A Theory of How Workers Keep Up With Inflation*

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Abstract

We develop a model that integrates modern theories of labor market flows with nominal wage rigidities to study the consequences of inflation on the labor market. Nominal wage stickiness incentivizes workers to engage in job-to-job transitions after an unexpected increase in the price level. Such dynamics lead to a rise in aggregate vacancies associating a seemingly *tight* labor market with *lower* real wages—two facts observed during the recent inflation period. The calibrated model jointly matches aggregate and cross-sectional trends in worker flows and wages during the 2021-2024 period. Using historical data, we show that prior periods of high inflation were also associated with increasing vacancies and upward shifts in the Beveridge curve. Our results suggest that policymakers and academics should be cautious about viewing the rise in the vacancy-to-unemployment rate as a sign of a tight labor market during inflationary periods without holistically looking at other labor market indicators.

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Key Words: Inflation, Vacancies, Job-to-Job Flows, Beveridge curve, Wage Growth

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1 Introduction

Decades of low and stable inflation in the U.S. ended with the inflation spike of 2021. Whereas inflation had hovered annually at around 2.2 percent between 2000 and 2019, prices rose by over 14 percent cumulatively between April 2021 and May 2023. The unemployment rate continued to decline through the fall of 2021, stabilizing at pre-pandemic levels for the remainder of this period. At the same time, vacancy postings shot up and labor market tightness, measured by the aggregate vacancy-to-unemployment (V/U) ratio, reached historically high levels by mid-2022, as shown in Panel A of Figure 1.1. High inflation, low unemployment, and a high V/U ratio all pointed towards an economy that was "running hot" with too many firms chasing after too few workers, a narrative that was articulated by both policymakers and academics. In his post-FOMC press conference on November 2, 2022, Chair Powell declared that "the broader picture is of an overheated labor market where demand substantially exceeds supply."

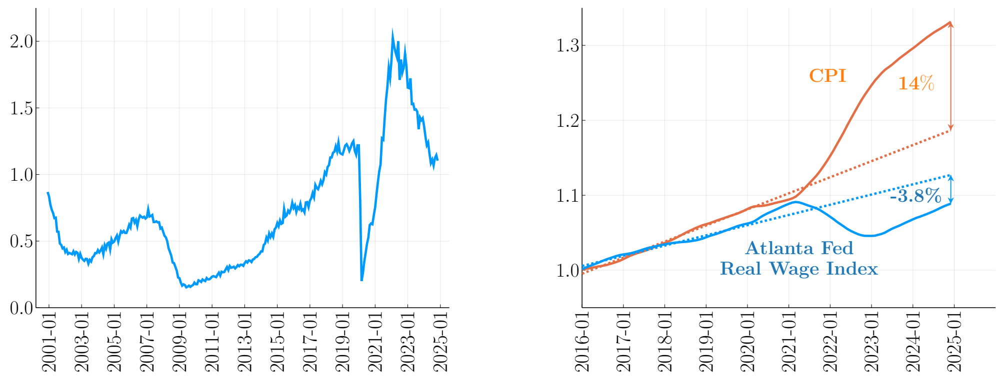
But was the labor market "overheated" during this period? Not according to real wages, which fell sharply with the rise in inflation. As seen in Panel B of Figure 1.1, real wages for the median worker, as measured by Atlanta Fed's Wage Tracker Index, remained persistently below their 2019 levels from the start of the inflationary period through mid 2024. As of December 2024, real wages for the median worker were still 3.8% below where they were predicted to be based on pre-2020 trends. Consistent with declining real wages, survey evidence documented that workers unambiguously perceived their well-being to have declined during the recent inflation period.[1] The juxtaposition of the seemingly "hot labor market" implied by the rising V/U ratio with the persistent decline in real wages questions the role of a tight labor market in driving up prices during the recent period.

With the above facts as a backdrop, our paper makes five contributions to the literature. First, we develop a new framework that combines modern models of labor market flows with nominal wage rigidities. While the model has many potential applications, we show that it can be used to explore the aggregate and distributional consequences of "inflation shocks" on labor market outcomes and worker well-being.[2] In particular, we show theoretically that unexpectedly high inflation induces workers to search more on-the-job, providing an

[1]See Stantcheva (2024) and Afrouzi, Dietrich, Myrseth, Priftis, and Schoenle (2024). The findings in these papers are consistent with the reported decline in measures of life satisfaction among respondents in Gallup surveys during the 2021-2025 period. See, for example, https://news.gallup.com/poll/655493/new-low-satisfied-personal-life.aspx.

[2]In the model, the "inflation shock" will be an unexpected exogenous increase in the price level. The goal of the paper is not to explain the causes of the recent inflation but, instead, to assess how inflation itself can causally affect labor market dynamics.

Figure 1.1: Vacancy-to-Unemployment Ratio, CPI and Real Wages Over Time



PANEL A: VACANCY-TO-UNEMPLOYMENT RATIO: 2000-2024

PANEL B: CPI AND REAL WAGES: 2016-2024

Notes: Panel A shows the vacancy-to-unemployment rate from 2001M1 through 2024M12, where vacancies come from the JOLTS survey. Panel B shows the evolution of the CPI (red line) and the Atlanta Fed's Nominal Wage Index deflated by the CPI (blue line). The dashed lines in the figure project the growth rate in each series from January 2016 and December 2019 over the entire sample period. See Section 2 for additional details on the series construction.

incentive for firms to post more vacancies during periods of declining real wages. Second, we show quantitatively that our model, calibrated using pre-2020 data, matches well the time series and cross-sectional trends in U.S. labor market flows and wages during the 2021-2024 period, with the only underlying labor market shock being the observed inflation dynamics. Third, we use historical data from 1950 to 2019 to show that vacancies have systematically increased and the Beveridge curve has systematically shifted upward during periods of prior inflation. These findings highlight that the implications of our model are not simply limited to the recent post-pandemic inflation. Fourth, we use the model to show that the recent inflation substantially reduced worker welfare throughout the income distribution. As a result, our framework provides a model-driven reason why workers report disliking periods of unexpectedly high inflation (Shiller, 1997, Stantcheva, 2024). Finally, our model provides novel additional real costs and benefits of inflation to an economy stemming from costly job search, costly wage renegotiation, and declining firm layoffs.

We begin the paper by using data from the *Job Openings and Labor Turnover Survey* (JOLTS), the *Current Population Survey* (CPS), the *Atlanta Fed Wage Tracker Index*, and *ADP's Pay Insights* to document a series of facts about labor market flows and wages during the 2021-2023 inflation period. We show that relative to the 2016-2019 period, E-E flows, quits, and vacancies jumped during the recent inflation period while the layoff rate fell and the U-E rate remained relatively stable. These patterns were pronounced across all industries. Likewise, relative to the pre-period, nominal wage growth grew significantly more for job-changers than for job-stayers. Real wages declined more for higher wage workers than for lower wage workers during the inflation period. The collective wage patterns, including those shown in Figure 1.1, persist even when we look at occupations that are not amenable to working from home.

Motivated by these patterns, we develop a framework that combines a modern macro-labor search model with sticky wages consistent with the observed micro-data on nominal wage adjustments and rich worker heterogeneity. At any given time, based on their current states, workers decide whether to renegotiate their wage, quit to unemployment, or search for a new job, while firms determine whether to lay workers off.[3] Nominal wages are sticky within a match. Our model postulates two main channels for employed workers to overcome the stickiness of their nominal wages. First, workers can pay a randomly drawn fixed cost to renegotiate their wage to any level at any time. Second, we assume that the wages of new hires are flexible, meaning that workers can also adjust their nominal wages by searching on the job and potentially moving to a match with a new employer. Job search is frictional and directed on the part of both workers and firms.

To examine how different workers are affected by an unexpected temporary burst of inflation, the model includes heterogeneous worker types who differ in their latent productivity. In addition to ex-ante heterogeneity, the productivity of the employed (unemployed) is a Brownian motion process with positive (negative) drift. We also allow the worker's flow benefits of non-employment and the cost of vacancy posting on the part of firms to flexibly scale with worker productivity. These forces allow for a potential mechanism by which the labor market decisions of high and low wage workers can differ in response to the same underlying labor market shocks.

On the methodological front, the model requires solving for the equilibrium strategies of the game between matched workers and firms. Due to nominal wage rigidities, we cannot rely on the usual equivalence to a planner's problem that maximizes the surplus of the match on behalf of firms and workers. Instead, we use a Markov Perfect Equilibrium concept

[3] Our framework shares similarities to the model of inefficient separations with nominal wage rigidities found in Blanco, Drenik, Moser, and Zaratiegui (2024). Such endogenous quits, layoffs, and wage renegotiations with sticky wages introduce the key ideas of models of inaction from the output pricing literature (e.g., Barro, 1972, Sheshinski and Weiss, 1977) into a modern macro labor model with search.

in continuous time to characterize both firms' and workers' decisions. Workers' strategies consist of which submarket to enter while unemployed, and once within a match, when to renegotiate, when to quit, or when to search for a new job. Different submarkets offer different combinations of offered wages and job-finding rates. Firms' strategies are when to lay off their employed workers. Our contribution here is to recast the strategic interaction between matched firms and workers as a stochastic non-zero sum game with stopping times in continuous time. This approach characterizes the equilibrium conditions as two Hamilton-Jacobi-Bellman Variational Inequalities (HJBVIs) describing optimal policies and value functions, and allows us to use efficient numerical methods to solve for the equilibrium.

Through the lens of the model, an increase in inflation reduces the real wages of matched workers. These workers respond by increasing their on-the-job search effort, resulting in an inflation-induced increase in both aggregate quits and E-E flows. The spike in worker on-the-job search increases the incentive for firms to post vacancies, thereby resulting in an inflation-induced spike in aggregate vacancies. Additionally, workers adjust their on-the-job search toward submarkets with higher job-finding rates, lower starting wages, and lower job-filling rates. This composition shift generates an increase in aggregate vacancy duration consistent with firms reporting that it was more difficult to hire a worker during this period. The model also allows for workers to forgo search and instead choose to engage in costly renegotiation with their firm to increase their real wage. Finally, the reduction in worker real wages systematically moves workers further away from the firm's layoff threshold, resulting in an inflation-induced reduction in aggregate layoffs.

We then use a variety of micro-data sources in the years prior to 2020 to calibrate the key labor market parameters of our model. In particular, we use administrative payroll data on the frequency of wage changes and the distribution of the size of wage changes to calibrate the parameters governing nominal wage rigidities. We also use both time series and cross-sectional data on worker flows to help discipline the parameters governing the search environment. For example, we discipline the extent to which the value of non-employment and vacancy posting scales with productivity with micro data on differences in job-finding rates and job-to-job flows across the wage distribution during the pre-inflation period. We estimate that the value of non-employment is relatively higher and the cost of posting a vacancy is relatively lower for low-productivity workers, implying they are more responsive to unexpected increases in the price level.

Using the calibrated model, we find that an unexpected temporary inflation shock of the size comparable to the inflation experienced in the U.S. during the 2021-2023 period quantitatively matches key patterns observed in the labor market at that time. In particular, our quantitative model matches both the decline in real wages and the increase in the aggregate vacancy-to-unemployment rate shown in Figure 1.1. Additionally, the model matches the fact that quits and E-E flows increased, layoffs declined, real wages fell more for higher wage workers, and real wages fell more for job-stayers relative to job-changers. Finally, we show that the model generates an inflation-induced upward shift in the Beveridge curve similar to what was observed in the U.S. economy during the last few years due to the increased vacancies created in response to the higher E-E churn.

We next turn to measuring the effect of the recent inflation on worker welfare. We find that inflation reduced the average welfare of workers in all deciles of the income distribution. In our conservative counterfactual, we estimate that the median worker lost about 20% of one month's income – or about $1,000 – from the recent inflation period. We estimate that the majority of the welfare losses stem from the nominal wage rigidities which transferred resources from workers to firms; this finding is consistent with the historically high corporate profit rates experienced by US firms during the 2021-2023 period. We also show that the increased search and renegotiation costs incurred by workers to have their real wages keep up with inflation further reduced worker welfare beyond the real wage declines. These findings highlight additional real costs of inflation through costly actions taken by workers in response to inflation. Conversely, we also find that workers received offsetting welfare gains from the recent inflation stemming from reduced layoffs.

Looking beyond the inflation surge of 2021, in the last section of the paper we use historical data to show that high inflation rates systematically increase the vacancy-to-unemployment ratio and result in upward shifts in the Beveridge curve. Using Barnichon (2010)'s unified vacancy series, we identify eight periods where the vacancy-to-unemployment rate substantially exceeded its long-run average. Four of those periods were associated with very high inflation: those periods were in the early 1950s, the mid-1970s, the late 1970s, and the current post-COVID period. All of these periods were marked by large negative aggregate supply shocks that contributed in part to the high inflation. The other periods of high vacancy-to-unemployment rates had relatively low inflation and a sharply declining unemployment rate consistent with moving along a stable Beveridge curve. We then document that the vacancy rate and the vacancy-to-unemployment rate both systematically increased when inflation was high during the 1950-2019 period conditional on the aggregate unemployment rate. These results provide additional empirical support for our theory using data prior to the post-pandemic period. Collectively, our findings suggest that academics and policymakers should be cautious about viewing the rise in the V/U ratio as a sign of an overheating labor market during inflationary periods without holistically looking at other labor market indicators.[4]

Related Literature. A key implication of our model is that accounting for the role of vacancies targeted toward employed vs. unemployed workers is key for understanding the recent rise in the aggregate V/U ratio and the shift in the Beveridge curve. To that end, our paper provides additional supporting evidence for the mechanism highlighted in Cheremukhin and Restrepo-Echavarria (2023) which argues that the shape of the Beveridge curve depends on the extent to which outstanding vacancies are filled with E-E transitions as opposed to U-E transitions. Likewise, our paper is related to Moscarini and Postel-Vinay (2023) which introduces on-the-job search into a monetary DSGE New-Keynesian model and shows that the ratio of E-E transitions to U-E transitions serves as a key predictor of inflationary pressures. Complementing this literature, our paper demonstrates that inflation itself can alter the pattern of job-to-job transitions and vacancy creation, leading to shifts in the Beveridge curve. Together, these mechanisms highlight the importance of distinguishing between job-to-job transitions and transitions from unemployment when analyzing inflationary episodes.

A key element of our framework is that wages are more flexible for job-changers compared to job-stayers during inflationary periods. Recently, Hazell and Taska (2024) highlights an asymmetry between the relative upward and downward cyclicality of new hire wages. Using job-posting data to look at within job variation, Hazell and Taska (2024) find that nominal wages do not fall for a given job when economic conditions contract similar to the results for job-stayers.[5] However, nominal wages of job-changers rise sharply during periods of economic expansions. The estimated nominal wage growth of job-changers during periods of economic expansions documented in Hazell and Taska (2024) is much larger than the nominal wage growth of job-stayers shown in Grigsby, Hurst, and Yildirmaz (2021) during similar years. The findings in Hazell and Taska (2024) motivate our assumption of the relative flexibility of

[4] Recently, both Benigno and Eggertsson (2023) and Autor, Dube, and McGrew (2024) have interpreted the rising V/U ratio as a sign that the U.S. labor market was tight during the post-pandemic period.

[5] Gertler, Huckfeldt, and Trigari (2020) and Grigsby, Hurst, and Yildirmaz (2021) examine the relative cyclicality of new hire wages without examining an asymmetry between periods when wages should be rising or when they should be falling. Most of the identification in these papers come from periods when the unemployment rate rises sharply as it did during the Great Recession. As seen from Hazell and Taska (2024), both the wages of incumbent workers and new hires are downwardly rigid during economic contractions.

job-changer wages during inflationary periods. Moreover, their conclusions are also consistent with the empirical finding from the ADP payroll data that shows the gap between the nominal wage growth of job-changers increased sharply relative to job-stayers during the 2021-2023 inflation surge.

Our work is also related to a set of recent papers showing how worker well-being is affected by recent inflation. Hajdini, Knotek, Leer, Pedemonte, Rich, and Schoenle (2022), Pilossoph and Ryngaert (2024), and Pilossoph, Ryngaert, and Wedewer (2024) all highlight how increased inflation can result in workers searching more for another job. Pilossoph and Ryngaert (2024) use survey data to show that workers with higher inflation expectations increase job search effort. They then develop a decision-theoretic model of job search with nominal wage rigidities to show that surprise inflation can increase workers' on-the-job search effort and lower the reservation wage for job transitions. Separately, Pilossoph, Ryngaert, and Wedewer (2024) further formalizes these insights by extending the model of Postel–Vinay and Robin (2002) to include endogenous search effort and a price level with deterministic trend inflation. Using this extended framework, they show that unexpected inflation can also have allocative consequences by inducing workers to move to better matches. However, they show that these allocative effects were quantitatively small during the recent inflation period.

