Supplemental Appendix

# Labor Market Discrimination and the Racial Unemployment Gap: Can Monetary Policy Make a Difference?

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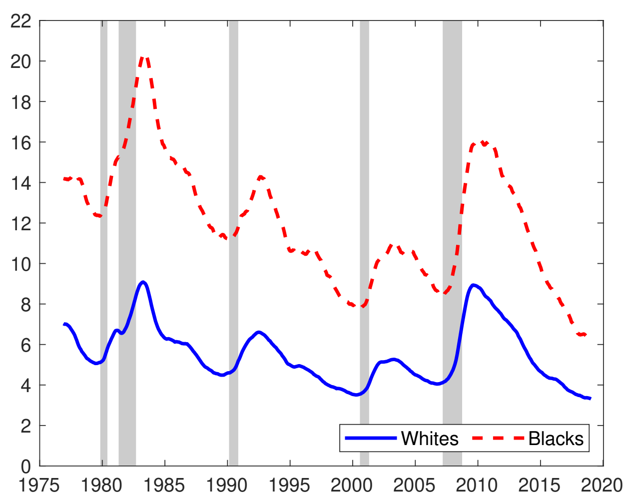
## A Additional Empirical Results

### A.1 Unemployment Rates and Labor Market Volatility by Race

Figure A.1 plots the unemployment rate by race over the sample period analyzed in this paper.

Figure A.1: Unemployment Rates by Race




*Note:* We plot 12-month moving averages. The shaded areas represent NBER recessions.

Table A.1 reports two measures of volatility for the main labor market variables of interest. Absolute volatilities are defined as standard deviations of the data expressed in deviations from an HP trend with a smoothing parameter of $10^5$. Relative volatilities are defined analogously, except that all variables are initially expressed in natural logarithms. Relative volatilities have been used in the recent search and matching literature to assess the quantitative properties of search and matching models. Given the interest of this paper in studying the unemployment rate gap between Blacks and Whites, our preferred measure of volatilities is absolute volatilities. This preference avoids the distorting effect of different unemployment rate means between Blacks and Whites on relative volatility measures.

As shown in Table A.1, Black workers experience larger employment volatility than white workers, regardless of which volatility measure is used. The same conclusion is reached in terms of unemployment volatility when looking at absolute volatilities. However, the opposite is reached when

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Table A.1: Labor Market Volatility by Race

| | Absolute volatilities | | | Relative volatilities | | |
|---|---|---|---|---|---|---|
| | Blacks | Whites | Ratio | Blacks | Whites | Ratio |
| Employment rate | 2.1 | 1.2 | 1.8 | 2.4 | 1.3 | 1.9 |
| Unemployment rate | 2.1 | 1.2 | 1.8 | 17.6 | 20.7 | 0.9 |
| Job-finding rate | 7.9 | 10.7 | 0.7 | 20.8 | 21.1 | 1.0 |
| Separation rate | 0.8 | 0.3 | 2.9 | 13.0 | 9.6 | 1.4 |

*Note:* Absolute volatilities are defined as standard deviations of the data expressed in deviations from an HP trend with a smoothing parameter of $10^5$. Relative volatilities are defined analogously, except that all variables are initially expressed in natural logarithms.

looking at the relative volatility, as the volatility of the white unemployment rate is actually *higher* than that of the Black unemployment rate. The reason why white workers have a more volatile unemployment rate in terms of log deviations is only due to their lower mean unemployment rate.

## A.2 Unemployment Gross Flow Rates

We now assess the contribution of each unemployment flow in generating the observed racial unemployment rate gap by considering a three-state system where individuals can be employed ($E$), unemployed ($U$), or out of the labor force ($I$). We follow the same approach as in Section I.A of the main text to determine the relative importance of each margin, but with the steady-state unemployment approximation now

$$u_t^{i*} \approx \frac{EI_t^i IU_t^i + IE_t^i EU_t^i + IU_t^i EU_t^i}{EI_t^i IU_t^i + IE_t^i EU_t^i + IU_t^i EU_t^i + UI_t^i IE_t^i + IU_t^i UE_t^i + IE_t^i UE_t^i}.$$

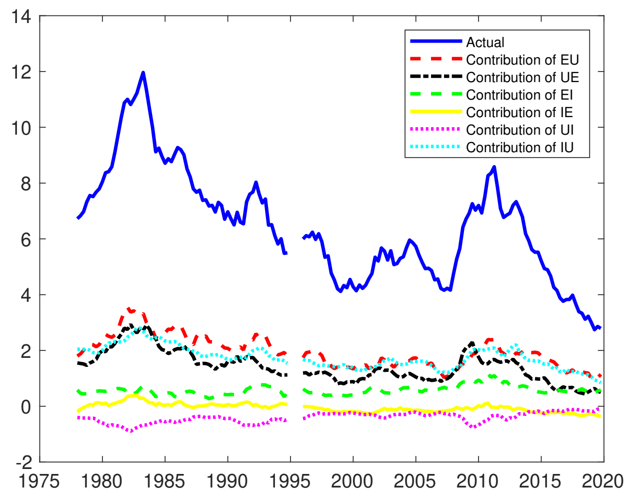
Figure A.2 is the analog of Figure 1 in the main text, and Table A.2 is the analog of Table 2 in the main text, for the three-state system. The results show that the $EU$ transition rate is the most important contributor in explaining the mean and the variance of the racial unemployment rate gap even when considering the transitions in and out of the labor force. In addition, the EU and UE margins are key to explain the dynamics of the racial unemployment rate gap in the data, supporting our two-state modeling of the labor market in this paper.

Table A.2: Contributions of Unemployment Gross Flow Rates to the Racial Unemployment Rate Gap in the Data (Three-State System)

| | $EU$ | $UE$ | $EI$ | $IE$ | $UI$ | $IU$ |
|---|---|---|---|---|---|---|
| Mean | 0.30 | 0.22 | 0.09 | -0.01 | -0.06 | 0.27 |
| Cyclical variance | 0.27 | 0.23 | 0.07 | 0.06 | -0.05 | 0.16 |

*Note:* The rows do not sum to 100 percent, as the decomposition is not exact. Variances and covariances are computed using data in deviations from an HP trend with a smoothing parameter of $10^5$.

Figure A.2: Racial Unemployment Rate Gap:
Actual versus Counterfactuals (Three-State System)




*Note:* Series are quarterly averages of monthly data spanning from 1978:Q1 to 2019:Q4. Data are expressed in terms of 4-quarter moving averages.

## A.3 Aggregate Labor Market Conditions and Racial Discrimination

Figure A.3 replicates the work of Cajner et al. (2017) by decomposing the unemployment rate gap between Black and white workers into an explained and unexplained component using a Oaxaca-Blinder decomposition, where the observables are age, gender, education, marital status, and state. The data is at annual frequency from 1976 to 2019.

Figure A.3: Racial Unemployment Rate Gap: Oaxaca-Blinder Decomposition

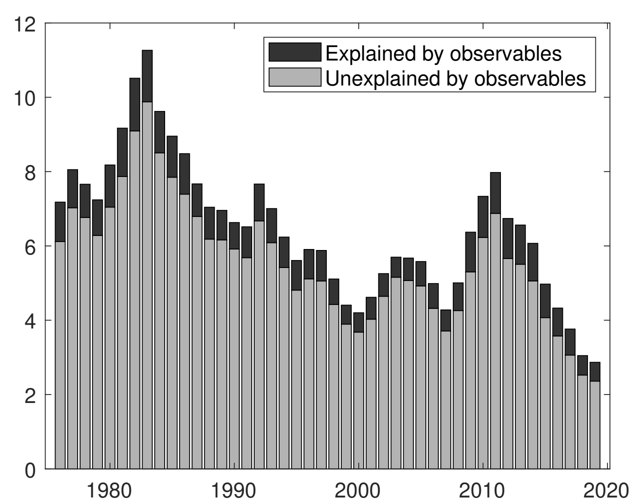
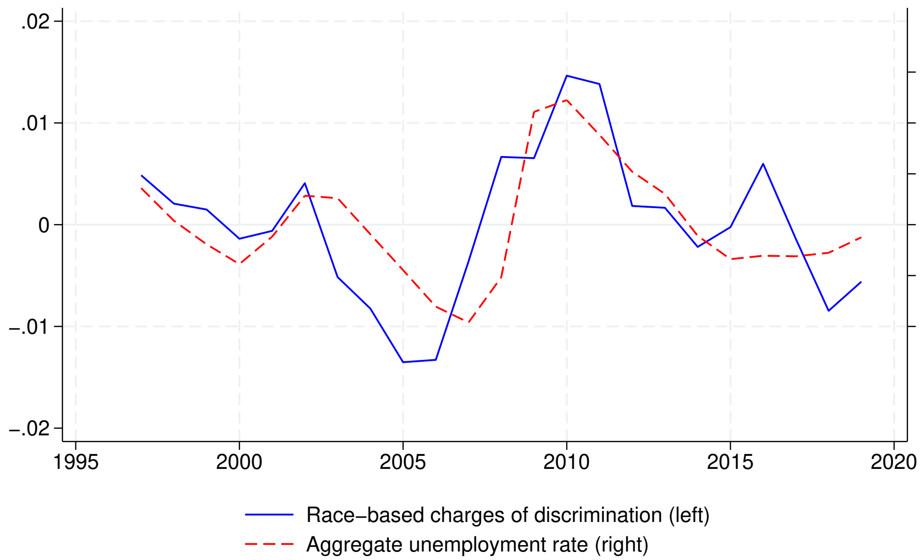



