A Theory of How Workers Keep Up With Inflation*

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Abstract

In this paper, we develop a model that combines elements of frictional labor markets with nominal wage rigidities to assess the link between inflation and worker well-being. Costly worker search effort and sticky wages increase firm market power in response to an unexpected burst of inflation, leading to an initial drop in real wages. The decline in real wages incentivizes workers to take costly actions such as looking for a new job or renegotiating their wages with their employer. Differing labor supply elasticities across worker types imply that inflation's welfare costs will also vary across workers. Calibrating with pre-2020 data, we show the model matches well trends in worker flows and nominal wage changes during the 2021-2024 period. We find that the recent inflation in the United States, all else equal, reduced welfare for workers at the bottom and top deciles of the wage distribution by 58% and 79% of monthly real income, respectively. We also show that our quantitative model matches the dynamics of the Beveridge Curve during the last few years by generating a large number of vacancies to accommodate the increased labor market churn among employed workers without a significant change in unemployment. Finally, we compare the predictions of our model where inflation causes labor market dynamics to alternate "hot labor market" theories where labor market dynamics cause wage and price inflation.

JEL Codes: E24, E31, J31, J63
Key Words: Inflation, Vacancies, Job-to-Job Flows, Beveridge Curve, Wage Growth

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1 Introduction

Between 2000 and 2019, U.S. price inflation averaged about 2.2 percent per year. However, during the 26 months spanning April 2021 and May 2023, the cumulative U.S. inflation rate was over 14%. The recent inflation surge was accompanied by rising nominal wages and an increasing vacancy-to-unemployment ratio, suggesting a potentially tight U.S. labor market. Such observations have led to renewed interest among academics and policymakers about the link between labor markets and inflation.[1] At the same time, workers report a strong dislike of the recent inflationary period and perceive its impact on their well-being to be negative.[2] The juxtaposition of a seemingly "hot labor market" with such a strong dislike of inflation among workers raises two questions: Why do workers report hating inflation so much if the labor market is also running hot? Can a burst of inflation, all else equal, make it *appear* that labor market tightness has increased even when there were no other labor market shocks?

In this paper, we fill a gap in the literature by exploring both theoretically and quantitatively the role of "inflation shocks" on the distribution of worker well-being in a modern macro-labor model.[3] In particular, we incorporate nominal wage rigidities into a model with heterogeneous workers and frictional labor markets with many types of endogenous worker flows (quits, layoffs, and on-the-job search) to explore the effects of inflation on worker wages and welfare. In this environment, a burst of inflation, all else equal, reduces real wages on impact. In order to have their real wages keep up with inflation, workers can take steps to renegotiate their wage with their existing firm at a cost, search more intensely for another job where they could contract over an updated real wage, or simply quit to unemployment if they find their eroded wages to be too low.

Our framework has three implications for how inflation affects worker well-being. First, it implies that firms' labor market power increases in periods when inflation unexpectedly occurs resulting in larger wage-markdowns as labor supply is relatively inelastic in short-run. Second,

[1]See for example, Blanchard (1986), Lorenzoni and Werning (2023a,b), Benigno and Eggertsson (2023) for a discussion of the link between aggregate demand and the labor market that could generate wage-price spirals.

[2]Stantcheva (2024) surveyed a large sample of Americans between December 2023 and January 2024 about their views on the current inflationary period. She finds that workers report that the current inflation made them worse off because they "do not perceive their wage increases sufficiently to keep up with inflation rates". Similar results are found in Shiller (1997) for an earlier period. Afrouzi, Dietrich, Myrseth, Priftis, and Schoenle (2024) provides consistent but causal evidence that erosion of wages by inflation leads workers to prefer lower inflation rates for the economy. Also, likely voters in the 2024 U.S. elections report that inflation is their most serious concern (Ballard, 2024).

[3]In the model, the "inflation shock" will be a monetary shock that generates inflation. The goal of the paper is not to explain the causes of the current inflation but, instead, to assess how inflation affects labor market dynamics, all else equal.

it implies that the true welfare costs of inflation on worker well-being need to incorporate both the initial real wage declines as well as the costly actions incurred by workers to have their real wages keep up with inflation. Third, our model highlights how inflation can cause a rise in the vacancy-to-unemployment ratio creating the appearance of a tight labor market without any additional labor market shocks. Quantitatively, we show that the inflation shock reduced the present value of worker utility by 58% of monthly real income for low-wage (bottom decile) workers and 79% of monthly real income for high-wage (top decile) workers. We also provide empirical support for the causality implied in our model that is distinct from the hot labor market stories. Consistent with U.S. data during the 2021-2023 period, our model generates a large fall in real wages for workers throughout the wage distribution, little change in the aggregate employment rate, and a relatively constant job-finding rate of the unemployed; shocks that actually create a "hot" labor market have trouble matching these patterns.[4]