Guerreiro, Hazell, Lian, and Patterson (2024) fielded a novel survey in early 2024 asking respondents about whether they took costly actions—asking their boss for a raise, partaking in union activity, or soliciting external job offers—in response to the recent inflation. They find that about one-fifth of all workers engaged in costly actions to raise their wages during the recent inflation period. They then developed a menu cost model of nominal wage adjustments to show how workers optimally choose to take more of these costly actions during inflationary periods given nominal wage rigidities. Calibrating the model with their novel survey, they find that incorporating the costly actions that workers took to have their real wages keep up with inflation doubled the aggregate cost of inflation to workers, relative to the costs implied by falling real wages alone.

Finally, there is an emerging literature documenting the shift towards working-from-home (WFH) during the post-pandemic period, particularly for higher wage workers.[6] This literature has shown that workers value the ability to work from home (Cullen, Pakzad-Hurson, and Perez-Truglia, 2025), that such an amenity can reduce worker turnover (Bloom,

[6]See, for example, Dingel and Neiman (2020), Bick, Blandin, and Mertens (2023) and Hansen, Lambert, Bloom, Davis, Sadun, and Taska (2023).

Han, and Liang, 2024), and WFH can reduce worker productivity in some sectors (Emanuel, Harrington, and Pallais, 2023). Closest in spirit to our paper, Bagga, Mann, Sahin, and Violante (2025) quantify a structural model of the labor market to assess the importance of shifting job amenities (such as WFH) on worker flows and wages during the post-pandemic period. They show that the sudden availability of WFH can also generate declining real wages and increasing worker churn. As we highlight throughout, both our story and the WFH story have empirical support in the data and emerge as two of the leading explanations for post-pandemic labor market dynamics.[7]

2 The U.S. Labor Market During the Recent Inflation Period

We refer to the recent "*inflation period*" in the United States as beginning in April 2021 and extending through May 2023; for each month during this period, the year-over-year CPI inflation rate exceeded 4%. The cumulative price level increase was roughly 13.5% during this 26-month period. For comparison, the inflation rate in the United States averaged about 2% per year during the 2000-2019 period and averaged just over 3% at an annualized rate during the "*post-inflation*" period of May 2023 through December 2024.

In this section, we document a set of facts about how labor market flows and wages evolved during the recent inflation period within the United States both in the aggregate and across different income groups. We compare the labor market outcomes in the "*inflation period*" to a *"pre-period"* defined as the pre-pandemic period spanning January 2016 through December 2019. Collectively, these patterns motivate the setup of our model described in the next section. In later sections, we evaluate the success of our model by its ability to match the broad time series patterns documented below.[8]

2.1. Aggregate Wages and Employment During the Inflation Period

Figure 1.1 above shows the decline in real wages experienced by the median U.S. worker during the inflation period. To measure trends in real wage growth, we use data from the *Atlanta Federal Reserve's Wage Tracker Index*. The *Atlanta Fed Wage Tracker Index* uses the panel component of the *Current Population Survey (CPS)* to make a measure of composition-adjusted year-over-year change in the worker's per hour nominal wage on their

[7] For example, our mechanism can explain the fact that real wages fell even in occupations that are not amenable to WFH and the fact that nominal wages systematically increased more for job-changers relative to job-stayers. The WFH mechanism can explain the relatively larger wage declines in occupations amenable to WFH and the persistent decline in real wages even when worker flows returned to normal.

[8] A more detailed discussion of all data used in this section can be found in the Online Appendix.

main job. Given the Atlanta Fed provides a series on monthly nominal wage growth, we create a series of monthly real wage growth by deflating by the CPI inflation rate over the corresponding period. We normalize our real wage index to 1 in December 2015.

Additionally, as seen in Appendix Figure B.2, the average employment-to-population ratio for those aged 15-65 and the average U.S. unemployment rate remained roughly constant between the pre-period and the inflation period. While the employment rate fell and the unemployment rate increased sharply during the pandemic, they both returned to roughly pre-pandemic levels by the fall of 2021. These patterns also occurred within various demographic groups. Given this, the results we show below are unchanged whether or not we control for composition shifts between the pre-period and the inflation period; neither the level nor the composition of the labor force changed much between *pre-pandemic* and *inflation* periods.

2.2. Aggregate Quits, Layoffs, and Vacancies During the Inflation Period

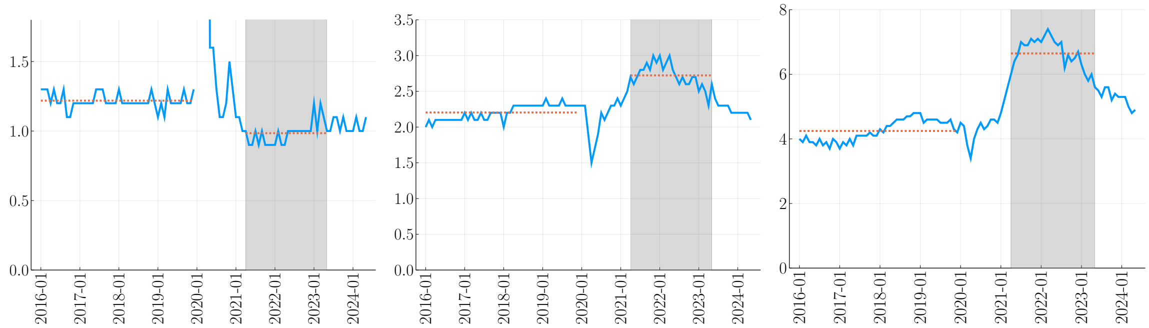
Figure 2.1 shows the trends in the monthly layoff rate, quit rate, and vacancy rate for the United States between 2016 and 2024 using data from the BLS's *Job Openings and Labor Turnover Survey* (JOLTS). The JOLTS dataset provides a snapshot of worker hiring and separation flows for a nationally representative sample of non-farm business and government employers during a given month.

Layoff Rate. Panel A of Figure 2.1 shows the time series trend in the layoff rate prior to, during, and after the inflation period. Between January 2016 and December 2019 (the "*pre-period*"), the average layoff rate was fairly constant at about 1.22% per month. However, throughout the inflation period, the monthly layoff rate fell sharply to about 0.98% per month; during this period, the layoff rate was at its lowest level since the JOLTS data started in 2000. Relative to the pre-period, firms terminated workers at a much lower rate during the inflation period.

Quit Rate. Panel B of Figure 2.1 shows the time series trend in the quit rate during the 2016-2024 period. From 2016 through 2019, the quit rate averaged about 2.2% per month. During the inflation period, the quit rate jumped to an average of about 2.7% per month. The time series path of the quit rate followed closely the time series path of inflation; for example, both the inflation rate and the quit rate peaked in the second quarter of 2022. By early 2024, both the quit rate and the inflation rate had returned to their 2016-2019 levels.

Vacancy Rate. Panel C of Figure 2.1 shows the time series patterns of the vacancy rate. The average monthly vacancy rate jumped from 4.25% per month during the 2016-2019 period

Figure 2.1: Layoff Rate, Quit Rate, and Job Opening Rate 2016-2024, JOLTS Data



Panel A: Layoff Rate — Panel B: Quit Rate — Panel C: Vacancy Rate

Notes: The figure shows the monthly layoff, quit, and vacancy rates for the U.S. economy between 2016 and 2024 using the BLS's JOLTS data. The dashed red lines show the average of the series during the 2016-2019 pre-period and then separately during the inflation period (shaded area), respectively. To make the graph easier to read, we excluded the historic spike in the layoff rate during the beginning of the COVID recession from the figure.

to 6.65% per month during the inflation period. Again, the time path of the vacancy rate tracked closely the time path of inflation during the 2021 to 2024 period.

2.3. Worker Flows During the Inflation Period

The quit rate from the JOLTS data shown above captures workers who left the firm by either (i) flowing into unemployment before starting to look for another job (a voluntary "E-U" flow), (ii) directly transitioning to another firm (an "E-E" flow), or (iii) leaving the labor force (an "E-N" flow). In this subsection, we use data from the *Current Population Survey* (CPS) to further highlight that the increase in quits from the JOLTS data was primarily driven by an increase in job-to-job flows and not driven by an increase of workers into non-employment.[9]

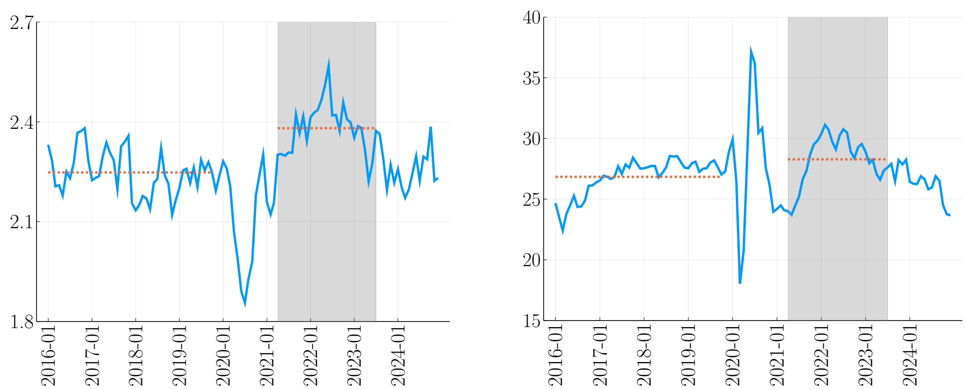
Panel A of Figure 2.2 shows the time series of a three month moving average of the monthly E-E rate for U.S. workers during the 2016-2024 period.[10] In the 2016-2019 period, the average E-E rate was 2.24% per month. During the 26-month inflation period, the E-E rate jumped to an average of 2.38% per month (p-value of difference < 0.01). In mid-2022,

[9] Ellieroth and Michaud (2024) document that quits to non-employment did not increase during the 2021-2023 period relative to the 2016-2019 pre-period. Appendix Figure B.3 uses data from the CPS to also show that there was relatively little increase in the flow of non-participant workers into employment during the 2021-2024 period.

[10] For this analysis, we use the measure of E-E flows created in Fujita, Moscarini, and Postel-Vinay (2024) based on CPS data. The data can be downloaded directly from the Philadelphia Federal Reserve's website https://www.philadelphiafed.org/surveys-and-data/macroeconomic-data/employer-to-employer-transition-probability.

the E-E rate peaked at 2.57% per month. The CPS data complement the JOLTS data by showing that the increasing quit rate is accompanied by an increase in employer-to-employer transitions.

Figure 2.2: E-E and U-E Flows 2016-2024, CPS Data



Panel A: E-E Rate   Panel B: U-E Rate

Notes: Panel A of Figure shows the time series pattern of monthly E-E flows using the series created by Fujita, Moscarini, and Postel-Vinay (2024). Panel B shows the time series pattern of monthly U-E flows downloaded directly from the FRED database. The dashed red lines in both panels provide the average flows during the pre-period and the inflation period (shaded area), respectively. For both series we plot a three month moving average.

Panel B of Figure 2.2 shows the time series patterns for monthly U-E flows during 2014-2024. The monthly job-finding rate measures the share of unemployed workers who transition to employment during a given month.[11] There was no statistically significant change in the U-E rate between the pre-period and the inflation period. Unemployed workers found employment in a given month at roughly the same 27% rate during both the inflation period and the pre-period. While it is normally the case that changes in the U-E rate explain the vast majority of unemployment dynamics (Shimer, 2012), changes in the job-finding rate explained relatively little of the unemployment dynamics during the 2021-2024 period.[12]

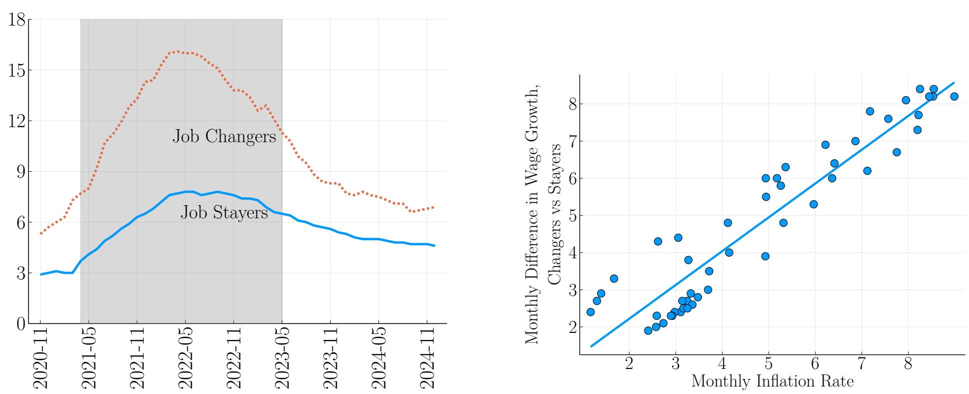
[11] For ease of replication, we downloaded this series directly from the St. Louis Federal Reserve's Economic Database (FRED). In particular, we downloaded the series "Labor Force Flows Unemployed to Employed" and "Unemployment Level"; both of these series come from the Current Population Survey and are provided at the monthly level. We divide the former by the latter and then take a three month moving average to make the monthly U-E rate.

[12] We show the decomposition of changes in the unemployment rate to changes in the U-E rate and changes in the layoff margin in Appendix Figure B.4. We thank Joe Hazell for suggesting we add this decomposition to our appendix.

2.4. Wage Growth, Job-Changers vs Job-Stayers

We next use data from *ADP Pay Insights* to examine the relative earnings growth of job-changers vs. job stayers during the inflation period. ADP is a payroll processing company that processes payroll for roughly one-fifth of the U.S. labor market. Given the size of their data, ADP can track earnings for workers who remain with the same firm and for workers who transition from one firm to another.[13] Our analysis with the ADP data spans the 2020 to 2024 period given that ADP Pay Insights only started publishing earnings growth data for broad groups such as job-changers vs. job-stayers starting in 2020. It should be noted that the ADP data reports the nominal growth in worker annual earnings as opposed to hourly wages.

Figure 2.3: Nominal Wage Growth 2020-2024, Job-Changers, and Job-Stayers



Panel A: ADP Wage Growth, By Switching Status

Panel B: Changer-Stayer Difference vs. Inflation Rate

Notes: Panel A of the figure shows the median nominal income growth of job-stayers (solid line) and job-changers (dashed line) during the October 2020 through December 2024 period from the ADP Pay Insights database. Panel B plots the monthly difference between the two series vs the monthly year-over-year inflation rate.

Panel A of Figure 2.3 shows the median annualized nominal earnings growth (year-over-year) for (i) workers who remained with their same employer during the prior 12 months

[13] We downloaded the data from ADP Pay Insights directly from https://payinsights.adp.com/. As we discuss in Appendix Section B.3, we prefer using the ADP measures for our job-changer analysis because the CPS does not allow for a way to measure job-changes for a given individual between their outgoing rotation waves. As a result, the Atlanta Fed imputes job-changing behavior using additional data on changes in worker industry or occupation. The measurement error induced by the imputation substantially mitigates the wage growth differential between job-stayers and job-changers in the Atlanta Fed data relative to the ADP data. As we show in this appendix, despite the measurement error, even the Atlanta Fed data shows that the nominal wage growth gap between job-changers and job-stayers increased during the inflation period.

(job-stayers, solid line) and (ii) workers who switched employers during the prior 12 months (job-changers, dashed line). During the middle of the inflation period, the median nominal earnings growth of job-changers increased by about 8 percentage points relative to early 2021 (from about 8% to 16%). By the middle of the inflation period, the median annualized nominal earnings growth of job-stayers increased by only about 4 percentage points (from about 3% to 7%). Panel B of the figure shows that the gap in wage growth between job-changers and job-stayers is strongly correlated with the monthly inflation rate. As seen from the panel, job-changers were able to get even larger wage increases relative to job-stayers when inflation was higher. By 2024, the relative gap in nominal wage growth between job-changers and job-stayers returned to early 2021 levels. Given that the ADP Pay Insights data started in late 2020, there is no direct way to compare the gap in nominal earnings growth between stayers and changers to a pre-period. However, Grigsby, Hurst, and Yildirmaz (2021) find that the median nominal base wage growth gap between job-changers and job-stayers in the ADP sample was roughly 4 percentage points during the 2008-2016 period that they analyzed. Given that, the gap in 2024 appears to have returned to roughly pre-pandemic levels.

