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Making Sense of Labor Market Indicators Amid Data Imperfections

Appendix

ABSTRACT This appendix describes details about data series used, explains the sampling method for the narrative rotations that we apply, provides derivations of some of the expressions in the main text, and includes additional results and details about results.

ACKNOWLEDGMENTS The views expressed in this paper are those of the authors and not necessarily those of the institutions that they are affiliated with, including the Federal Reserve System, the Federal Reserve Bank of Chicago, the National Bureau of Economic Research, Princeton University, and U.T. Austin. Parts of this paper were prepared with the assistance of generative artificial intelligence (GenAI) tools. The authors reviewed, edited, and take full responsibility for the final version of the manuscript.

Conflict of Interest Disclosure: The authors did not receive financial support from any firm or person for this paper or from any firm or person with a financial or political interest in this paper. The authors are not currently an officer, director, or board member of any organization with a financial or political interest in this paper.

A Textual Analysis of Policy Communications

This appendix describes the procedure used to construct the textual analysis summarized in Figure 2. The goal of the exercise is descriptive: to examine how policymakers link narrative labor market concepts to observable indicators when discussing labor market conditions.

A.1 Document Collection

The text corpus consists of speeches and official statements by current members of the Federal Reserve Board available through the FRASER archive maintained by the Federal Reserve Bank of St. Louis. The earliest documents in the archive date back to 2013. These speeches range from conference remarks and economic outlook presentations to prepared statements delivered at public events. To supplement these sources, we also include the Economic Reports of the President for the years 2013–2025. In total, the combined dataset contains 502 documents.

A.2 Identification of Narrative Drivers

To identify references to narrative drivers, we apply a set of regular expression searches to the raw text of the documents. Each narrative concept is associated with a small set of keywords. For example, references to labor demand are identified using terms such as “demand,” while discussions of matching frictions are identified using expressions such as “mismatch,” “matching,” or “search friction.” These searches extract sentences containing potential references to each narrative concept.

A.3 Identification of Labor Market Indicators

We then examine the extracted sentences for references to commonly used labor market indicators, including unemployment, vacancies, wage growth, participation, population growth, and hiring. To improve coverage, the search procedure includes common variations of these terms (for example, “job growth” and “job gains,” or “vacancy” and “vacancies”) as well as simple filters designed to reduce false matches.

A.4 Interpretation

The resulting counts measure how frequently narrative drivers and labor market indicators appear in close textual proximity. Because many policy discussions reference multiple drivers simultaneously—for example, discussing labor demand and labor supply in the same paragraph—individual indicators may appear in association with more than one narrative concept. For this reason, the analysis is intended only to illustrate broad patterns in policy communication rather than provide a precise mapping between narrative concepts and individual indicators.

B Mathematical derivations

Derivation of equation (1): Start with the accounting identity

$$\log E_t^{\text{CES}} = \log\left(\frac{E_t^{\text{CES}}}{E_t^{\text{Adj}}}\right) + \log\left(\frac{E_t^{\text{Adj}}}{E_t^{\text{CPS}}}\right) + \log E_t^{\text{CPS}}. \quad (\text{B.1})$$

Taking first differences yields

$$\Delta \log E_t^{\text{CES}} = \Delta \log\left(\frac{E_t^{\text{CES}}}{E_t^{\text{Adj}}}\right) + \Delta \log\left(\frac{E_t^{\text{Adj}}}{E_t^{\text{CPS}}}\right) + \Delta \log E_t^{\text{CPS}}. \quad (\text{B.2})$$

We refer to the first term as the *survey difference* and the second as the *scope difference*. By CPS definitions,

$$E_t^{\text{CPS}} = (1 - u_t) \text{LFPR}_t P_t. \quad (\text{B.3})$$

Taking logs and differences gives the *exact* log identity

$$\Delta \log E_t^{\text{CPS}} = \Delta \log(1 - u_t) + \Delta \log \text{LFPR}_t + \Delta \log P_t. \quad (\text{B.4})$$

Substituting (B.4) into (B.2) yields the exact decomposition

$$\Delta \log E_t^{\text{CES}} = \underbrace{\Delta \log\left(\frac{E_t^{\text{CES}}}{E_t^{\text{Adj}}}\right)}_{\text{survey difference}} + \underbrace{\Delta \log\left(\frac{E_t^{\text{Adj}}}{E_t^{\text{CPS}}}\right)}_{\text{scope difference}} + \Delta \log(1 - u_t) + \Delta \log \text{LFPR}_t + \Delta \log P_t. \quad (\text{B.5})$$

For small changes in u_t , the first term in (B.4) satisfies

$$\Delta \log(1 - u_t) = \log(1 - u_t) - \log(1 - u_{t-1}) \approx -\frac{\Delta u_t}{1 - \bar{u}_t}, \quad (\text{B.6})$$

where \bar{u}_t is a point between u_t and u_{t-1} (by the mean value theorem). When u moves modestly and is not too close to one, researchers often use the even simpler approximation $\Delta \log(1 - u_t) \approx -\Delta u_t$. Using (B.6) (or the $-\Delta u_t$ shorthand) gives the practical five-term decomposition:

$$\Delta \log E_t^{\text{CES}} \approx \underbrace{\Delta \log\left(\frac{E_t^{\text{CES}}}{E_t^{\text{Adj}}}\right)}_{(1) \text{ survey difference}} + \underbrace{\Delta \log\left(\frac{E_t^{\text{Adj}}}{E_t^{\text{CPS}}}\right)}_{(2) \text{ scope difference}} - \Delta u_t + \underbrace{\Delta \log \text{LFPR}_t}_{(4)} + \underbrace{\Delta \log P_t}_{(5)}. \quad (\text{B.7})$$

Equation (B.7) is the version reported in the main text; (B.5) provides the exact counterpart.

C Sampling the Narrative Rotations

To map the statistical principal components \mathbf{v}_t into economically interpretable narrative factors, we define a linear transformation

$$\mathbf{f}_t = \mathbf{R}\mathbf{v}_t,$$

where $\mathbf{f}_t \in \mathbb{R}^K$ denotes the vector of narrative factors. In the oblique framework, $\mathbf{R} \in \mathbb{R}^{K \times K}$ is a nonsingular, generally non-orthogonal transformation, allowing the narrative factors to be contemporaneously correlated.

Rather than sampling \mathbf{R} directly, we work with its inverse $\mathbf{W} = \mathbf{R}^{-1}$, which rotates the loading space. Given the principal-components loading matrix $\mathbf{\Lambda}$, the implied narrative loadings are

$$\mathbf{\Gamma} = \mathbf{\Lambda}\mathbf{W}.$$

Crucially, the reconstruction of the observed data is invariant to the choice of \mathbf{W} . Specifically,

$$\mathbf{y}_t = \mathbf{\Lambda}\mathbf{f}_t + \boldsymbol{\epsilon}_t = (\mathbf{\Lambda}\mathbf{W})(\mathbf{W}^{-1}\mathbf{v}_t) + \boldsymbol{\epsilon}_t = \mathbf{\Lambda}\mathbf{v}_t + \boldsymbol{\epsilon}_t, \quad (\text{C.1})$$

so that alternative narrative rotations preserve the statistical fit of the underlying principal-components representation.

Each candidate rotation matrix \mathbf{W} is constructed as

$$\mathbf{W} = \mathbf{Q}\mathbf{L}_c^{-1}, \quad (\text{C.2})$$

where \mathbf{Q} is orthogonal and \mathbf{L}_c is a lower-triangular Cholesky factor. The sampling procedure consists of three stages.

1. Correlation structure and unit-variance normalization. We draw a Cholesky factor \mathbf{L}_c from an Lewandowski-Kurowicka-Joe (LKJ) distribution with shape parameter $\eta = 1$. This distribution has full support over correlation matrices and does not privilege any particular pattern of comovement ex ante. By construction,

$$\text{diag}(\mathbf{L}_c\mathbf{L}_c^\top) = \mathbf{1},$$

which ensures that each narrative factor $f_{j,t}$ has unit variance. This normalization fixes scale and allows comparisons across narrative interpretations to reflect differences in comovement rather than arbitrary rescaling. The implied covariance matrix of the narrative factors is

$$\text{Var}(\mathbf{f}_t) = (\mathbf{W}^\top\mathbf{W})^{-1} = \mathbf{L}_c\mathbf{L}_c^\top.$$

2. Uniform orientation. Conditional on a given correlation structure, we apply a random orthogonal re-orientation to ensure uniform exploration of the admissible rotation space. Specifically, we draw a matrix

$\mathbf{Z} \in \mathbb{R}^{K \times K}$ with independent standard normal entries, $Z_{ij} \sim \mathcal{N}(0, 1)$.

$$\mathbf{Z} = \mathbf{Q}\mathbf{R}_{\text{qr}}, \quad (\text{C.3})$$

and adjusting signs so that the diagonal elements of \mathbf{R}_{qr} are positive. This step removes any dependence on variable ordering or on a particular Cholesky factorization.

