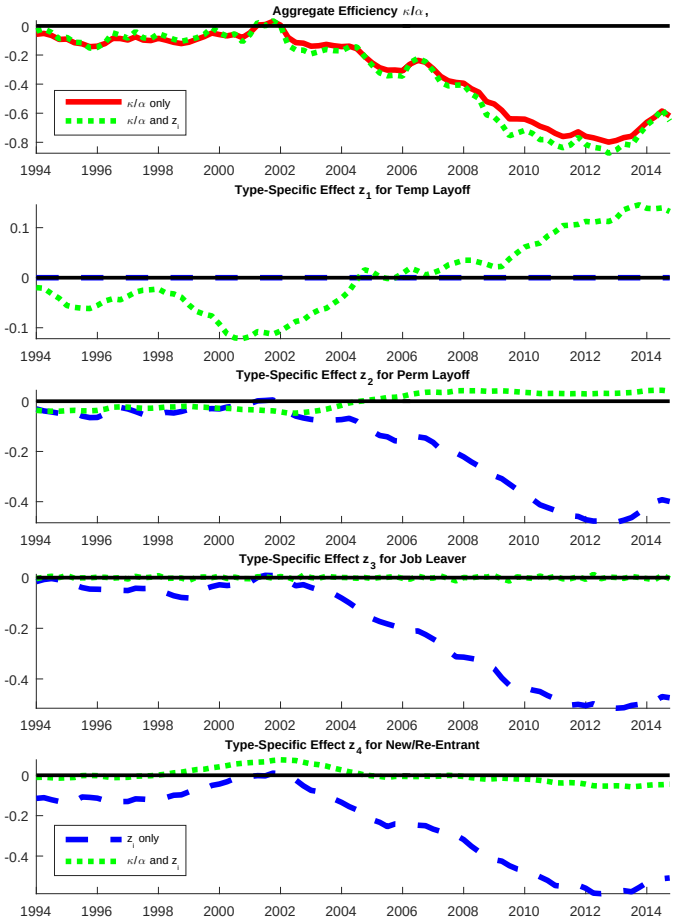
Note: Smoothed posterior estimate of the aggregate matching efficiency from a model with random walk in aggregate efficiency and AR(1)'s for type-specific matching efficiencies. For the samples and model specifications refer to Table 2.C. All efficiencies are normalized to zero in 2001Q1.

Figure 2.C.b Unemployment by reason: aggregate and type-specific efficiencies
Type-specific matching efficiencies



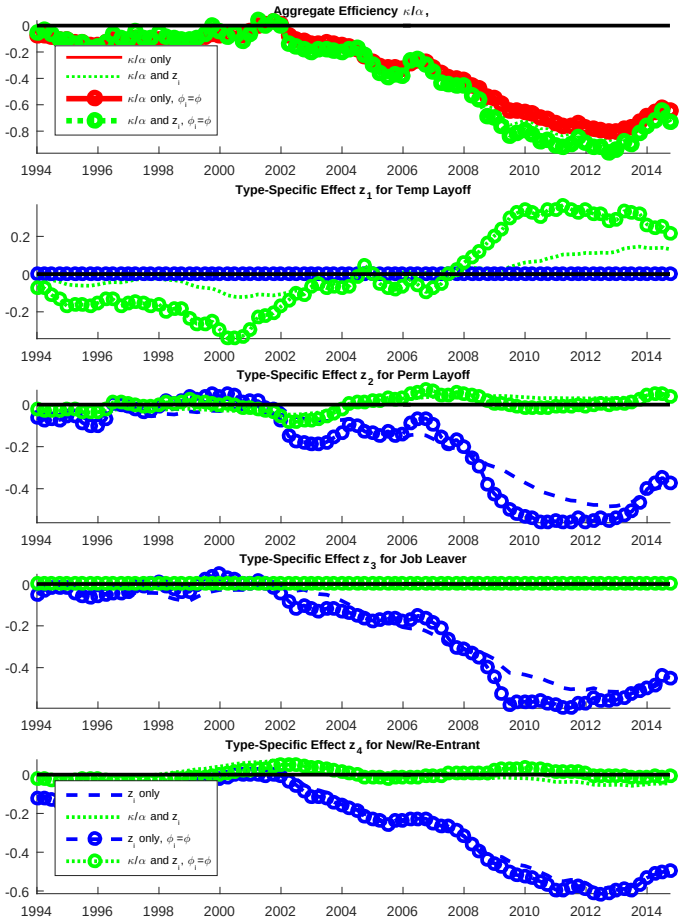
Note: Smoothed posterior estimate of type-specific matching efficiencies from a model with random walk in aggregate efficiency and AR(1)'s for type-specific matching efficiencies. For the samples and model specifications refer to Table 2.C. All efficiencies are normalized to zero in 2001Q1.

Figure 2.D.a Unemployment by reason: aggregate and type-specific efficiencies, ϕ_i unrestricted



Note: Smoothed posterior estimates of the aggregate and type-specific efficiencies for the sample 1994-2016, cf. columns (1a) in Tables 2.A-C. All efficiencies are normalized to zero in 2001Q1.

Figure 2.D.b Unemployment by reason: aggregate and type-specific efficiencies with restriction $\phi_i = \phi$



Note: Smoothed posterior estimates of the aggregate and type-specific efficiencies for the sample 1994-2016, cf. columns (1b) in Tables 2.A-C. All efficiencies are normalized to zero in 2001Q1.

2.3. Matching function elasticity and search effort cyclicality

Note: Results in Figure 2.E.a-d are based on sample and model specification with aggregate matching efficiency only represented by column (1a) in Table 2.A. All variables normalized to zero in 1994Q1.

Figure 2.E a Components of the average transition rate to employment: tightness, effort, and efficiency