2.5. Heterogeneity in Labor Market Outcomes Across Occupations, Worker Types, and Sectors

In this subsection, we briefly summarize how the worker flows and wage dynamics documented above vary across occupations, worker types, and sectors. We provide a more extensive discussion in the Online Appendix.

Real Wage Declines Occurred in Occupations Not Amenable to Working From Home. As noted in the introduction, there was a large shift in the share of individuals working from home after the COVID-19 pandemic, with the increase being largest for higher wage workers. The ability to work from home (WFH) is an amenity that some workers value, which could have put downward pressure on real wages during the 2022-2024 period. Figure 2.4 plots real wages over time by potential WFH status to assess how much of the decline in real wages observed during the post-pandemic period could potentially be attributed to the shift to work-from-home. Specifically, Figure 2.4 documents the evolution of real wages separately for workers in occupations amenable to WFH (solid line) and for workers in occupations not amenable to WFH (dashed line) based on the Dingel and Neiman (2020) classification.[14] To

[14]We use the underlying processed CPS data produced by the Atlanta Fed for their Wage Tracker Index for this analysis. We thank Melinda Pitts from the Atlanta Fed for providing us with their processed micro data. Based on occupational task measures, Dingel and Neiman (2020) create a 0/1 indicator for whether

facilitate comparison across the various real wage series, Figure 2.4 plots real wages *relative* to their occupation-by-group predicted trend, where, as in Figure 1.1, the trend is based on 2016-2019 data.[15]

Panel A of the figure shows the patterns of median real wage growth for all workers in the U.S. economy broken down by WFH status. Roughly half of all individuals work in occupations that were classified as being amenable to WFH by the Dingel and Neiman (2020) measure. Consistent with WFH being an amenity valued by workers, real wages fell more in WFH occupations relative to trend as compared to non-WFH occupations during the post-pandemic period. However, consistent with the hypothesis of our paper, real wages still fell sharply in non-WFH occupations. In particular, towards the end of the inflation period in early 2023, real wages were roughly 5% below trend in non-WFH occupations. As of December 2024, real wages were still roughly 3% below trend in non-WFH occupations. As a result, the ability to WFH may have had an effect on depressing real wages during the post-pandemic period (the difference between the solid and dashed lines) but it was not the primary reason why real wages fell during the inflation period. The fact that real wages fell sharply even in occupations not amenable to working from home reinforces our narrative that the inflation period was one where real wages were depressed despite rising vacancies.

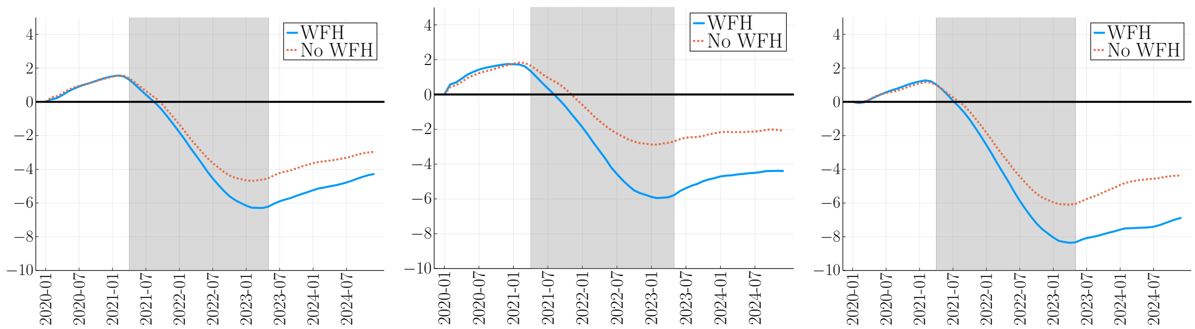
Real Wage Declines Were Larger for Higher Wage Workers. The Atlanta Fed produces wage series for workers whose wage is in different quartiles of the initial overall wage distribution. Panels B and C of Figure 2.4 show real wages relative to trend for workers in the bottom and top quartiles of the wage distribution by WFH status. Consistent with the patterns documented in Autor, Dube, and McGrew (2024), real wage declines were much larger for workers at the top of the wage distribution relative to workers in the bottom. These patterns still hold even after accounting for the differential propensity to WFH across the income groups. For example, in non-WFH occupations, real wages were roughly 6% below trend for top quartile workers and were 3% below trend for bottom quartile workers as of early 2023. As of December 2024, the real wages of top and bottom quartile workers were 4% and 2% below trend, respectively.[16]

workers in over 750 detailed occupations have the ability to work from home. The detailed occupation codes used in Dingel and Neiman (2020) map directly to the CPS occupation codes given their provided crosswalk.

[15]Across the various lines in Figure 2.4, the gap between the actual and predicted real wage was essentially zero in January 2020. As a result, we normalize the gap to exactly zero for each line to facilitate exposition.

[16]Whether the real wages for bottom quartile workers are still below trend as of December 2024 depends on the chosen trend rate. In the appendix, we show results where the trends are defined over the longer 2000-2019 period. We also show patterns for workers in the second and third quartiles as well as showing the

Figure 2.4: % Deviations from trend in Real Wages by Occupation Type



Panel A:
All Workers

Panel B:
Bottom Quartile

Panel C:
Top Quartile

Notes: The figure shows the evolution of real wages *relative to predicted trend* for workers in occupations that are amenable to WFH (solid blue line) and those that are not amenable to WFH (dashed red line), based on the Dingel and Neiman (2020) classification. Panel A shows the patterns for all workers, while Panels B and C show the patterns for workers in the bottom and top quartiles of the aggregate wage distribution. The share of individuals working in WFH occupations in each of the three panels is 47%, 26%, and 67%, respectively.

Quits and Vacancies Increased and Real Wages Declined in All Sectors. Online Appendix Table B.3 shows that vacancies and quits increased while real wages fell relative to trend in all broad industry groups during the inflation period. These results suggest that the aggregate patterns highlighted above also hold within broad sectors. Additionally, Figure B.9 shows that 2-digit industries that had the largest increase in quits between the pre-period and the inflation period were also the industries that had the largest increase in vacancies. This finding provides some suggestive evidence for one of the key mechanisms in our paper that worker churn is related to increasing vacancies.

Subjective Measures of Well-Being Declined During the Inflation Period. In Online Appendix Section B.8, we use various questions from Gallup Analytics to assess how individual measures of subjective well-being evolved during the inflation period relative to the pre-period. Consistent with the patterns of real wages, reported measures of subjective well-being fell sharply during the inflation period for all income groups, but declines were largest for higher wage workers. These patterns reinforce the survey results in Stantcheva (2024) where workers report strongly disliking inflation because it reduces their purchasing power by eroding their real wages. This set of results suggests that the real wage declines reported above are consistent with self-reported declines in worker well-being.

actual real wage series, as opposed to series relative to trend, for each of the quartiles.

3 Model

In this section, we develop a model of how workers respond to unexpected changes in the inflation rate and ask whether such changes, all else equal, can causally generate the patterns documented in Section 2.[17]

3.1. Environment

Time is continuous and indexed by t. The economy is populated by a unit measure of workers, denoted by $i \in [0,1]$. Workers can either be employed ($E_{it} = 1$) or unemployed ($E_{it} = 0$). Workers die at an exogenous rate $\chi > 0$ and are replaced by newly unemployed workers. To focus on and isolate the effects of rigidities in the labor market, we abstract away from rigidities in firm pricing and assume the price of the homogeneous consumption good is exogenous.

Exogenous Worker Productivity. Worker productivity can be expressed as $Z_{it} = exp(\bar{z}_i + \hat{z}_{it})$ where $\bar{z}_i$ is the worker's permanent productivity drawn at birth from a log-normal distribution with mean μ_{z0} and standard deviation σ_{z0}. After birth, a worker's idiosyncratic productivity $\hat{z}_{it}$ evolves according to a Brownian motion with drift such that:

$$\mathrm{d}\log(Z_{it}) = \gamma(E_{it})\mathrm{d}t + \sigma \mathrm{d}W^Z_{it}, \tag{1}$$

where the drift $\gamma(E) = \gamma_e$ if $E = 1$ and $\gamma(E) = \gamma_u$ if $E = 0$. We allow the drift to potentially depend on the employment state to account for the potential of on-the-job human capital accumulation while employed and the depreciation of skills while not working. We refer to workers with differing Z's as being workers of differing types.

Production Technology. While employed in a match, worker i produces Z_{it} units of output. Such a worker then receives a real wage $W_{it} = \tilde{W}_{it}/P_t$, where $\tilde{W}_{it}$ is the nominal wage and P_t is the exogenous price level with growth rate denoted by π. While unemployed, worker i receives a flow real income of $BZ^{\phi_B}_{it}$, which captures the flow value of non-employment.[18] The parameter ϕ_B measures the extent to which the flow value of non-employment scales with worker productivity. When $\phi_B < 1$, employed low-productivity workers will be, on average, closer to their value of non-employment. ϕ_B will be one important parameter in determining

[17] Our framework builds on and extends the model developed in Blanco, Drenik, Moser, and Zaratiegui (2024).

[18] The fact that the value of non-employment is in real terms is consistent with the findings of Chodorow-Reich and Karabarbounis (2016a). They find that most of the value of non-employment is due to the value of non-working time (e.g., the value of leisure or home production) which is not subject to nominal rigidities.

whether the elasticity of worker flows in response to labor market shocks differs across worker types.

Search and Matching Technology. Job search is frictional and directed for both workers and firms. Firms announce wage-specific vacancies to attract workers with productivity Z at a vacancy posting cost of KZ^{ϕ_k}. There is an infinite mass of potential firms that can open a vacancy and hire a worker in any of these markets. Thus, the expected benefit of opening a vacancy in any market must be zero. The parameter ϕ_K measures the extent to which vacancy posting costs scale with worker productivity. When $\phi_K > 1$, it is more expensive for firms to hire a high-productivity worker. ϕ_K will be the second important parameter in determining whether the elasticity of worker flows in response to labor market shocks differs across worker types.

The creation of matches in each market is governed by a standard matching function with constant returns to scale between vacancies and the search intensity of workers. Each worker chooses search intensity s subject to a convex utility cost function that depends on their search effort and employment status, denoted by:

$$S(s;Z,E) = \eta(E)^{1/\phi_s}\frac{s^{1+1/\phi_s}}{1+1/\phi_s}Z, \tag{2}$$

where $\eta(E) = \eta_e$ if $E = 1$, $\eta(E) = \eta_u$ if $E = 0$, and $\phi_s > 0$. We assume the disutility of searching on the job is larger than the disutility of searching while unemployed, that is, $\eta_e > \eta_u$. In addition to endogenous separations, matches are also subject to exogenous separation shocks at rate $\delta(Z_{it})$ that possibly varies with worker productivity.

Let $\theta(Z, W)$ denote a measure of tightness in its corresponding market; i.e., the ratio of vacancies to the total effective units of search intensity of workers with productivity Z looking in the market with a real wage W. In a market with tightness θ, workers find jobs with probability $sf(\theta)$ while firms find workers with probability $q(\theta) = f(\theta)/\theta$. As is common in the literature, we assume a Cobb-Douglas matching technology so that the job-finding rate and the job-filling rate are, respectively, $f(\theta) = \theta^{1-\alpha}$ and $q(\theta) = \theta^{-\alpha}$, where $\alpha \in (0, 1)$ is the elasticity of matches to total search intensity. We assume that firms and workers can only visit one market at a time.

Wage Determination within a Match. The key economic mechanism in our model is that nominal wages are sticky for workers within a match. We model the rigidities so that it can potentially replicate the empirical features of the nominal wage change distribution for job-stayers found in the ADP micro data for the 2008-2016 period, as documented by Grigsby, Hurst, and Yildirmaz (2021).[19] The distribution of nominal wage changes has five features. First, there is a large spike at zero, such that about one-third of job-stayers do not receive a nominal wage adjustment during the year. Second, there is another spike in the annual nominal wage change distribution, with about one quarter of job-stayers getting a nominal wage change in the range of 2-3% per year. Third, there is a missing mass of workers getting small nominal wage adjustments, with only about 5% of job-stayers getting wage changes of about 1%. Fourth, there is a long tail of nominal wage increases above 3% for job-changers. Finally, there are stark asymmetries in nominal wage changes around zero, with only about 2% of job-stayers receiving a nominal wage cut during a year.

With this empirical distribution in mind, we model worker nominal wage adjustments within a match as follows. First, in a time period $\mathrm{d}t$, with probability $\beta^{\Pi}\,\mathrm{d}t$, the worker has the opportunity of a "free" wage increase. These free wage increases reset worker real wages to their Nash-bargained level with the constraint that the nominal wage change must be in the range of 0 and $\Delta\bar{w}_{\pi^*}$. This process proxies for the fact that most employers evaluate their worker wages once a year and, potentially because of norms, make a decision on whether to give the worker a raise within a range between 0 and some upper bound, like a 2 or 3% raise. Allowing for free wage changes of this sort helps generate the spikes in nominal wage adjustments at both zero and at 2-3% as observed in the data. Going forward, we set $\Delta\bar{w}_{\pi^*} = \pi^*$, which is the steady-state trend inflation in the economy.[20] Allowing for free wage adjustments minimizes the extent to which workers have to expend costly effort to have their wages keep up with unexpected temporary periods of inflation.

Second, we allow workers to pay a random menu cost ψ^+ drawn from an exponential distribution—measured in units of utility—to initiate a wage renegotiation process with their employer to increase their nominal wages to their unconstrained Nash bargained level.[21] This gives workers the opportunity to accelerate their nominal wage adjustment relative to the "free" wage adjustments discussed above. In particular, at any point in time, with probability $\beta_+\mathrm{d}t$ the worker can pay a stochastic cost $\psi^+ Z$ to start a negotiation to increase the current

[19]The online appendix reproduces Figure 2 of Grigsby, Hurst, and Yildirmaz (2021) showing the distribution of year-over-year nominal wage changes for job-stayers.

[20]We take $\bar{w}_{\pi^*}$ as exogenous and do not attempt to micro-found why there is such a large spike in nominal wage adjustments at 2 or 3 percent. Doing so would be an interesting avenue for future research.

[21]It should be noted that we treat search costs and renegotiation costs as being two distinct decisions. However, workers could search for another job and bring their external offer back to their original firm to facilitate a renegotiation of their current wage. In this case, the renegotiation costs could stem, in part, from costly search. Treating search and renegotiation as two separate decisions facilitates model tractability without changing any of the model's broad conclusions. However, given the potential link between the two, we group these costs together when assessing the welfare costs of inflation on worker well-being.

nominal wage. With the remaining probability, renegotiation costs are infinitely large. Finally, to allow for asymmetry between wage increases and wage declines, with probability $\beta_{-}\mathrm{d}t$ the worker can pay $\psi^{-}Z$ units of utility to start bargaining to negotiate a wage cut; workers may prefer a wage cut relative to being laid off. The cumulative distributions for ψ^{+} and ψ^{-} are $\Psi^{+}(\psi)$ and $\Psi^{-}(\psi)$ with non-negative support, respectively. Upon renegotiation, the new wage is set by maximizing a Nash Bargaining objective, where the worker's bargaining power is denoted by τ and the outside option in case bargaining fails is the dissolution of the match.[22]

It is worth noting that nominal rigidities in this model only occur with respect to wages of workers within a current match. We assume that wages of new hires are perfectly flexible. This implies that workers can escape their falling real wages on the job when there is a burst of inflation by engaging in costly search for a new match.

Agents' Objectives. Workers born at period t maximize their expected utility and discount the future at rate ρ. They have linear preferences over flow income Y_{it} net of search effort, $(Y_t - S_t)\mathrm{d}t$, where flow income is equal to the real wage if employed and home production if unemployed. They can pay a stochastic renegotiation cost in utility terms to change their nominal wages $\psi_t Z_t$ as described above. On the other side, firms maximize expected profits and also discount the future at rate ρ. A matched firm's flow profits are given by revenues net of real wages.[23]

3.2. Values and Equilibrium Conditions

Let $J(z,w)$, $U(z)$, and $H(z,w)$ denote the values of firms, unemployed workers, and employed workers, respectively, where w denotes the log-real wage and z denotes the log of worker productivity. Let $\theta(z,w)$ denote the market tightness in the (z,w) submarket where workers search. We now describe the equilibrium conditions.