3. Rejection sampling under narrative restrictions. Narrative assumptions are expressed as inequality restrictions on the implied loading matrix,

$$\mathbf{H} \text{vec}(\mathbf{\Gamma}) = \mathbf{H} \text{vec}(\mathbf{\Lambda}\mathbf{W}) \geq \mathbf{0}. \quad (\text{C.4})$$

We reject all candidate rotations that violate these restrictions. Exact zero restrictions are imposed as soft constraints: among each block of 100,000 candidate draws that satisfy the inequality restrictions, we retain the 2% with the smallest ℓ_2 distance from the zero constraints. This procedure enforces approximate exclusion while preserving a broad set of admissible narrative interpretations.

D Additional results

The results in this section provide a deeper look into the robustness and interpretability of the narrative factors. Figure D.2 presents the *Identification Uncertainty*, or narrative entropy, for each of the five factors: Labor Demand, Labor Supply, Labor Wedge, Matching Efficiency, and the Kitchen Sink. This metric captures the average dispersion among the set of structural paths that satisfy our narrative restrictions at any given point in time. Higher values on the y-axis indicate periods where the narrative sign restrictions are less informative, allowing for a broader range of consistent structural interpretations, whereas lower values suggest the narrative constraints more tightly pin down the factor’s path.

Figure D.3 shows the means for the narrative factors in the narrative feasible set for our baseline and four alternative specifications. The “BLS data only” specification is the one where we only include the 64 indicators published by the Bureau of Labor Statistics (BLS) or ones based on BLS data, including the those derived from Current Population Survey (CPS) microdata. The results for this specification are very similar to our baseline. But there are some periods where they diverge. This is mainly because our identifying restrictions include constraints on the factor loadings for the diffusion index for the share of small businesses that have increased wages over the past three months, published by the National Federation of Independent Businesses (NFIB). This indicator is useful for identification because it is a proxy for composition-adjusted cyclical wage increases. The 64 indicators in this specification get very close to the baseline specification, suggesting that the cross-sectional dimension in the baseline is larger than needed for identification of the narrative factors. “No data on match efficiency/mismatch” excludes measured matching efficiency and mismatch indicators, which depend on assumed elasticities of the matching function. The results excluding these two measures are virtually indistinguishable from our baseline. Hence, the assumptions made to construct these indicators had no material impact on our results.

The final two specifications include two different subsamples of the data. The first, “Post-2007 data,” only includes data from 2008 onwards. This sample includes only the Great Recession, since we do not use data from the Covid period for estimation of the Principal Component Analysis (PCA). This sample also has a relatively small time dimension compared to the number of indicators that we include. That makes the estimation of the covariance structure that is at the heart of the PCA relatively unreliable. The result is that, apart from the labor demand factor, the other factors are very different than in the baseline. The second, “Post-1993 data,” only includes data from 1994 onwards. Though, in this case the time dimension is much longer than the previous specification, this sample still only contains two recessions. It also has a hard time identifying the medium-run fluctuations in population growth and matching efficiency that are central to the baseline results because it does not yield data for the ’70s and ’80s when these fluctuations occurred.

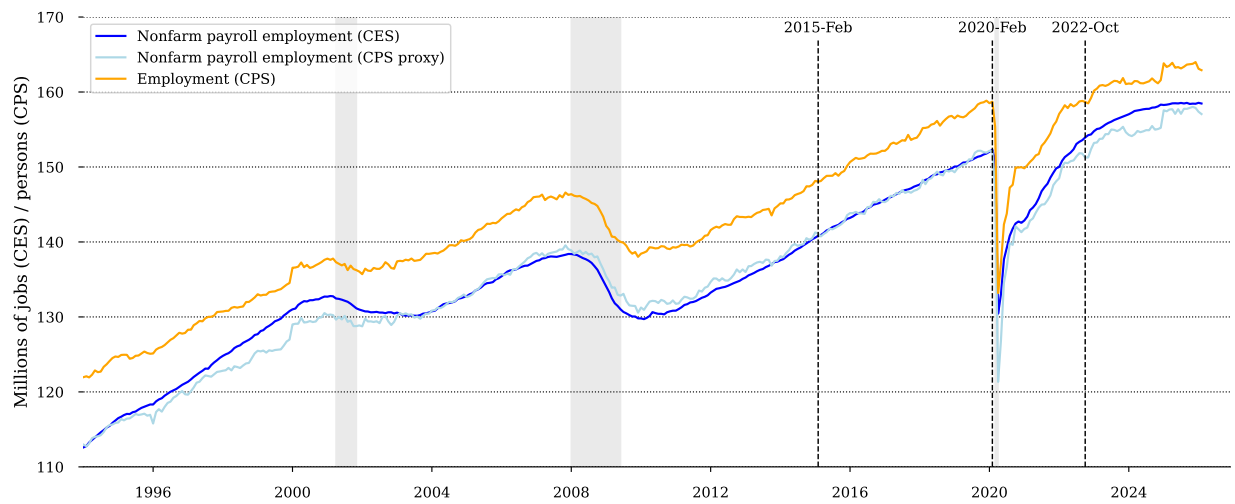
Figure D.4 displays the posterior distribution of correlations between the identified factors across all valid narrative rotations. To provide a benchmark for these results, the figure includes the LKJ prior distribution ($\eta = 1$) as a red dashed line, representing the agnostic starting point of our sampling procedure. The deviation of the blue shaded posterior from this prior illustrates how the narrative restrictions—rather than our initial assumptions—force specific patterns of co-movement between economic drivers to satisfy the observed data.

Figure D.5 quantifies structural labor market dynamics by estimating a VAR(1) for the estimated narrative factors in the narrative feasible set. To account for model and identification uncertainty, we utilize an ensemble identification approach. For each valid rotation matrix R in our ensemble, we examine the full set of recursive (Cholesky) orderings of the latent factors. We impose a structural hierarchy where *Labor Demand* is ordered first (most exogenous) and the *Kitchen Sink* factor is ordered last (most endogenous). The intermediate factors —*Long-Run Labor Supply*, *Short-Run Labor Supply*, and *Matching Efficiency*—are allowed to enter the recursive chain in all possible permutations.

A candidate structural path is only accepted if the resulting impact matrix satisfies our narrative sign restrictions on the observed variables. The structural impulse response functions (IRFs) are then constructed by projecting these identified structural shocks back into the variable space using the factor loading matrix Λ and the corresponding rotation R . The distribution of the accepted impulse response functions is shown in Figure D.5.

Finally, Table D.1 provides a detailed *Identified Variance Decomposition* for the full suite of 94 macro-labor indicators. For each indicator, the table reports the percentage of its total variation attributed to each of the five narrative factors and a remaining residual component. This allows for a granular assessment of which economic forces drive specific indicators. For instance, the decomposition reveals the extent to which “Job Openings” are driven by Labor Demand versus Matching Efficiency, or how much “Average Hourly Earnings” are influenced by Labor Supply shifts.

Figure D.1: Three measures of employment



Note: Three employment concepts. Nonfarm payroll employment from the Current Employment Statistics, nonfarm payroll employment proxy based on data from CPS, and broad employment measure from CPS. Monthly observations; seasonally adjusted.

Source: BLS and authors' calculations.