We begin the paper by documenting a series of facts about the U.S. labor market during the recent inflation period. We use these facts to both motivate the elements we include in the model and to evaluate the success of our model by its ability to match these facts. Using data from the *Job Openings and Labor Turnover Survey* (JOLTS), we show that the layoff rate plummeted by roughly 20%, the quit rate jumped by roughly 20%, and the vacancy rate jumped by roughly 50% starting in April 2021 relative to the 2016-2019 period. We show that the monthly quit rate and the monthly vacancy rate were very closely correlated with the monthly inflation rate during this period. The quit and vacancy rates were the highest when the inflation rate was the highest; as the inflation rate returned to 3% during the last year, the quit rate and vacancy rate returned to their pre-period levels. Importantly, we also show that there was no change in the job-finding rate of the unemployed during this period. Using data from the *Current Population Survey*, we document that E-E flows jumped for individuals throughout the income distribution during the inflation period with the increase being largest for lower-wage workers. Finally, we show that compared to the pre-period, nominal wage growth grew much more for job-changers than job-stayers. Overall, the median worker had a real wage that was 4% lower in mid-2024 relative to mid-2021; accounting for normal trend wage growth, the real

[4] Academics and policymakers usually refer to the labor market as "hot" when job-openings increase sharply relative to the unemployment rate. The implicit assumption often made is that the hot labor market is driven either by increasing labor demand which increases firms' desire to hire workers at prevailing real wages or a reduction in labor supply which reduces individuals' desire to work at prevailing real wages. One of the key takeaways of our paper is that inflation can cause a rising vacancy-to-unemployment ratio without any additional underlying shocks to labor demand or labor supply. In periods of rising inflation, the increase in the vacancy-to-unemployment need not be a signal that the labor market is "hot".

wage for the median worker was 8% below where it should have been in 2024 relative to 2021. The decline in the real wage was larger for higher-wage workers relative to lower-wage workers.

Motivated by these patterns, we develop a model that mixes elements of modern theories of labor market flows with frictions in nominal wage adjustments. In particular, the model includes elements of sticky wages from the New Keynesian literature with lack of two-sided commitment on the side of both workers and firms. The model has endogenous quits, layoffs and job-to-job transitions, some of which are inefficient given the nominal rigidities and the lack of commitment.[5] Our model assumes nominal wages are rigid within a match and postulates two main channels for employed workers to overcome the stickiness of their nominal wages. First, for workers who remain with their employer, their wages can adjust to a level that is not greater than the long-run target inflation rate with no additional utility cost; we model this adjustment process with an exogenous Poisson arrival rate. Additionally, workers can pay a fixed cost that allows them to adjust their real wage at any time. Second, we assume that the wages of new hires are fully flexible, meaning that workers can also adjust their nominal wages by searching on the job (also at a cost) and potentially moving to a match with a new employer. Job search is frictional and directed on the part of both workers and an infinite mass of homogeneous firms. Finally, we assume that the flow benefits to the non-employed are set in real terms.

To examine how welfare of different workers responds to an unexpected temporary burst of inflation, the model includes heterogeneous worker types who differ by their latent productivity. In addition to ex-ante heterogeneity, the productivity of the employed (unemployed) evolves over time according to i.i.d. Brownian motions with positive (negative) drift. We also allow the worker's flow benefits of non-employment to flexibly scale with worker productivity. For example, we allow for the possibility that the wages of low productivity workers are, on average, closer to or farther away from the outside option of non-employment; later letting the data speak to either of these possibilities. In a similar vein, we also allow vacancy posting costs to flexibly scale with worker productivity. This allows for the possibilities that it is either more or less expensive to hire a high-productivity worker relative to a low-productivity worker. As discussed below, we discipline these scaling factors with micro data on differences in job-finding rates and job-to-job flows across the wage distribution. The possibility that the value of non-employment and the cost of posting a vacancy differs by productivity allows for the elasticity of worker flows

[5]Recently, Blanco, Drenik, Moser, and Zaratiegui (2024) illustrates how adding in nominal wage rigidities and two-sided lack of commitment into otherwise standard modern models of frictional labor markets can generate inefficient job separations. Our framework shares many of the insights about inefficient separations when nominal wages are sticky as highlighted in Blanco, Drenik, Moser, and Zaratiegui (2024).

in response to labor market shocks to differ across worker types.

On the methodological front, the model requires solving a two-sided mean field game where every worker plays a Markov strategy against a continuum of firms and vice versa. Workers' strategies consist of which market to enter while unemployed, and once within a match, when to negotiate, when to quit, or when to search for a new job. Firms' strategies are when to layoff their employed workers. A technical contribution of our paper is to recast the strategic interaction between heterogeneous firms and employed workers as a stochastic non-zero sum game—since the surplus of a match is non-zero—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.