[22]As emphasized by Shimer (2006), the axiomatic foundations of Nash bargaining may fail in search models with on-the-job search as the bargaining set might not be convex. While our numerical simulations suggest bargaining sets are convex in our calibrated model, our wage-setting assumptions can be interpreted in terms of a broader wage-setting protocol because maximizing the Nash bargaining objective in our environment implies that a worker's real wage is reset to the flexible wage of comparable new hires. This feature gives the model a chance to let workers adjust their wages without engaging in on-the-job search, while allowing the data to discipline the extent of such flexibility through the parameters of wage adjustment costs on the job.

[23]To improve numerical convergence of the model by smoothing their value functions, we also assume workers of type Z_t face an arbitrarily small stochastic quitting cost and firms face an arbitrarily small stochastic cost of laying off a worker of type Z_t. We suppress the notation for these smoothing parameters in the main text to simplify exposition but discuss them more fully in the calibration section of the Online Appendix.

Free Entry Condition. Free entry implies the complementary slackness condition:

$$\min \left\{ K e^{\phi_k z} - q(\theta(z,w))J(z,w), \theta(z,w) \right\} = 0. \tag{3}$$

Equation 3 imposes a zero-profit condition in each of the open sub-markets where workers are searching and ensures that profits are non-positive in sub-markets where workers are not searching.

Unemployed Workers. The value of being unemployed is characterized by the following Hamilton-Jacobi-Bellman (HJB) equation:

$$\begin{aligned}(\rho+\chi)U(z) = B e^{\phi_b z} + & \underbrace{\gamma_u \partial_z U(z) + \frac{\sigma^2}{2}\partial_z^2 U(z)}_{\text{Law of motion of } z \text{ during unemployment}} \\ & + \underbrace{\max_{s_u, w_u} \left\{ s_u f(\theta(z,w_u)) \left(H(z,w_u) - U(z)\right) - e^z \eta_u^{1/\phi_s} \frac{s_u^{1+1/\phi_s}}{1+1/\phi_s} \right\}}_{\text{Expected value of searching for a job}}. \end{aligned} \tag{4}$$

The value function for an unemployed worker consists of three components. First, workers receive the flow value $Be^{\phi_b z}$, which represents their home production or utility from leisure. Second, the function accounts for the evolution of worker productivity during unemployment through the drift term γ_u and diffusion term σ^2. Third, workers derive value from their optimal job search decisions, which involve two key choices: (i) search intensity s_u, which determines how vigorously they look for employment, and (ii) target sub-market w_u, which determines the real wage w_u^* they will receive upon finding employment. The optimal sub-market choice $w_u^*(z)$ is the solution to the following problem

$$w_u^*(z) = \arg\max_{w_u} \left\{ f(\theta(z,w_u)) \left[H(z,w_u) - U(z)\right] \right\}, \tag{5}$$

in which a worker trades off the benefit of finding a job quickly with finding a job that pays a higher wage. Unemployed workers enter the labor market at the bottom rung of their respective job ladders. From the free-entry condition for open sub-markets, the job-finding probability is related to the firm's value. Thus, equation (5) can be also expressed as

$$w_u^*(z) = \max_{w_u^*} \left\{ J(z,w_u)^{1-\alpha} \left(H(z,w_u) - U(z)\right)^{\alpha} \right\}. \tag{6}$$

The optimal search effort of the unemployed $s_u^*(z)$ that solves equation (4) is given by

$$s_u^*(z) = \eta_u^{-1} \left(f(\theta(z, w_u^*(z))) \frac{H(z, w_u^*(z)) - U(z)}{e^z} \right)^{\phi_s}, \tag{7}$$

where η_u^{-1} determines the level of search effort, while ϕ_s captures the elasticity of search effort to the expected value of finding a job.

On-the-Job Renegotiation. When an employed worker pays the bargaining cost, the newly renegotiated wage $w_b^*(z)$ is characterized by the Nash bargaining solution

$$w_b^*(z) = \max_{w_b} \left(J(z, w_b)\right)^{1-\tau} \left(H(z, w_b) - U(z)\right)^{\tau}, \tag{8}$$

which is a weighted average of the firm's and the worker's values with worker bargaining power given by τ. Notice that when $\tau = \alpha$, which is the case in our calibration, the entry real wage of the unemployed worker with productivity z ($w_u^*(z)$ as defined in equation (6)) will be the same as the renegotiated real wage of a worker with productivity z ($w_b^*(z)$ as defined in equation (8)). Thus, when workers choose to renegotiate their wages, they move to the bottom rung of their productivity-specific job ladder.

From the optimal renegotiation decision, we have the renegotiation hazard for a worker of productivity z earning real wage w, $\beta(z, w)$, given by:

$$\begin{aligned}\beta(z, w) = {}& \beta_+ \mathbb{I}_{\{w_b^*(z,w)>w\}} \Psi^+ \left(\frac{H(z, w_b^*(z, w)) - H(z, w)}{e^z}\right) \\ & + \beta_- \mathbb{I}_{\{w_b^*(z,w)<w\}} \Psi^- \left(\frac{H(z, w_b^*(z, w)) - H(z, w)}{e^z}\right).\end{aligned}$$

Similarly, the new real wage resulting from free adjustments, denoted by $w_{\pi^*}^*(z, w)$, maximizes the same bargaining objective but is subject to the constraint $w_{\pi^*} \in [0, \pi^*]$.

The Game Between Firms and Employed Workers. We formulate the interaction between matched firms and workers as a dynamic game with Markovian strategies, where we seek a Markov Perfect Equilibrium. In this framework, once a match is formed, the payoff-relevant state variables are limited to the worker's productivity (z) and real wage (w). Given these states, the firm's strategy is to choose whether or not to lay off the worker. We denote by $\mathcal{W}^{j*}$ the set of (z, w) pairs where the firm chooses to continue the match.[24] For each productivity level z, we define $w_l(z)$ as the layoff threshold, which represents the maximum real wage the firm is willing to pay before choosing to terminate the match.

The strategy of a matched worker with productivity z consists of three components: (i) on-the-job search decisions, characterized by search intensity $s_e^*(z, w)$ and target sub-market $w_{jj}^*(z, w)$; (ii) wage renegotiation timing decisions, determining when to pay the renegotiation

[24] As in Blanco, Drenik, Moser, and Zaratiegui (2024), we require the continuation set to be a weakly dominating strategy to ensure the uniqueness of equilibrium.

cost to adjust wages; and (iii) quit decisions, determining the set $\mathcal{W}^{h*}$ of (z, w) pairs where the worker chooses to remain employed. The continuation set for the worker is described by a quitting threshold $w_q(z)$, defined as the greatest lower bound of real wages for which a worker of productivity z is willing to continue the match.

Given these strategies, we define the *continuation set* of the game as the intersection of wages and productivities for which the firm and the worker are both willing to continue the match, $\mathcal{W}^{h*} \cap \mathcal{W}^{j*}$. We assume that $\mathcal{W}^{j*}$ and $\mathcal{W}^{h*}$ are both half-intervals in the real wage dimension with $w_q(z) < w_l(z)$. Consequently, the continuation set at any productivity level z is the interval $(w_q(z), w_l(z))$.

Employed Workers. Within the continuation region of the game, an employed worker's value satisfies the Hamilton-Jacobi-Bellman equation:

$$\begin{aligned}
\rho H(z,w) = e^w &+ \underbrace{\partial_z H(z,w)\gamma_e + \frac{\sigma^2}{2}\partial_z^2 H(z,w) - \partial_w H(z,w)\pi^*}_{\text{Law of motion of } (z,w) \text{ during employment}} \\
&- \underbrace{\delta(H(z,w) - U(z)) - \chi H(z,w)}_{\text{Separation and death shocks}} + \underbrace{\beta^\pi \left(H(z, w^*_{\pi^*}(w,z)) - H(z,w)\right)}_{\text{Value of free wage adjustment}} \\
&+ \underbrace{\beta_+ \mathbb{I}_{\{w_b^*(z,w)>w\}} \int \max\left\{H(z, w_b^*(z,w)) - H(z,w) - \psi e^z, 0\right\} \Psi^+(\mathrm{d}\psi)}_{\text{Net value of costly upward wage adjustment}} \\
&- \underbrace{\beta_- \mathbb{I}_{\{w_b^*(z,w)\leq w\}} \int \max\left\{H(z, w_b^*(z,w)) - H(z,w) - \psi e^z, 0\right\} \Psi^-(\mathrm{d}\psi)}_{\text{Net value of costly downward wage adjustment}} \\
&+ \underbrace{\max_{s_e, w_{jj}} \left\{ s_e f(\theta(z, w_{jj}))\left(H(z, w_{jj}) - H(z,w)\right) - e^z \eta_e^{1/\phi_s} \frac{s_e^{1+1/\phi_s}}{1+1/\phi_s} \right\}}_{\text{Expected net value of on-the-job search}}, \qquad (9)
\end{aligned}$$

and for all states where either agent decides to terminate the match, $w \notin (w_q(z), w_l(z))$, the employed worker's value equals the unemployment value $H(z, w) = U(z)$. Additionally, at the boundaries of the continuation set, the standard value-matching condition holds $H(z, w_l(z)) = H(z, w_q(z)) = U(z)$. Finally, since the worker chooses the quitting threshold optimally, the smooth-pasting condition holds at this threshold for both state variables, $\partial_z H(z, w_q(z)) = \partial_z U(z)$ and $\partial_w H(z, w_q(z)) = 0$.

This value function captures several components of worker utility. The first term e^w represents the instantaneous flow value from the current real wage. The next term accounts for the stochastic evolution of the state variables (z, w) and the continuous erosion of real wages due to inflation at rate π^*. The function also incorporates exogenous separation risk δ and mortality risk χ, as well as the option value of free periodic wage adjustments that occur with probability β^π. The following term captures changes in value due to wage renegotiation. The final term represents the value of on-the-job search, where workers simultaneously choose search intensity and target sub-market. We now describe the optimal policies for these latter two decisions. In particular, the optimal policy for on-the-job search is:

$$w_{jj}^*(z,w) = \arg\max_{w_{jj}} \left\{ f(\theta(z,w_{jj})) \left[H(z,w_{jj}) - H(z,w) \right] \right\}, \tag{10}$$

where $w_{jj}^*(z,w)$ is the optimal real wage that a worker of productivity z with current real wage w will target when they engage in job-to-job transitions (hence the jj subscript). The optimal policy for on-the-job search can be expressed as follows:

$$s_e^*(z,w) = \eta_e^{-1} \left(f(\theta(z,w_{jj}^*(z,w))) \frac{H(z,w_{jj}^*(z,w)) - H(z,w)}{e^z} \right)^{\phi_s}. \tag{11}$$

The policy functions for on-the-job search operate through the same economic mechanisms as those for search during unemployment, with the crucial distinction being that the opportunity cost of finding a new job under employment $H(z,w)$ depends on the *current real wage*.

Firms. Similarly, the HJB equation for a firm employing a worker at wage w with productivity z in the continuation set of the game is given by

$$\begin{aligned} \rho J(z,w) = {} & e^z - e^w + \partial_z J(z,w)\gamma_e + \frac{\sigma^2}{2}\partial_z^2 J(z,w) - \partial_w J(z,w)\pi^* \\ & + \beta(z,w)\left(J(w_b^*(z,w),z) - J(z,w)\right) + \beta^\pi \left(J(z,w_{\pi^*}^*(z,w)) - J(z,w)\right) \\ & - (\delta + \chi + s_e(z,w) f(\theta(z,w_{jj}^*(z,w)))). \end{aligned} \tag{12}$$

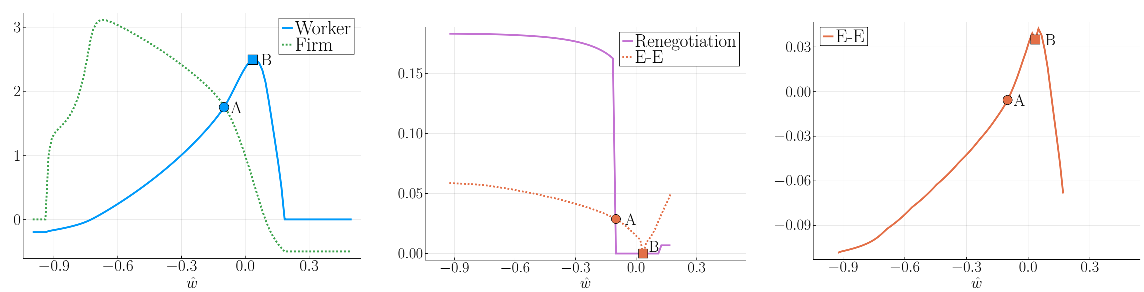
For $w \notin (w_q(z), w_l(z))$, we have that $J(z,w) = 0$. The corresponding value-matching and smooth-pasting conditions are now given by $J(z,w_l(z)) = J(z,w_q(z)) = \partial_z J(z,w_l(z)) = \partial_w J(z,w_l(z)) = 0$.

Equilibrium Definition. An equilibrium in this economy consists of a set of value and policy functions for all firms and workers such that: (i) Given the firm's value, the free-entry condition for vacancy posting in all open sub-markets (i.e., equation (3) holds); (ii) Given market tightness, workers' policies during unemployment are optimal (equation (4) holds); (iii) The wage satisfies the Nash bargaining solution (equation (8) holds); (iv) Given the firm's layoff policy and market tightness, workers' on-the-job strategies are optimal (equation (9) holds, with value matching and smooth pasting for $H(z,w)$); and (v) Given employed workers' policies and market tightness, firms' layoff strategies are optimal (equation (12) holds, with value matching and smooth pasting for $J(z,w)$).

3.3. Model Mechanisms in Response to an Unexpected Rise in the Price Level

This section analyzes how individual worker-firm policies respond to an unexpected increase in inflation. We first analyze these responses for a worker with given productivity z. Clearly, the impact of inflation on this worker will depend on the current real wage, which serves as their key state variable. Since what matters for both the worker and the firm is the real wage (w) relative to the worker's productivity (z), we recast the policies of workers and firms as functions of productivity and wage markdowns $\hat{w}$—defined as the log difference between the real wage and productivity, $\hat{w} \equiv w - z$.

Figure 3.1: Values, Hazard Rates and Target Wage Markdown for a Worker of Type Z



Panel A: Worker and Firm Values

Panel B: E-E and Renegotiation Hazard Rates

Panel C: Target Wage Markdown

Notes: Panel A shows the values of an employed worker with given productivity z (net of their unemployment value) and the firm that hires that worker as a function of the markdown, $\hat{w} = w - z$. Panel B shows the renegotiation rate (solid line) and the E-E rate (dashed line) for a worker of productivity z as a function of their markdown. Panel C shows the target wage markdown that a worker of productivity z seeks to obtain when making an E-E transition.

Steady State. Figure 3.1 illustrates the values and policy functions for a worker of type z under our baseline parameterization discussed in Section 4 below. Panel A shows the net value of an employed worker of type z relative to unemployment $(H(z,\hat{w}) - U(z))$ and a firm who is matched with that worker $(J(z,\hat{w}))$ as a function of their log markdown. Consider the worker value in the solid blue line in Panel A. The circle on this line (labeled with point A) indicates the entry markdown when the worker transitions from unemployment to employment, as defined by equation (5). When a worker starts a job from unemployment, the optimal target markdown implies a positive value for both the firm and the worker. Once employed, markdowns evolve stochastically between the quitting and layoff thresholds with a negative drift due to both inflation and productivity growth. If the markdown becomes sufficiently high, the firm's profits turn negative and it chooses to lay off the worker. On the opposite end, when markdowns become sufficiently low, the value of employment falls below the value of unemployment and the worker opts to quit aiming to find a new job from unemployment with a better entry markdown.

Importantly, the worker's maximum value is attained at a markdown lower than the layoff threshold. We denote this markdown as $\hat{w}^H(z)$, labeled as point B at the peak of the worker value function. This reflects a trade-off. On one hand, a marginal increase in the markdown raises the flow payoff, thereby increasing the worker's value. On the other hand, it also raises the layoff probability, reducing the worker's expected value. At this optimal markdown from the worker's perspective, the marginal benefit equals the marginal cost. Crucially, if workers had a free opportunity to switch to any job (i.e., without internalizing that higher markdown jobs have lower job finding rates) they would target this optimal markdown. We come back to this feature when explaining wage renegotiation and E-E policies below.[25]

The solid purple line in Panel B shows the hazard rate at which workers pay the fixed cost to renegotiate wages with their employer. At point B, workers earn a wage that maximizes their value and have no incentive to renegotiate. Since renegotiation resets wages to the Nash bargaining solution with unemployment as the outside option (equation (8)), wages would be reset to point A in Panel A. Consequently, workers with markdowns between points A and B optimally choose not to renegotiate, as it would lower their wage and value. Once the markdown dips below point A, workers are willing to renegotiate with their employer depending on their draw of the renegotiation menu cost.