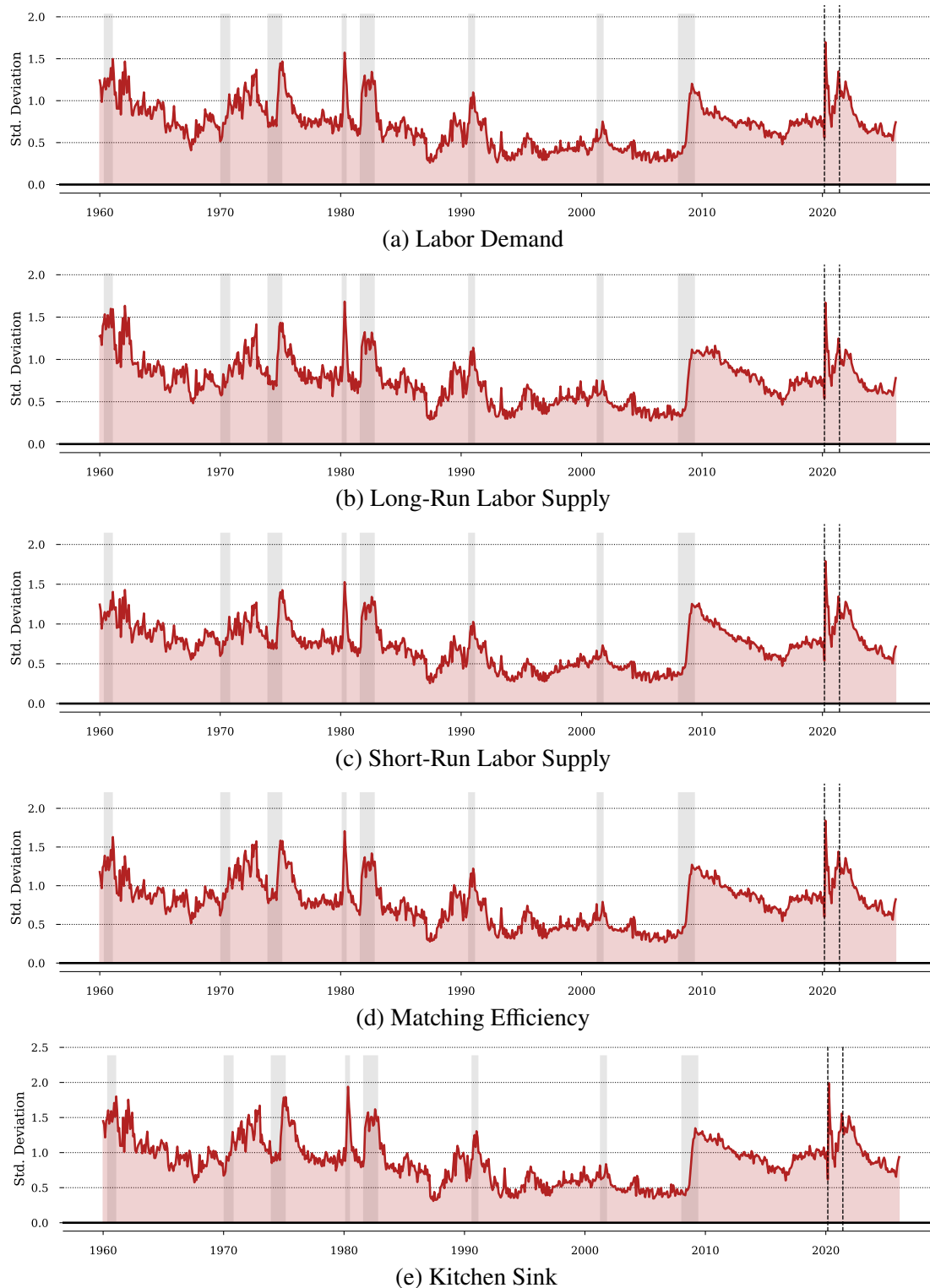


Figure D.2: Identification Uncertainty (Narrative Entropy)

Note: This figure plots the *Identification Uncertainty* for each narrative factor. At each point in time, the value represents the average dispersion of the structural paths that satisfy the narrative restrictions. A higher value indicates a period of greater identification uncertainty (entropy), where the narrative signs are less restrictive in narrowing the set of consistent structural models. Shaded gray bars indicate NBER-dated recessions.

Source: Authors' calculations.

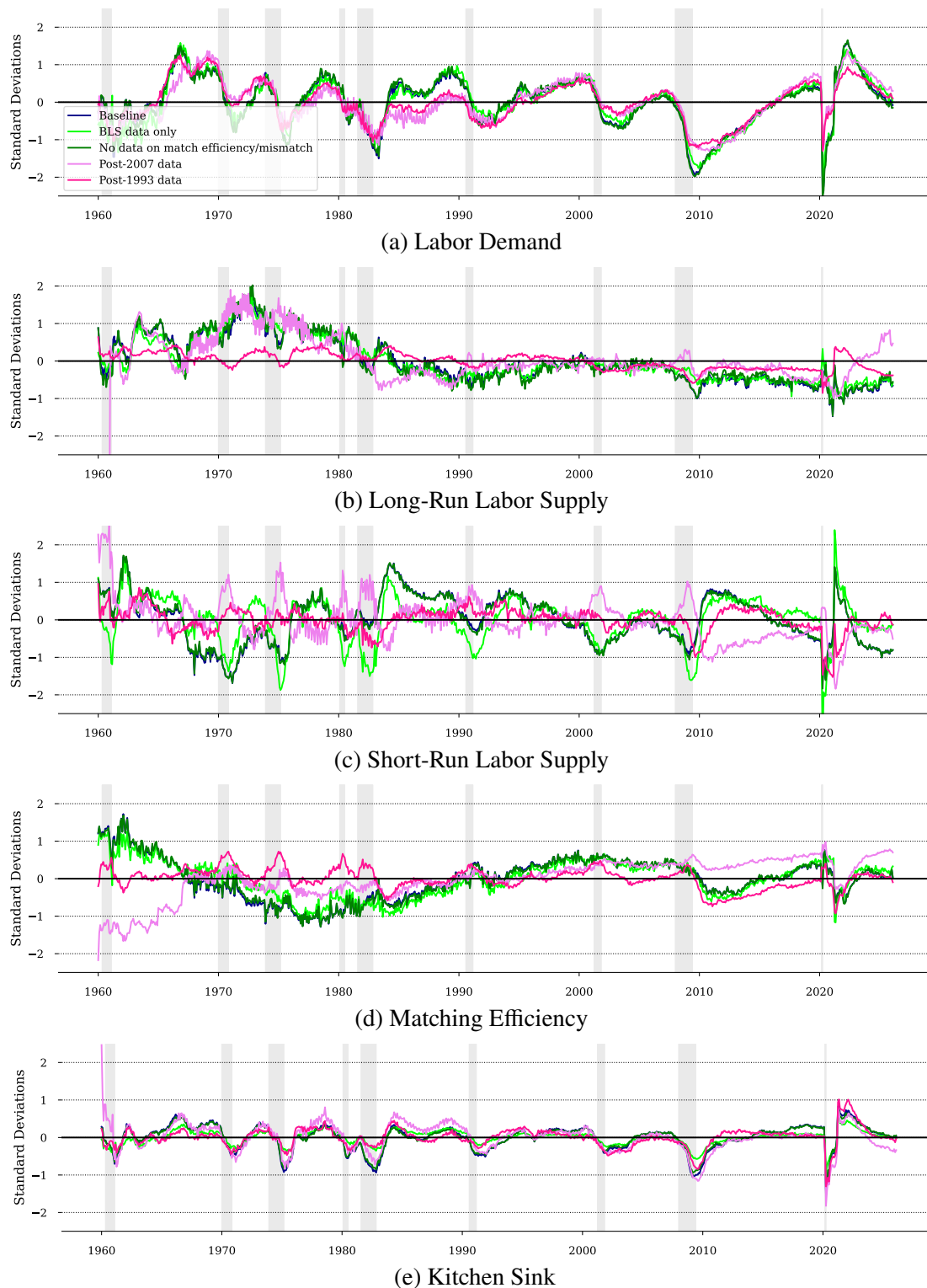


Figure D.3: Comparison of means of narrative factors across five specifications

Note: This figure plots the means for each narrative factor for the baseline specification in the main text and four alternative specifications. “BLS data only”: includes only the 64 indicators published by the BLS or derived from them or the underlying CPS microdata, “No data on match efficiency/mismatch”: Excludes measured matching efficiency and mismatch indicators, which depend on assumed elasticities of the matching function, “Post-2007 data”: Only includes data from Jan-2008 onwards, “Post-1993 data”: Only includes data from Jan-1994 onwards.

Source: Authors’ calculations.