We use a variety of microdata sources in the years prior to 2020 to estimate and calibrate the key parameters of our model. For example, the extent to which the job-finding rate of the unemployed (U-E rate) and the job-switching rate of the employed (E-E rate) varies by deciles of the income distribution helps to discipline the extent to which the vacancy posting costs and flow benefits of non-employment vary with productivity. Administrative payroll data on the frequency of wage changes and the distribution of the size of wage changes help to calibrate the parameters governing nominal wage rigidities. Data on average E-E flows, U-E flows, the quit rate, the vacancy rate, and the unemployment rate pin down other key parameters governing exogenous separations and worker search costs. The calibrated model matches additional non-targeted moments. In particular, our calibrated model implies that the average wage markdown is larger for higher-productivity workers relative to lower-productivity workers. The reason for this is that low wage workers are more elastic to labor market shocks giving the firms less market power over these workers; we estimate that lower productivity workers are closer to their outside option and that firms are willing to post more vacancies for such workers given that the costs of doing so are lower. The model prediction that wage markdowns are larger for high-wage workers is consistent with the empirical estimates using Danish microdata in Chan, Mattana, Salgado, and Xu (2023).

Using the calibrated model, we find that the temporary inflation experienced in the U.S. during the 2021-2023 period reduced the average welfare of workers in all deciles of the income distribution. The losses were greatest, however, for higher wage workers who are relatively more inelastic; workers in the bottom decile, the median decile and top decile of the wage distribution experienced welfare losses from the current inflation of 58%, 66% and 79% of monthly real income, respectively. Additionally, even though we calibrate the model to data prior to 2020, we show that only feeding an appropriately sized inflation shock into our model generates time series patterns of firm layoffs, worker flows, vacancies, and wages that match closely the actual data. The model also shows that firms are better off from the burst of inflation because their market power increase; this finding is consistent with the historically high corporate profits to GDP ratio experienced by US firms during the 2021-2023 period. Lastly, we show that a substantive portion of the welfare losses come from workers having to incur costly search and renegotiation costs.

Our model also matches the upward shift in the Beveridge Curve observed in the US economy during the last few years. The Beveridge Curve plots the time series relationship between the unemployment rate and the vacancy rate. In particular, our model predicts a large jump in vacancies due to increased E-E churn caused by rising inflation with little change in the aggregate unemployment rate. To that end, our paper provides additional supporting evidence for the model developed in Cheremukhin and Restrepo-Echavarria (2023) which highlights 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.[6]

Finally, we end the paper by discussing how the predictions of our model are distinct from the predictions of alternate "hot labor markets" theories put forth to explain recent labor market dynamics. For example, recent papers by Benigno and Eggertsson (2023) and Autor, Dube, and McGrew (2024) point to the fact that the vacancy-to-unemployment rate increased as evidence that the U.S. labor market during the 2021-2023 period was tight. As noted above, our model highlights that a pure inflation shock can generate an increase in vacancies with little effect on unemployment stemming from the increase in E-E flows. The increase in the vacancy-to-unemployment ratio occurs despite there being no actual underlying shocks that put upward pressure on worker real wages. Other aspects of the U.S. data suggests that the labor market was not hot during this period. In particular, as noted above, during the inflation period: (i) real wages fell substantively for workers of all productivity levels, (ii) employment rates did not increase, and (iii) the job-finding rate of the unemployed did not increase. We show that shocks that move aggregate demand (a discount rate shock), productivity shocks, and shocks to the efficiency of the matching function all generate aspects of a hot labor market where worker real wages, employment and/or the job-finding rate of the unemployed increase.

[6]Cheremukhin and Restrepo-Echavarria (2023) provide theoretical and empirical evidence using historical data showing that the Beveridge Curve steepens in periods when E-E flows are relatively high, all else equal.

This evidence suggests that the causation implied in our model can make it appear that the labor market was hot (by increasing vacancies relative to unemployment) without underlying forces that would increase worker's real wages as in the hot labor market stories. Our model is consistent with the fact that a combination of recent supply chain disruptions, energy price increases and increased aggregate demand from Pandemic related policies put upward pressure on prices but had relatively offsetting effects on labor demand.[7] However, our model highlights how the inflation itself can generate declining welfare for workers and increased labor market churn. Our model provides a theoretical rational for the survey findings in Stantcheva (2024) while at the same time providing an explanation for how increasing job-to-job churn can cause a rise in the vacancy-to-unemployment ratio making it appear that the labor market was running hot.