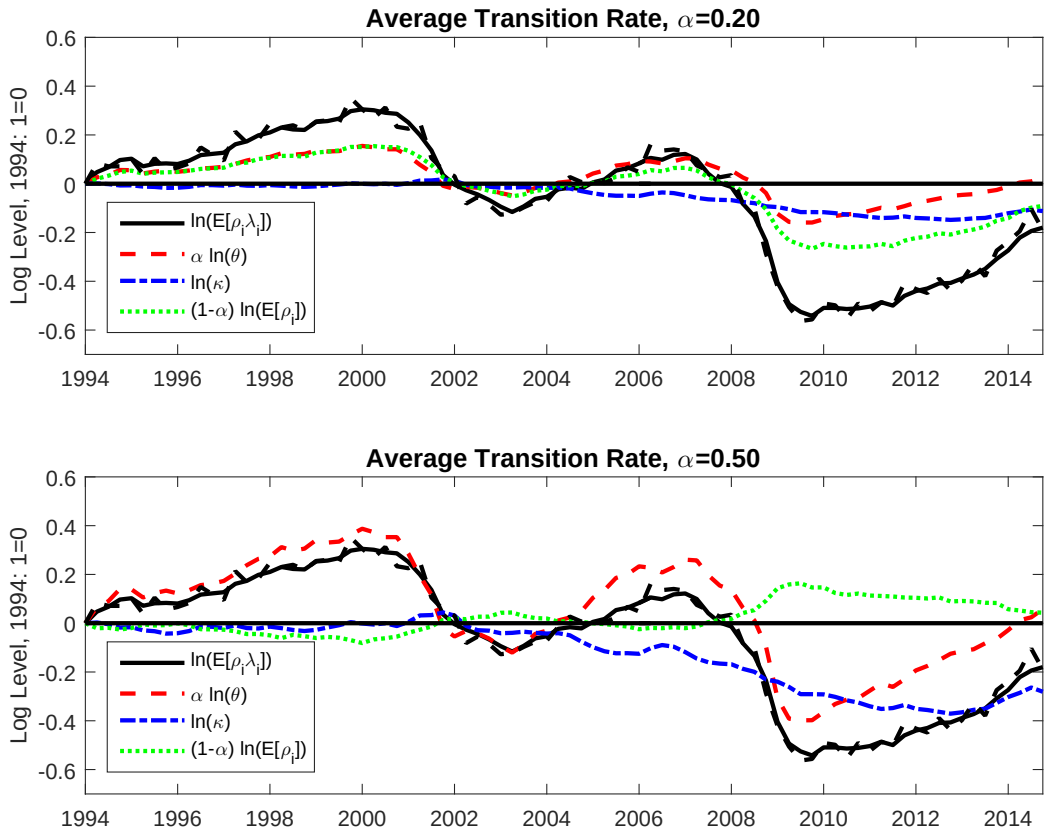


Figure 2.E b Components of average search effort: composition and variable search effort

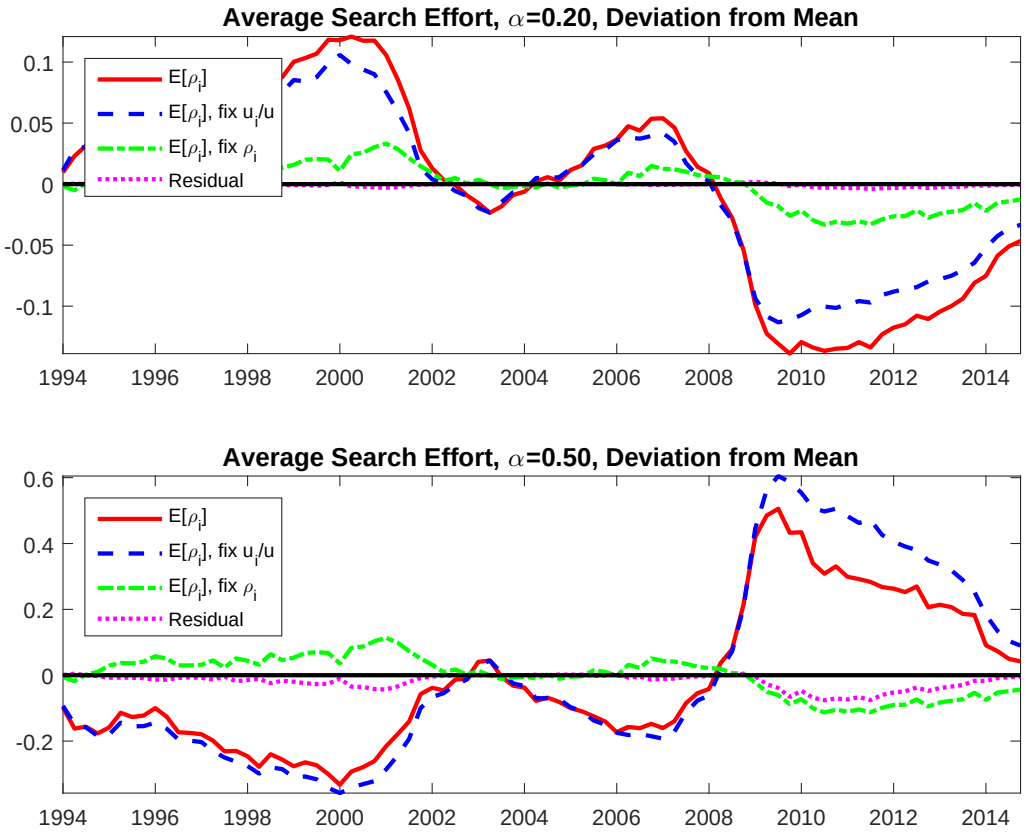


Figure 2.E.c Decomposition of average transition rate for $\alpha = 0.2$: pro-cyclical search effort