Figure A.4 plots the cyclical component of the race charges variable (discussed in Section I.B of the main text) from 1997 to 2019, together with the cyclical component of the aggregate unemployment rate. For context in interpreting these numbers, the state with the most discrimination is Arkansas, with an average race charges rate of 26 basis points, and the state with the least discrimination is Maine, with an average race charges rate of 2 basis points. So a 1 basis point change in the race charges rate is commensurate with 4 percent of the difference between Arkansas and

Maine. Note that the state level data are available at an annual frequency for only the 2009–2019 period. To compute the cyclical volatility we first detrend the data using the HP filter. We use a smoothing parameter of 100, given that race-based charges are available at an annual frequency.

Figure A.4: Aggregate Labor Market Conditions and Racial Discrimination




*Note:* Data are annual and series are cyclical components from an HP filter with a smoothing parameter of 100.

## A.4 Employer-to-Employer Transition Rates by Race

Our model assumes that exogenous separation rates are the same between Black and white workers. In the literature, exogenous separation rates are related to quits. Given that the JOLTS data do not allow the computation of quits by demographic characteristics, we compute employer-to-employer transition rates as an alternative measure of quits by race from the CPS data. In particular, we compute employer-to-employer transition rates by race, following the approach in Fallick and Fleischman (2004). We focus, though, on self-reported responses in the CPS in order to avoid the selection bias from the changes in the interviewing process in 2007 documented by Fujita et al. (2024). Table A.3 shows that employer-to-employer transition rates differ very little by demographic groups, supporting the assumption that exogenous separation rates in the model do not differ by race.

Table A.3: Employer-to-Employer Transition Rates by Race

| | Aggregate | Whites | Blacks |
|---|---|---|---|
| Average 1994–2019 (in percent) | 1.92 | 1.90 | 2.04 |

## A.5 Inflation Rates by Race

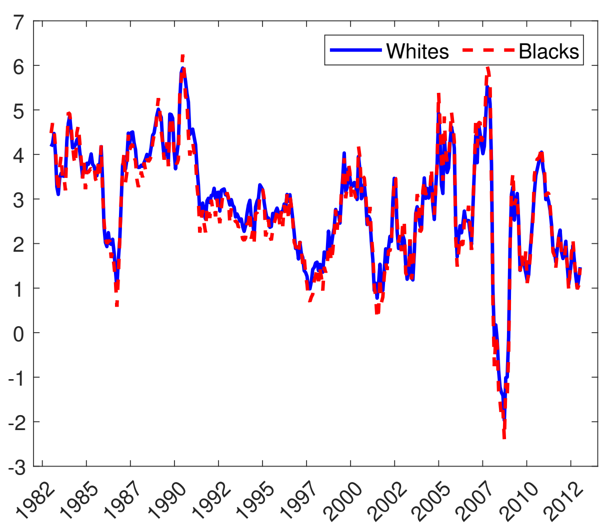
We use the Chicago Fed Income Based Economic Index (IBEX) 12 Month Inflation Rates, which are monthly inflation measures designed to capture the inflation experiences of specific socioeconomic and demographic groups available from 1983 to 2013. Each monthly IBEX inflation rate measures the percentage change in prices over the past 12 months for a particular group. Details on the methodology to compute IBEX inflation rates are described in McGranahan and Paulson (2006). Table A.4 and Figure A.5 show that, on average, the inflation rates faced by Black and white individuals are not very different over the available period. In particular, the average inflation rates over the 1983–2013 period are 2.87 percent for Whites and 2.80 percent for Blacks. The cumulative gap over the 30-year period between Whites and Blacks is equal to 5.27 percentage points, or roughly 18 basis points per year on average. Overall, the results presented in this section support the assumption of equal inflation rates across Black and white workers in our model.

Table A.4: IBEX Inflation Rates by Race: 1983–2013 (in percent)

| | All | White | Black |
|---|---|---|---|
| Average | 2.86 | 2.87 | 2.80 |

*Note:* Chicago Fed Income Based Economic Index (IBEX) 12 Month Inflation Rates. "All" refers to all urban consumer units, "White" means reference person and spouse are white, and "Black" means reference person or spouse is Black or of Afro-American origin.

Figure A.5: IBEX Inflation Rates by Race (in percent)



# B Additional Model Results

## B.1 Alternative Calibrations

Table A.5 compares the parameter values used to solve our baseline model with the alternative calibrations used for the segmented labor market and perfect foresight versions of our model. Table A.6 shows that the recalibrated models do a good job in matching the targeted moments.

Table A.5: Alternative Calibrations

| Parameter | Description | Baseline Model | Segmented Labor Markets Model | Perfect Foresight Model |
|---|---|---|---|---|
| $\gamma$ | Elasticity of subs. between goods | 6 | 6 | 6 |
| $\varepsilon$ | Matching function elasticity | 0.5 | 0.5 | 0.5 |
| $\zeta$ | Firm's bargaining power | 0.5 | 0.5 | 0.5 |
| $\chi$ | Vacancy posting cost | 0.11 | 0.11 | 0.11 |
| $h$ | Unemployment benefits | 0.71 | 0.71 | 0.71 |
| $\varsigma$ | Matching efficiency | 0.946 | 0.960 | 0.946 |
| $\lambda^x$ | Exogenous separation rate | 0.141 | 0.156 | 0.141 |
| $\mu_z$ | Mean log idiosyncratic prod. | -0.0242 | -0.0237 | -0.0242 |
| $\sigma_z$ | SD log idiosyncratic prod. | 0.159 | 0.157 | 0.159 |
| $\delta$ | Type 1 labor share | 0.15 | 0.15 | 0.15 |
| $\kappa_1$ | Discrimination against type 1 | 0.0293 | 0.0266 | 0.0293 |
| $\kappa_2$ | Discrimination against type 2 | 0 | 0 | 0 |
| $\phi_\pi$ | Monetary policy rule: Inflation gap | 1.5 | 1.5 | 1.5 |
| $\phi_u$ | Monetary policy rule: Unemp. gap | -0.15 | -0.15 | -0.15 |
| $\pi$ | Inflation target/steady state | 0.005 | 0.005 | 0.005 |
| $\psi$ | Price adjustment cost parameter | 500 | 500 | 430 |
| $\rho_A$ | Autocorr., productivity shock | 0.94 | 0.94 | 0.94 |
| $\sigma_A$ | SD, productivity shock | 0.0041 | 0.0041 | 0.0041 |
| $\rho_\xi$ | Autocorr., risk premium shock | 0.88 | 0.88 | 0.88 |
| $\sigma_\xi$ | SD, risk premium shock | 0.0015 | 0.0015 | 0.0016 |
| $\beta$ | Discount factor | $1/(1+.00225/4)$ | $1/(1+.00225/4)$ | $1/(1+.001/4)$ |

Table A.6: Targeted Moments for Alternative Calibrations

| Moments | Data | Segmented Labor Markets Model | Perfect Foresight Model |
|---|---|---|---|
| Aggregate job-finding rate in steady state | 83 | 83 | 83 |
| Aggregate separation rate in steady state | 5.4 | 5.5 | 5.5 |
| Racial unemployment rate gap in steady state | 6.5 | 6.4 | 6.4 |
| Mean inflation rate (annual rate, 1995-2019) | 1.81 | 1.89 | 2.04 |
| Volatility unemployment rate | 1.3 | 1.2 | 1.2 |
| Volatility inflation rate (annual rate, 1984-2019) | 0.85 | 0.84 | 0.81 |
| Corr. unemployment rate and inflation rate (1984-2019) | -0.26 | -0.32 | -0.29 |
| Corr. unemployment rate and output | -0.80 | -0.71 | -0.76 |
| Autocorrelation of labor productivity | 0.90 | 0.94 | 0.92 |
| Probability of binding ELB | 16 | 14 | 12 |

*Note:* See note to Table 5 in the main text.