Two contemporaneous papers also explore the effects of recent inflation on U.S. labor markets. Both papers provide survey evidence that helps to motivate the framework developed in this paper. Pilossoph and Ryngaert (2023) use data from the New York Fed's *Survey of Consumer Expectations* to show that employed workers who expect higher inflation are (i) more likely to search for another job and (ii) subsequently more likely to quit and take a job at another firm. The authors also fielded a new survey to assess how nominal wages and search behavior would respond to various inflation scenarios. Pilossoph and Ryngaert (2023) then calibrate a model with nominal wage rigidities and costly worker search behavior to show how an increase in inflation expectations can match the patterns from their survey. The survey evidence in Pilossoph and Ryngaert (2023) provides supporting evidence for the link between inflation and worker E-E flows that are at the center of our framework.

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 activity. They find that about one-fifth of all workers engaged in costly actions to raise their wage during the recent inflation period. They also document that workers who did not engage in costly actions believe that their wage growth would have been higher if they had. This latter finding is consistent with our modeling choice of having a fixed cost associated with on-the-job renegotiating of wages between workers and firms. Guerreiro, Hazell, Lian, and Patterson (2024) develop a framework with nominal wage rigidities and costly renegotiation of wages that are

[7] Lorenzoni and Werning (2023a,b) and Bernanke and Blanchard (2024) highlight the importance of commodity price increases, supply disruptions and sectoral reallocation in explaining the recent rise in the U.S. price level.

consistent with their survey evidence. Despite having a stylized labor market model, their broad conclusions are similar to one of ours. In particular, they conclude that workers experience declining welfare during inflationary periods even when their real wages remain constant given that they had to incur the conflict costs to prevent their real wage from falling.[8]

The remainder of the paper is organized as follows. In Section 2 we document a series of facts about labor market flows and wages during the recent inflationary period. Section 3 develops our model of how workers keep up with inflation. We discuss the estimation, calibration and steady-state properties of our model in Section 4. Section 5 presents the results from our calibrated model to unexpected temporary changes to inflation. Section 6 discusses potential alternate mechanisms for the observed labor market flows including those that generate a tight labor market. The last section concludes.

2 Wages and Labor Market Flows During the Recent U.S. 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 annualized CPI inflation rate exceeded 4%. The cumulative price level increase exceeded 14% during this 26 month period. As way of comparison, the inflation rate in the United States averaged 2.2% per year during the 2000-2019 period and averaged 3.3% during the post-inflation period of May 2023 through June 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. Using detailed microdata from the *Current Population Survey* (CPS), we further show how these patterns evolved for individuals at different parts of the income distribution. 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.

2.1. Quits, Layoffs, and Vacancies During the Inflation Period

Figure 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*

[8] Our paper also contributes to a growing literature merging together elements of New Keynesian models with modern models of frictional labor markets. See, for example, Christiano, Eichenbaum, and Trabandt (2016) and Moscarini and Postel-Vinay (2023) who both incorporate search and matching labor market frictions into medium-scale DSGE models.

Turnover Survey (JOLTS).[9] 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: The *layoff rate* reflects all workers who were involuntarily terminated by a firm during a given month divided by total monthly employment. Involuntary terminations include workers laid-off with no intent to rehire; workers fired or discharged for cause; workers whose discharge resulted from mergers, downsizing, or firm closings; and seasonal workers discharged at the end of the season. Panel A of Figure 1 shows the time series trend in the layoff rate prior to, during, and after the inflation period.[10] Between January 2016 and December 2019 (which we refer to throughout this section as 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 levels since the JOLTS data started in 2000. Relative to the pre-period, firms terminated workers at a much lower rate during the inflation period. Interestingly, the layoff remains depressed during the "post-period" even as the inflation rate has returned to 3% during the last year. Our model will be able to replicate the trends in the layoff rate during both the inflation period and the post-inflation period.

Quit Rate: The *quit rate* reflects workers who left voluntarily during the month divided by total employment at the end of the month. Panel B of Figure 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 almost returned to their 2016-2019 levels. Panel A of Figure 2 highlights the close relationship between the monthly CPI inflation rate and the monthly quit rate during this period. Each observation in the figure is a month during the 2016 to 2024 period. As seen from Panel A, there is a strong positive relationship between monthly price inflation and the monthly quit rate. A simple linear regression through

[9] A detailed discussion of all data used in this section can be found in the Online Appendix. For this figure, we downloaded the data directly from the United State's *Bureau of Labor Statistics* (BLS) (https://www.bls.gov/jlt/data.htm).

[10] 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. In March and April of 2020, the layoff rate jumped to 9.0% and 7.0%, respectively.