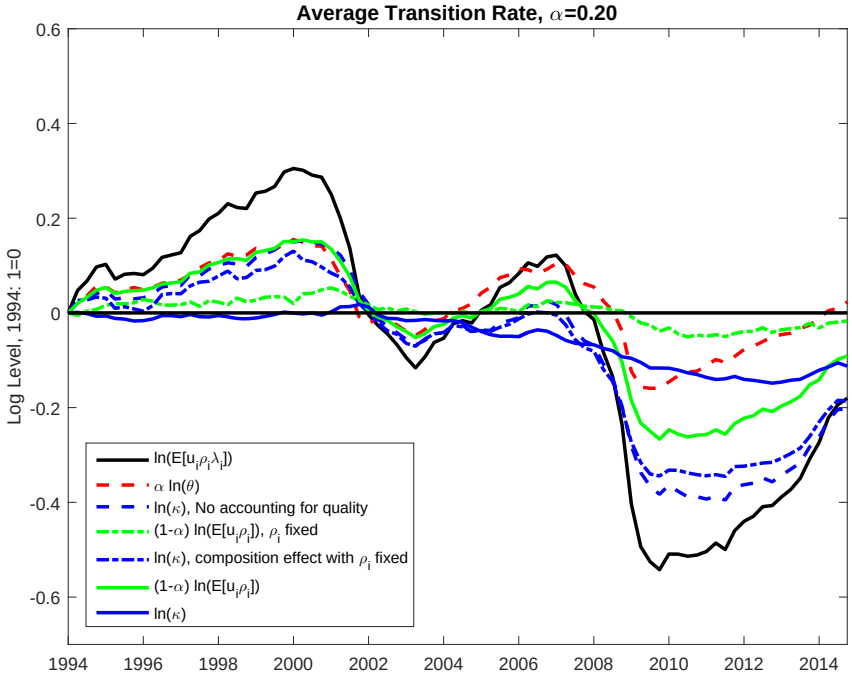
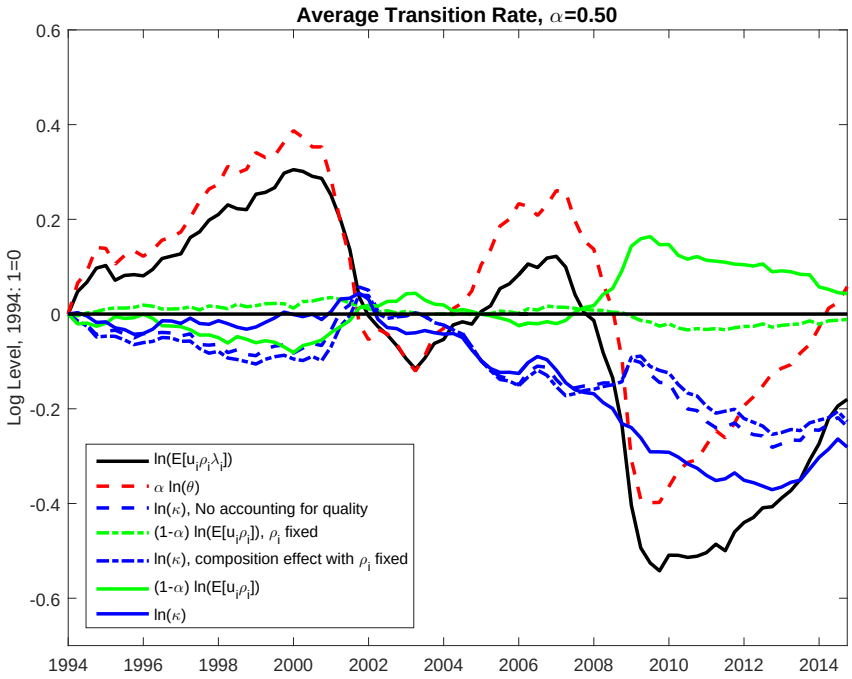


Figure 2.E d Decomposition of average transition rate for $\alpha = 0.5$: counter-cyclical search effort



3. Nonemployment by gender and LFS

- Table.3 Parameter estimates for different samples and specifications with
  - Table 3.A Aggregate matching efficiency z_0
  - Table 3.B Type-specific matching efficiency z_i
  - Table 3.C. Aggregate and type-specific matching efficiency (z_0, z_i)
- Figure 3. Estimated matching efficiency for unemployment by duration
  - Figure 3.A Model with aggregate matching efficiency only
  - Figure 3.B Model with type-specific matching efficiencies only
  - Figure 3.C Model with aggregate and type-specific matching efficiencies
    - Figure 3.C.a Aggregate matching efficiency
    - Figure 3.C.b Type-specific matching efficiency
  - Figure 3.D All 3 Models, 1994-2015
    - Figure 3.D.a Unrestricted ϕ_i
    - Figure 3.D.b Restriction $\phi_i = \phi$
- Figure 3.E Search effort cyclicality and matching function elasticity: Aggregate matching efficeincy only
  - Figure 3.E.a Components of the average transition rate to employment: tightness, effort, and efficiency
  - Figure 3.E.b Components of average search effort: composition and variable search effort
  - Figure 3.E.c Decomposition of average transition rate for $\alpha = 0.2$: pro-cyclical search effort
  - Figure 3.E.d Decomposition of average transition rate for $\alpha = 0.5$: counter-cyclical search effort

3.1. Tables

Table 3.A Search pool by LFS and gender for different samples and specifications with aggregate matching efficiency $\hat{\kappa}$

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$E[\hat{\kappa}_1]$	-3.798	-9.267	-3.841	-3.965	-3.635	-3.770
	(0.657)	(4.806)	(1.021)	(0.850)	(0.822)	(0.567)
c_2	-0.035	-0.081	-0.077	-0.047	-0.069	-0.069
	(0.027)	(0.029)	(0.025)	(0.036)	(0.042)	(0.034)
c_3	-2.563	-1.885	-2.562	-2.520	-2.494	-2.507
	(0.032)	(0.021)	(0.027)	(0.041)	(0.032)	(0.033)
c_4	-2.841	-2.107	-2.834	-2.755	-2.731	-2.737
	(0.025)	(0.020)	(0.018)	(0.025)	(0.027)	(0.026)
ϕ_1	0.755	0.153	0.663	0.593	0.769	0.834
	(0.525)	(0.060)	(0.048)	(0.077)	(0.146)	(0.138)
ϕ_2	0.788	-	0.666	0.617	0.783	0.850
	(0.555)	-	(0.048)	(0.081)	(0.150)	(0.138)
ϕ_3	0.272	-	0.239	0.245	0.314	0.335
	(0.200)	-	(0.023)	(0.039)	(0.062)	(0.066)
ϕ_4	0.232	-	0.208	0.244	0.297	0.319
	(0.159)	-	(0.018)	(0.036)	(0.059)	(0.056)
$\sigma_{\varepsilon,1}$	0.040	0.184	0.040	0.040	0.040	0.037
	(0.004)	(0.014)	(0.003)	(0.003)	(0.006)	(0.005)
$\sigma_{\varepsilon,2}$	0.044	0.195	0.046	0.046	0.048	0.049
	(0.006)	(0.015)	(0.003)	(0.003)	(0.006)	(0.005)
$\sigma_{\varepsilon,3}$	0.060	0.040	0.065	0.064	0.044	0.047
	(0.006)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
$\sigma_{\varepsilon,4}$	0.054	0.025	0.043	0.040	0.037	0.038
	(0.004)	(0.004)	(0.002)	(0.002)	(0.004)	(0.004)
σ_{ς}	0.053	0.179	0.053	0.055	0.059	0.040
	(0.035)	(0.069)	(0.007)	(0.009)	(0.015)	(0.010)

Table 3.A, continued

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$\lambda_{adj,1}$	-	-	0.071	0.091	-	-
	-	-	(0.038)	(0.034)	-	-
$\lambda_{adj,2}$	-	-	0.095	0.116	-	-
	-	-	(0.038)	(0.036)	-	-
$\lambda_{adj,3}$	-	-	-0.085	-0.075	-	-
	-	-	(0.017)	(0.017)	-	-
$\lambda_{adj,4}$	-	-	0.024	0.034	-	-
	-	-	(0.014)	(0.015)	-	-
$\phi_{hU,1}$	-	-	-	0.021	-	-
	-	-	-	(0.013)	-	-
$\phi_{hU,2}$	-	-	-	0.011	-	-
	-	-	-	(0.014)	-	-
$\phi_{hU,3}$	-	-	-	-0.006	-	-
	-	-	-	(0.011)	-	-
$\phi_{hU,4}$	-	-	-	-0.019	-	-
	-	-	-	(0.009)	-	-
Log Likelihood	497.557	334.669	951.175	962.969	360.069	385.024
No Obs	84	84	156	156	56	59
No Par	13	10	17	21	13	13

Note: Parameter estimates for non-employment by labor force status and gender where $i = 1$ denotes 'male and unemployed,' $i = 2$ denotes 'female and unemployed,' $i = 3$ denotes 'male and OLF,' and $i = 4$ denotes 'female and OLF.' For the definitions of parameters and specifications see Table 1A.