The dashed red line in Panel B shows the probability rate of the worker making an E-E transition, given by $s_e(z, \hat{w}) f(\theta(z, \hat{w}^*_{jj}(z, \hat{w})))$ which reflects the worker's search intensity ($s_e(z, \hat{w})$) and their target markdown at their new employer ($\hat{w}^*_{jj}(z, \hat{w})$) as defined in equation (11). Again, at point B, workers are at their bliss point and will not engage in any E-E transitions. As wages rise above point B, workers start searching because of increasing layoff risk. Likewise, as wages fall below B, workers start searching to potentially climb their job ladder back towards point B. Importantly, as shown in Panel C, as the markdown falls, the worker becomes willing to switch to employers offering lower starting markdowns. Specifically,

[25] Notice that firm values turn negative for higher wages given that, as discussed above, we impose small stochastic layoff costs to improve the numerical convergence of the model.

all workers who make an E-E transition will choose a starting markdown between points A and B. Since, in searching for a job, workers face the trade-off that—holding search intensity and productivity fixed—jobs with higher wages have lower finding rates, the lower the markdown at the incumbent firm, the more willing workers are to make an E-E transition with a starting markdown closer to point A (equation (10)) in order to transition more quickly to a job with a higher wage. This implies that $\hat{w}^*_{jj}$ falls for job changers as their wage in their incumbent firm falls.

Inflation Effects on Worker Flows, Worker Welfare, and Vacancies. Figure 3.1 provides much of the intuition for how the labor market will respond to an unexpected increase in the price level. An unexpected burst of inflation will decrease the worker's markdown given nominal wages are sticky. All else equal, this *direct* effect of inflation will make all workers worse off by directly reducing their real wage. At the same time, matched firms are made better off from this direct effect as their profits increase, since they are paying workers of a given productivity less in real terms. Thus, a first-order effect of inflation is to transfer resources away from workers towards firms. But beyond this direct effect, such an inflation shock will also affect worker and firm values by endogenously changing worker flows. Initially, the inflation will move workers further away from their layoff margin, unambiguously decreasing layoffs. Because workers dislike unemployment, inflation also has a *positive* effect on worker welfare by reducing layoff risk.[26] This effect is largest for workers whose initial markdown is to the right of point B. For them, their value of employment increases on net as their markdown falls.

However, most workers in our calibrated model have an initial markdown that is to the left of point B. For them, their welfare is strictly reduced from an unexpected burst of inflation. The decreasing markdown induces higher levels of on-the-job search, resulting in a higher E-E transition rate (Panel B). Additionally, for those workers who engage in E-E transitions, it will induce them to search in markets with a lower initial wage markdown (Panel C). Lastly, the higher inflation increases the probability that these workers pay the fixed cost to renegotiate their wage with their existing employers. The declining real wages, increased search effort, and increased renegotiation costs all reduce the welfare of these workers in response to the unexpected inflation.

[26] In this sense, our model has an implication where inflation can "grease the wheels of the labor market" by causing real wages to fall and reducing the incentive for firms to fire workers. For a related literature see, for example, Tobin (1972), Card and Hyslop (1997), and Blanco and Drenik (2023).

Given these forces at work, we can now answer the question of how an unexpected burst of inflation will affect firm vacancy creation. To further build intuition, let us assume that (i) the worker has an initial markdown to the left of point B and (ii) the number of employed workers who are searching in the new sub-market remains constant before and after the inflation shock. This latter assumption allows us to focus solely on individual worker choices, temporarily abstracting from aggregation. As noted above, the burst of inflation causes these workers to search more in sub-markets that have lower initial markdowns. This response causes firm vacancies to increase for two reasons. To formalize this decision, suppose a worker had an initial markdown of $\hat{w}$ that fell by an amount Δ in response to the unexpected inflation. The total number of vacancies $\mathcal{V}$ posted in the sub-market where this worker of productivity z now searches can be expressed as:

$$\mathcal{V} = \theta(z, \hat{w}_{jj}(z, \hat{w} - \Delta))s(z, \hat{w} - \Delta). \tag{13}$$

Given the properties of the matching function, market tightness within a sub-market—defined by a wage markdown for a worker with a given productivity level—is just the ratio of vacancies $\mathcal{V}$ to worker search effort S. The free entry condition implies that market tightness will remain constant within a given sub-market. Given this, an increase in worker search effort in a sub-market will directly result in an increase in firm vacancies in that sub-market, as shown in the second term of equation (13). By increasing worker search effort, inflation leads to increased vacancies.

However, inflation also has an additional effect on aggregate firm vacancy creation. Given the Cobb-Douglas matching function and the free entry condition, the job-filling rate can be expressed as $q(z, w) = \theta^{-\alpha} = Ke^{\phi_K Z}/J(z, w)$. Using these conditions, equation (13) can be rewritten as:

$$\mathcal{V} = \left(\frac{J(z, \hat{w}_{jj}(z, \hat{w} - \Delta))}{Ke^{\phi_k z}} \right)^{1/\alpha} s(z, \hat{w} - \Delta). \tag{14}$$

As workers of a given productivity shift their search effort to sub-markets with a lower entry markdown in response to inflation, firm value $J(.)$ increases. These sub-markets are more profitable for firms since they offer lower markdowns for a worker of the same productivity and, as a result, they are willing to post more vacancies in these sub-markets. Consequently, these sub-markets have higher vacancies per searcher (i.e., higher market tightness θ). Aggregate vacancies will therefore increase for two reasons in response to an inflationary shock. First, more workers will be searching overall, which will increase vacancies in all sub-markets where search effort increases. Second, there will also be a systematic shift towards sub-markets that have higher job-finding rates and lower job-filling rates. Both forces cause aggregate vacancies to rise in response to an unexpected burst of inflation. The expected duration of vacancies, measured by the inverse of the job-filling rate, will also increase in response to an inflationary shock. In our quantification below, we show these results hold in the aggregate since the share of workers with markdowns to the right of point B is only a small fraction of all workers.

4 Quantifying the Model

In this section, we discuss our calibration of the model parameters. The time period in our model is a month. We calibrate the model using the simulated method of moments (SMM) approach targeting several moments of the microdata. The Online Appendix contains further details on the construction of moments, a sensitivity analysis following the procedure in Andrews, Gentzkow, and Shapiro (2017), and robustness to alternative parameter values.

4.1. Fixed Parameters

Table 1 shows the parameters that we set externally. We set the monthly discount factor ρ to 0.005, consistent with an annual discount rate of 6% (Hall, 2017). The death rate χ is calibrated to an annual rate of 5% per year to match the 85th percentile of the expected labor market experience distribution of 40 years (Durante, Larrimore, Park, and Tranfaglia, 2017). We set the steady state trend inflation π^* to 2.2% annually, consistent with the observed inflation dynamics during the post-2000 period within the United States. Likewise, we also set the upper bound of the free nominal wage adjustment process, $\Delta\bar{w}_{\pi^*}$, to 2.2% annually. The elasticity of the matching function α is set to the standard value of 0.5, following Petrongolo and Pissarides (2001). We also set the worker's bargaining power, τ, equal to the elasticity of the matching function. This assumption implies that the entry wage markdown is equal to the incumbent workers' markdown following renegotiation. Finally, we normalize the mean of the initial productivity distribution, μ_{z0}, to zero and the search cost scale parameter for the unemployed, η_u, to one.

4.2. Calibrated Parameters

Table 2 shows the set of parameters that we calibrate along with their calibrated values. To calibrate these parameters, we target a series of empirical moments on the evolution of wages over the life cycle, worker flows in the aggregate and across the income distribution, and the nominal wage adjustment process reported in Grigsby, Hurst, and Yildirmaz (2021). Below,

Table 1: Fixed Parameters

Parameter	**Description**	**Value**	**Target**
ρ	Discount factor	0.005	Annual discount rate of 6%
χ	Death rate	0.004	85th perc. of experience dist.
μ_{z0}	Mean of initial productivity	0.0	Normalization
η_u	Search cost scale when unemployed	1.0	Normalization
α	Elast. of the matching function	0.5	Standard value
τ	Worker's bargaining power	0.5	Standard value
$\Delta\bar{w}_{pi^*}$	Trend inflation	0.002	Annual inflation rate 2016-2019
π^*	Target inflation	0.002	Annual inflation rate 2016-2019

Notes: The table lists the values of model parameters externally set and their sources.

we discuss how these targets are jointly used to calibrate the model parameters.

Table 2: Internally Calibrated Model Parameters

Parameter	**Description**	**Value**
Productivity Process		
γ_e	Productivity drift for employed	0.002
γ_u	Productivity drift for unemployed	-0.006
σ	Std. dev. of productivity shock	0.033
σ_{z0}	Std. of initial productivity	0.559
Labor Market Flows		
B	Non-employment production	1.087
ϕ_b	Elast. of unemp. income wrt. z	0.722
K	Vacancy cost	9.71
ϕ_k	Elast. of vacancy cost wrt. z	1.453
η_e	Search cost scale when employed	5.405
ϕ_s	Elast. of search cost	0.095
Exogenous Separations		
δ_0	Exog. separation rate function	0.005
δ_1	Exog. separation rate function	0.019
δ_2	Exog. separation rate function	-2.295
Nominal Wage Adjustment		
β_{π^*}	Prob. of free wage adjustment	0.083
β_+	Prob. of positive wage renegotiation	0.184
β_-	Prob. of negative wage renegotiation	0.007
λ	Prob. mass at zero for menu cost dist.	0.864
ζ	Rate parameter of menu cost dist.	0.647

Notes: The table lists the values of model parameters internally set.

Productivity process. σ_{z0} is chosen to match a P90-P50 weekly earnings ratio for workers aged 25-27 of 2.02 between 2016 and 2019 from the CPS.[27] For productivity dynamics, we

[27]Our focus on the P90–P50 ratio, both here and for initial skill dispersion, reflects that top-end earnings inequality primarily reflects differences in human capital and skills, whereas bottom-end variation is more

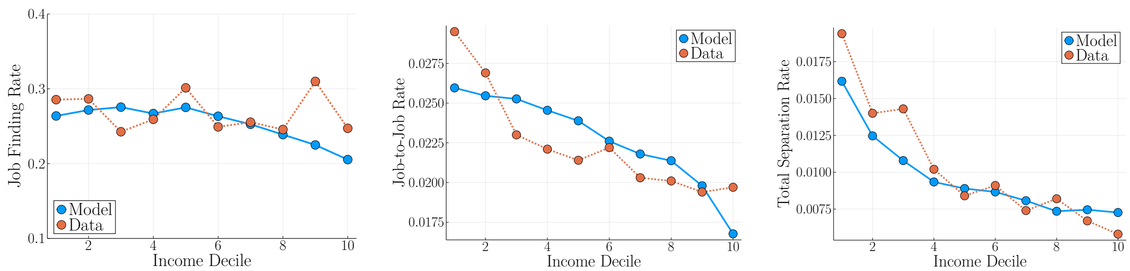
set the productivity drift while employed to $\gamma_e = 0.002$ per month to capture a 70 percent growth rate in average earnings of employed workers over 30 years (Alves and Violante, 2025). The negative drift for the unemployed $\gamma_u = -0.006$ matches the elasticity of wage changes between consecutive jobs with respect to the length of the intervening unemployment spell as estimated by Jarosch (2023). The standard deviation of productivity shocks, σ, is set to 0.033 to match the P90-P50 weekly earnings ratio for workers aged 25-55.

Exogenous Separations. In the model, separation into unemployment results from endogenous choices and exogenous shocks $\delta(Z)$. We discipline the exogenous separation process by using data from the 2016-2019 CPS where unemployed respondents are asked the reason why they became unemployed. Possible answers to this question include whether the worker was a "job leaver" (e.g., quits), whether they were a "job loser/on layoff" (e.g., layoffs), or whether they were unemployed for other reasons such as being an "other job loser" or whether their "temporary job ended". We map quits and layoffs in the CPS to the endogenous quits and endogenous layoffs in the model. In the CPS during the 2016-2019 period, roughly 17%, 22%, and 61% of the unemployed, respectively, report that their unemployment spell originated from a quit, a layoff, or another reason. We interpret separations due to other reasons as being the data analog of exogenous separations $\delta(Z)$ within the model. We parameterize the relationship between exogenous separations and worker productivity with the following functional form $\delta(Z) = \delta_0 + \delta_1 \exp(\delta_2 Z)$. To set these three parameters, we follow an indirect-inference approach and target the separation rate into unemployment due to "other reasons" across the earnings distribution prior to the separation. As shown in Panel C of Figure 4.1, exogenous separations fall sharply with respect to worker earnings.

Endogenous Labor Market Flows. Our goal is to replicate not only aggregate endogenous flows but also flows throughout the income distribution. The ability of unemployed workers to find jobs is determined by their search effort and their job-finding rate per efficiency unit of search. We calibrate the search cost of the employed η_e and the average vacancy posting cost K to match the aggregate average E-E and U-E transition rates from the CPS data during the 2016-2019 period. Additionally, following Faberman, Mueller, Şahin, and Topa (2022), we set the elasticity parameter ϕ_s in the search cost function to match the estimated search effort-wage elasticity of -0.52 (based on hours spent searching) in their survey data, which is obtained by regressing log search effort on log real income and replacing their controls

heavily influenced by heterogeneity in labor supply at the extensive margin (see Alves and Violante, 2025, for a similar approach).

Figure 4.1: Targeted Moments: Flows in the Labor Market



Panel A: U-E Rate   Panel B: E-E Rate   Panel C: E-U Rate

Notes: The figure shows the U-E rate, E-E rate and E-U rate both in the data (dashed line) and as predicted by the calibrated model (solid line).

for worker characteristics with worker fixed effects in the model regression. To match the average endogenous separation rate given by the sum of quits and layoffs (endogenous E-U flows), we exploit the fact that a larger level of home production B raises the opportunity cost of employment and pushes up the wages that workers search for during unemployment, which gets them closer to the layoff threshold. The calibrated value of B implies a ratio of average home production among the unemployed to average production among the employed of 58%, which is in the range reported by Chodorow-Reich and Karabarbounis (2016b).

Two parameters play an important role in shaping the heterogeneity of labor market flows in the data: ϕ_k and ϕ_b, which determine how vacancy posting cost and home production of the unemployed scale with workers' productivity, respectively. These parameters also govern how labor market flows will respond differentially throughout the income distribution in response to an unexpected shock to the price level. The dashed red lines in Panels A and B of Figure 4.1 use CPS data from the 2016-2019 period to show how U-E rates and E-E rates differ across the income distribution. These patterns identify ϕ_k and ϕ_b.

Through the lens of the model, the fact that E-E rates decline with income is indicative that the vacancy cost of hiring more productive workers is higher *relative* to their productivity ($\phi_k > 1$); high wage workers churn less while employed in part because we estimate that it is expensive for firms to hire them. The extent to which the U-E rate varies with income helps to pin down ϕ_b. If it is more expensive to hire a high productivity worker, we would expect the U-E rate to also be declining with income. However, in the data, the U-E rate is relatively constant with income. The calibration rationalizes this pattern by estimating that $\phi_b < 1$ which implies that more productive workers lose more—in relative terms—by staying in the unemployment state. In other words, the market wage of low productivity workers is on average closer to their value of non-employment while the gap between market wages and the value of non-employment is on average larger for high productivity workers. This incentivizes high-productivity workers to search more intensively while unemployed, despite facing greater difficulty finding jobs due to the higher costs firms incur when hiring them. As seen from Figure 4.1, our calibration (blue lines) matches closely both the level and cross-income variation of U-E flows, E-E flows, and E-U flows from the CPS data (dashed red lines).