Figure 1: Layoff Rate, Quit Rate and Job Opening Rate 2016-2024, JOLTS Data

Panel A: Layoff Rate

Panel B: Quit Rate

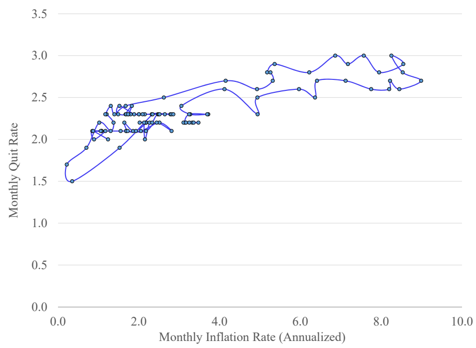
Panel C: Vacancy Rate

Notes: Figure shows the layoff rate, the quit rate, and the vacancy rate for the U.S. economy from January 2016 through May 2024 using the BLS's JOLTS data. The shaded years are what we designate as the inflation period. The dashed red lines show the average of the series during the 2016-2019 period and then separately during the inflation period. See the online appendix for additional details of the data construction.

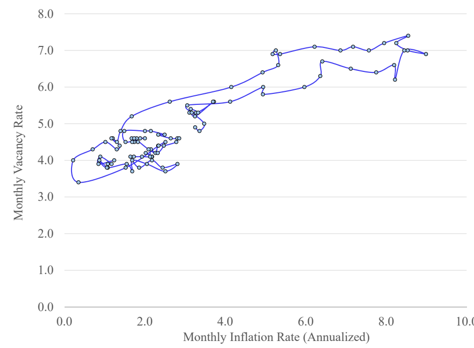
the scatter plot finds that a 1 percentage point increase in the inflation rate is associated with a 0.103 percentage point increase in the quit rate (standard error = 0.007); the R-squared of the regression was 0.70. The model developed below highlights how a burst of inflation can endogenously cause the quit rate to increase.[11]

[11]The quit rate 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). Ellieroth and Michaud (2024) document that quits to non-employment did not increase during the 2021-2023 relative to the 2016-2019 pre-period. This suggests that the increasing

Figure 2: Monthly Inflation vs Monthly Labor Market Flows



Panel A: Quit Rate vs. Inflation Rate



Panel B: Vacancy Rate vs. Inflation Rate

Notes: Figure shows a scatter plot of the monthly CPI inflation rate vs the monthly quit rate (Panel A) and the monthly vacancy rate (Panel B). Each observation is a month between January 2016 and May 2024. The quit and vacancy rates are obtained from JOLTS while the inflation numbers are from the BLS'S CPI for urban consumers. See the online appendix for additional details of the data construction.

Vacancy Rate: The *vacancy rate* (or job-opening rate) is the the number of open positions on the last business day of the month divided by the sum of employment and vacancies on the last day of the month. Panel C of Figure 1 shows the time series patterns of the vacancy rate, which closely follows the time series patterns of the quit rate; firms often post a vacancy to replace workers who quit. The average monthly vacancy rate jumped from 4.25% per month during the 2016-2019 period to 6.65% per month during the inflation period. Panel B of Figure 2 shows the tight relationship between the monthly CPI inflation rate and the monthly vacancy rate over the entirety of the 2016 to 2024 period. This figure is analogous to the Beveridge curve but with the price inflation rate on the x-axis instead of the unemployment rate. While there has been a well-documented breakdown of the Beveridge curve during the last few years, the relationship between the inflation rate and the vacancy rate remained relatively stable during this time period. In particular, a simple linear regression through the scatter plot finds that a 1 percentage point increase in the inflation rate is associated with a 0.438 percentage point increase in the vacancy rate (standard error = 0.020); the R-squared of the regression was

quit rate was driven by job-to-job transitions. We show evidence for this below.

0.83. Again, the model we develop highlights that unexpected bursts of inflation can cause vacancies to increase holding the unemployment rate fixed thereby providing an explanation for the Beveridge Curve dynamics during the last few years.

2.2. Worker Flows During the Inflation Period

In this sub-section, we use data from the *Current Population Survey* (CPS) to measure time series patterns in employer-to-employer transitions between two adjacent months (E-E flows) and the unemployment-to-employer transitions between two adjacent months (U-E flows) during the 2016 to 2024 period. For these flows, we use the monthly CPS files. The CPS data allows us to isolate the portion of worker quits documented above driven by E-E flows. Moreover, the detailed CPS micro-data permits us to measure changes in worker flows for individuals at different part of the income distribution during the inflation period.[12]

E-E and U-E Flows, Aggregate: Panel A of Figure 3 shows the time series of the monthly E-E rate during the 2016-2024 period averaged at the quarterly frequency. In the 2016-2019, the average E-E rate was about 2.30% per month. During the 26-month inflation period, the E-E rate jumped to an average of about 2.42% per month (p-value of difference < 0.01). In mid-2022, the E-E rate peaked at about 2.55% 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. The high inflation during the last few years is associated with an increase in E-E churn among workers. During the last few months – in the post-inflation period – E-E flows have returned to pre-period levels.