Table 3.B Search pool by LFS and gender for different samples and specifications with type-specific matching efficiency z_i

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$E[z_{1,1}]$	-3.003	-1.664	-2.654	-2.517	-2.941	-3.296
	(1.320)	(0.860)	(0.367)	(0.609)	(0.292)	(0.285)
$E[z_{2,1}]$	-2.770	-1.736	-2.465	-2.371	-2.875	-3.130
	(1.081)	(0.859)	(0.243)	(0.554)	(0.370)	(0.295)
$E[z_{3,1}]$	-3.398	-3.593	-3.248	-3.258	-3.412	-3.429
	(0.570)	(0.514)	(0.391)	(0.371)	(0.378)	(0.317)
$E[z_{4,1}]$	-3.539	-3.840	-3.610	-3.583	-3.517	-3.588
	(0.596)	(0.551)	(0.265)	(0.358)	(0.271)	(0.295)
ϕ_1	0.806	0.272	0.716	0.651	0.823	0.885
	(0.173)	(0.057)	(0.080)	(0.071)	(0.108)	(0.176)
ϕ_2	0.679	-	0.571	0.528	0.779	0.806
	(1.233)	-	(0.080)	(0.073)	(0.095)	(0.114)
ϕ_3	0.192	-	0.218	0.223	0.237	0.223
	(0.070)	-	(0.048)	(0.050)	(0.059)	(0.052)
ϕ_4	0.148	-	0.187	0.175	0.182	0.192
	(0.066)	-	(0.034)	(0.041)	(0.049)	(0.055)
$\sigma_{\varepsilon,1}$	0.039	0.030	0.037	0.038	0.033	0.034
	(0.005)	(0.006)	(0.003)	(0.003)	(0.010)	(0.005)
$\sigma_{\varepsilon,2}$	0.042	0.035	0.040	0.040	0.048	0.047
	(0.014)	(0.006)	(0.003)	(0.004)	(0.007)	(0.007)
$\sigma_{\varepsilon,3}$	0.044	0.044	0.038	0.038	0.031	0.031
	(0.012)	(0.005)	(0.003)	(0.003)	(0.004)	(0.005)
$\sigma_{\varepsilon,4}$	0.025	0.024	0.025	0.025	0.022	0.021
	(0.005)	(0.004)	(0.002)	(0.002)	(0.003)	(0.004)
$\sigma_{\xi,1}$	0.037	0.052	0.033	0.031	0.044	0.030
	(0.017)	(0.007)	(0.005)	(0.004)	(0.010)	(0.007)
$\sigma_{\xi,2}$	0.037	0.048	0.033	0.031	0.039	0.032
	(0.008)	(0.007)	(0.004)	(0.004)	(0.008)	(0.008)
$\sigma_{\xi,3}$	0.022	0.023	0.018	0.018	0.016	0.014
	(0.006)	(0.006)	(0.003)	(0.003)	(0.004)	(0.003)
$\sigma_{\xi,4}$	0.023	0.026	0.017	0.017	0.017	0.018
	(0.006)	(0.005)	(0.003)	(0.003)	(0.004)	(0.004)

Table 3.B, continued

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$\lambda_{adj,1}$	-	-	0.050	0.039	-	-
	-	-	(0.048)	(0.046)	-	-
$\lambda_{adj,2}$	-	-	0.087	0.081	-	-
	-	-	(0.050)	(0.051)	-	-
$\lambda_{adj,3}$	-	-	-0.022	-0.020	-	-
	-	-	(0.040)	(0.039)	-	-
$\lambda_{adj,4}$	-	-	0.018	0.016	-	-
	-	-	(0.030)	(0.031)	-	-
$\phi_{hU,1}$	-	-	-	-0.017	-	-
	-	-	-	(0.010)	-	-
$\phi_{hU,2}$	-	-	-	-0.013	-	-
	-	-	-	(0.010)	-	-
$\phi_{hU,3}$	-	-	-	0.001	-	-
	-	-	-	(0.007)	-	-
$\phi_{hU,4}$	-	-	-	-0.003	-	-
	-	-	-	(0.006)	-	-
Log Likelihood	503.239	488.601	1007.880	1010.056	357.099	392.706
No Obs	84	84	156	156	56	59
No Par	16	13	20	24	16	16

Note: For the definitions of parameters and columns see Table 3A and 1.B.

Table 3.C Search pool by LFS and gender for different samples and specifications with aggregate and type-specific matching efficiency, $\hat{\kappa}$ and z_i

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$E[\hat{\kappa}_1]$	-4.071	-7.428	-4.167	-4.288	-4.005	-4.006
	(1.122)	(3.403)	(1.282)	(1.465)	(1.100)	(1.081)
c_2	-0.030	-0.077	-0.071	-0.040	-0.066	-0.064
	(0.035)	(0.132)	(0.041)	(0.054)	(0.058)	(0.052)
c_3	-2.568	-1.884	-2.532	-2.422	-2.621	-2.640
	(0.065)	(0.085)	(0.076)	(0.099)	(0.076)	(0.074)
c_4	-2.847	-2.108	-2.826	-2.767	-2.878	-2.810
	(0.065)	(0.085)	(0.044)	(0.053)	(0.066)	(0.068)
ϕ_1	0.623	0.209	0.557	0.517	0.626	0.707
	(0.107)	(0.072)	(0.081)	(0.081)	(0.147)	(0.136)
ϕ_2	0.653	-	0.562	0.541	0.638	0.722
	(0.111)	-	(0.078)	(0.086)	(0.151)	(0.133)
ϕ_3	0.222	-	0.196	0.237	0.189	0.203
	(0.054)	-	(0.039)	(0.055)	(0.060)	(0.041)
ϕ_4	0.191	-	0.182	0.204	0.169	0.227
	(0.047)	-	(0.032)	(0.042)	(0.050)	(0.054)
$\sigma_{\varepsilon,1}$	0.029	0.017	0.027	0.028	0.013	0.024
	(0.008)	(0.013)	(0.006)	(0.006)	(0.014)	(0.007)
$\sigma_{\varepsilon,2}$	0.000	0.032	0.017	0.020	0.000	0.000
	(0.024)	(0.006)	(0.027)	(0.022)	(0.020)	(0.029)
$\sigma_{\varepsilon,3}$	0.040	0.039	0.036	0.035	0.029	0.030
	(0.006)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)
$\sigma_{\varepsilon,4}$	0.023	0.022	0.022	0.022	0.020	0.018
	(0.004)	(0.003)	(0.002)	(0.003)	(0.003)	(0.004)
σ_{ς}	0.075	0.136	0.078	0.079	0.090	0.063
	(0.013)	(0.042)	(0.014)	(0.013)	(0.021)	(0.013)
$\sigma_{\xi,1}$	0.028	0.058	0.028	0.027	0.029	0.024
	(0.010)	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)
$\sigma_{\xi,2}$	0.034	0.048	0.032	0.031	0.035	0.038
	(0.005)	(0.007)	(0.015)	(0.015)	(0.005)	(0.006)
$\sigma_{\xi,3}$	0.024	0.000	0.016	0.015	0.013	0.011
	(0.008)	(0.034)	(0.003)	(0.003)	(0.005)	(0.004)