## B.2 Segmented Labor Markets under the Deviations Rule

This section documents the performance of the recalibrated model under the assumption of segmented labor markets.

Table A.7: Aggregate Outcomes under Segmented Labor Markets

| | $U$ | $\lambda$ | $f$ | $\pi$ |
|---|---|---|---|---|
| *Panel A: Data* | | | | |
| Mean | 6.29 | 3.30 | 51.27 | 1.81 |
| Volatility | 1.31 | 0.33 | 9.68 | 0.85 |
| *Panel B: Segmented Labor Market Model, Discrimination* | | | | |
| Mean | 6.31 | 3.21 | 48.28 | 1.89 |
| Volatility | 1.23 | 0.43 | 3.87 | 0.84 |

*Note:* See note to Table 6 in the main text.

Table A.8: Labor Market Outcomes by Race under Segmented Labor Markets: Data *versus* Model

| | Unemployment rate | | | Separation rate | | Job-finding rate | |
|---|---|---|---|---|---|---|---|
| | $B$ | $W$ | Racial gap | $B$ | $W$ | $B$ | $W$ |
| *Panel A: Data* | | | | | | | |
| Mean | 11.96 | 5.51 | 6.46 | 5.84 | 2.99 | 43.46 | 54.06 |
| Volatility | 2.12 | 1.21 | 1.08 | 0.84 | 0.29 | 7.89 | 10.67 |
| *Panel B: Segmented Labor Market Model, Discrimination* | | | | | | | |
| Mean | 11.81 | 5.34 | 6.47 | 5.16 | 2.99 | 38.90 | 53.94 |
| Volatility | 1.85 | 1.12 | 0.75 | 0.53 | 0.40 | 3.13 | 5.03 |

*Note:* See note to Table 6 in the main text. $B$ refers to Blacks (group 1 in the model), and $W$ to Whites (group 2 in the model).

## B.3 Other Potential Explanations

Table A.9: Other Potential Explanations: Steady-State Labor Market Outcomes by Race

| | Unemployment rate | | | Separation rate | | Job-finding rate | |
|---|---|---|---|---|---|---|---|
| | $B$ | $W$ | Racial gap | $B$ | $W$ | $B$ | $W$ |
| *Panel A: Discrimination* | | | | | | | |
| Baseline model | 11.7 | 5.3 | 6.4 | 6.2 | 2.8 | 47.0 | 49.5 |
| Segmented labor markets | 11.7 | 5.3 | 6.4 | 5.1 | 3.0 | 38.9 | 53.6 |
| *Panel B: Other Potential Explanations* | | | | | | | |
| Matching efficiency | 11.7 | 5.3 | 6.4 | 3.2 | 3.0 | 24.6 | 53.6 |
| Vacancy posting costs | 11.7 | 5.3 | 6.4 | 3.2 | 3.0 | 24.6 | 53.6 |
| Mean id. productivity | 11.7 | 5.3 | 6.4 | 5.0 | 3.0 | 37.7 | 53.6 |
| Unemployment benefits | 11.7 | 5.3 | 6.4 | 5.1 | 3.0 | 38.9 | 53.6 |
| Worker's bargaining power | 11.7 | 5.3 | 6.4 | 3.8 | 3.0 | 29.2 | 53.6 |

*Note:* $B$ refers to Blacks (group 1 in the model), and $W$ to Whites (group 2 in the model).

## B.4 Shortfalls Rule versus Deviations Rule

This section presents additional results comparing the Shortfalls rule to the Deviations rule. Table A.10 shows labor market outcomes by race under the Deviations and the Shortfalls rules and complements Table 11 in the main text.

Table A.10: Labor Market Outcomes by Race for Alternative Monetary Policy Rules

| | Unemployment rate | | | Separation rate | | Job-finding rate | |
|---|---|---|---|---|---|---|---|
| | *B* | *W* | Racial gap | *B* | *W* | *B* | *W* |
| *Panel A: Baseline Model, Deviations Rule with ELB* | | | | | | | |
| Mean | 11.84 | 5.36 | 6.48 | 6.26 | 2.77 | 47.22 | 49.71 |
| Volatility | 2.01 | 1.14 | 0.88 | 0.64 | 0.39 | 4.53 | 4.50 |
| *Panel B: Baseline Model, Shortfalls Rule with ELB* | | | | | | | |
| Mean | 11.89 | 5.39 | 6.50 | 6.28 | 2.78 | 47.80 | 50.30 |
| Volatility | 2.47 | 1.40 | 1.08 | 0.77 | 0.49 | 7.48 | 7.50 |
| *Panel C: Baseline Model, Deviations Rule without ELB* | | | | | | | |
| Mean | 11.79 | 5.34 | 6.46 | 6.25 | 2.76 | 47.20 | 49.68 |
| Volatility | 1.75 | 0.98 | 0.76 | 0.56 | 0.34 | 4.06 | 4.02 |
| *Panel D: Baseline Model, Shortfalls Rule without ELB* | | | | | | | |
| Mean | 11.88 | 5.39 | 6.49 | 6.28 | 2.77 | 47.79 | 50.30 |
| Volatility | 2.45 | 1.38 | 1.07 | 0.76 | 0.48 | 7.39 | 7.41 |
| *Panel E: Perfect Foresight, Deviations Rule with ELB* | | | | | | | |
| Mean | 11.77 | 5.32 | 6.44 | 6.24 | 2.76 | 47.40 | 49.88 |
| Volatility | 1.95 | 1.11 | 0.84 | 0.62 | 0.38 | 4.41 | 4.37 |
| *Panel F: Perfect Foresight, Shortfalls Rule with ELB* | | | | | | | |
| Mean | 11.02 | 4.90 | 6.12 | 6.11 | 2.62 | 52.91 | 55.52 |
| Volatility | 2.76 | 1.56 | 1.20 | 0.74 | 0.53 | 16.29 | 16.65 |
| *Panel G: Racial Gap-Augmented Policy Rule, Deviations Rule with ELB* | | | | | | | |
| Mean | 11.86 | 5.37 | 6.48 | 6.26 | 2.77 | 47.32 | 49.81 |
| Volatility | 2.19 | 1.24 | 0.95 | 0.69 | 0.43 | 5.13 | 5.09 |
| *Panel H: Racial Gap-Augmented Policy Rule, Shortfalls Rule with ELB* | | | | | | | |
| Mean | 11.94 | 5.42 | 6.52 | 6.31 | 2.78 | 48.03 | 50.54 |
| Volatility | 2.71 | 1.53 | 1.18 | 0.83 | 0.53 | 8.67 | 8.72 |

*Note:* See note to Table 6 in the main text. $B$ refers to Blacks (group 1 in the model), and $W$ to Whites (group 2 in the model).

Table A.11 shows that the Shortfalls rule significantly reduces the probability of a binding ELB with respect to the Deviations rule. In addition, the Shortfalls rule strengthens the negative correlation between the inflation rate and the unemployment rate, and the negative correlation between output and the unemployment rate, when compared with an economy governed by the Deviations rule.

Table A.11: Additional Business Cycle Moments: Data *versus* Model

| | ELB probability | Corr$(u, \pi)$ | Corr$(u, y)$ |
|---|---|---|---|
| *Data* | 15.9 | -0.26 | -0.80 |
| *Baseline Model, Deviations rule* | 14.5 | -0.37 | -0.71 |
| *Baseline Model, Shortfalls rule* | 3.4 | -0.38 | -0.80 |

*Note:* "Corr" refers to the cyclical correlation, and it is computed for the variables expressed in deviations from an HP trend with a smoothing parameter of $10^5$.