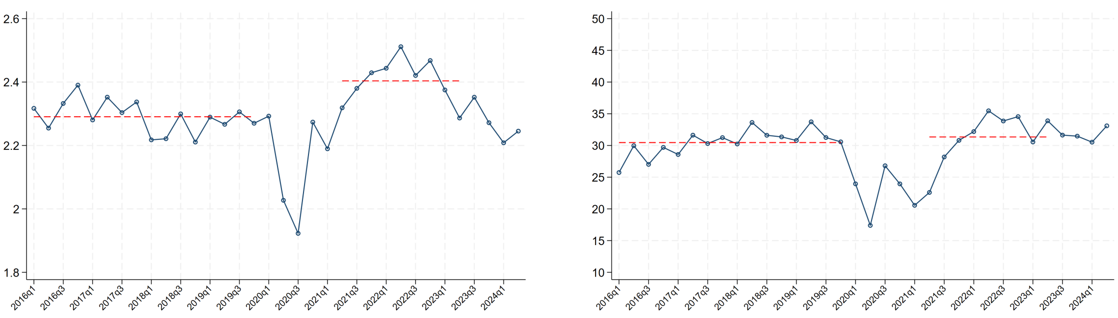
Panel B of Figure 3 shows the time series patterns for monthly U-E flows during 2014-2024 also averaged at the quarterly frequency. The monthly U-E rate (job-finding rate) measures the share of unemployed workers who transition to employment during a given month. There was no statistically significant change in the U-E rate between the pre-period and the inflation period. Unemployed workers found finding employment in a given month at roughly the same 31% rate during both the inflation period and the pre-period.

E-E Flows, By Education: Table 1 shows the change in the E-E rate during the pre-inflation period and the September 2021 through December 2022 period by education group.[13] We use

[12] For this analysis, we follow the procedure of Shimer (2005) to define U-E flows in the CPS so they are consistent with the aggregate unemployment rate. Additionally, we follow the procedure of Fujita, Moscarini, and Postel-Vinay (2024) to measure E-E flows in the CPS. See the online appendix for additional details.

[13] We highlight the change in the E-E rate during a subset of the inflation period given that, as seen in Figure 3, this is the period when E-E rates were the highest.

Figure 3: E-E and U-E Flows 2016-2024, CPS Data



Panel A: E-E Rate

Panel B: U-E Rate

Notes: Figure shows the time series pattern of monthly E-E flows (Panel A) and U-E flows (Panel B) averaged at the quarterly frequency using data from the CPS. Each observation is a quarter between January 2016 and May 2024. See the online appendix for additional details of the data construction. The dashed red lines provide the average flows during the 2016Q1-2019Q4 and the 2021Q2-2023Q2 periods.

education group as a proxy for the individual's position in the income distribution. The figure documents that the change in the E-E rate was not constant throughout the income distribution. Lower educated (lower income) individuals had a much larger change in the E-E rate (0.23 percentage points) than did higher educated (higher income) individuals (0.11 percentage points). Any model of the the inflationary effects on labor market flows needs to allow for the fact that the response may differ for individuals at different parts of the income distribution.

2.3. Nominal and Real Wage Growth During the Inflation Period

The above data shows that quits and E-E transitions increased dramatically during the inflation period, particularly for lower educated (lower income) workers. In this subsection, we use data from *ADP Pay Insights* to examine the wage 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 the ADP data, ADP can track the components of compensation over time both for workers who remain with the same firm and for workers who transition from one firm to another.[14] We additionally use wage data from the CPS to measure

[14]ADP Pay Insights has much larger samples and essentially no measurement error in wage measures which makes it more ideal to measure wage changes for job-changers and job-stayers than the CPS data. We downloaded the data from ADP Pay Insights directly from `https://payinsights.adp.com/`. For additional information on how the ADP payroll data can be used to measure changes in compensation over time for the US population, see Grigsby, Hurst, and Yildirmaz (2021). ADP Pay Insights only publishes aggregate annual earnings growth data

Table 1: Change in E-E Flows by Education during Inflation Period

Education	2016M1-2019M12	2021M9-2022M12	Change
Less than Bachelors	2.34%	2.57%	0.23 p.p. (0.04)
Bachelors or More	2.22%	2.33%	0.11 p.p. (0.05)