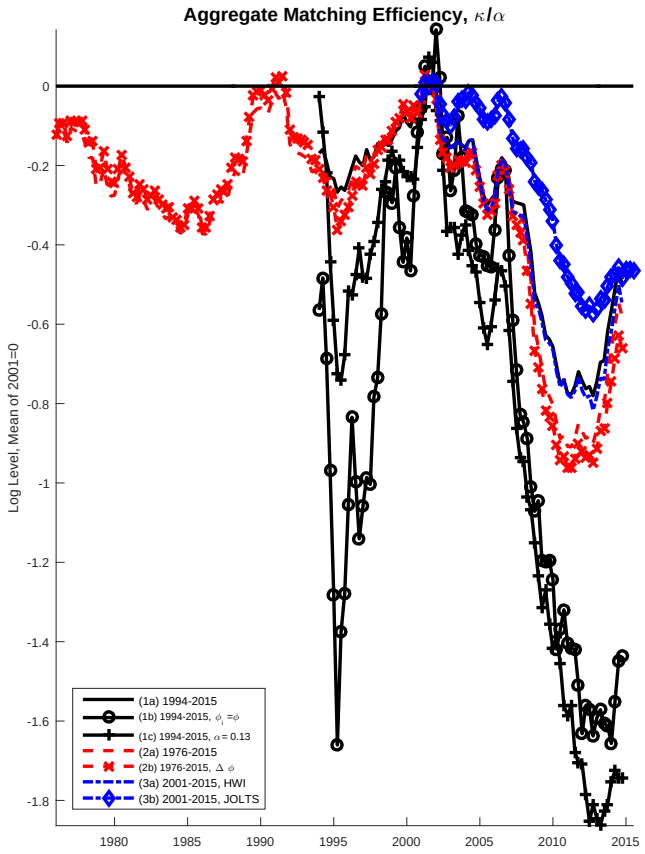
Table 3.C, continued

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
$\sigma_{\xi,4}$	0.022	0.005	0.016	0.016	0.013	0.017
	(0.005)	(0.004)	(0.003)	(0.003)	(0.004)	(0.005)
γ_1	0.571	0.938	0.702	0.690	0.673	0.702
	(0.190)	(0.035)	(0.126)	(0.120)	(0.155)	(0.144)
γ_2	-0.428	0.959	-0.291	-0.280	-0.503	-0.489
	(0.136)	(0.025)	(0.167)	(0.207)	(0.134)	(0.179)
γ_3	0.860	0.180	0.980	0.986	0.968	0.980
	(0.095)	(289.299)	(0.022)	(0.017)	(0.048)	(0.028)
γ_4	0.900	0.949	0.904	0.901	0.967	0.890
	(0.057)	(0.066)	(0.047)	(0.051)	(0.044)	(0.091)
$\lambda_{adj,1}$	-	-	0.092	0.098	-	-
	-	-	(0.043)	(0.042)	-	-
$\lambda_{adj,2}$	-	-	0.121	0.128	-	-
	-	-	(0.042)	(0.043)	-	-
$\lambda_{adj,3}$	-	-	-0.028	-0.012	-	-
	-	-	(0.038)	(0.038)	-	-
$\lambda_{adj,4}$	-	-	0.028	0.035	-	-
	-	-	(0.023)	(0.023)	-	-
$\phi_{hU,1}$	-	-	-	0.015	-	-
	-	-	-	(0.011)	-	-
$\phi_{hU,2}$	-	-	-	0.006	-	-
	-	-	-	(0.012)	-	-
$\phi_{hU,3}$	-	-	-	-0.013	-	-
	-	-	-	(0.010)	-	-
$\phi_{hU,4}$	-	-	-	-0.008	-	-
	-	-	-	(0.007)	-	-
Log Likelihood	549.459	520.687	1067.496	1071.702	397.497	423.572
No Obs	84	84	156	156	56	59
No Par	21	18	25	29	21	21

Note: For the definitions of parameters and columns see Table 3A&B and 1.C.