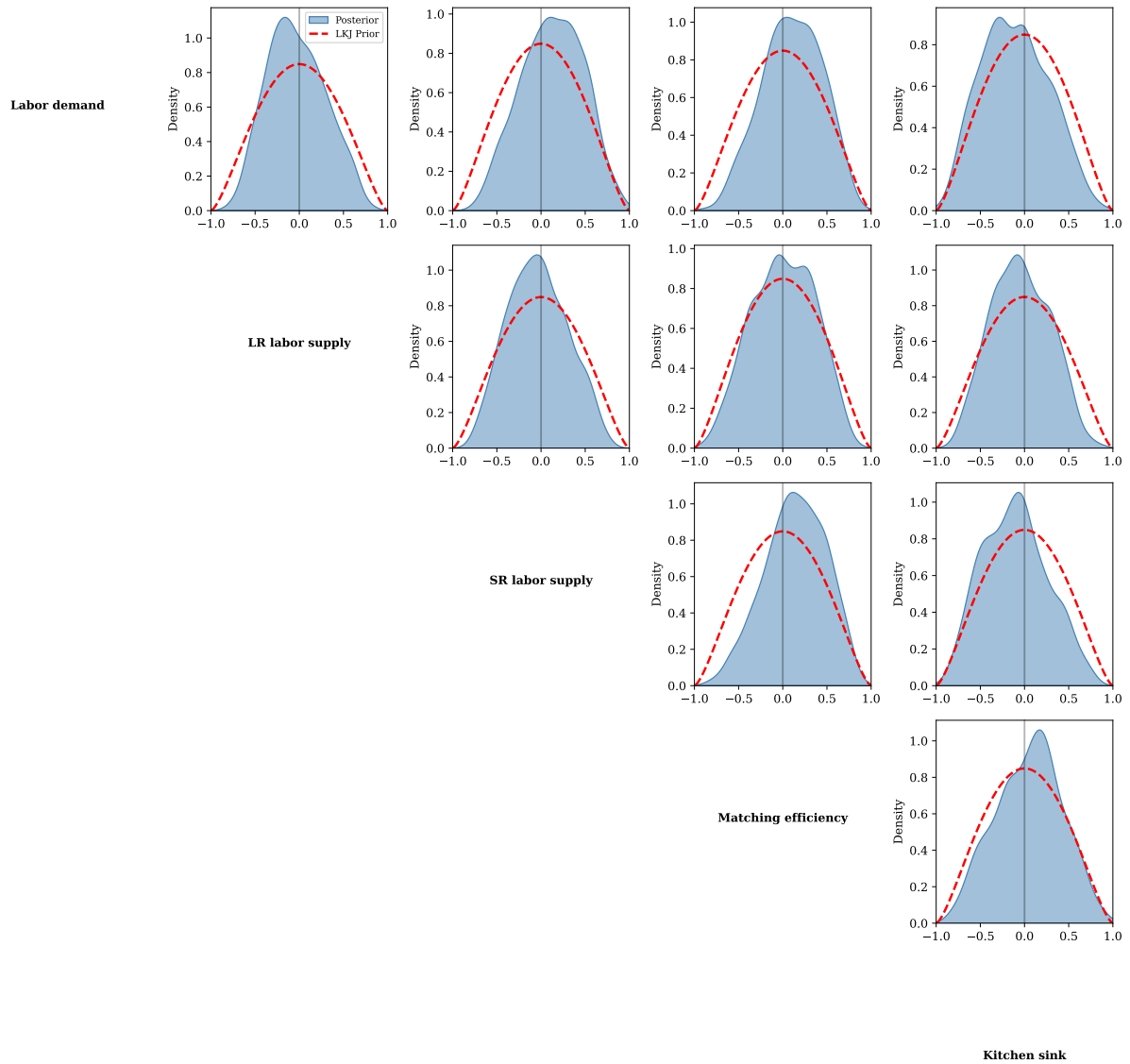


Figure D.4: Factor correlations

Note: Distribution of correlations across factors across draws in the Narrative feasible set. The red dashed lines are the distribution of the correlations we sampled from using the LKJ distribution.
Source: Authors' calculations.

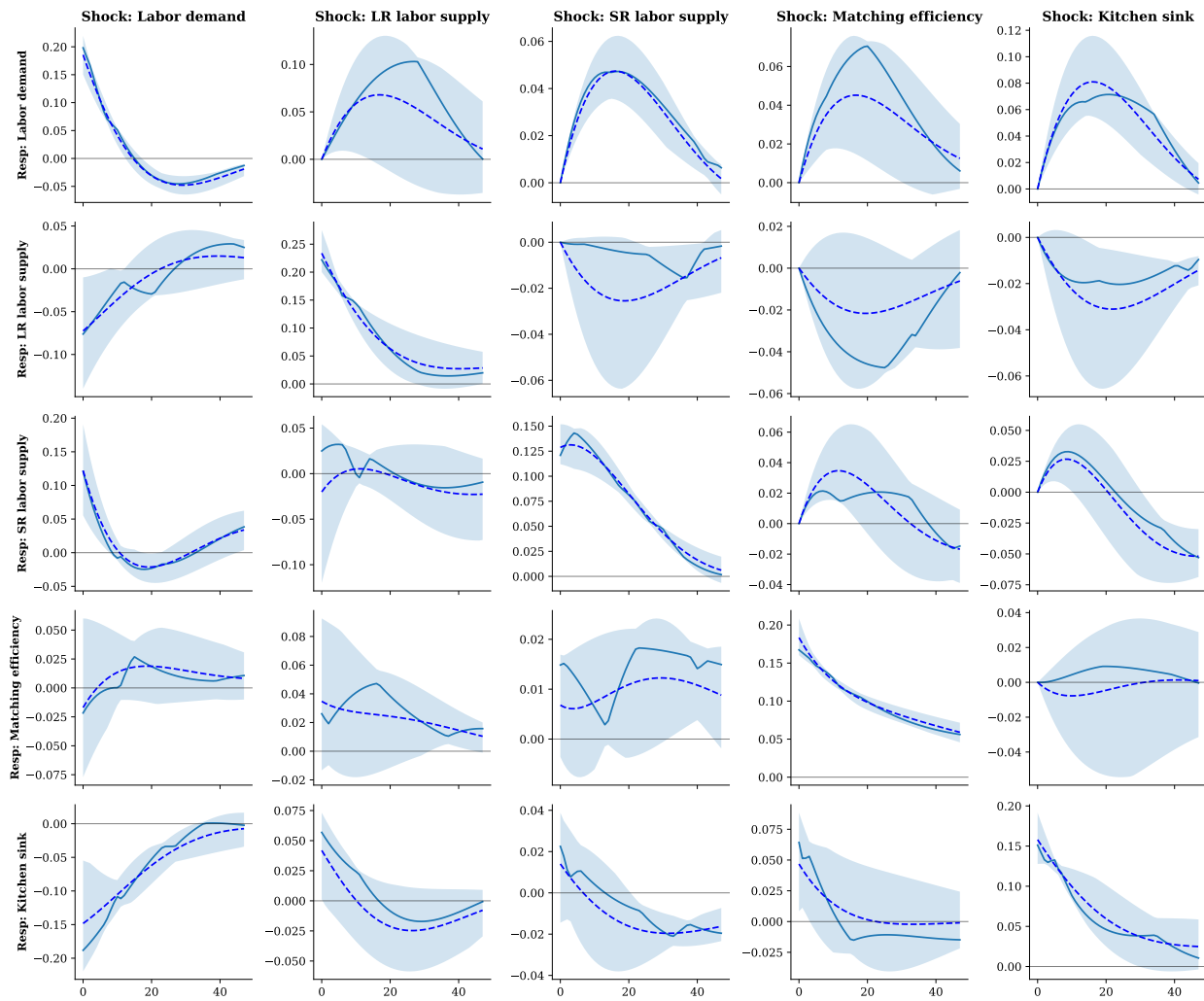


Figure D.5: Structural impulse response functions

Note: We still need an explanatory note here.
Source: Authors' calculations.