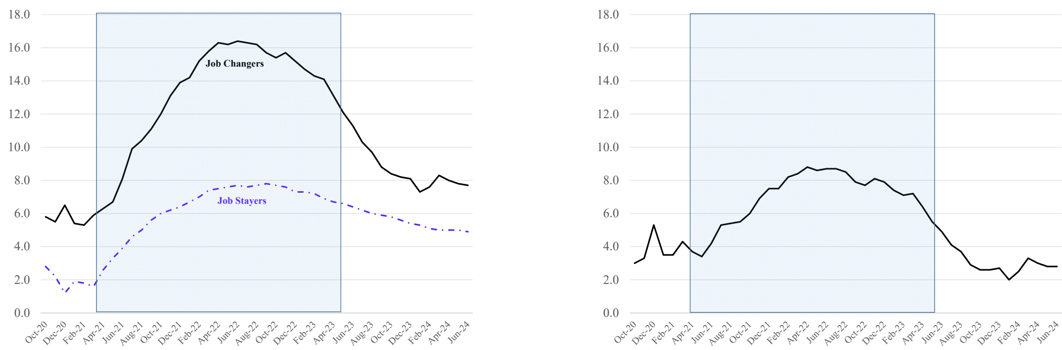
Notes: The table shows the average E-E rate for individuals with less than a Bachelor's degree (top row) and individuals with a Bachelor's degree or more (bottom row) during the inflation pre-period (column 1) and then again during the September 2021 through December 2022 period (column 2). Column three shows the difference in E-E rates between the two periods with the standard error of the difference in parentheses. The sample is restricted to those aged 25-55 from the monthly CPS files.

how real wage growth evolved during the inflationary period relative to the 2016-2019 period for individuals in different parts of the earnings distribution.

Nominal Wage Changes, Job-Stayers vs Job-Changers: Panel of Figure 4 shows the median annualized nominal earnings growth (year-over-year) for (i) workers who remained with their same employer during the prior 12 months (job-stayers, dashed line) and (ii) workers who switched employers during the prior 12 months (job-switchers, solid line). The ADP Pay Insights data starts in October of 2020 and runs through the most recent period. During the inflation period, the median nominal earnings growth of job-changers increased to over 16%. By mid-2024, the median nominal earnings growth of job-changers appears to have stabilized at around 8.0%. Given that the ADP Pay Insights data started in late 2020, there is no direct way to compare to a pre-period. However, Grigsby, Hurst, and Yildirmaz (2021) find that median nominal wage growth for job changers in the ADP sample was slightly above 8% during the 2008-2016 period that they analyzed. Given that, it seem that the median nominal earnings growth of job-changers in 2024 has returned to pre-pandemic levels. Conversely, the median nominal wage growth of job-stayers peaked at only 8% during the inflation period. Notice, the gap in median nominal earnings growth between job-changers and job-stayers widened substantially during the inflation period and has roughly returned to pre-inflation period levels by 2024 (Panel B). In

starting in late 2020 for broad groups such as job-changers vs job-stayers. We do not have access to the ADP microdata to compute the frequency of wage changes during longer periods in the aggregate or for workers at different parts of the income distribution. Later in the paper, we rely on statistics produced in Grigsby, Hurst, and Yildirmaz (2021) who analyzed the ADP data during the 2008-2016 period to calibrate our model during the pre-period.

Figure 4: Nominal Wage Growth 2020-2024, Job-Changers and Job-Stayers



Panel A: ADP Wage Growth, By Switching Status

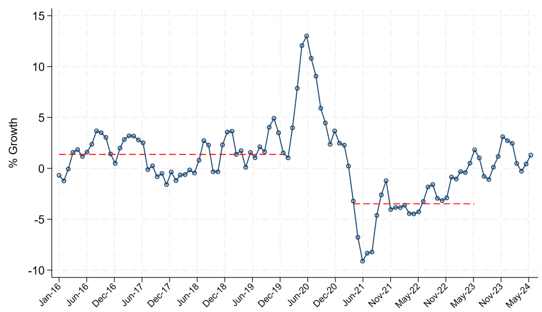
Panel B: Job-Changer vs. Job-Stayer Difference

Notes: Panel A of the figure shows the median nominal base wage growth of job-stayers (dashed line) and job-changers (solid line) during the October 2020 through June 2024 period from the ADP Pay Insights database. Panel B plots the difference between the two series. See text for additional details.

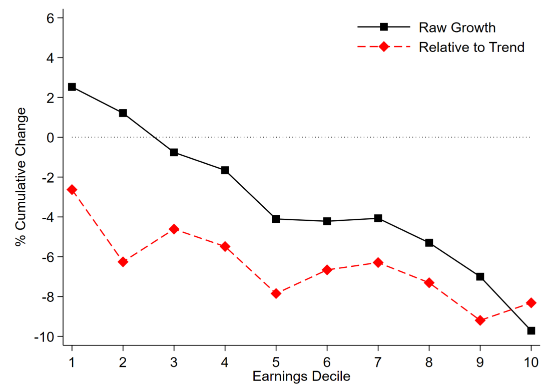
other words, job-changers were able to get even larger wage increases (relative to job-stayers) during the inflation period.