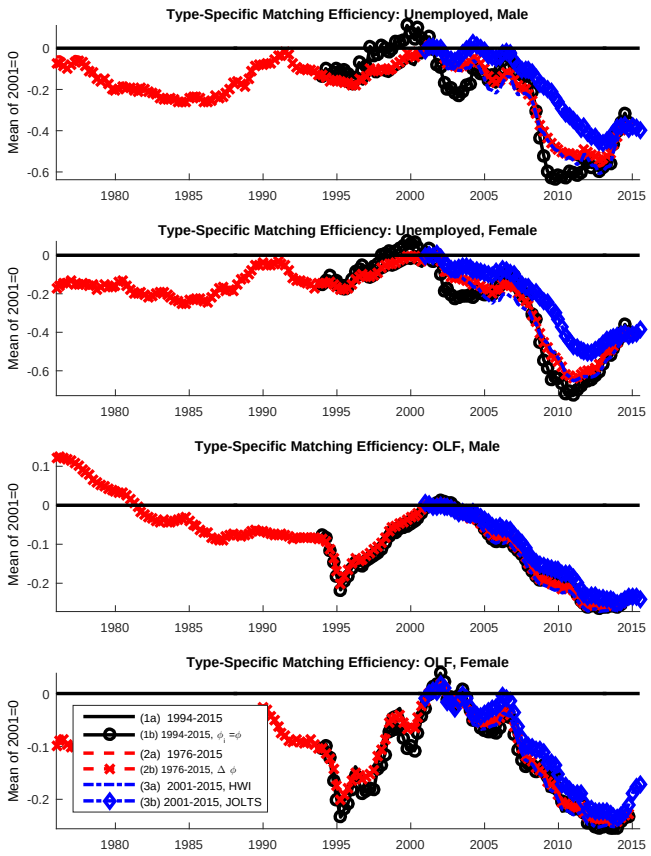
3.2. Estimated matching efficiencies

Figure 3.A Nonemployment by gender and LFS: Aggregate matching efficiency only



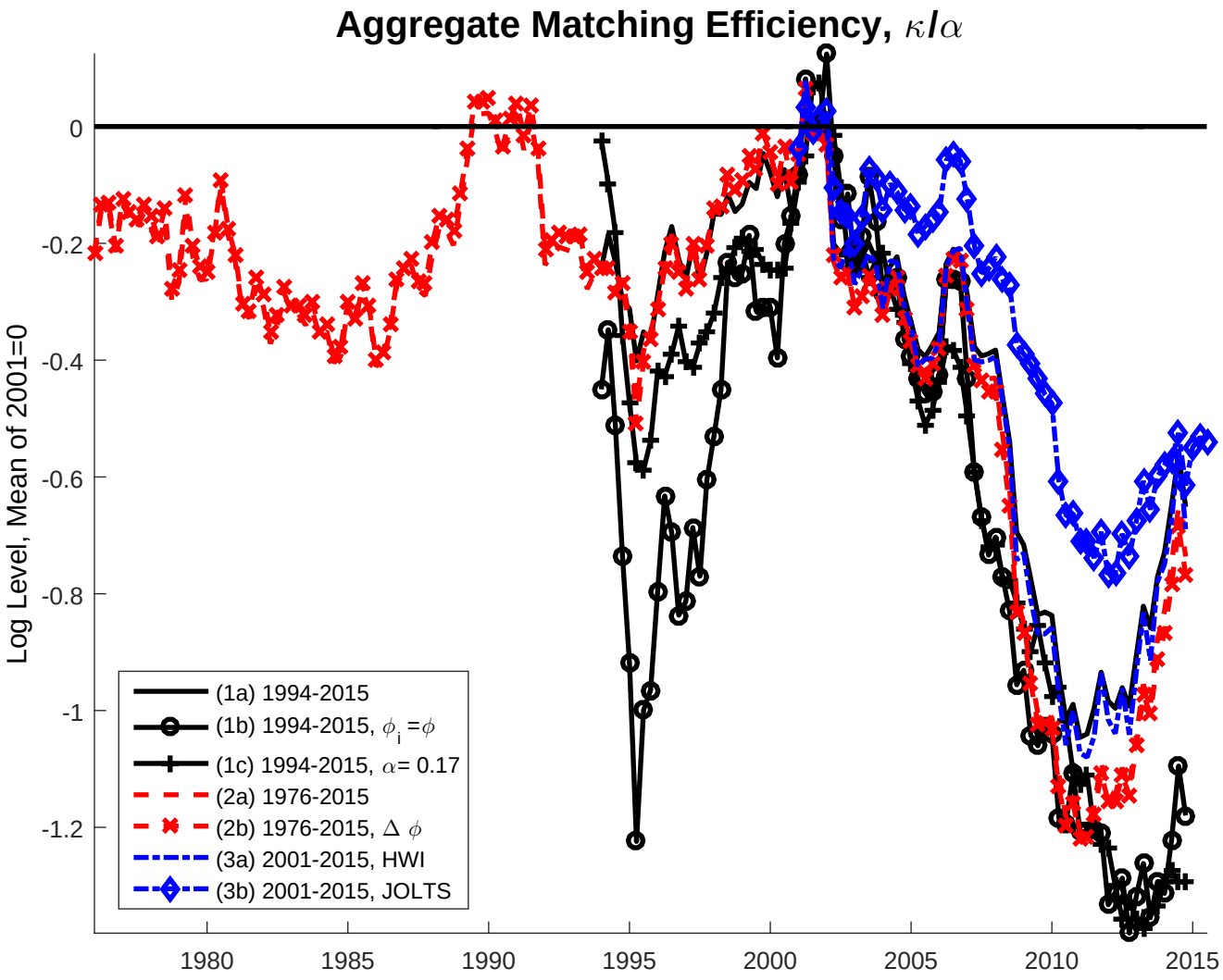
Note: Smoothed posterior estimate of the aggregate matching efficiency from a model with a random walk in aggregate matching efficiency. For the samples and model specifications refer to Table 3.A. All efficiencies are normalized to zero in 2001Q1.

Figure 3.B Nonemployment by gender and LFS: Type-specific matching efficiencies only



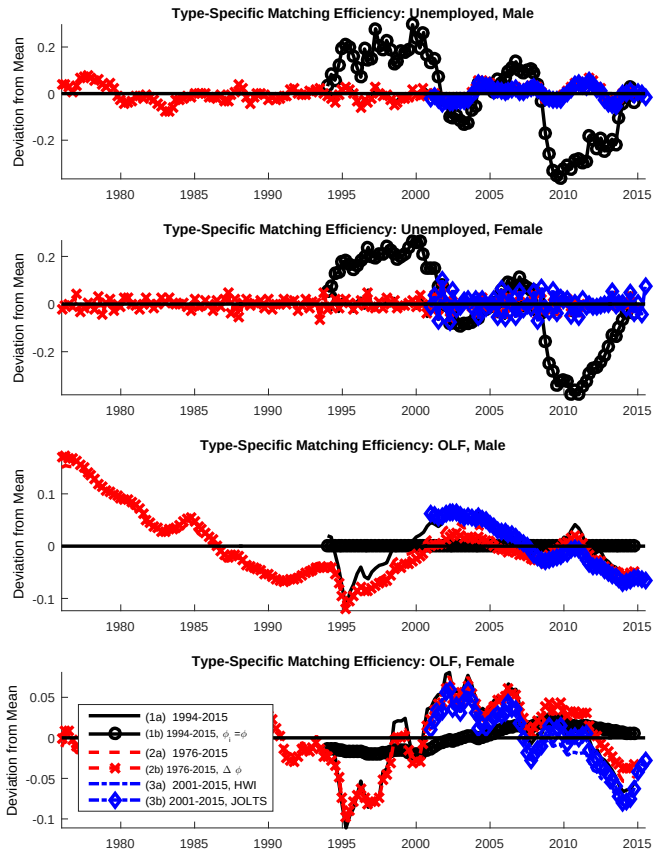
Note: Smoothed posterior estimates of type-specific matching efficiencies from a model with random walks in type-specific matching efficiencies. For the samples and model specifications refer to Table 3.B. All efficiencies are normalized to zero in 2001Q1.