Nominal Wage Adjustments. We parameterize how wages adjust on the job using the moments provided in Grigsby, Hurst, and Yildirmaz (2021) who use data from the payroll processing firm ADP to measure wage adjustments for U.S. workers during the 2008-2016 period. The Calvo parameter β^{π} governs the arrival rate of costless wage changes between 0 and $\Delta\bar{w}_{\pi^*}$. This process helps us match the large spike in wage changes at 0 and 2-3% with a missing mass in between. We set β_{π^*} to a monthly arrival rate of 0.083 to reflect common human resources practices that nominal wages have the opportunity to costlessly adjust once a year. The parameters β_+ and β_- directly inform the frequency of positive and negative wage changes, respectively. The former is calibrated to 0.184, implying an actual monthly frequency of positive wage changes of 6.4%, consistent with the moments provided in Grigsby, Hurst, and Yildirmaz (2021). The value of the latter is much lower, implying that opportunities to bargain wage cuts rarely arrive, which is needed to match the observed small share of negative wage changes found in Grigsby, Hurst, and Yildirmaz (2021). The heterogeneous menu cost part of the model helps us match the long tail in wage changes of job-changers above 2%. Conditional on $\beta_+ dt$, the renegotiation cost for workers increasing their wage is then drawn from the distribution Ψ^+, which we model as an exponential distribution with a mass point at zero. We define ζ as the rate parameter of the exponential distribution while the parameter λ governs the size of the mass point at zero.[28] λ and ζ are parameterized to match the share of small versus large wage changes in the ADP data.

Targeted and Untargeted Moments. Table 3 shows how our model matches the targeted moments for the wage change distribution, the income distribution over the life cycle, and various labor market flow elasticities. The goodness of fit for the labor market flows was

[28]Similar to the modeling of menu costs in the pricing literature as in Nakamura and Steinsson (2010) and Alvarez, Le Bihan, and Lippi (2016), the mass point at zero allows us to match the continuously declining probability of larger nominal wage changes beyond 2-3%.

discussed in Figure 4.1 above.

Table 3: Comparison of Targeted Moments between Model and Data

Moment	Data	Model
Frequency of on-the-job wage decreases	0.004	0.0
Frequency of on-the-job wage increases	0.063	0.064
Share $\Delta w_b \in (0,6)/(0,\infty)$	0.73	0.73
Share $\Delta w_b \in [6,11)/(0,\infty)$	0.14	0.16
Share $\Delta w_b \in [11,\infty)/(0,\infty)$	0.13	0.12
Search effort-wage elasticity	-0.52	-0.55
P90/P50 real wages (age 25)	2.02	2.02
P90/P50 real wages (ages 25-55)	2.33	2.39
Avg. 30-year wage growth	0.7	0.71
New wage-unemployment length elasticity	-0.006	-0.006

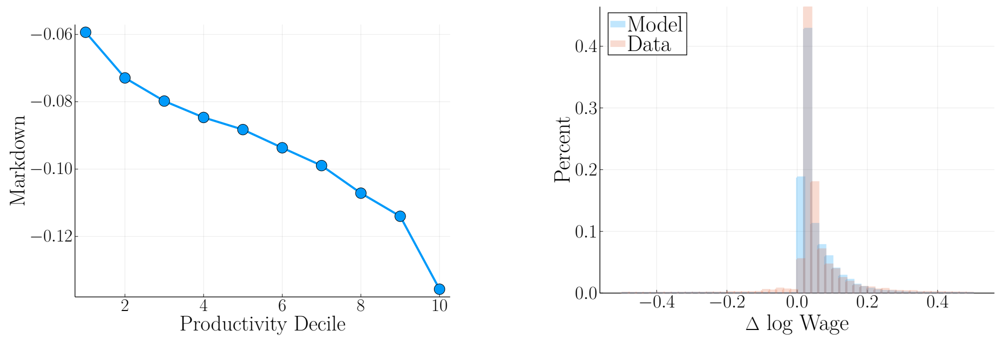
Notes: The table shows the set of moments (excluding the labor market flows, the results for which are reported in Figure 4.1) that were targeted for calibration.

Figure 4.2 shows that our model also matches two untargeted moments. First, given our estimates of ϕ_b and ϕ_k, our model also implies a negative relationship between markdowns and productivity as shown in Panel A. Lower productivity workers are more elastic and, as a result, experience lower wage markdowns on average. This prediction of our model aligns well with the findings of Chan, Mattana, Salgado, and Xu (2023) using Danish microdata and Volpe (2024) using Norwegian microdata; both document that lower productivity workers face smaller wage markdowns. Panel B shows that our model matches well the distribution of nominal wage changes, conditional on a positive change, found in the ADP data. We target that only 6% of job-stayers receive a wage change during a given month. Our model matches that moment (row 2 of Table 3). We also target the fraction of wage changes that are between 0 and 6%, between 6% and 11%, and between 11% and infinity. Despite this crude calibration, Panel B of Figure 4.2 shows that the model matches well the full distribution of nominal wage changes conditional on a positive change occurring. For example, our model generates the large spike in nominal wage changes at 2% as seen in the data.

5 How Workers Respond to Temporary Changes in Inflation

In this section, we analyze how labor market flows, the vacancy-to-unemployment rate, wages, and worker welfare respond to a temporary shock to the inflation rate. We start by exploring a one-time unexpected increase in the price level of 13.5%, all else equal. The 13.5% increase

Figure 4.2: Untargeted Moments: Markdowns and the Distribution of Wage Changes



Panel A: Markdowns   Panel B: (Non-zero) Wage Changes

Notes: Panel A shows the average markdowns (defined as log real wage minus productivity) by productivity decile in the equilibrium of our model. Panel B shows the distribution of non-zero wage changes for job-stayers in the model.

represents roughly the jump in the U.S. price level during the April 2021 and May 2023 period. This experiment allows us to assess the dynamics of flows and wages to a one-time shock separately from the dynamics of the shock. Doing so allows us to better understand the model mechanisms and dynamics.

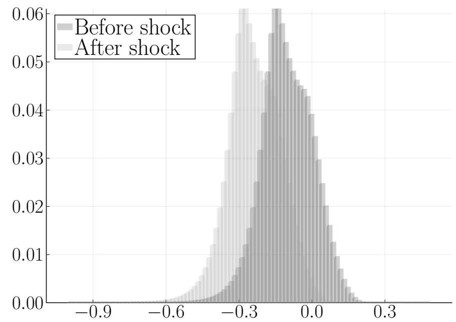
Our second exercise explores a more conservative counterfactual by showing how wages and labor market flows respond to a series of unexpected inflation shocks that replicate the actual inflation path observed during the 2021-2024 period. Throughout this period, we impose that workers consistently maintain expectations of 2.2% annual inflation going forward, implying that in each period the realized inflation rate is an unexpected surprise. We conclude this section by quantifying the welfare effects for different types of workers under both counterfactual scenarios.

5.1. Counterfactual 1: One-Time Unexpected Increase in the Price-Level

We begin by assessing how an unexpected one-time increase in the price level of 13.5% affects the dynamics of labor market flows and wages.

5.1.1. Wage Markdowns On Impact. Panel A of Figure 5.1 shows the distribution of wage markdowns in the economy right before (in dark gray) and right after (in light gray) the temporary inflation shock. Given the nominal wage rigidity, an unexpected jump in the price level of 13.5% results in the wage markdown decreasing for all workers by 13.5 percentage points upon impact. As discussed above, the overwhelming majority of workers have initial markdowns to the right of point B in our illustrative example in Figure 3.1.

Figure 5.1: Markdown Distribution



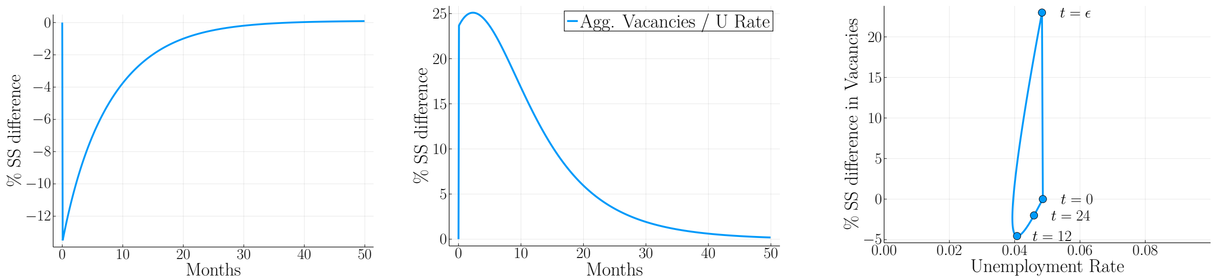
Notes: Figure shows the distribution of wage markdowns right before and right after the unexpected increase in the price level.

5.1.2. Aggregate Wage and Worker Flow Dynamics. We motivated the paper by pointing out the puzzle that during the inflation period the vacancy-to-unemployment rate was at historically high levels while real wages were falling sharply. Figure 5.2 plots the model implied dynamics of aggregate real wages (panel A), the vacancy-to-unemployment rate (panel B) and the corresponding Beveridge curve (panel C) in response to the unexpected 13.5% increase in the price level through the lens of our model. Upon impact, real wages fall by 13.5% given the nominal wage rigidity. However, within about 30 months real wages return to their steady-state path. The real wage declines are accompanied by a large increase in the vacancy-to-unemployment rate upon impact, as in the data. Given the small movements in the unemployment rate, essentially, all of the increase in the V/U ratio is driven by an increase in vacancies. The V/U ratio also returns to steady-state levels within about 30 months.

These findings illustrate three key results. First, our model shows that an unexpected burst of inflation causally generates a decline in real wages and an increase in the vacancy to unemployment rate without any other underlying labor market shocks matching key empirical regularities of the U.S. labor market during the 2021-2024 period. Second, the model implies meaningful dynamics in that the one-time shock to the price level causes real wages to be below steady-state levels for just under three years. Finally, our model highlights how the Beveridge curve can systematically shift upward during periods of inflation, all else equal.[29]

[29]The shifting Beveridge curve also highlights the difference between this model and benchmark sticky wage models such as the one in Galí (2015), where wage inflation and unemployment are negatively correlated through a conventional Phillips curve. In such a model, a temporary burst of inflation would be mirrored by changes in unemployment, whereas here a substantial part of the response is through an increase in the aggregate vacancy-to-unemployment rate rather than a change in unemployment.

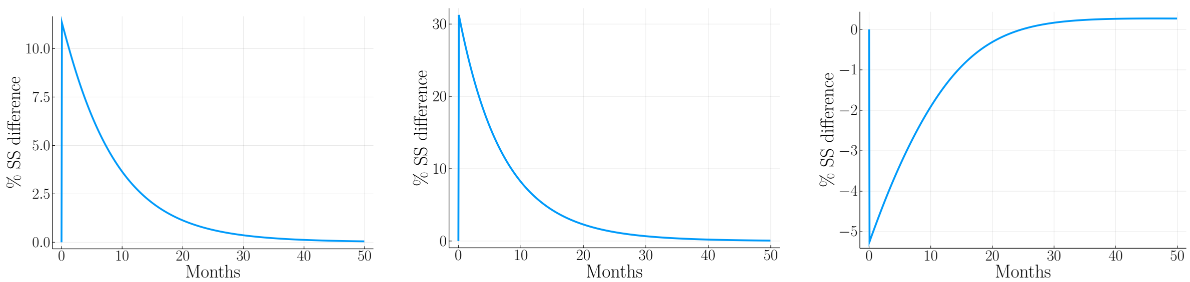
Figure 5.2: Real Wage, V/U Ratio, and the Beveridge curve



Panel A: Real Wage | Panel B: V/U Ratio | Panel C: Beveridge curve

Notes: Panels A and B show the time series response of aggregate log real wage and the vacancy-to-unemployment rate, respectively, in response to the unexpected price level increase. Panel C shows the dynamics of the Beveridge curve in response to the same shock.

Figure 5.3: Employed Search Effort, E-E Rate, and Initial Markdown of Job-Changers

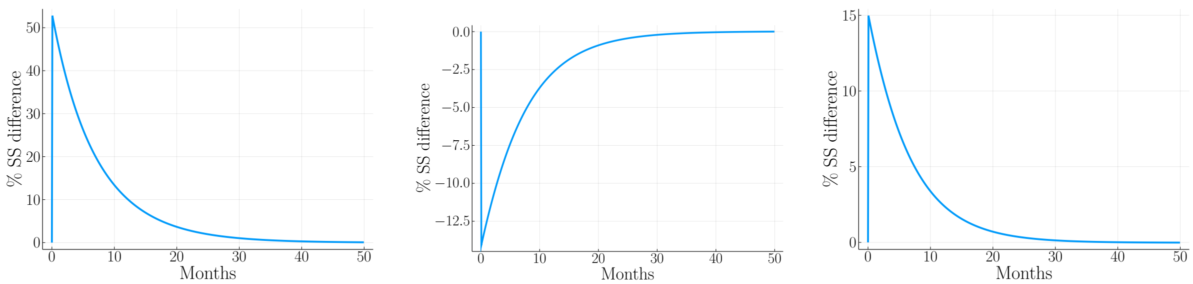


Panel A: Search Intensity of Employed | Panel B: E-E Rate | Panel C: Starting Markdown of Job-Changers

Notes: Figure shows the search effort the employed, the E-E rate, and the starting markdown of job-changers, respectively, in response to the one-time unexpected change in the price-level. All panels are reported as percent deviation from the steady-state.

Figures 5.3 and 5.4 show the underlying mechanisms within our model that generate the rise in vacancies in response to a burst of inflation. As highlighted in Section 3.3, a combination of a rise in E-E flows, coupled with the free entry condition on vacancies, incentivizes firms to post more vacancies when workers are searching more. Additionally, searching workers during inflationary periods will systematically sort to markets with a lower offered wage and a higher job-finding rate; workers making E-E transitions will systematically enter their new job ladder on a lower real wage rung during inflation periods. Panels A, B, and C of Figure 5.3 show the average worker search effort, the E-E transition rate, and the entry wage during E-E transitions after the 13.5% increase in the price level. Upon impact, the average workers' search effort increases by about 11%, the E-E rate increases by about 30%, and the entry real wage of workers making E-E flows falls by about 5% relative to their steady-state values.

Figure 5.4: E-E Vacancies, Vacancy Filling Rate, and Vacancy Duration



Panel A: E-E Vacancies   Panel B: E-E Vacancy Filling Rate   Panel C: E-E Vacancy Duration

Notes: Panel A shows the time series response of E-E vacancies in response to the unexpected price level increase. Panels B and C show the time series response of the E-E vacancy filling rate and E-E vacancy duration, respectively, in response to the same shock.

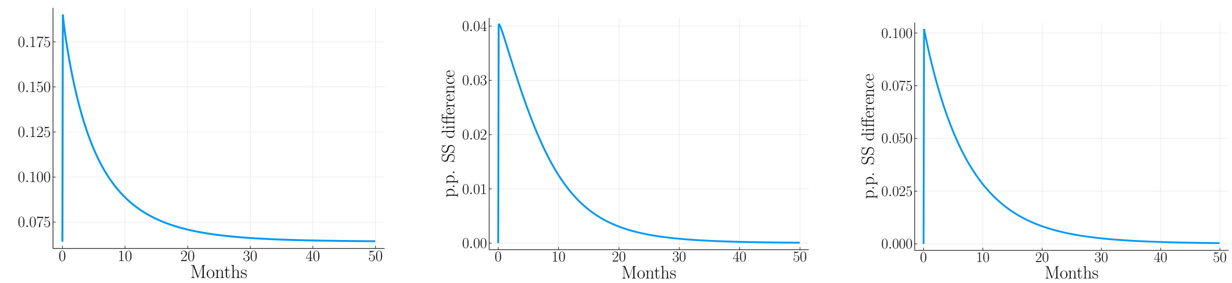
Figure 5.4 shows the response of vacancies created for workers making on-the-job transitions (Panel A), the E-E vacancy filling rate from the firm's perspective (Panel B) and the duration of E-E vacancies (Panel C). On impact, vacancies for E-E workers increase by 50% relative to their steady-state value.[30] As discussed in Section 3.3, the corresponding increase in vacancies associated with increasing E-E flows results in the firm's E-E job-filling rate falling and the duration of E-E vacancies rising. These findings are consistent with both the empirical finding that vacancy durations increased sharply during the recent inflation period and with the fact that U.S. firms reported that it was difficult to hire workers during late 2021 and 2022.[31]

While there is a large increase in E-E flows induced by inflation, most workers still remain with their original employer. Some of these workers chose to pay the fixed cost to renegotiate their nominal wage. Panel A of Figure 5.5 shows that in response to inflation the frequency of

[30] Total vacancies increase less than 50% because the vacancies created for U-E workers do not change much. In the Online Appendix, we show the the implied response of both the U-E rate and the layoff rate under counterfactual 1. Because both the value of not working and the new hire wage are in real terms, changes in the aggregate price level do not meaningfully affect the U-E rate. The layoff rate plummets with the one time price level increase as real wages fall moving incumbent workers further away from the layoff margin.