# C Additional Model Details

## C.1 Intermediate Goods Producer Details

The first-order conditions with respect to vacancies and employment are

$$\begin{aligned}
v_t : \chi &= q_{1t}(1 - G(z_{1t}^R))\phi_{1t} + q_{2t}(1 - G(z_{2t}^R))\phi_{2t}, \\
n_{1t} : \phi_{1t} &= \int_{z_{1t}^R} (p_t^m A_t z - w_t(z)) \frac{g(z)}{1 - G(z_{1t}^R)} dz - \kappa_1 + (1 - \lambda^x) E_t \Lambda_{t,t+1} \phi_{1t+1} (1 - G(z_{1t+1}^R), \\
n_{2t} : \phi_{2t} &= \int_{z_{2t}^R} (p_t^m A_t z - w_t(z)) \frac{g(z)}{1 - G(z_{2t}^R)} dz - \kappa_2 + (1 - \lambda^x) E_t \Lambda_{t,t+1} \phi_{2t+1} (1 - G(z_{2t+1}^R)),
\end{aligned}$$

where $\phi_{it}$ are Lagrange multipliers. The first-order condition for the reservation productivities is slightly more involved. Start with

$$\begin{aligned}
&- n_{it} \left( \frac{-1}{1 - G(z_{it}^R)} w_{it}(z_{it}^R) g(z_{it}^R) + \int_{z_{it}^R} w_{it}(z) g_i(z) \frac{g(z_{it}^R)}{(1 - G(z_{it}^R))^2} \right) \\
&- \phi_{it}[(1 - \lambda^x) n_{t-1} + q_{it} v_t] g(z_{it}^R) - p_t^m A_t n_{it} \left( \frac{1}{1 - G(z_{it}^R)} z_{it}^R g(z_{it}^R) - \int_{z_{it}^R} z g_i(z) dz \frac{g(z_{it}^R)}{(1 - G(z_{it}^R)^2} \right) = 0,
\end{aligned}$$

and factor out $\frac{-n_{it} g_i(z_{it}^R)}{1 - G(z_{it}^R)}$ to get

$$\left( -w_{it}(z_{it}^R) + \int_{z_{it}^R} \frac{w_{it}(z) g(z)}{1 - G(z_{it}^R)} \right) + \phi_{it} + p_t^m A_t \left( z_{it}^R - \int_{z_{it}^R} \frac{z g(z) dz}{1 - G(z_{it}^R)} \right) = 0.$$

Then substitute for $\phi_{it}$ from the first-order condition with respect to $n_{it}$ to get

$$\begin{aligned}
&- w_{it}(z_{it}^R) + p_t^m A_t z_{it}^R - \kappa_i + (1 - \lambda^x) E_t \Lambda_{t,t+1} \phi_{it+1} (1 - G(z_{it+1}^R) \\
&+ \int_{z_{it}^R} \frac{(w_{it}(z) - p_t^m A_t z) g(z)}{1 - G(z_{it}^R)} dz + \int_{z_{it}^R} \frac{(p_t^m A_t z - w_{it}(z)) g(z)}{1 - G(z_{it}^R)} dz = 0 \implies \\
&p_t^m A_t z_{it}^R - w_{it}(z_{it}^R) - \kappa_i + (1 - \lambda^x) E_t \Lambda_{t,t+1} \phi_{it+1} (1 - G(z_{it+1}^R) = 0.
\end{aligned}$$

Combining and rearranging the first-order conditions yield

$$\begin{aligned}
(1 - G(z_{it}^R))\phi_{it} &= \int_{z_{it}^R} p_t^m A_t (z - z_{it}^R) - (w_t(z) - w_t(z_{it}^R)) g(z) dz \\
p_t^m A_t z_{it}^R + (1 - \lambda^x) E_t \Lambda_{t,t+1} &(1 - G(z_{it+1}^R)) \phi_{it+1} = w_t(z_{it}^R) + \kappa_i.
\end{aligned}$$

Realized per-period profits are

$$\Pi_t^{int} = p_t^m A_t (n_{1t} \bar{z}_{1t} + n_{2t} \bar{z}_{2t}) - \bar{w}_{1t} n_{1t} - \bar{w}_{2t} n_{2t} - \chi v_t.$$

## C.2 Household Details

The first-order conditions for the household problem are

$$
\begin{aligned}
c_t: &\quad \frac{1}{c_t} = \lambda_t, \\
B_t: &\quad \lambda_t = \beta\xi_t(1+i_t)E_t\frac{P_t}{P_{t+1}}\lambda_{t+1},
\end{aligned}
$$

where $\lambda_t$ is the Lagrange multiplier associated with the budget constraint. Combining these two first-order conditions leads to the Euler equation. The stochastic discount factor is

$$\Lambda_{t,t+\tau} = \beta^{\tau}\frac{c_t}{c_{t+\tau}}.$$

## C.3 Final Good Producer Details

The first-order conditions for the final good producer's problem are

$$
\begin{aligned}
y_{jt}: &\quad P_{jt} = \nu_t\frac{\gamma-1}{\gamma}\left(\frac{y_{jt}}{y_t}\right)^{\frac{-1}{\gamma}}\frac{1}{y_t}, \\
y_t: &\quad P_t = \nu_t\frac{\gamma-1}{\gamma}\left(\frac{1}{y_t}\right)^{\frac{-1}{\gamma}}\frac{1}{y_t^2}\int_0^1 y_{jt}^{\frac{\gamma-1}{\gamma}}\,dj,
\end{aligned}
$$

where $\nu_t$ is the Lagrange multiplier on the aggregator constraint. Dividing these two equations yields

$$\frac{P_{jt}}{P_t} = \left(\frac{y_{jt}}{y_t}\right)^{\frac{-1}{\gamma}}\int_0^1\left(\frac{y_{jt}}{y_t}\right)^{\frac{\gamma-1}{\gamma}}dj \implies y_{jt} = \left(\frac{P_{jt}}{P_t}\right)^{-\gamma}y_t.$$

Thus, $\frac{y_{jt}}{y_t} = \left(\frac{P_{jt}}{P_t}\right)^{-\gamma}$, which, if we plug into the aggregator, results in

$$\int_0^1\left(\frac{P_{jt}}{P_t}\right)^{1-\gamma}dj = 1 \implies P_t = \left(\int_0^1 P_{jt}^{1-\gamma}\right)^{\frac{1}{1-\gamma}}.$$

We will also note that final good producer profits are zero in equilibrium, as they behave competitively and their production technology exhibits constant returns to scale.

## C.4 Wage Bargaining Details

Combining the equations for $H_{it}$ and $U_{it}$ and splitting the continuation value of $U_{it}$ between the $\lambda^x$ and $(1-\lambda^x)$ terms in $H_{it}(z)$ yield

$$
\begin{aligned}
V_{it}(z) &= w_{it}(z) - h + (1-\lambda^x)E_t\Lambda_{t,t+1}\left[\int_{z^R_{it+1}} H_{it+1}(y)g(y)dy + G(z^R_{it+1})U_{it+1}\right] \\
&\quad - (1-\lambda^x)E_t\Lambda_{t,t+1}\left[p_{t+1}\left(\int_{z^R_{it+1}} H_{it+1}(y)g(y)dz + G(z^R_{it+1})U_{it+1}\right) + (1-p_{t+1})U_{it+1}\right] \\
&= w_{it}(z) - h + (1-\lambda^x)E_t\Lambda_{t,t+1}\left[(1-p_{t+1})\left(\int_{z^R_{it+1}} H_{it+1}(y)g(y)dy + G(z^R_{it+1})U_{it+1}\right) - (1-p_{t+1})U_{it+1}\right] \\
&= w_{it}(z) - h + (1-\lambda^x)E_t\Lambda_{t,t+1}\int_{z^{Ri}_{t+1}} V_{it+1}(y)g(y)dy - (1-\lambda^x)E_t\Lambda_{t,t+1}p_{t+1}\int_{z^{Ri}_{t+1}} V_{it+1}(y)g(y)dy.
\end{aligned}
$$

Using the first-order condition from the Nash bargaining problem, we can rewrite

$$\int_{z_{it+1}^R} V_{it+1}(y)g(y)dy = \frac{1-\zeta}{\zeta}\int_{z_{it+1}^R} J_{it+1}(z)g(y)dy.$$