Table D.1: Identified Variance Decomposition (Percentage of Total Variation)

Indicator	Labor demand	LR labor supply	SR labor supply	Matching efficiency	Kitchen sink	Residual
Actual birth-death contribution (CES)	46.0	2.7	8.4	8.2	25.6	9.1
Aggregate Weekly Hours (CES)	19.7	6.4	32.4	11.2	23.0	7.3
Announced hiring (CGC)	15.3	3.7	3.4	8.5	7.3	61.9
Announced job cuts (CGC)	9.1	2.7	26.1	10.2	9.4	42.6
Attrition rate (Revelio)	20.5	4.6	39.4	14.9	14.6	6.0
Average hourly earnings	12.8	19.4	10.5	23.6	11.0	22.8
Average weekly hours – all employees (CES)	12.1	10.6	18.7	7.4	12.6	38.5
Average weekly hours – prod and non-sup (CES)	8.5	4.9	22.9	9.6	11.1	43.0
Average weekly wage (QCEW)	7.4	11.6	0.1	13.0	6.0	61.9
Broad unemployment rate (U6) (CPS)	51.5	5.5	19.5	4.1	18.0	1.5
Compensation (ECI)	31.0	6.3	1.3	5.8	13.3	42.4
Compensation per hour (P&C)	12.4	20.0	7.4	21.9	11.7	26.7
Composite Help-Wanted Index (Barnichon)	37.2	10.1	3.4	13.4	16.9	19.0
Covered payroll employment (QCEW)	29.3	6.0	21.6	12.0	19.7	11.3
EE flow rate (FRB Phi)	8.7	18.7	4.4	22.8	20.8	24.7
EPOP ratio (CPS)	29.8	3.4	23.0	11.7	21.5	10.6
EU flow rate (CPS)	26.1	10.8	17.2	11.0	27.3	7.6
Employment (Revelio)	33.5	8.7	18.8	13.7	17.5	7.8
Estimated match efficiency (Cobb-Douglas) (LMU)	5.3	3.5	4.3	3.8	4.4	78.8
Expectations about unemployment rate change (Umich)	6.0	4.5	20.5	9.3	12.6	47.0
Harmonized civilian noninstitutional population (FRBoG)	6.7	40.5	11.5	13.4	14.3	13.6
Hires rate (JOLTS)	25.1	10.0	1.6	18.7	29.9	14.7
Hiring rate (Revelio)	19.8	4.5	40.4	14.8	14.5	5.9
Hourly earnings at small businesses (Paychex)	47.9	12.4	-0.2	14.0	16.9	9.1
Hours worked nonfarm business sector (P&C)	17.7	6.9	32.8	12.6	20.7	9.3
Imputed birth-death contribution (CES)	30.0	14.4	6.3	12.7	15.9	20.7
Initial claims (DOLETA)	33.4	8.1	15.0	6.2	25.9	11.3
Job Openings (Revelio)	32.2	7.7	19.7	15.1	16.1	9.2
Job openings (Indeed)	28.8	6.0	29.1	16.3	15.1	4.7
Job openings (Lightcast)	15.9	3.0	8.0	14.8	6.1	52.3
Job openings rate (JOLTS)	60.2	7.0	5.1	3.7	20.6	3.4
Job quality index (SUNY Buffalo)	4.8	1.4	2.3	0.5	2.8	88.3
LF inflow rate (CPS)	16.1	8.4	19.3	4.9	9.0	42.2

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Table D.1: Identified Variance Decomposition (Percentage of Total Variation)

Indicator	Labor demand	LR labor supply	SR labor supply	Matching efficiency	Kitchen sink	Residual
LF outflow rate (CPS)	4.6	26.8	1.2	26.6	14.5	26.3
LFPR (CPS)	29.2	7.7	0.5	13.9	10.0	38.7
Labor market differential (jobs gap)	6.3	5.4	12.8	12.1	16.3	47.2
Labor shortage (NFIB)	53.9	3.9	8.4	0.9	20.4	12.5
Layoffs rate (JOLTS)	44.2	8.8	2.2	12.0	18.8	14.0
Long-term unemployment share (27 weeks or more) (CPS)	28.9	25.5	10.2	12.6	15.7	7.1
Manufacturing Employment Index (ISM)	10.2	14.8	14.4	14.3	21.8	24.5
Manufacturing hires rate (historical) (LMU+JOLTS)	35.1	9.5	5.6	4.0	16.9	28.9
Manufacturing layoffs rate (historical) (LMU+JOLTS)	14.8	15.5	8.0	18.5	25.3	17.9
Manufacturing quits rate (historical) (LMU+JOLTS)	42.0	15.7	6.5	6.5	14.3	15.1
Median duration of unemployment (CPS)	32.2	22.5	7.3	10.8	15.3	11.8
Median usual weekly earnings (CPS)	19.8	8.0	6.5	17.9	10.6	37.2
Mismatch (LMU)	33.3	4.3	7.7	7.1	26.3	21.2
Multiple job holders (CPS)	8.9	19.4	3.6	24.0	19.3	24.7
New Hires Quality (Upjohn)	7.5	12.7	13.4	8.4	13.6	44.3
Non-employment index (FRB Ric)	52.7	4.1	21.1	1.5	18.8	1.8
Nonfarm payroll employment (ADP)	16.0	5.1	22.8	12.8	10.8	32.4
Nonfarm payroll employment (CPS proxy)	35.0	3.6	14.3	7.8	23.9	15.3
Nonfarm payroll employment - current value (CES)	35.0	8.8	19.3	10.1	23.2	3.6
Nonfarm payroll employment - first release (CES)	35.6	7.8	17.6	8.2	21.5	9.2
Nonfarm payroll employment - post benchmark (CES)	35.3	8.7	18.9	10.1	23.4	3.6
Nonfarm payroll employment - second release (CES)	35.2	7.9	18.0	8.3	21.6	9.1
Nonfarm payroll employment - third release (CES)	35.0	7.9	18.0	8.3	21.5	9.3
Noninstitutionalized population	5.9	34.3	9.0	11.6	11.4	27.8
Part-time for economic reasons (CPS)	33.1	6.8	24.0	6.0	16.9	13.2
Participation Cycle (LMU)	33.6	3.1	10.7	6.7	23.4	22.5
Plans to increase employment (NFIB)	30.8	5.1	7.1	10.6	25.7	20.6
Positions not able to fill (NFIB)	44.3	7.6	13.9	2.0	23.2	9.0
Posted wages (Indeed)	0.1	5.5	43.8	21.2	9.5	19.9
Prevalence of zero wage changes (LMU)	12.5	9.9	22.5	22.7	11.9	20.4

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Table D.1: Identified Variance Decomposition (Percentage of Total Variation)

Indicator	Labor demand	LR labor supply	SR labor supply	Matching efficiency	Kitchen sink	Residual
Private households wage and salary workers (CPS)	18.1	10.6	6.6	15.1	8.5	41.2
Probability of losing job (Umich)	12.8	4.9	6.2	7.0	12.0	57.1
Quits rate (JOLTS)	50.2	8.7	-0.7	9.0	26.2	6.6
Salaries (Revelio)	0.6	2.1	1.0	1.3	0.8	94.1
Self employed (unincorporated) (CPS)	8.0	23.3	18.2	18.0	17.6	14.9
Services Employment Index (ISM)	11.3	8.7	16.3	11.0	22.8	29.9
Share of LF U job losers (CPS)	46.5	6.0	13.5	5.5	23.2	5.4
Share of LF inflows to E (CPS)	43.0	4.7	24.2	0.9	15.9	11.2
Share of LF outflows from E (CPS)	44.1	4.8	26.1	1.4	15.1	8.5
Share of labor force U Job leavers (CPS)	6.4	18.8	10.7	24.9	18.6	20.6
Share of laid off on temporary layoff (CPS)	23.2	14.2	13.8	10.3	11.1	27.4
Small Business Employment (Intuit)	2.6	3.0	36.7	12.0	7.6	38.0
Small business job growth (Paychex)	35.0	11.2	1.5	16.5	13.9	21.8
Small business share raising compensation (NFIB)	55.6	4.7	8.8	1.5	21.6	7.8
Staffing Index (ASA)	30.2	3.7	13.1	9.7	28.8	14.5
Temporary help employment (CES)	5.5	3.6	54.9	6.7	12.2	17.1
Temporary layoff outflow rate	25.0	6.1	5.4	3.2	10.3	50.0
UE flow rate (CPS)	40.9	14.6	10.3	6.8	17.6	9.9
Unemployment Rate - 20 Yrs. & Over, Women (CPS)	35.3	8.4	17.3	12.5	23.5	3.0
Unemployment Rate - Black or African American (CPS)	30.3	10.4	25.3	8.7	21.7	3.5
Unemployment Rate - Hispanic or Latino (CPS)	30.9	10.5	21.6	7.5	22.7	6.7
Unemployment inflow rate (s) (LMU)	8.8	26.7	9.3	22.7	24.6	7.8
Unemployment outflow rate (f) (LMU)	39.3	18.4	8.4	6.4	15.2	12.3
Unemployment rate (U3) (CPS)	40.5	6.4	18.1	9.6	24.0	1.4
WARN Act notices (FRB Cleveland)	13.3	9.8	15.9	22.1	16.7	22.1
Wage growth of job changers (ATL Fed)	44.5	12.1	-1.2	12.5	20.6	11.5
Wage growth of job stayers (ADP)	5.2	2.5	39.5	16.2	9.6	27.0
Wage growth of job stayers (ATL Fed)	36.6	11.5	8.8	13.6	17.0	12.5
Wage growth of job switchers (ADP)	6.7	1.0	13.7	10.8	5.0	62.9
Wages of new hires (Upjohn)	1.3	4.1	0.7	1.7	2.8	89.4
Workers with unpaid absences (CPS)	6.8	11.8	-0.6	8.8	10.3	62.9