[31] In the Appendix, we follow the methodology in Davis, Faberman, and Haltiwanger (2013) to show that the duration of vacancies did, in fact, increase sharply during the inflation period.

Figure 5.5: Frequency of Wage Increases and Wage Changes of Job Stayers and Changers



Panel A: Monthly Freq. of Wage Increases

Panel B: Wage Changes of Job Stayers

Panel C: Wage Changes of Job Changers

Notes: Panel A shows the time series response of the frequency of monthly wage changes for job stayers in response to the unexpected price level increase. Panels B and C show the time series response of the job stayers and job changers, respectively, in response to the same shock.

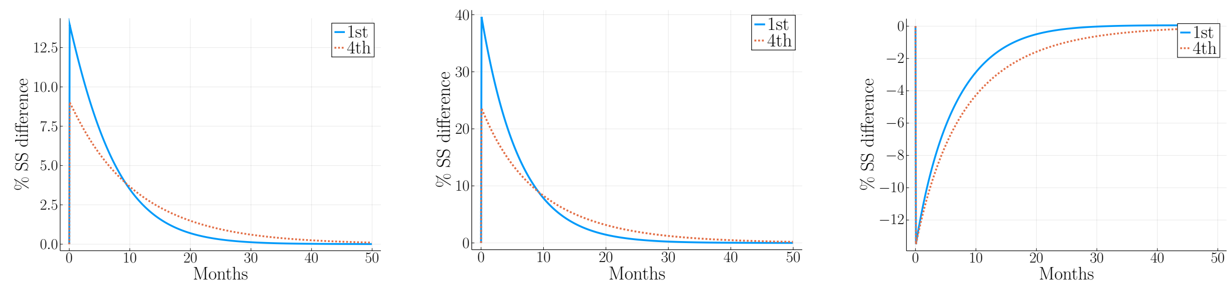
wage increases for job-stayers jumped by 9 percentage points (from 6% per month to around 18% per month). In addition, the average nominal wage change of job-stayers conditional on a change increased by about 4 percentage points in response to the inflation shock. Panel C also shows the analogous nominal wage change of job-changers in response to inflation. The nominal wages of job-changers increased by about 10 percentage points after the unexpected price level increase.[32] The model therefore replicates the empirical finding that the gap between the wage changes of job-changers and the wage change of job-stayers increased sharply during the recent inflationary period.

5.1.3. Disaggregated Wage and Worker Flow Dynamics. Figure 5.6 shows the time series pattern of job search, E-E flows, and real wages for workers at the top and bottom income quartiles within our model. Upon impact, lower productivity workers (1st quartile) increase their on-the-job search (Panel A) and, as a result, their job-to-job flows (Panel B) more than higher wage (productivity) workers. With the one-time shock, the difference in search behavior and E-E flows between the two groups upon impact is large. Because low-wage workers search more in response to inflation, their real wages recover more quickly (Panel C). In response to the one-time 13.5% unexpected price level shock, the real wages of bottom quartile workers recover within two years, with most of the gain occurring in the first twelve months. The real wages of top quartile workers, however, take almost four

[32]As discussed above, the nominal wage change of job-changers increases by less than 13.5% because the job-changers are now searching in markets with larger wage markdowns on average (as shown in Panel C of Figure 5.3).

years to fully recover. High-wage workers, therefore, have elevated on-the-job search—and subsequent E-E flows—for a much larger period of time than low-wage workers. We view it as a strength of our calibrated model that it replicates empirical labor market patterns for both the aggregate time series and separately for different wage quartiles during the recent inflationary period.

Figure 5.6: Heterogeneity in Job Search Effort, E-E Rate, and Real Wages



Panel A: Job Search by Productivity Quartiles | Panel B: E-E Rate by Productivity Quartiles | Panel C: Real Wages by Productivity Quartiles

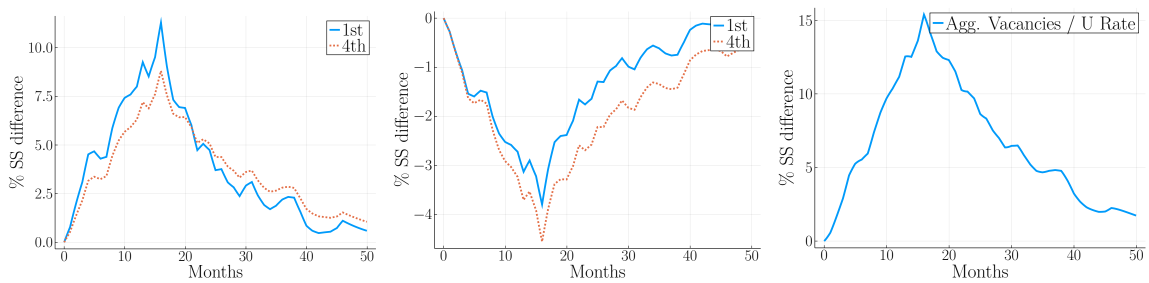
Notes: The figure shows the time series response of the job search effort, E-E rate, and real wages for workers in the bottom productivity quartile (solid blue line) and for workers in the top productivity quartile (dashed red line) in response to the unexpected price level increase.

5.2. Counterfactual 2: Series of Unexpected Price Level Shocks

In this subsection, we feed in a series of unexpected price level shocks so that it matches the actual time path of price level changes in the U.S. data during the April 2021 through December 2024 period. This counterfactual is designed to better match quantitatively how inflation has affected the time path of the various labor market outcomes. As a result, we compare the model predictions of this counterfactual to the empirical patterns documented in Section 2.

Panel A of Figure 5.7 shows the model implied response of E-E flows is roughly consistent with its empirical counterpart. For example, about 15 months after the inflation period started—which would be mid-2022—our model predicts that the E-E rate increased by 8-10% for both low- and high-wage workers relative to their steady-state levels. As seen from the data analog in Figure 2.2, the E-E rate for the overall economy increased from a rate of 2.24 percent per month in the pre-period to a rate of 2.57 percent per month in June 2022—a roughly 10% increase. Moreover, the quantitative predictions of our second counterfactual are also close to the survey responses reported in Stantcheva (2024). In particular, Stantcheva

Figure 5.7: E-E Rate, Real Wages and V/U Ratio



Panel A: E-E Rate   Panel B: Real Wages   Panel C: V/U Ratio

Notes: Figure shows the time series response of search effort among the employed (Panel A), E-E rates (Panel B), and wages (Panel C) for top (4th) and bottom (1st) quartiles of productivity in response to a series of unexpected price level shocks that match the inflation dynamics during the March 2021 to December 2024 period.

(2024) finds that roughly 9% of the workers in her survey reported that they actually changed jobs as a result of the recent inflation. The total additional E-E flows implied by our model in response to the recent inflation—which is calculated by integrating over the time paths shown in Panel A—is an additional 4.6 percent of employed workers.[33]

Panel B shows that our model implies that the recent inflation caused real wages of high- and low-wage workers to fall by about 4.5% and 3.5% relative to trend, respectively, as of mid-2022. Empirically, as shown in Figure 2.4, real wages fell by -5% and -3% for high- and low-wage workers in non-WFH sectors as of mid-2022. However, our model does not match the persistent decline in real wages observed in the data as the inflation rate returned towards steady-state levels. For example, as of December 2024, real wages for workers in non-WFH occupations were still 4% and 2% depressed relative to trend for high- and low-wage workers according to the Atlanta Fed Wage Tracker. Our model implies that after 45 months real wages for both groups should be almost back to their pre-trend levels.

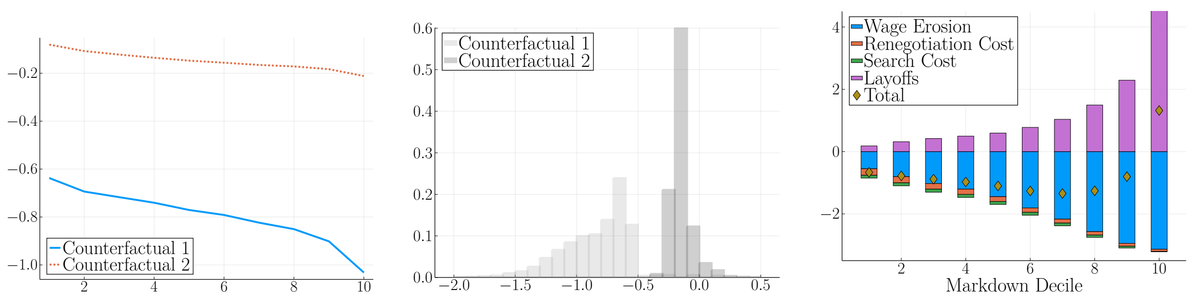
Panel C shows that our model implies that the vacancy-to-unemployment rate should have increased by 15% relative to its steady-state value as of mid-2022. The vacancy-to-unemployment rate actually increased by over 60% between late 2019 and mid-2022. As a result, our model is underpredicting the rise in vacancies observed in the data. A likely reason for this is that while our model is rich on many dimensions, we are missing a key

[33]The Online Appendix shows the evolution of both the U-E rate and the layoff rate under counterfactual 2. As in the data, the U-E rate did not change. The layoff rate fell, on average, by about 30% over the two years after the inflation shock started under counterfactual 2. The comparable number in the data was about 20%.

mechanism that can amplify the vacancy response. If there is a fixed sunk cost to posting an initial vacancy, replacement hiring can be an important component of labor market flows.[34] Incorporating a notion of replacement hiring could amplify the vacancy response from an inflationary shock. In fact, Bagga, Mann, Sahin, and Violante (2025) find that some notion of replacement hiring is needed to match the vacancy dynamics during the post-pandemic period in response to a shift towards working-from-home. Our framework shows that unexpected inflation can lead to a burst of vacancy creation even without any replacement hiring. However, we acknowledge that omitting such a mechanism results in our model underpredicting the actual empirical rise in vacancies observed during the inflation period.

5.3. Worker Welfare

Figure 5.8: Welfare Loss from Recent Inflation, in Units of One Month's Consumption



Panel A: Welfare Change by Income | Panel B: Welfare Distribution | Panel C: Welfare Decomposition

Notes: Panel A of the figure shows the welfare cost of the unexpected inflation shock for workers in different deciles of the worker income distribution under our two counterfactual scenarios. Results are shown in consumption equivalent units of monthly income. Panel B of the figure shows the distribution of welfare changes for all workers under both counterfactuals. The x-axis for this panel is again in consumption equivalent units of monthly income. Panel C shows the decomposition of welfare losses by markdown decile into its various components.

Panel A of Figure 5.8 shows the welfare response of workers across different initial wage deciles under our two counterfactual scenarios. We measure the welfare costs to workers in consumption equivalent units (in multiples of monthly real income before the shock); a

[34]For a discussion of how unfilled vacancies can retain positive value in equilibrium even under free entry, see, for example, Fujita and Ramey (2007) and Hornstein, Krusell, and Violante (2007). Both Elsby, Gottfries, Michaels, and Ratner (2025) and Mercan and Schoefer (2020) show that replacement hiring, which results when there is a fixed sunk cost associated with posting a vacancy, is an important component of total vacancies particularly during periods when there is significant worker churn due to quits.

welfare cost of 1.0 means a worker would be willing to give up one month of their pre-shock real wage to avoid the temporary increase in inflation. As seen from the figure, workers in all productivity deciles experience welfare losses by the unexpected increase in the price level under both counterfactuals, with higher-productivity workers consistently suffering larger losses than lower-productivity workers. Under the one-time shock scenario (counterfactual 1, solid blue line) the average worker experiences a welfare loss equal to approximately 80% of one month's income.

While counterfactual 1 primarily serves to illustrate the model's mechanisms, we consider the welfare results from counterfactual 2 (dashed red line) to provide a more accurate assessment of the actual welfare costs incurred during the recent inflation period. In this scenario, the average worker lost approximately one-fifth of monthly earnings due to inflation's effects in our sticky-wage model. For context, the median worker has an average annual real income of about $60,000 during this period, implying that the recent inflation reduced the welfare of the median worker by about $1000. This is also a very sizeable number. Given there are about 150 million workers in the U.S. labor market, the total loss to workers from the recent inflation was over $150 billion. As we show below, a substantial portion of these losses translates into gains for firms. Although we do not explicitly model firm ownership, incorporating this feature would moderate the losses for higher-income workers who typically hold the majority of firm equity.

Panel B reveals substantial heterogeneity in welfare losses underlying the patterns in Panel A. Consider the distribution of welfare losses from counterfactual 2 shown in the darker gray bars. Some workers lost over a half of one month's income in consumption equivalent terms, while others lost hardly anything. This variation is larger than the variation across income groups shown in Panel A. What drives the additional variation? The answer lies in the model mechanisms described in Section 3.3. For workers whose initial wage is to the right of point B on the worker value line in Figure 3.1, a burst of inflation can actually be welfare-increasing because it moves them further away from the layoff threshold. Specifically, inflation shifts their markdown from a point to the right of point B close to the layoff threshold to a point closer to point B, reducing their layoff risk. Consequently, workers initially close to the layoff threshold are the ones with the smallest welfare losses—or even welfare gains—in Panel B of Figure 5.8. There are very few workers close to the layoff margin in our calibration, but these are the ones with the welfare changes close to zero. Conversely, workers with the largest welfare losses are the unlucky workers who failed to receive a nominal wage adjustment, either because they did not receive a free wage adjustment opportunity or because they drew very large renegotiation costs.

With this in mind, the welfare effects for employed workers can be decomposed into four components: (i) workers receive real wage declines due to sticky wages in response to the inflation increase and their limited mobility across employers, (ii) workers have to incur search costs to increase their wage at other firms, (iii) workers have to incur renegotiation costs to increase their wage at their current firm, and (iv) workers benefit from lower layoff risk. Panel C of Figure 5.8 shows the decomposition of welfare losses for workers of differing initial wage markdown under our first counterfactual. We focus on this scenario because it provides the intuition of the model mechanisms discussed above. The diamonds positioned within each bar represent the total welfare effects, while the blue portion of the bars represents the direct effects of the real wage declines, the purple area represents the welfare gains from the declining layoff margin, and the green and orange areas represent the welfare losses from the incurred search and renegotiation costs, respectively.

Consistent with our discussion above, the welfare gains from the reduced layoff margins are largest for workers with the highest initial markdowns (top decile). These are the workers who are closest to the layoff margin. The markdown deciles are drawn based on the ex-ante markdown before the inflation shock, but the idiosyncratic productivity shocks move workers across the markdown distribution ex-post. Thus, all ex-ante markdown deciles derive some benefit from moving away from the layoff margin. The welfare losses from the increased search and renegotiation are small but non-negligible. The welfare loss incurred by the median worker from the sum of the renegotiation and search costs in counterfactual 1 is approximately 20% of the total welfare loss. This percentage is similar to what we estimate from counterfactual 2, where also 20% of the total welfare loss for the median worker is attributed to increased search and renegotiation costs.

5.4. Parameter Robustness, Alternate Mechanisms and Further Discussion

In this subsection, we provide a brief summary of the robustness of our results to different parameters, summarize how other shocks would affect labor market dynamics through the lens of our model, and discuss potential limitations of our model. A more detailed discussion of these issues is provided in the Online Appendix.

Parameter Robustness. In Online Appendix Section C, we investigate the sensitivity of our results to a variety of alternate parameter values. In addition, we implement the procedure of Andrews, Gentzkow, and Shapiro (2017) which highlights which of our empirical targets are important for determining our calibrated parameter values—measured by the magnitude of parameter elasticities to moments. Not surprisingly, the empirical distribution of nominal wage changes is important for pinning down the parameters governing the frequency and the cost of on-the-job nominal wage adjustments. The fact that these parameters are pinned down by the distribution of wage changes is of significance because the parameters governing nominal wage stickiness are crucial to both the response of real wages and vacancies to inflationary shocks. If nominal wages within a match were perfectly flexible, real wages and welfare would not fall, and vacancies would not rise in response to a large inflationary shock. Beyond the wage adjustment parameters, Online Appendix C also shows that the search effort-wage elasticity and the average 30-year wage growth moments are important for pinning down the cost elasticity of search (ϕ_s) and trend in productivity of employed workers (γ_e), respectively. Furthermore, the E-E flows and the U-E flows across the income distribution are important for determining both ϕ_k and ϕ_b, as well as for the parameters governing vacancy costs and home production. Finally, this section shows that the choice of many parameters such as the elasticity of the search cost function (ϕ_s) or the bargaining weight between workers and firms (τ) has little effect on our key results.