Figure 3.C.a Nonemployment by gender and LFS: Aggregate and type-specific efficiencies
Aggregate matching efficiency



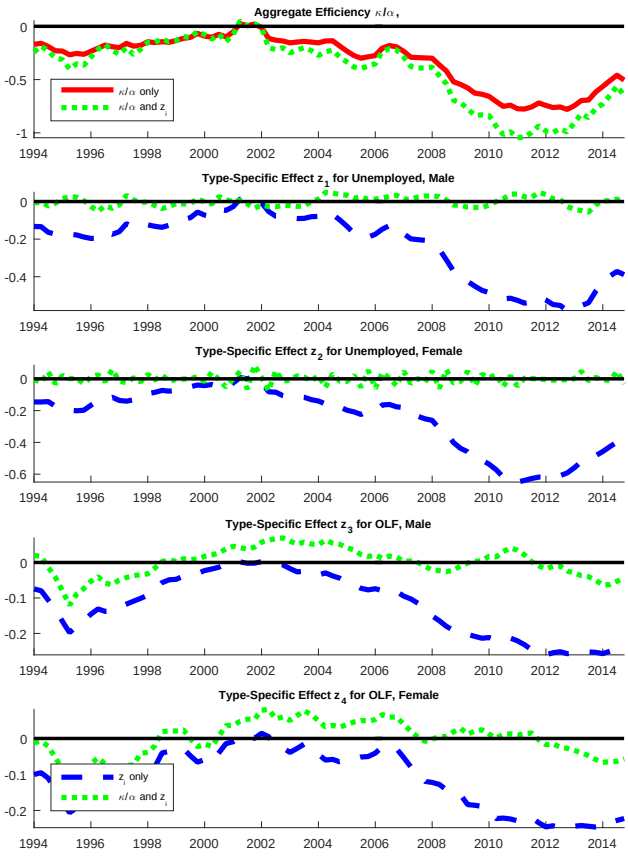
Note: Smoothed posterior estimate of the aggregate matching efficiency from a model with random walk in aggregate efficiency and AR(1)'s for type-specific matching efficiencies. For the samples and model specifications refer to Table 3.C. All efficiencies are normalized to zero in 2001Q1.

Figure 3.C.b Nonemployment by gender and LFS: aggregate and type-specific efficiencies
Type-specific matching efficiencies



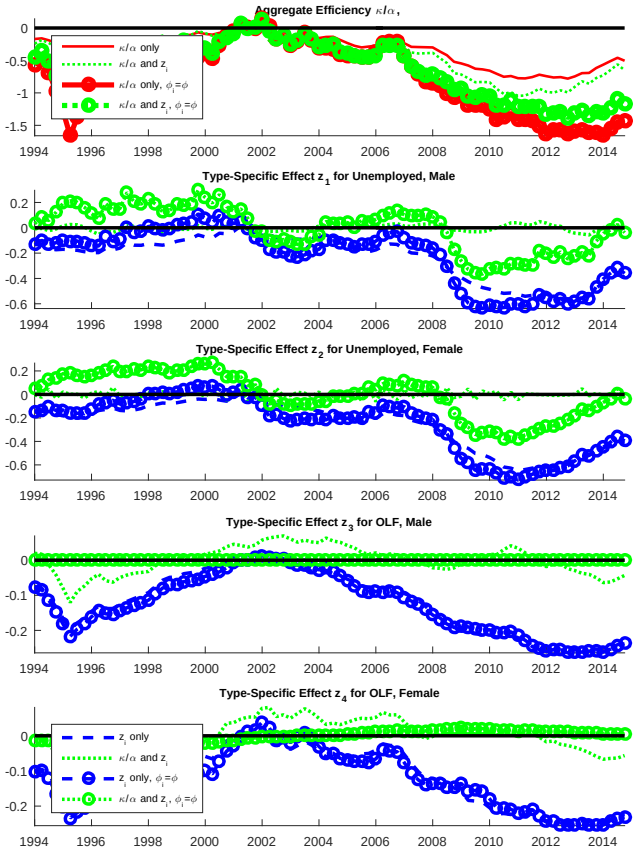
Note: Smoothed posterior estimates of type-specific matching efficiencies from a model with random walk in aggregate efficiency and AR(1)'s for type-specific matching efficiencies. For the samples and model specifications refer to Table 3.C. All efficiencies are normalized to zero in 2001Q1.

Figure 3.D.a Nonemployment by gender and LFS: aggregate and type-specific efficiencies, ϕ_i unrestricted



Note: Smoothed posterior estimates of the aggregate and type-specific efficiencies for the sample 1994-2016, cf. columns (1a) in Tables 3.A-C. All efficiencies are normalized to zero in 2001Q1.

Figure 3.D.b Nonemployment by gender and LFS: aggregate and type-specific efficiencies with restriction $\phi_i = \phi$



Note: Smoothed posterior estimates of the aggregate and type-specific efficiencies for the sample 1994-2016, cf. columns (1b) in Tables 3.A-C. All efficiencies are normalized to zero in 2001Q1.

3.3. Matching function elasticity and search effort cyclicality

Note: Results in Figure 3.E.a-d are based on sample and model specification with aggregate matching efficiency only represented by column (1a) in Table 3.A. All variables normalized to zero in 1994Q1.

Figure 3.E a Components of the average transition rate to employment: tightness, effort, and efficiency