Table D.2: Mean Factor Loadings

Indicator	Labor demand	LR labor supply	SR labor supply	Matching efficiency	Kitchen sink
Actual birth-death contribution (CES)	0.56	0.19	0.47	-0.29	0.56
Aggregate Weekly Hours (CES)	0.28	0.36	0.81	-0.20	0.63
Announced hiring (CGC)	0.43	-0.06	0.14	-0.69	0.23
Announced job cuts (CGC)	-0.22	0.16	-0.88	0.44	-0.42
Attrition rate (Revelio)	0.31	-0.03	0.86	-0.36	0.38
Average hourly earnings	0.52	0.31	-0.49	-0.59	0.01
Average weekly hours – all employees (CES)	-0.35	0.56	0.57	0.31	0.39
Average weekly hours – prod and non-sup (CES)	-0.40	0.21	0.76	0.16	0.30
Average weekly wage (QCEW)	0.34	0.33	-0.07	-0.43	0.10
Broad unemployment rate (U6) (CPS)	-0.83	-0.21	0.74	-0.23	-0.26
Compensation (ECI)	0.55	-0.18	-0.09	0.20	0.17
Compensation per hour (P&C)	0.45	0.36	-0.31	-0.47	0.01
Composite Help-Wanted Index (Barnichon)	0.82	0.27	-0.05	-0.43	0.46
Covered payroll employment (QCEW)	0.52	0.34	0.65	-0.38	0.63
EE flow rate (FRB Phi)	0.02	-0.09	0.85	0.60	0.20
EPOP ratio (CPS)	0.52	0.20	0.63	-0.41	0.61
EU flow rate (CPS)	-0.56	0.11	0.56	-0.21	-0.26
Employment (Revelio)	0.56	-0.03	0.57	-0.25	0.32
Estimated match efficiency (Cobb-Douglas) (LMU)	0.28	-0.10	-0.30	0.00	-0.10
Expectations about unemployment rate change (Umich)	-0.22	0.19	0.75	0.08	0.38
Harmonized civilian noninstitutional population (FRBoG)	0.10	0.65	-0.27	-0.13	-0.01
Hires rate (JOLTS)	0.34	-0.16	1.00	0.83	0.57
Hiring rate (Revelio)	0.30	-0.04	0.88	-0.36	0.38
Hourly earnings at small businesses (Paychex)	1.05	-0.10	-0.25	-0.47	0.15
Hours worked nonfarm business sector (P&C)	0.26	0.34	0.82	-0.33	0.61
Imputed birth-death contribution (CES)	0.51	-0.52	-0.25	0.29	-0.08
Initial claims (DOLETA)	-0.66	-0.02	0.49	-0.03	-0.34
Job Openings (Revelio)	0.54	-0.01	0.58	-0.39	0.32
Job openings (Indeed)	0.48	-0.00	0.69	-0.45	0.34
Job openings (Lightcast)	0.43	0.12	0.27	-0.76	0.20

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Table D.2: Mean Factor Loadings

Indicator	Labor demand	LR labor supply	SR labor supply	Matching efficiency	Kitchen sink
Job openings rate (JOLTS)	0.86	-0.09	-0.42	-0.48	0.28
Job quality index (SUNY Buffalo)	0.24	0.18	-0.23	0.05	0.14
LF inflow rate (CPS)	-0.64	0.38	0.88	0.53	0.05
LF outflow rate (CPS)	0.04	0.42	-0.09	-0.59	0.00
LFPR (CPS)	0.67	0.20	0.10	-0.49	0.30
Labor market differential (jobs gap)	-0.00	-0.36	-0.56	-0.45	-0.44
Labor shortage (NFIB)	0.89	0.07	-0.44	-0.17	0.38
Layoffs rate (JOLTS)	-0.76	-0.08	0.60	0.85	-0.24
Long-term unemployment share (27 weeks or more) (CPS)	-0.65	-0.43	0.34	-0.07	-0.13
Manufacturing Employment Index (ISM)	-0.06	0.34	0.44	-0.03	0.41
Manufacturing hires rate (historical) (LMU+JOLTS)	0.63	0.29	-0.14	-0.10	0.40
Manufacturing layoffs rate (historical) (LMU+JOLTS)	-0.22	0.07	-0.00	0.28	-0.29
Manufacturing quits rate (historical) (LMU+JOLTS)	0.73	0.36	-0.23	-0.18	0.35
Median duration of unemployment (CPS)	-0.66	-0.41	0.21	-0.11	-0.20
Median usual weekly earnings (CPS)	0.69	0.04	-0.57	-0.67	-0.06
Mismatch (LMU)	-0.52	-0.39	0.13	0.10	-0.50
Multiple job holders (CPS)	0.05	0.09	0.46	0.65	0.14
New Hires Quality (Upjohn)	-0.20	0.68	0.44	0.19	0.44
Non-employment index (FRB Ric)	-0.85	-0.25	0.80	-0.15	-0.29
Nonfarm payroll employment (ADP)	0.46	-0.15	1.08	-0.58	0.47
Nonfarm payroll employment (CPS proxy)	0.55	0.26	0.55	-0.15	0.64
Nonfarm payroll employment - current value (CES)	0.58	0.38	0.57	-0.34	0.64
Nonfarm payroll employment - first release (CES)	0.60	0.35	0.55	-0.28	0.61
Nonfarm payroll employment - post benchmark (CES)	0.58	0.37	0.57	-0.34	0.63
Nonfarm payroll employment - second release (CES)	0.59	0.35	0.56	-0.28	0.61
Nonfarm payroll employment - third release (CES)	0.59	0.36	0.56	-0.29	0.61
Noninstitutionalized population	0.14	0.60	-0.25	-0.16	0.03
Part-time for economic reasons (CPS)	-0.71	-0.17	0.70	-0.34	-0.23
Participation Cycle (LMU)	0.59	0.05	0.37	-0.09	0.54

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Table D.2: Mean Factor Loadings