Potential Welfare Gains from Improving Match Quality. A strong assumption we made throughout is that output is only a function of worker productivity. In particular, we have abstracted from both firm-specific and match-specific productivity. Including such forces would not change the underlying mechanism in our model linking rising inflation to declining real wages, increasing worker churn and rising firm vacancies given nominal wage rigidities. However, allowing for match-specific capital would potentially alter our welfare calculations by providing another benefit of inflation to the economy. In related work, Pilossoph, Ryngaert, and Wedewer (2024) develop a model with nominal wage rigidities, frictional labor markets, costly worker search and match-specific productivity. Within their calibrated model, the increasing churn induced by the recent inflation does increase allocative efficiency in the economy but the aggregate welfare gains coming from this channel were quantitatively small during this period. The reason for the small effect in their counterfactual is that job-changers were only a small portion of the overall population and the productivity gains of the marginal movers induced by the inflation were relatively modest in magnitude.

Other Labor Market Shocks During the Inflation Period. In Online Appendix Section D, we show how various other labor market shocks—such as an aggregate TFP shock, a discount rate shock, a shock to vacancy posting costs, or a shock to the value of not working—affect labor market outcomes through the lens of our model. We show that none of these other shocks in isolation can explain the rise in aggregate vacancies while simultaneously matching the real wage dynamics of job-stayers and job-switchers as well as other labor market flows. For example, a positive TFP shock can match the large rise in the V/U ratio implied by our baseline model only if real wages also increase substantially, which is counterfactual to the data during this period. Likewise, a large positive demand-side shock (declining discount rate or declining vacancy cost) can match the large rise in the V/U ratio only if there is a corresponding large increase in the U-E rate and if the wages of both stayers and switchers are relatively constant in the short run. In summary, it is hard for other shocks to generate sharply rising vacancies, while real wages of job-stayers were falling both in absolute levels and relative to switchers.

The Underlying Cause of the Inflation and Labor Market Flows. In Online Appendix Section D, we also discuss how the proposed underlying drivers of the recent inflation period would have affected labor market dynamics. Rising oil prices and supply chain backlogs due to pandemic closures have similar effects on the labor market as a negative aggregate productivity shock. These negative supply shocks will reduce labor demand, putting downward pressure on the V/U ratio, E-E flows, U-E flows, vacancies, employment, and average real wage growth. Conversely, a positive aggregate demand shock due to increased government spending, expansive monetary policy, or pent-up demand from the pandemic would increase the demand for labor, putting upward pressure on the V/U ratio, U-E flows, vacancies, employment, and real wages. These two shocks at the center of many of the explanations for the current inflation have offsetting effects on labor demand. This could be a possible explanation for why aggregate employment (and GDP) did not change much during the current inflation period. If that is the case, the effects of inflation itself could be the primary driver of the real wage dynamics and labor market flows observed during the 2021-2024 period.

Economic Expansions and Declining Wage Inequality. It is well-known that periods of economic expansions are also periods where the bottom of the wage distribution improves relatively more than the top of the wage distribution.[35] Our quantitative framework shows that an

[35] See, for example, Okun (1972), Akerlof, Rose, and Yellen (1988), Katz and Krueger (1999), Aaronson, Daly, Wascher, and Wilcox (2019), and Autor, Dube, and McGrew (2024).

inflation shock can also generate a compression in the wage distribution between high and low wage workers. This is also consistent with the data during this period where the real wage declines were larger for higher wage workers. Autor, Dube, and McGrew (2024) attribute the convergence during this period to the economy being relatively hotter for lower wage workers resulting in increased competition for their labor services. They also show that lower wage workers were systematically moving to better jobs during the inflation period. Our model is a partial equilibrium exercise where we analyze an increase in the inflation rate all else equal. As a result, we cannot rule out that part of the reason that lower wage workers had smaller real wage declines or were moving to systematically better jobs was, in part, due to the fact that the aggregate labor demand shock was relatively more positive for lower wage workers. A combination of the nominal wage rigidity framework in our paper coupled with a higher relative aggregate demand story for lower wage workers can explain why the real wage declines of lower wage workers were smaller than higher wage workers. Such caveats should be kept in mind when interpreting cross-worker wage compression during this period.[36]

6 Inflation and the Vacancy-to-Unemployment Rate Over Time

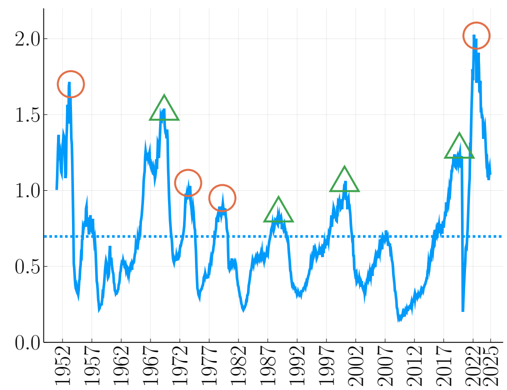
In the final section of the paper, we use historical U.S. data to systematically show that periods of high inflation are associated with an increase in vacancies, an increase in the vacancy-to-unemployment rate, and an upward shift in the Beveridge curve after controlling for the unemployment rate. We also show that these periods were also associated with a systematic rise in firm profits as predicted by our model. These patterns provide evidence that the link between inflation and labor market flows during the post-pandemic period is a broader feature of the U.S. labor market during the last half century.

Panel A of Figure 6.1 shows the monthly vacancy-to-unemployment rate in the U.S. between 1950 and 2024.[37] As seen from the figure, there are eight periods when the vacancy-to-unemployment rate spiked sharply relative to the average: the early-1950s, the late-1960s, the mid-1970s, the late-1970s, the late-1980s, the late-1990s, the late-2010s, and the post-pandemic period. Four of those periods—where the spikes in the vacancy-to-unemployment

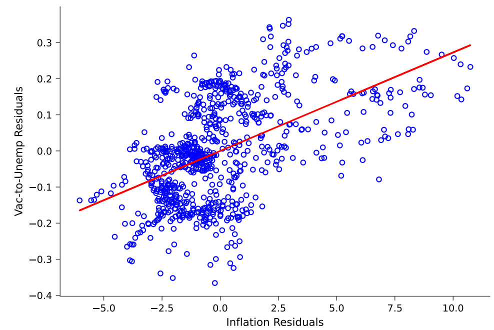
[36] Jäger, Roth, Roussille, and Schoefer (2024) show that lower wage workers systematically underestimate their outside option at other firms. When the increasing inflation generates churn, as in our model, it may induce lower wage workers to systematically find better matches relative to higher wage workers providing an additional reason why inflation generates wage compression.

[37] To make this figure, we use data on aggregate U.S. job vacancies produced in Barnichon (2010), who combines data from the Conference Board's Help Wanted Index and Help Wanted Online Index prior to 2000 with the JOLTS dataset after 2000 to make a harmonized monthly vacancy series for the United States.

Figure 6.1: Vacancy to Unemployment Rate and Inflation Over Time



Panel A:
V/U Ratio Over Time



Panel B: V/U Residuals
vs. Inflation Residuals

Notes: Panel A of Figure shows the evolution of the vacancy to unemployment rate between 1950 and 2024. The periods denoted with a triangle are the periods of high V/U ratio that are consistent with movements along a stable Beveridge curve. The periods denoted with circles are periods of high V/U rate that results from shifts in the Beveridge curve. See text for additional discussion. Panel B formalizes this relationship by plotting residualized monthly V/U ratios against residualized monthly year-over-year inflation rates for the 1950 to 2019 period. The residuals are computed by separately regressing both variables on the unemployment rate and the unemployment rate squared.

rate are denoted with the green triangles—are consistent with the traditional view that a rising vacancy-to-unemployment rate represents a tight labor market; these periods are ones where the economy was moving along a stable Beveridge curve. In particular, the underlying unemployment rate fell sharply as the vacancy-to-unemployment rate rose during each of these periods. These periods were also associated with relatively low and stable inflation rates; the inflation rate during the run up to the green triangle peaks was always less than 4%. However, the other four peaks (marked with a red circle) occurred during periods when the inflation rate was rising and at levels that were persistently above 7%. The unemployment rate was either high by historical standards (in the mid- and late-1970s) or was relatively constant (during the early 1950s and the 2021-2023 period); these periods, as we show below, are periods when the Beveridge curve shifted upwards. Notice that the four periods denoted with the red circles are also periods where it has been shown that aggregate supply shocks were important drivers of the observed inflation.[38]

[38]The inflationary period in 1950-1952 has been attributed to the start of the Korean War when households scrambled to buy many goods in case there was a return to WWII rationing and supply was constrained given the shift of production towards supporting the war (see Reed, 2014). The inflation in the mid-1970s has been linked to rising oil prices.

The above patterns suggest that there may be two proximate causes of a rising vacancy-to-unemployment rate. First, the rising vacancy-to-unemployment rate may be caused by a traditional tight labor market story such that labor demand (measured by vacancies) exceeded labor supply (measured by the unemployment rate). During these periods, a primitive positive shock to labor demand puts upward pressure on the vacancy-to-unemployment rate while at the same time putting downward pressure on the unemployment rate; this is the logic underlying movements along a standard downward-sloping Beveridge curve. However, during other periods, a large burst of inflation may cause excessive labor market churn as workers try to raise their real wages as nominal wages are rigid.[39]

To formally show that high inflation rates can cause a systematic upward shift in the Beveridge curve, we estimate the following equation using U.S. monthly data between January 1951 and December 2019 (prior to the start of the global pandemic):

$$y_t = \alpha_0 + \alpha_1 \times unemp_t + \alpha_2 \times unemp_t^2 + \beta \times \pi_t + \epsilon_t, \tag{15}$$

where y_t denotes either the vacancy rate or the vacancy-to-unemployment rate in period t depending on the specification. We define $unemp_t$ as the monthly unemployment rate (in percent) and π_t as the monthly year-over-year inflation rate (in percent). To allow for a potential non-linear Beveridge curve, we also include the square of the monthly unemployment rate in some specifications. The relationship between the vacancy rate and the unemployment rate is the traditional Beveridge curve. By including π in the regression, we are assessing whether higher inflation is systematically associated with an upward shift in the Beveridge curve conditional on the unemployment rate.

The results of estimating these regressions are reported in Table 4. Columns (1)-(3) show the results when the dependent variable is the vacancy rate; these regressions explore whether inflation systematically shifts the Beveridge curve. Columns (4)-(6) have the vacancy-to-unemployment rate as the dependent variable. As seen in columns (1) and (4), the unemployment rate itself is a strong predictor of movements in both the vacancy rate and the vacancy-to-unemployment rate. The former is the well-documented Beveridge curve relationship, while the latter finds that market tightness increases when the unemployment rate is low—the traditional tight labor market story.

Columns (2) and (5) highlight the main contribution of our paper. In particular, the

[39] In fact, Hyatt (2015) shows data on job-to-job flows from 1975 through 2013 using data from the Current Population Survey. He documents that job-to-job flows were at their highest level during this 38-year period period during 1979; this was a time when the inflation rate was approaching its highest level in modern U.S. history.

results in these columns show that higher inflation results in an upward shift in the Beveridge curve by increasing vacancies conditional on unemployment (column (2)) and results in an increase in the V/U rate conditional on unemployment (column (5)). For example, the regression shows that an increase in the inflation rate by 10 percentage points increases the vacancy-to-unemployment rate by 0.24 percentage points. This is a large effect given that the average vacancy-to-unemployment rate during this period is about 0.7. As a reminder, these regressions are estimated using data prior to 2020, suggesting that the link between inflation and vacancies is a common feature of U.S. labor markets during the last 75 years. Finally, columns (3) and (6) show that the inflation results persist even when we allow for a non-linear Beveridge curve by including the square of the unemployment rate in the regression.

Table 4: Historical Beveridge curve Estimation

	Vacancy Rate			Vacancy-Unemp Rate		
	(1)	(2)	(3)	(4)	(5)	(6)
Unemp. Rate (%)	-0.261	-0.301	-0.545	-0.154	-0.160	-0.542
	(0.015)	(0.013)	(0.076)	(0.004)	(0.003)	(0.015)
Unemp. Rate Sq.			0.019			0.030
			(0.006)			(0.001)
Inflation Rate (%)		0.149	0.151		0.024	0.027
		(0.007)	(0.007)		(0.002)	(0.001)
R^2	0.26	0.50	0.51	0.68	0.73	0.85

Notes: The table shows the coefficients from the estimation of equation (15). Each observation is a month between January 1951 and December 2019. Robust standard errors are in parenthesis.

Panel B of Figure 6.1 plots the partial effect of inflation on the vacancy-to-unemployment rate during the 1950-2019 period in graphical form. In particular, we regress the monthly inflation rate on the monthly unemployment rate and the unemployment rate squared and take the residuals from this regression; we denote this by the residualized inflation rate. We then repeat these steps for the vacancy-to-unemployment rate and plot the two residuals against each other. The slope of the line through the scatter plot is the same as the inflation regression coefficient in column (6) of Table 4. The benefit of the figure is to show that the inflation coefficients in the above table are not being driven by outliers. It is worth noting that the points in the upper-right quadrant of this figure all originate from months either during the 1970s or the early 1950s.

Lastly, consistent with our sticky wage model, the corporate profit-to-GDP ratio also systematically increases during inflationary periods. Specifically, between 1950 and 2000, there were only four periods when the corporate profit to GDP ratio exceeded 7%; three of those were the early 1950s, 1974, and 1979. Additionally, in mid-2022, the corporate profit to GDP ratio was at 12%, which was the highest level during the prior 75 years. In Appendix Table B.5 and Appendix Figure B.15 of the online appendix, we show that the corporate profit to GDP ratio systematically increases during periods of inflation conditional on the unemployment rate and, relatedly, there is a strong positive relationship between the residualized corporate profit share and the residualized inflation rate in U.S. data during the last 75 years.

7 Conclusion

The dramatic recent increase in the vacancy-to-unemployment rate has renewed interest among both academics and policymakers about the causal effect of tight labor markets on inflation. In this paper, we develop a model that combines elements of modern frictional labor markets with nominal wage rigidities to show that the causation can flow in the opposite direction: High unexpected inflation can drive a rise in the vacancy-to-unemployment rate, creating the appearance of a tight labor market even as real wages fall. Calibrating the model with pre-2020 data, we show our model successfully matches trends in worker flows and wage changes during the 2021-2024 period where the only underlying shock is a rise in inflation. We provide additional evidence of our model mechanisms using historical data. In particular, prior periods of high inflation within the United States were systematically associated with increases in vacancies, an upward shift in the Beveridge curve, and rising firm profits.

We also use the calibrated model to compute the welfare losses to U.S. workers generated by the recent inflation. Our conservative estimate finds that the average worker cumulatively lost approximately one-fifth of one month's consumption stemming from the 2021-2023 inflation, equivalent to about $1000 for the average worker. Most of the welfare loss stems from the real wage declines given nominal wages are sticky, which effectively transfers resources from workers to firms. Our framework, therefore, also provides a rationale for the historically high profit rate of U.S. firms during the recent inflation period. However, we also identify additional real costs and benefits from the recent inflation above and beyond the transfer between workers and firms: Workers are made worse off by the additional search and renegotiation costs incurred to escape the nominal wage rigidity, but benefit from inflation-induced reductions in layoffs.

The goal of our paper is not to explain the causes of the recent inflation, but rather to assess how inflation itself can causally affect labor market dynamics. Nevertheless, the underlying causes of 2021-2023 inflation have their own direct effects on the labor market. Negative aggregate supply shocks due to pandemic-induced supply chain bottlenecks will increase prices but reduce labor demand, firm vacancies, and real wages. Conversely, positive aggregate demand shocks due to increased government spending and deferred consumption from the pandemic will also increase prices but increase labor demand, firm vacancies, and real wages. While both of these broad shocks have been identified as important drivers of the recent inflation, they have offsetting effects on the labor market. It would be fruitful for future work to develop a model that incorporates how both of the underlying causes of inflation directly affect labor outcomes alongside our innovation of incorporating the direct effect of inflation on the labor market highlighted in this paper. Additionally, to fully account for the labor market dynamics during this period, it would be desirable to account for the recent amenity of being allowed to work from home as in Bagga, Mann, Sahin, and Violante (2025). Their framework can explain why the real wages of high productivity workers—who are more likely to work from home—remain significantly depressed relative to trend even by late 2024, a phenomenon our model cannot explain. Ultimately, all of these forces—the direct effect of inflation on the labor market, the effect of the shocks that caused the inflation, and the effects stemming from the innovation in working from home—jointly determined labor market flows and wages during this period.

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