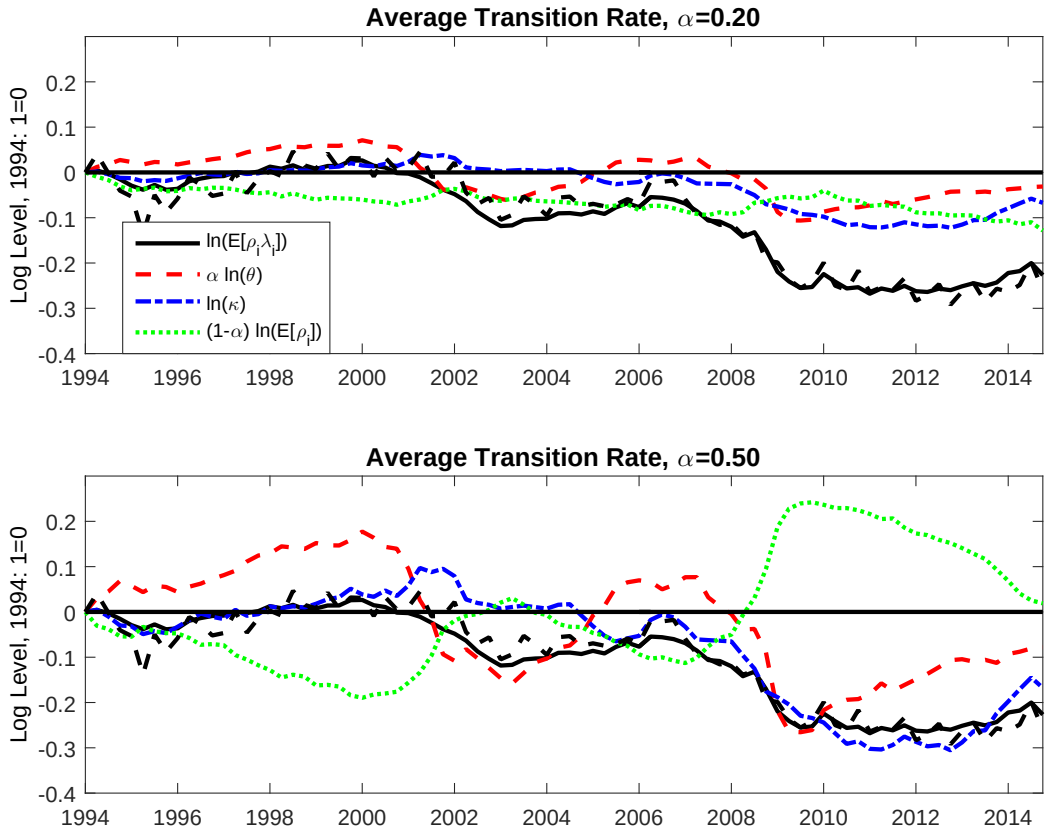


Figure 3.E b Components of average search effort: composition and variable search effort

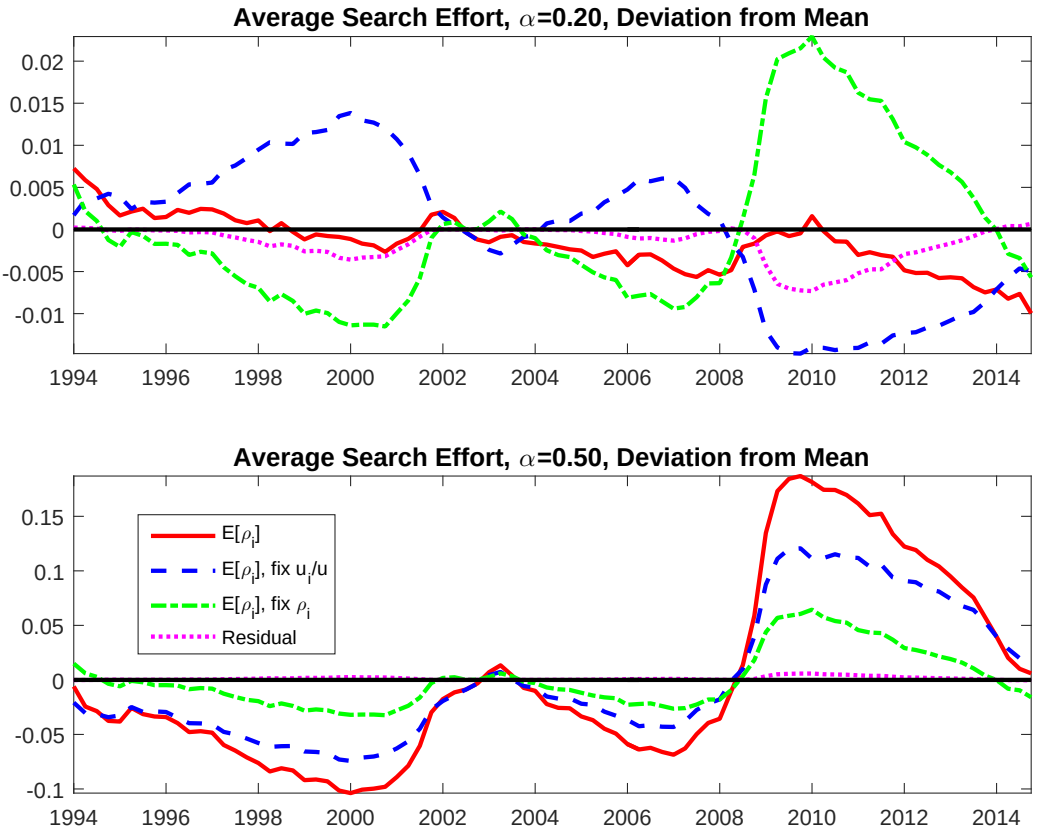


Figure 3.E.c Decomposition of average transition rate for $\alpha = 0.2$: pro-cyclical search effort

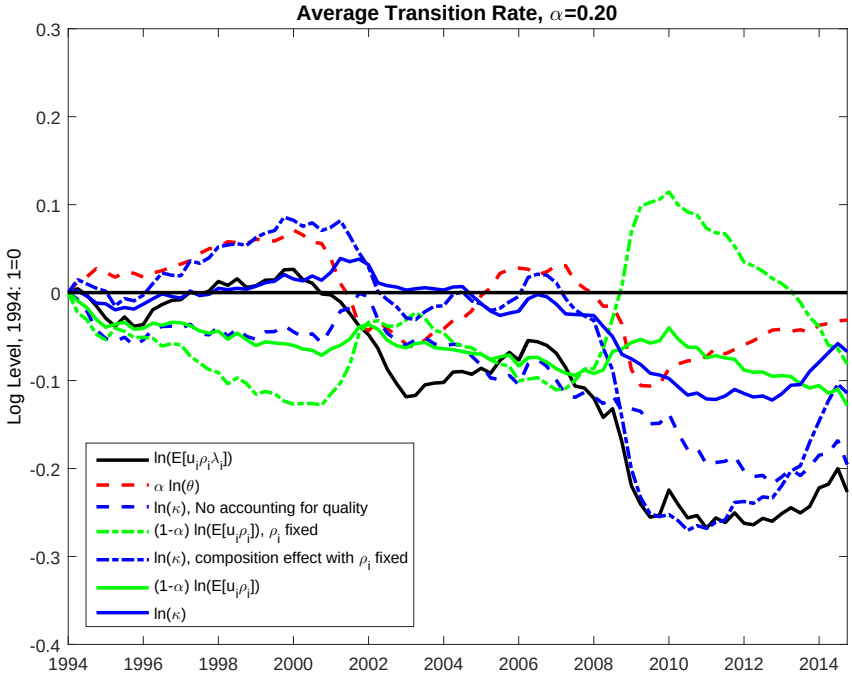


Figure 3.E d Decomposition of average transition rate for $\alpha = 0.5$: counter-cyclical search effort