Next, we integrate $J_{it}(z)$ against $g(z)$ to get

$$\int_{z_{it}^R} J_{it}(z)g(z)dz = \int_{z_{it}^R} (p_t^m A_t z - w_{it}(z)g(z)dz - (1-G(z_{it}^R))\kappa_i + (1-G(z_{it}^R))(1-\lambda^x)E_t\Lambda_{t,t+1}\int_{z_{it+1}^R} J_{it+1}(y)g(y)dy$$

$$\implies \int_{z_{it}^R} \frac{J_{it}(z)g(z)}{1-G(z_{it}^R)}dz = \int_{z_{it}^R} \frac{(p_t^m A_t z - w_{it}(z)g(z)}{1-G(z_{it}^R)}dz - \kappa_i + (1-\lambda^x)E_t\Lambda_{t,t+1}(1-G(z_{it+1}^R))\int_{z_{it+1}^R} \frac{J_{it+1}(y)g(y)}{1-G(z_{it+1}^R)}dy.$$

Thus, from the first-order condition of the firm's problem with respect to $n_{it}$, we can see that the average value across all employed workers of type $i$ to the firm, $\int_{z_{it}^R} \frac{J_{it}(z)g_i(z)}{1-G_i(z_{it}^R)}dz$, evolves according to the same equation as $\phi_{it}$. If we employ this substitution into the equation for $J$, we see that

$$J_{it}(z) = p_t^m A_t z - w_{it}(z) - \kappa_i + (1-\lambda^x)E_t\Lambda_{t,t+1}\phi_{it+1}(1-G(z_{it+1}^R)),$$

which, by the job destruction condition, we can see is equal to 0 when $z = z_{it}^R$. In other words, the surplus to the firm (and thus to the worker via the surplus sharing equation) from a worker of type $i$ with the reservation productivity is exactly 0. Now we can write

$$V_{it}(z) = w_{it}(z) - h - (1-\lambda^x)E_t\Lambda_{t,t+1}p_{t+1}\frac{1-\zeta}{\zeta}(1-G(z_{it+1}^R))\phi_{it+1} + (1-\lambda^x)E_t\Lambda_{t,t+1}\frac{1-\zeta}{\zeta}(1-G(z_{it+1}^R))\phi_{it+1}.$$

We assume that wages are set by Nash bargaining, which requires that the wage for each worker type and at each productivity level is set to maximize the Nash product $V_{it}(z)^{1-\zeta}J_{it}(z)^{\zeta}$, where $(1-\zeta)$ is the workers' bargaining power. The first-order condition of this problem is

$$(1-\zeta)J_{it}(z) = \zeta V_{it}(z).$$

Plugging $J_{it}(z)$ and $V_{it}(z)$ into the first-order condition of the Nash bargaining problem along results in

$$(1-\zeta)A_t p_t^m z - (1-\zeta)w_{it}(z) - (1-\zeta)\kappa_i + (1-\zeta)(1-\lambda^x)E_t\Lambda_{t,t+1}\phi_{it+1}(1-G(z_{it}^R)) =$$
$$\zeta w_t(z) - \zeta h - (1-\zeta)(1-\lambda^x)E_t\Lambda_{t,t+1}p_{t+1}(1-G(z_{it+1}^R))\phi_{it+1} + (1-\zeta)(1-\lambda^x)E_t\Lambda_{t,t+1}(1-G(z_{it+1}^R))\phi_{it+1}.$$

Rearranging, we obtain

$$w_{it}(z) = (1-\zeta)A_t p_t^m z + \zeta h - (1-\zeta)\kappa_i + (1-\zeta)(1-\lambda^x)E_t\Lambda_{t,t+1}p_{t+1}(1-G(z_{it+1}^R))\phi_{it+1},$$
$$w_{it}(z) = (1-\zeta)(A_t p_t^m z - \kappa_i + (1-\lambda^x)E_t\Lambda_{t,t+1}p_{t+1}(1-G(z_{it+1}^R))\phi_{it+1}) + \zeta h.$$

Integrating over $z$, we find that the average wage for type $i$ workers is

$$\bar{w}_{it} = (1-\zeta)(A_t p_t^m \bar{z}_{it} - \kappa_i + (1-\lambda^x)E_t\Lambda_{t,t+1}p_{t+1}(1-G(z_{it+1}^R))\phi_{it+1}) + \zeta h.$$

## C.5 Equilibrium

Note that to solve for the equilibrium, we can write the job creation and job destruction conditions in terms of the aggregate surplus. In particular, taking into account the surplus-splitting rule due to Nash bargaining, the total surplus is

$$S_{it}(z) = V_{it}(z) + J_{it}(z) = A_t p_t^m z - h - \kappa_i + E_t\Lambda_{t,t+1}\left((1-\lambda^x)(1-(1-\zeta)p_{t+1})\int_{z_{it+1}^R} S_{it+1}(y)g(y)dy\right).$$

Ex-ante average surplus conditional on $z > z_{it}^R$ is then

$$\bar{S}_{it} = \frac{1}{1-G\left(z_{it}^R\right)} \int_{z_{it}^R} S_{it}(y) g(y) dy = A_t p_t^m \bar{z}_{it} - h - \kappa_i + E_t \Lambda_{t,t+1}(1-\lambda^x)(1-(1-\zeta)p_{t+1})(1-G(z_{it+1}^R))\bar{S}_{it+1}$$

The surplus sharing rule will also hold at the average level so we can express the ex-ante average value of employment as

$$\phi_{it} = \frac{1}{1-G\left(z_{it}^R\right)} \int_{z_{it}^R} J_{it}(y) g(y) dy = \zeta \bar{S}_{it}.$$

The job creation condition is

$$\begin{aligned}
\chi &= \sum_i q_{it} \left(1-G\left(z_{it}^R\right)\right) \phi_{it} \\
&= \frac{\delta - n_{1t-1} + \lambda^x n_{1t-1}}{1-n_{t-1}+\lambda^x n_{t-1}} \varsigma \theta_t^{\varepsilon-1} \left(1-G\left(z_{1t}^R\right)\right) \zeta \bar{S}_{1t} + \frac{1-\delta - n_{2t-1} + \lambda^x n_{2t-1}}{1-n_{t-1}+\lambda^x n_{t-1}} \varsigma \theta_t^{\varepsilon-1} \left(1-G\left(z_{2t}^R\right)\right) \zeta \bar{S}_{2t}.
\end{aligned}$$

The job destruction condition states that at the threshold, $z_t^R$ that the value of a match to the firm is zero. Because of Nash bargaining, we also know that total surplus must be zero at the threshold. Thus, we can express the job destruction condition as

$$A_t p_t^m z_{it}^R - h - \kappa_i + E_t \Lambda_{t,t+1}(1-\lambda^x)(1-(1-\zeta)p_{t+1}) \left(1-G\left(z_{it+1}^R\right)\right) \bar{S}_{it+1} = 0.$$

Combining the job destruction condition with the recursion for $\bar{S}_{it}$ yields

$$\bar{S}_{it} = A_t p_t^m \left(\bar{z}_{it} - z_{it}^R\right).$$

The aggregate resource constraint is

$$A_t \bar{z}_t n_t = c_t + \chi v_t + A_t \bar{z}_t n_t \frac{\psi}{2}(\pi_t - \pi)^2,$$

where

$$\bar{z}_t = \frac{n_{1t}}{n_t}\bar{z}_{1t} + \frac{n_{2t}}{n_t}\bar{z}_{2t}.$$

## C.6 Definition of Equilibrium and Full Set of Model Equations

Equilibrium in our baseline economy is defined as the path of

$$\{p_t^m, c_t, \Lambda_{t,t+1}, \pi_t, n_{1t}, n_{2t}, n_t, s_{1t}, s_{2t}, s_t, v_t, p_t, q_t, q_{1t}, q_{2t}, z_{1t}^R, z_{2t}^R, \theta_t, G_{1t}, G_{2t},$$

$$U_t, U_{1t}, U_{2t}, U_t^R, \bar{S}_{1t}, \bar{S}_{2t}, i_t, y_t, \bar{z}_{1t}, \bar{z}_{2t}, \bar{z}_t, \lambda_{1t}, \lambda_{2t}, \lambda_t, f_{1t}, f_{2t}, f_t, \mathcal{D}_t^f, \mathcal{D}_t^\lambda, \mathcal{D}_t\}$$

that satisfies equations (C.1) to (C.37) for all $t \geq 0$, given the evolution of the exogenous shocks $\{\epsilon_{A,t}, \epsilon_{\xi,t}\}_{t=0}^\infty$, the laws of motion for $\{A_t, \xi_t\}$ given by equations (C.41) and (C.42), and the initial values of the endogenous state variables $\{n_{1s}, n_{2s}\}$ for $s = -1$.