Indicator	Labor demand	LR labor supply	SR labor supply	Matching efficiency	Kitchen sink
Plans to increase employment (NFIB)	0.58	0.11	-0.12	0.34	0.44
Positions not able to fill (NFIB)	0.86	-0.12	-0.64	-0.06	0.30
Posted wages (Indeed)	-0.43	-0.11	1.03	-0.78	0.28
Prevalence of zero wage changes (LMU)	-0.30	-0.10	0.70	-0.73	0.11
Private households wage and salary workers (CPS)	-0.64	0.01	1.17	1.16	0.17
Probability of losing job (Umich)	-0.27	0.32	-0.89	-0.17	-0.35
Quits rate (JOLTS)	0.68	-0.23	0.23	0.25	0.39
Salaries (Revelio)	-0.26	-0.26	0.37	0.15	0.01
Self employed (unincorporated) (CPS)	-0.13	0.40	0.56	0.37	0.14
Services Employment Index (ISM)	0.08	0.64	0.41	0.15	0.60
Share of LF U job losers (CPS)	-0.81	-0.14	0.45	-0.24	-0.36
Share of LF inflows to E (CPS)	0.86	0.06	-0.76	0.06	0.23
Share of LF outflows from E (CPS)	0.88	0.06	-0.79	0.11	0.20
Share of labor force U Job leavers (CPS)	-0.05	0.32	0.47	-0.55	-0.00
Share of laid off on temporary layoff (CPS)	0.61	0.24	-0.49	-0.04	0.02
Small Business Employment (Intuit)	-0.43	-0.01	1.37	-0.69	0.45
Small business job growth (Paychex)	-0.95	0.28	-0.14	1.00	-0.21
Small business share raising compensation (NFIB)	0.94	0.01	-0.49	-0.03	0.37
Staffing Index (ASA)	0.38	0.08	0.75	0.31	0.60
Temporary help employment (CES)	-0.15	0.30	1.42	0.03	0.62
Temporary layoff outflow rate	0.62	-0.23	-0.43	0.12	0.11
UE flow rate (CPS)	0.75	0.38	-0.29	0.29	0.33
Unemployment Rate - 20 Yrs. & Over, Women (CPS)	-0.71	0.13	0.66	-0.44	-0.22
Unemployment Rate - Black or African American (CPS)	-0.71	0.20	0.87	-0.27	-0.14
Unemployment Rate - Hispanic or Latino (CPS)	-0.70	0.19	0.79	-0.21	-0.17
Unemployment inflow rate (s) (LMU)	-0.03	0.41	0.36	-0.40	-0.06
Unemployment outflow rate (f) (LMU)	0.76	0.42	-0.31	0.09	0.29
Unemployment rate (U3) (CPS)	-0.77	-0.00	0.63	-0.38	-0.28
WARN Act notices (FRB Cleveland)	-0.31	0.11	-0.44	0.70	-0.36
Wage growth of job changers (ATL Fed)	0.67	-0.30	0.04	0.14	0.16

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Table D.2: Mean Factor Loadings

Indicator	Labor demand	LR labor supply	SR labor supply	Matching efficiency	Kitchen sink
Wage growth of job stayers (ADP)	-0.02	-0.07	0.98	-0.61	0.38
Wage growth of job stayers (ATL Fed)	0.62	-0.27	-0.36	0.20	-0.02
Wage growth of job switchers (ADP)	0.16	0.13	0.50	-0.64	0.29
Wages of new hires (Upjohn)	0.00	-0.40	0.06	-0.00	-0.17
Workers with unpaid absences (CPS)	0.15	-0.75	0.84	0.13	0.02

E Data details

We use a dataset of 94 macro-labor time series. Most of them are monthly and only a few quarterly. The sample covers the period from January 1960 to February 2026. Data are sourced from ADP, American Staffing Association, Atlanta Fed, Barnichon, Bureau of Labor Statistics, Challenger, Gray & Christmas, Cleveland Fed, Conference Board, Department of Labor Employment and Training Administration, Federal Reserve Bank of Philadelphia, Federal Reserve Bank of Richmond, Federal Reserve Board of Governors, Indeed, Institute for Supply Management, Intuit, LaborMarketUpdate.net, Lightcast, National Federation of Independent Businesses, Paychex, Revelio Labs, Self, University of Buffalo, University of Michigan, and Upjohn Institute and retrieved via ALFRED, Barnichon, BoG, FRED, Haver, LMU, LMU/JOLTS, Revelio, Self, and UMICH. Detailed transformation and sample metadata for each series are provided in Table E.1 below. More details about the data, as well as retrieval code, can be found in the replication files distributed with this article. For some series the mnemonic for the numerator is listed. The ratio is constructed from the ratio of that numerator and the appropriate denominator.

Table E.1: Dataset Overview and Variable Transformations

Label	Transf.	Start	End	Distributor	Code
Actual birth-death contribution (CES)	$y_{i,t}$	2009/03	2025/03	Self	actualbirthdeaths
Aggregate Weekly Hours (CES)	$100 \times \Delta_{12} \ln y_{i,t}$	1965/01	2026/02	FRED	AWHI
Announced hiring (CGC)	$100 \times \ln y_{i,t}$	2004/05	2026/02	Haver	CGCHTO@SURVEYS
Announced job cuts (CGC)	$100 \times \ln y_{i,t}$	1989/03	2026/02	Haver	CGCTO@SURVEYS
Attrition rate (Revelio)	$y_{i,t}$	2021/01	2026/02	Revelio	Web download
Average hourly earnings	$100 \times \Delta_{12} \ln y_{i,t}$	1965/01	2026/02	FRED	AHETPI
Average weekly hours – all employees (CES)	$100 \times \Delta_{12} \ln y_{i,t}$	2007/03	2026/02	FRED	AWHAETP
Average weekly hours – prod and non-sup (CES)	$100 \times \Delta_{12} \ln y_{i,t}$	1965/01	2026/02	FRED	AWHNONAG
Average weekly wage (QCEW)	$100 \times \Delta_{12} \ln y_{i,t}$	1976/01	2025/04	Haver	WW0TZ0@CEW
Broad unemployment rate (U6) (CPS)	$\ln y_{i,t}$	1994/01	2026/02	FRED	U6RATE
Compensation (ECI)	$100 \times \Delta_{12} \ln y_{i,t}$	2002/01	2025/10	FRED	ECICOM
Compensation per hour (P&C)	$100 \times \Delta_{12} \ln y_{i,t}$	1961/01	2025/10	FRED	COMPNFB
Composite Help-Wanted Index (Barnichon)	$\ln y_{i,t}$	1960/01	2000/11	Barnichon	CHWI
Covered payroll employment (QCEW)	$100 \times \Delta_{12} \ln y_{i,t}$	1976/01	2025/06	Haver	EM0TZ0@CEW
EE flow rate (FRB Phi)	$y_{i,t}$	1995/10	2026/01	FRED	FMPSA
EPOP ratio (CPS)	$100 \times \Delta_{12} \ln y_{i,t}$	1961/01	2026/02	FRED	CE16OV
EU flow rate (CPS)	$y_{i,t}$	1967/06	2026/02	FRED	LNS17400000
Employment (Revelio)	$100 \times \Delta_{12} \ln y_{i,t}$	2022/01	2026/02	Revelio	Web download
Estimated match efficiency (Cobb-Douglas) (LMU)	$100 \times \Delta_{12} y_{i,t}$	1961/02	2025/12	Self	matchefficiency
Expectations about unemployment rate change (Umich)	$100 \times \ln y_{i,t}$	1978/01	2026/02	UMICH	S30
Harmonized civilian noninstitutional population (FR-BoG)	$100 \times \Delta_{12} \ln y_{i,t}$	1961/01	2025/05	BoG	pn16
Hires rate (JOLTS)	$y_{i,t}$	2000/12	2025/12	FRED	JTSHIL
Hiring rate (Revelio)	$y_{i,t}$	2021/01	2026/02	Revelio	Web download
Hourly earnings at small businesses (Paychex)	$100 \times \Delta_{12} \ln y_{i,t}$	2015/01	2026/02	Haver	LPXHE@USECON

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Table E.1: Dataset Overview and Variable Transformations