Labor market tightness:

$$\theta_t = \frac{v_t}{s_t} \tag{C.1}$$

Job-meeting probability:

$$p_t = \varsigma \theta_t^\varepsilon \tag{C.2}$$

Vacancy-meeting probability:

$$q_t = \varsigma \theta_t^{\varepsilon - 1} \tag{C.3}$$

Job searchers:

$$s_t = s_{1t} + s_{2t} \tag{C.4}$$

Type 1 job searchers:

$$s_{1t} = \delta - n_{1t-1} + \lambda^x n_{1t-1} \tag{C.5}$$

Type 2 job searchers:

$$s_{2t} = (1 - \delta) - n_{2t-1} + \lambda^x n_{2t-1} \tag{C.6}$$

Employment:

$$n_t = n_{1t} + n_{2t} \tag{C.7}$$

Evolution of type 1 employment:

$$n_{1t} = [1 - G_{1t}][(1 - \lambda^x) n_{1t-1} + q_{1t} v_t] \tag{C.8}$$

Evolution of type 2 employment:

$$n_{2t} = [1 - G_{2t}][(1 - \lambda^x) n_{2t-1} + q_{2t} v_t] \tag{C.9}$$

Type 1 vacancy-meeting probability:

$$q_{1t} = \frac{s_{1t}}{s_t} q_t \tag{C.10}$$

Type 2 vacancy-meeting probability:

$$q_{2t} = \frac{s_{2t}}{s_t} q_t \tag{C.11}$$

Unemployment rate:

$$U_t = 1 - n_t \tag{C.12}$$

Type 1 unemployment rate:

$$U_{1t} = \frac{\delta - n_{1t}}{\delta} \tag{C.13}$$

Type 2 unemployment rate:

$$U_{2t} = \frac{(1 - \delta) - n_{2t}}{1 - \delta} \tag{C.14}$$

Racial unemployment rate gap:

$$U_t^R = U_{1t} - U_{2t} \tag{C.15}$$

Separation rate:

$$\lambda_t = \frac{\lambda_{1t} n_{1t-1} + \lambda_{2t} n_{2t-1}}{n_{t-1}} \tag{C.16}$$

Job-finding rate:

$$f_t = \frac{f_{1t-1}(\delta - n_{1t-1}) + f_{2t-1}(1 - \delta - n_{2t-1})}{1 - n_{t-1}} \tag{C.17}$$

Type 1 separation rate:

$$\lambda_{1t} = \lambda^x (1 - p_t) + [(1 - \lambda^x) + p_t \lambda^x] G_{1t} \tag{C.18}$$

Type 2 separation rate:

$$\lambda_{2t} = \lambda^x (1 - p_t) + [(1 - \lambda^x) + p_t \lambda^x] G_{2t} \tag{C.19}$$

Type 1 job-finding rate:
$$f_{1t} = p_t[1 - G_{1t}] \tag{C.20}$$
Type 2 job-finding rate:
$$f_{2t} = p_t[1 - G_{2t}] \tag{C.21}$$
Productivity c.d.f. at type 1 reservation productivity threshold:
$$G_{1t} = logncdf(z_{1t}^R, \mu_z, \sigma_z) \tag{C.22}$$
Productivity c.d.f. at type 2 reservation productivity threshold:
$$G_{2t} = logncdf(z_{2t}^R, \mu_z, \sigma_z) \tag{C.23}$$
Job creation condition:
$$\chi = q_{1t}(1 - G_{1t})\zeta\bar{S}_{1t} + q_{2t}(1 - G_{2t})\zeta\bar{S}_{2t} \tag{C.24}$$
Type 1 ex-ante average surplus:
$$\bar{S}_{1t} = A_t p_t^m \left(\bar{z}_{1t} - z_{1t}^R\right) \tag{C.25}$$
Type 2 ex-ante average surplus:
$$\bar{S}_{2t} = A_t p_t^m \left(\bar{z}_{2t} - z_{2t}^R\right) \tag{C.26}$$
Type 1 average idiosyncratic productivity:
$$\bar{z}_{1t} = \int_{z_{1t}^R} \frac{z}{1 - G_{1t}} g(z) dz \tag{C.27}$$
Type 2 average idiosyncratic productivity:
$$\bar{z}_{2t} = \int_{z_{2t}^R} \frac{z}{1 - G_{2t}} g(z) dz \tag{C.28}$$
Average idiosyncratic productivity:
$$\bar{z}_t = \frac{n_{1t}}{n_t}\bar{z}_{1t} + \frac{n_{2t}}{n_t}\bar{z}_{2t} \tag{C.29}$$
Type 1 job destruction condition:
$$A_t p_t^m z_{1t}^R - h - \kappa_1 + E_t \Lambda_{t,t+1}(1 - \lambda^x)(1 - (1 - \zeta)p_{t+1})\left(1 - G_{1t+1}\right)\bar{S}_{1t+1} = 0 \tag{C.30}$$
Type 2 job destruction condition:
$$A_t p_t^m z_{2t}^R - h - \kappa_2 + E_t \Lambda_{t,t+1}(1 - \lambda^x)(1 - (1 - \zeta)p_{t+1})\left(1 - G_{2t+1}\right)\bar{S}_{2t+1} = 0 \tag{C.31}$$
Stochastic discount factor:
$$\Lambda_{t,t+1} = \beta\frac{c_t}{c_{t+1}} \tag{C.32}$$
Euler equation:
$$1 = \beta\xi_t(1 + i_t)E_t\frac{1}{\pi_{t+1}}\Lambda_{t,t+1} \tag{C.33}$$
Nonlinear Phillips curve:
$$(\pi_t - \pi)\pi_t = \left(\frac{\gamma - 1}{\psi}\right)\left(\frac{\gamma}{\gamma - 1}p_t^m - 1\right) + E_t\Lambda_{t,t+1}\frac{y_{t+1}}{y_t}(\pi_{t+1} - \pi)\pi_{t+1} \tag{C.34}$$

Output:

$$y_t = A_t(n_{1t}\bar{z}_{1t} + n_{2t}\bar{z}_{2t}) \tag{C.35}$$

Aggregate resource constraint:

$$y_t = c_t + \chi v_t + y_t \frac{\psi}{2}(\pi_t - \pi)^2 \tag{C.36}$$

Deviations interest rate rule:

$$i_t = \max\{0, i + \phi_\pi(\pi_t - \pi) + \phi_u(U_t - U)\} \tag{C.37}$$

Hiring margin discrimination:

$$\mathcal{D}_t^f = \frac{\delta - n_{1t-1}}{\delta} p_t [G_{1t} - G_{2t}] \tag{C.38}$$

Firing margin discrimination:

$$\mathcal{D}_t^\lambda = \frac{n_{1t-1}}{\delta}[(1 - \lambda^x) + p_t\lambda^x][G_{1t} - G_{2t}] \tag{C.39}$$

Aggregate discrimination:

$$\mathcal{D}_t = \mathcal{D}_t^f + \mathcal{D}_t^\lambda \tag{C.40}$$

Aggregate productivity:

$$\log A_t = \rho_A \log A_{t-1} + \sigma_A \epsilon_{A,t} \tag{C.41}$$

Risk premium:

$$\log \xi_t = \rho_\xi \log \xi_{t-1} + \sigma_\xi \epsilon_{\xi,t} \tag{C.42}$$

## C.7 Steady State Derivations

From the risk premium equation,

$$\xi = 1.$$

From the aggregate productivity equation,

$$A = 1.$$

From the Phillips curve,

$$p^m = \frac{\gamma - 1}{\gamma}.$$

From the stochastic discount factor equation,

$$\Lambda = \beta.$$

From the Euler equation,

$$i = \frac{\pi}{\beta} - 1.$$

Then, we can postulate a guess for $z_1^R, z_2^R$, and $\theta$. Given this guess we can derive

$$\begin{aligned}
\bar{S}_i &= p^m \left( \frac{1}{1-G\left(z_i^R\right)} \int_{z_i^R} y g(y) dy - z_i^R \right), \\
p &= \varsigma \theta^{\varepsilon}, \\
q &= \varsigma \theta^{\varepsilon - 1}, \\
f_i &= \left(1 - G\left(z_i^R\right)\right) p, \\
s_i &= \lambda^x (1-p) + (1 - \lambda^x + \lambda^x p) G\left(z_i^R\right), \\
u_1 &= \delta \frac{s_1}{s_1 + f_1}, \\
u_2 &= (1-\delta) \frac{s_1}{s_1 + f_1}, \\
u &= u_1 + u_2.
\end{aligned}$$

We can then use the job creation condition and two job destruction conditions as targets to pin down our guesses:

$$\begin{aligned}
&\chi = \left( \frac{u_1 + \lambda^x(\delta - u_1)}{u + \lambda^x(1-u)} \right) \varsigma \theta^{\varepsilon-1} \left(1 - G\left(z_1^R\right)\right) \zeta \bar{S}_1 + \left( \frac{u_2 + \lambda^x(1 - \delta - u_2)}{u + \lambda^x(1-u)} \right) \varsigma \theta^{\varepsilon-1} \left(1 - G\left(z_2^R\right)\right) \zeta \bar{S}_2, \\
&p^m z_1^R - h - \kappa_1 + \beta(1-\lambda^x)(1 - (1-\zeta)p) \left(1 - G\left(z_1^R\right)\right) \bar{S}_1 = 0, \\
&p^m z_2^R - h - \kappa_2 + \beta(1-\lambda^x)(1 - (1-\zeta)p) \left(1 - G\left(z_2^R\right)\right) \bar{S}_2 = 0.
\end{aligned}$$

## C.8 Global Solution Algorithm

We have 12 core endogenous variables, $p_t, c_t, \pi_t, i_t, n_{1t}, n_{2t}, p_t^m, z_{1t}^R, z_{2t}^R, \theta_t$, $\bar{S}_{1t}$ and $\bar{S}_{2t}$ (all other variables are simple transformations of these). $n_{1t}$ and $n_{2t}$ are endogenous state variables and $\xi_t$ and $A_t$ are exogenous state variables. We will discretize the exogenous processes for $\xi$ and $A$ to 5-point Markov chains with transition matrices $\Pi_\xi$ and $\Pi_A$. We will discretize $n_1$ and $n_2$ to 25 point grids. We will start with a guess for

$$\begin{aligned}
\mathcal{E}_e(\xi_t, A_t, n_{1t-1}, n_{2t-1}) &= E_t \frac{1}{\pi_{t+1} c_{t+1}} \\
\mathcal{E}_p(\xi_t, A_t, n_{1t-1}, n_{2t-1}) &= E_t \frac{\left( \frac{1}{1-G\left(z_{t+1}^R\right)} \int_{z_{t+1}^R} y g(y) dy \right) A_{t+1} n_{t+1}}{c_{t+1}} (\pi_{t+1} - \pi) \pi_{t+1} \\
\mathcal{E}_{j1}(\xi_t, n_{1t-1}, n_{2t-1}) &= E_t \frac{1}{c_{t+1}} (1-\lambda^x)(1 - (1-\zeta) p_{t+1}) \left(1 - G\left(z_{1t+1}^R\right)\right) \bar{S}_{1t+1} \\
\mathcal{E}_{j2}(\xi_t, n_{1t-1}, n_{2t-1}) &= E_t \frac{1}{c_{t+1}} (1-\lambda^x)(1 - (1-\zeta) p_{t+1}) \left(1 - G\left(z_{2t+1}^R\right)\right) \bar{S}_{2t+1}
\end{aligned}$$

defined on the full $5 \times 5 \times 25 \times 25$ grid. From here, we can solve for $c_t, \pi_t, i_t, n_{1t}, n_{2t}, p_t^m, z_{1t}^R, z_{2t}^R, \theta_t, \bar{S}_{1t}$ and $\bar{S}_{2t}$ point by point on the state space grid (so we can parallelize this step). Start with a guess for $p_t^m$ and $i_t$. We get:

$$
\begin{aligned}
c_t &= \frac{1}{(1+i_t)\xi_t\beta\mathcal{E}_{et}} \\
z_{it}^R &= \frac{h+\kappa_i - c_t\beta\mathcal{E}_{jit}}{A_t p_t^m} \\
\bar{S}_{it} &= A_t p_t^m \left( \left( \frac{1}{1-G\left(z_{it}^R\right)} \int_{z_{it}^R} y g(y) dy \right) - z_{it}^R \right) \\
\theta_t &= \left( \frac{\chi}{\frac{\delta - n_{1t-1} + \lambda^x n_{1t-1}}{1-n_{t-1}+\lambda^x n_{t-1}} \varsigma \left(1-G\left(z_{1t}^R\right)\right)\zeta\bar{S}_{1t} + \frac{1-\delta-n_{2t-1}+\lambda^x n_{2t-1}}{1-n_{t-1}+\lambda^x n_{t-1}} \varsigma \left(1-G\left(z_{2t}^R\right)\right)\zeta\bar{S}_{2t}} \right)^{\frac{1}{\varepsilon-1}} \\
p_t &= \varsigma\theta_t^\varepsilon \\
n_{1t} &= \left(1-G\left(z_{1t}^R\right)\right)\left((1-\lambda_x)n_{1t-1} + p_t(\delta-(1-\lambda_x)n_{1t-1})\right) \\
n_{2t} &= \left(1-G\left(z_{2t}^R\right)\right)\left((1-\lambda_x)n_{2t-1} + p_t(1-\delta-(1-\lambda_x)n_{2t-1})\right) \\
n_t &= n_{1t} + n_{2t} \\
\bar{z}_t &= \frac{n_{1t}}{n_t}\left( \frac{1}{1-G\left(z_{1t}^R\right)} \int_{z_{1t}^R} y g(y) dy \right) + \frac{n_{2t}}{n_t}\left( \frac{1}{1-G\left(z_{2t}^R\right)} \int_{z_{2t}^R} y g(y) dy \right) \\
\pi_t &= \frac{\pi + \sqrt{\pi^2 + 4\left(\frac{\gamma-1}{\phi}\left(\frac{\gamma}{\gamma-1}p_t^m - 1\right) + \beta\frac{c_t}{A_t n_t \bar{z}_t}\mathcal{E}_{pt}\right)}}{2}
\end{aligned}
$$

We will use the aggregate resource constraint and the Taylor rule as the target to pin down $p_t^m$ and $i_t$. We can then linearly interpolate all the policy functions off grid and use them along with $\Pi_\xi$ and $\Pi_A$ to compute new guesses for $\mathcal{E}_e$, $\mathcal{E}_p$, $\mathcal{E}_{j1}$ and $\mathcal{E}_{j2}$. We will iterate until convergence.

### C.9 Full set of Model Equations with Segmented Labor Markets

Equilibrium is defined as the path of

$$
\{p_t^m, c_t, \Lambda_{t,t+1}, \pi_t, n_{1t}, n_{2t}, n_t, s_{1t}, s_{2t}, v_{1t}, v_{2t}, p_{1t}, p_{2t}, q_{1t}, q_{2t}, z_{1t}^R, z_{2t}^R, \theta_{1t}, \theta_{2t}, G_{1t}, G_{2t},
$$
$$
U_t, U_{1t}, U_{2t}, U_t^R, \bar{S}_{1t}, \bar{S}_{2t}, i_t, y_t, \bar{z}_{1t}, \bar{z}_{2t}, \bar{z}_t, \lambda_{1t}, \lambda_{2t}, \lambda_t, f_{1t}, f_{2t}, f_t\}
$$

that satisfies equations (C.43) to (C.80) for all $t \geq 0$, given the evolution of the exogenous shocks $\{\epsilon_{A,t}, \epsilon_{\xi,t}\}_{t=0}^\infty$, the laws of motion for $\{A_t, \xi_t\}$ given by equations (C.81) and (C.82), and the initial values of the endogenous state variables $\{n_{1s}, n_{2s}\}$ for $s = -1$.