Label	Transf.	Start	End	Distributor	Code
Hours worked nonfarm business sector (P&C)	$100 \times \Delta_{12} \ln y_{i,t}$	1961/01	2025/10	FRED	HOANBS
Imputed birth-death contribution (CES)	$y_{i,t}$	2004/12	2026/02	Self	imputedbirthdeaths
Initial claims (DOLETA)	$100 \times \ln y_{i,t}$	1967/01	2026/02	FRED	ICSA
Job Openings (Revelio)	$y_{i,t}$	2022/01	2026/02	Revelio	Web download
Job openings (Indeed)	$y_{i,t}$	2020/02	2026/02	FRED	IHLIDXUS
Job openings (Lightcast)	$y_{i,t}$	2020/01	2026/02	Haver	USBG@WEEKLY
Job openings rate (JOLTS)	$\ln y_{i,t}$	2000/12	2025/12	FRED	JTSJOL
Job quality index (SUNY Buffalo)	$100 \times \Delta_{12} \ln y_{i,t}$	1991/01	2025/12	Haver	JQI@USECON
LF inflow rate (CPS)	$y_{i,t}$	1967/06	2026/02	FRED	LNS17900000
LF outflow rate (CPS)	$y_{i,t}$	1967/06	2026/02	FRED	LNS17800000
LFPR (CPS)	$100 \times \Delta_{12} \ln y_{i,t}$	1961/01	2026/02	FRED	CLF16OV
Labor market differential (jobs gap)	$y_{i,t}$	1967/02	2026/02	Haver	EFJN@CBDB
Labor shortage (NFIB)	$y_{i,t}$	1993/04	2026/02	Haver	NFIB21@SURVEYS
Layoffs rate (JOLTS)	$y_{i,t}$	2000/12	2025/12	FRED	JTSLDL
Long-term unemployment share (27 weeks or more) (CPS)	$y_{i,t}$	1960/01	2026/02	FRED	LNS13025703
Manufacturing Employment Index (ISM)	$y_{i,t}$	1960/01	2026/02	Haver	NAPMEI@USECON
Manufacturing hires rate (historical) (LMU+JOLTS)	$y_{i,t}$	1960/01	2025/12	LMU/JOLTS	historicallts
Manufacturing layoffs rate (historical) (LMU+JOLTS)	$y_{i,t}$	1960/01	2025/12	LMU/JOLTS	historicallts
Manufacturing quits rate (historical) (LMU+JOLTS)	$y_{i,t}$	1960/01	2025/12	LMU/JOLTS	historicallts
Median duration of unemployment (CPS)	$y_{i,t}$	1967/07	2026/02	FRED	UEMPMED
Median usual weekly earnings (CPS)	$100 \times \Delta_{12} \ln y_{i,t}$	1980/01	2025/07	FRED	LES1252881500Q
Mismatch (LMU)	$\ln y_{i,t}$	2001/02	2025/12	LMU	mismatch
Multiple job holders (CPS)	$y_{i,t}$	1994/01	2026/02	FRED	LNS12026619
New Hires Quality (Upjohn)	$100 \times \Delta_{12} \ln y_{i,t}$	2002/01	2026/01	Haver	NHQLV@USECON
Non-employment index (FRB Ric)	$y_{i,t}$	1994/01	2026/01	FRED	NEIM156SFRBRIC

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Table E.1: Dataset Overview and Variable Transformations

Label	Transf.	Start	End	Distributor	Code
Nonfarm payroll employment (ADP)	$100 \times \Delta_{12} \ln y_{i,t}$	2011/01	2026/02	Haver	LAXEPA@USECON
Nonfarm payroll employment (CPS proxy)	$100 \times \Delta_{12} \ln y_{i,t}$	1995/01	2026/02	Haver	LERSPCA@USECON
Nonfarm payroll employment - current value (CES)	$100 \times \Delta_{12} \ln y_{i,t}$	1961/01	2026/02	FRED	PAYEMS
Nonfarm payroll employment - first release (CES)	$100 \times \Delta_{12} \ln y_{i,t}$	1961/01	2026/02	ALFRED	PAYEMS
Nonfarm payroll employment - post benchmark (CES)	$100 \times \Delta_{12} \ln y_{i,t}$	1961/01	2025/03	ALFRED	PAYEMS
Nonfarm payroll employment - second release (CES)	$100 \times \Delta_{12} \ln y_{i,t}$	1961/01	2026/01	ALFRED	PAYEMS
Nonfarm payroll employment - third release (CES)	$100 \times \Delta_{12} \ln y_{i,t}$	1961/01	2025/12	ALFRED	PAYEMS
Noninstitutionalized population	$100 \times \Delta_{12} \ln y_{i,t}$	1961/01	2026/02	FRED	CNP16OV
Part-time for economic reasons (CPS)	$y_{i,t}$	1960/01	2026/02	FRED	LNS12032194
Participation Cycle (LMU)	$y_{i,t}$	1978/12	2026/02	LMU	participationcycle12monthchange
Plans to increase employment (NFIB)	$y_{i,t}$	1973/10	2026/02	Haver	NFIB1@SURVEYS
Positions not able to fill (NFIB)	$y_{i,t}$	1973/10	2026/02	Haver	NFIB2@SURVEYS
Posted wages (Indeed)	$100 \times \Delta_{12} \ln y_{i,t}$	2020/01	2026/01	Haver	LIWTY@USECON
Prevalence of zero wage changes (LMU)	$y_{i,t}$	1986/10	2026/01	LMU	prevalenceofzerowagechanges
Private households wage and salary workers (CPS)	$y_{i,t}$	2000/01	2026/02	FRED	LNU02032190
Probability of losing job (Umich)	$y_{i,t}$	1997/12	2026/02	UMICH	S17
Quits rate (JOLTS)	$y_{i,t}$	2000/12	2025/12	FRED	JTSQUL
Salaries (Revelio)	$100 \times \Delta_{12} \ln y_{i,t}$	2023/01	2026/02	Revelio	Web download
Self employed (unincorporated) (CPS)	$y_{i,t}$	1960/01	2026/02	FRED	LNS12032192
Services Employment Index (ISM)	$y_{i,t}$	1997/07	2026/02	Haver	NMFEI@USECON
Share of LF U job losers (CPS)	$y_{i,t}$	1967/01	2026/02	FRED	LNS13025699
Share of LF inflows to E (CPS)	$y_{i,t}$	1967/06	2026/02	FRED	LNS17200000
Share of LF outflows from E (CPS)	$y_{i,t}$	1967/06	2026/02	FRED	LNS17600000
Share of labor force U Job leavers (CPS)	$y_{i,t}$	1967/01	2026/02	FRED	LNS13023705
Share of laid off on temporary layoff (CPS)	$y_{i,t}$	1967/01	2026/02	FRED	LNS13023653
Small Business Employment (Intuit)	$100 \times \Delta_{12} \ln y_{i,t}$	2016/01	2026/01	Haver	LINTA@USECON

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Table E.1: Dataset Overview and Variable Transformations

Label	Transf.	Start	End	Distributor	Code
Small business job growth (Paychex)	$100 \times \Delta_{12} \ln y_{i,t}$	2015/01	2026/02	Haver	LPXJ@USECON
Small business share raising compensation (NFIB)	$y_{i,t}$	1984/04	2026/02	Haver	NFIB19@SURVEYS
Staffing Index (ASA)	$100 \times \ln y_{i,t}$	2006/06	2026/02	Haver	ASASI@SURVEYS
Temporary help employment (CES)	$100 \times \Delta_{12} \ln y_{i,t}$	1991/01	2026/02	FRED	TEMPHELPS
Temporary layoff outflow rate	$y_{i,t}$	1978/12	2026/01	LMU	unemploymentoutflowratebyreason
UE flow rate (CPS)	$y_{i,t}$	1967/06	2026/02	FRED	LNS17100000
Unemployment Rate - 20 Yrs. & Over, Women (CPS)	$\ln y_{i,t}$	1960/01	2026/02	FRED	LNS14000026
Unemployment Rate - Black or African American (CPS)	$\ln y_{i,t}$	1972/01	2026/02	FRED	LNS14000006
Unemployment Rate - Hispanic or Latino (CPS)	$\ln y_{i,t}$	1973/03	2026/02	FRED	LNS14000009
Unemployment inflow rate (s) (LMU)	$y_{i,t}$	1960/02	2026/01	LMU	2stateinflowrate
Unemployment outflow rate (f) (LMU)	$y_{i,t}$	1960/02	2026/01	LMU	2stateoutflowrate
Unemployment rate (U3) (CPS)	$\ln y_{i,t}$	1960/01	2026/02	FRED	UNEMPLOY
WARN Act notices (FRB Cleveland)	$100 \times \ln y_{i,t}$	1996/07	2026/01	Haver	WARNW@USECON
Wage growth of job changers (ATL Fed)	$y_{i,t}$	1997/03	2026/01	FRED	FRBATLWGT3MMAUMHWGJMJSW
Wage growth of job stayers (ADP)	$100 \times \Delta_{12} \ln y_{i,t}$	2021/10	2026/02	Haver	LPAYJS@USECON
Wage growth of job stayers (ATL Fed)	$y_{i,t}$	1997/03	2026/01	FRED	FRBATLWGT3MMAUMHWGJMJST
Wage growth of job switchers (ADP)	$100 \times \Delta_{12} \ln y_{i,t}$	2021/10	2026/02	Haver	LPAYJC@USECON
Wages of new hires (Upjohn)	$100 \times \Delta_{12} \ln y_{i,t}$	2002/01	2026/01	Haver	NHQLE@USECON
Workers with unpaid absences (CPS)	$y_{i,t}$	2000/01	2026/02	Haver	ENMXWUA@EMPL