Type 1 labor market tightness:

$$
\theta_{1t} = \frac{v_{1t}}{s_{1t}} \tag{C.43}
$$

Type 2 labor market tightness:

$$
\theta_{2t} = \frac{v_{2t}}{s_{2t}} \tag{C.44}
$$

Type 1 job-meeting probability:

$$
p_{1t} = \varsigma\theta_{1t}^\varepsilon \tag{C.45}
$$

Type 2 job-meeting probability:

$$
p_{2t} = \varsigma\theta_{2t}^\varepsilon \tag{C.46}
$$

Type 1 vacancy-meeting probability:

$$
q_{1t} = \varsigma\theta_{1t}^{\varepsilon-1} \tag{C.47}
$$

Type 2 vacancy-meeting probability:

$$q_{2t} = \varsigma \theta_{2t}^{\varepsilon - 1} \tag{C.48}$$

Type 1 job searchers:

$$s_{1t} = \delta - n_{1t-1} + \lambda^x n_{1t-1} \tag{C.49}$$

Type 2 job searchers:

$$s_{2t} = (1-\delta) - n_{2t-1} + \lambda^x n_{2t-1} \tag{C.50}$$

Employment:

$$n_t = n_{1t} + n_{2t} \tag{C.51}$$

Evolution of type 1 employment:

$$n_{1t} = [1 - G_{1t}][(1-\lambda^x) n_{1t-1} + q_{1t} v_t] \tag{C.52}$$

Evolution of type 2 employment:

$$n_{2t} = [1 - G_{2t}][(1-\lambda^x) n_{2t-1} + q_{2t} v_t] \tag{C.53}$$

Unemployment rate:

$$U_t = 1 - n_t \tag{C.54}$$

Type 1 unemployment rate:

$$U_{1t} = \frac{\delta - n_{1t}}{\delta} \tag{C.55}$$

Type 2 unemployment rate:

$$U_{2t} = \frac{(1-\delta) - n_{2t}}{1-\delta} \tag{C.56}$$

Racial unemployment rate gap:

$$U_t^R = U_{1t} - U_{2t} \tag{C.57}$$

Separation rate:

$$\lambda_t = \frac{\lambda_{1t} n_{1t-1} + \lambda_{2t} n_{2t-1}}{n_{t-1}} \tag{C.58}$$

Job-finding rate:

$$f_t = \frac{f_{1t-1}(\delta - n_{1t-1}) + f_{2t-1}(1 - \delta - n_{2t-1})}{1 - n_{t-1}} \tag{C.59}$$

Type 1 separation rate:

$$\lambda_{1t} = \lambda^x (1 - p_{1t}) + [(1-\lambda^x) + p_{1t}\lambda^x] G_{1t} \tag{C.60}$$

Type 2 separation rate:

$$\lambda_{2t} = \lambda^x (1 - p_{2t}) + [(1-\lambda^x) + p_{2t}\lambda^x] G_{2t} \tag{C.61}$$

Type 1 job-finding rate:

$$f_{1t} = p_{1t}[1 - G_{1t}] \tag{C.62}$$

Type 2 job-finding rate:

$$f_{2t} = p_{2t}[1 - G_{2t}] \tag{C.63}$$

Productivity c.d.f. at type 1 reservation productivity threshold:

$$G_{1t} = logncdf(z_{1t}^R, \mu_z, \sigma_z) \tag{C.64}$$

Productivity c.d.f. at type 2 reservation productivity threshold:

$$G_{2t} = logncdf(z_{2t}^R, \mu_z, \sigma_z) \tag{C.65}$$

Type 1 job creation condition:

$$\chi = q_{1t}(1 - G_{1t})\zeta \bar{S}_{1t} \tag{C.66}$$

Type 2 job creation condition:

$$\chi = q_{2t}(1 - G_{2t})\zeta \bar{S}_{2t} \tag{C.67}$$

Type 1 ex-ante average surplus:

$$\bar{S}_{1t} = A_t p_t^m \left(\bar{z}_{1t} - z_{1t}^R\right) \tag{C.68}$$

Type 2 ex-ante average surplus:

$$\bar{S}_{2t} = A_t p_t^m \left(\bar{z}_{2t} - z_{2t}^R\right) \tag{C.69}$$

Type 1 average idiosyncratic productivity:

$$\bar{z}_{1t} = \int_{z_{1t}^R} \frac{z}{1 - G_{1t}} g(z) dz \tag{C.70}$$

Type 2 average idiosyncratic productivity:

$$\bar{z}_{2t} = \int_{z_{2t}^R} \frac{z}{1 - G_{2t}} g(z) dz \tag{C.71}$$

Average idiosyncratic productivity:

$$\bar{z}_t = \frac{n_{1t}}{n_t} \bar{z}_{1t} + \frac{n_{2t}}{n_t} \bar{z}_{2t} \tag{C.72}$$

Type 1 job destruction condition:

$$A_t p_t^m z_{1t}^R - h - \kappa_1 + E_t \Lambda_{t,t+1} (1 - \lambda^x)(1 - (1 - \zeta) p_{1t+1}) \left(1 - G_{1t+1}\right) \bar{S}_{1t+1} = 0 \tag{C.73}$$

Type 2 job destruction condition:

$$A_t p_t^m z_{2t}^R - h - \kappa_2 + E_t \Lambda_{t,t+1} (1 - \lambda^x)(1 - (1 - \zeta) p_{2t+1}) \left(1 - G_{2t+1}\right) \bar{S}_{2t+1} = 0 \tag{C.74}$$

Stochastic discount factor:

$$\Lambda_{t,t+1} = \beta \frac{c_t}{c_{t+1}} \tag{C.75}$$

Euler equation:

$$1 = \beta \xi_t (1 + i_t) E_t \frac{1}{\pi_{t+1}} \Lambda_{t,t+1} \tag{C.76}$$

Nonlinear Phillips curve:

$$(\pi_t - \pi)\pi_t = \left(\frac{\gamma - 1}{\phi}\right) \left(\frac{\gamma}{\gamma - 1} p_t^m - 1\right) + E_t \Lambda_{t,t+1} \frac{y_{t+1}}{y_t} (\pi_{t+1} - \pi)\pi_{t+1} \tag{C.77}$$

Output:

$$y_t = A_t (n_{1t} \bar{z}_{1t} + n_{2t} \bar{z}_{2t}) \tag{C.78}$$

Aggregate resource constraint:

$$y_t = c_t + \chi v_t + y_t \frac{\psi}{2} (\pi_t - \pi)^2 \tag{C.79}$$

Deviations interest rate rule:

$$i_t = \max\{0, i + \phi_\pi(\pi_t - \pi) + \phi_u(U_t - U)\} \tag{C.80}$$

Aggregate productivity:

$$\log A_t = \rho_A \log A_{t-1} + \sigma_A \epsilon_{A,t} \tag{C.81}$$

Risk premium:

$$\log \xi_t = \rho_\xi \log \xi_{t-1} + \sigma_\xi \epsilon_{\xi,t} \tag{C.82}$$

# D Data Sources

The sources for all data series used in the main text and in this Appendix are:

### Labor productivity

- Bureau of Labor Statistics. 1947-2019. Nonfarm Business Sector: Output per Worker for All Workers. Federal Reserve Bank of St. Louis. https://fred.stlouisfed.org/series/PRS85006163 (accessed April 5, 2022).

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- Bureau of Economic Analysis. 1959-2019. Personal Consumption Expenditures: Chain-type Price Index. Federal Reserve Bank of St. Louis. https://fred.stlouisfed.org/series/PCEPI (accessed February 9, 2022).

### CBO Output gap:

- Computed as 100*(Real Gross Domestic Product-Real Potential Gross Domestic Product)/Real Potential Gross Domestic Product
- Real GDP
  - Bureau of Economic Analysis. 1947-2019. Real Gross Domestic Product. Federal Reserve Bank of St. Louis. https://fred.stlouisfed.org/series/GDPC1 (accessed April 5, 2022).
- Real potential GDP
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**Inflation rates by race**

- Federal Reserve Bank of Chicago. 1983-2013. The Chicago Fed Income Based Economic Index (IBEX) 12 Month Inflation Rates by Race/Ethnicity. https://www.chicagofed.org/research/data/ibex/ibex-inflation (accessed December 4, 2025).

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**McGranahan, Leslie and Anna Paulson**, "Constructing the Chicago Fed Income Based Economic Index – Consumer Price Index: Inflation Experiences by Demographic Group: 1983-2005," Working Paper 2005–20, Federal Reserve Bank of Chicago, November 2006.