Real Wage Changes Across the Wage Distribution: In this final subsection, we use CPS data to measure the real wage growth between April 2021 and June 2024 for all individuals (Panel A of Figure 5) and for individuals at different percentiles of the income distribution (Panel B of Figure 5). For this exercise, we use the data from the CPS's outgoing rotation sample where individuals are asked to report their usual weekly earnings. Focusing on a sample of individuals between the ages of 25 and 55 (inclusive) who report working full-time, we compute the nominal median weekly earnings for each month during the time period. We deflate the nominal weekly earnings by the corresponding monthly CPI to make a measure of real weekly earnings. We then plot the annualized real wage growth rate (relative to the same month in the prior year) for each month during the sample period. As seen from Panel A, median real wage growth averaged about 1.4% per year during the pre-inflation period. However, during the inflation period, median real wage growth average about -3.5% per year. Median real wage growth returned towards the 2016-2019 levels after the inflation period ended.[15]

Figure 5: Real Wage Growth, Overall and By Wage Decile



Panel A: Median Real Wage Growth: 2014M1-2024M5



Panel B: Cumulative Real Wage Growth, By Decile: 2021M4-2024M5

Notes: Panel A shows the median real wage growth from January 2016 through May 2024. Solid line in Panel B shows the cumulative real wage growth of different income deciles between April 2021 and May 2024. Dashed line in Panel B shows the cumulative real wage growth of different income deciles relative to predicted real wage growth for the same time period. All data come from the CPS monthly outgoing rotations for workers 25-55 years old. The wage measure in this picture is reported usual weakly earnings for employed individuals. See text for additional details.

For the patterns in Panel B of Figure 5, we place individuals into weekly earnings deciles for each month in the sample. We then compute the cumulative real wage growth for each decile for the 38 month period between April 2021 and May 2024 using the same CPS sample described above.[16] As seen from the solid line in the figure, real wages grew most since April 2021 for individuals at the bottom of the weekly earnings distribution. For example, cumulative real wages *grew* by roughly 2% for individuals in the bottom two weekly earnings deciles. However, real wages *fell* by a cumulative 7%, and 10% for individuals in the top two weekly earnings

[15]Our patterns using the CPS micro data are very similar to the patterns reported by the Atlanta Federal Reserve's Wage Growth Tracker (`https://www.atlantafed.org/chcs/wage-growth-tracker`) which exploits the panel nature of the CPS data. We show the patterns from the Atlanta Fed Wage Tracker in the Online Appendix.

[16]In particular, we average real weekly earnings for individuals in each decile during the 6 months spanning October 2020 through March 2021; we define this as average real weekly earnings in the decile at the start of the inflation period. We then average real weekly earnings for individuals in each decile during the 6 months spanning December 2023 through May 2024; we define this as average real weekly earnings at the end of the sample period. The figure shows the percentage change in real weekly earnings for each decile between these two periods. See the online appendix for additional details on the construction of this figure.

deciles, respectively.

The dashed red-line in Panel B of Figure 5 shows a counterfactual cumulative real wage change for each decile assuming real wages would have otherwise grown in each decile during the 38 month period after April 2021 at the same rate as they did between 2016 to 2019. Appendix Figure B.1 shows the actual average annual real wage growth of individuals aged 25 to 55 in each decile during the 2016 to 2019 period using the CPS data. The figure shows that real wages were growing more at the bottom of the wage distribution during the pre-inflation period.[17] In this counterfactual, workers in all deciles experience a real wage loss relative to trend during the inflation period. However, the losses are still larger for workers at the top of the income distribution relative to workers at the bottom of the income distribution (-9% versus -2%). Coupled with the results from the prior subsection, workers at the bottom of the income distribution engaged in more E-E flows and, at the same time, experienced smaller real wage declines compared to workers at the top of the income distribution.

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. The model mixes elements of modern theories of labor market flows with frictions in nominal wage adjustments and lack of commitment on the side of both workers and firms. The interaction of these two frictions leads to infrequent wage adjustments and inefficient labor market flows in response to shocks (as discussed in Blanco, Drenik, Moser, and Zaratiegui, 2024). In such an environment, a burst of inflation reduces workers' real wages, as a result of which some workers quit immediately, but those who stay on their job—while becoming more eager to engage in costly renegotiation for higher wages or on-the-job search—become a bargain for their employing firms and are thus less likely to be laid off. Altogether, these incentives result in a burst of quits, higher E-E flows, and higher vacancies for employed workers, consistent with the evidence.

[17] In particular, the red line is computed by taking the actual cumulative real wage change shown in the black line and simply subtracting off the predicted cumulative 38 month real wage growth assuming the decile-specific real wage trend during 2016-2019 period. The fact that real wages were growing more at the bottom of the income distribution during the 2016-2019 period was documented in recent work by Autor, Dube, and McGrew (2024).

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. The commodity space consists of money and a consumption good. 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 homogenous consumption good is determined flexibly in a competitive market.

Exogenous Worker Shocks. Each worker is subject to an idiosyncratic productivity shock, Z_{it}, that evolve over time as follows. When workers are born, they draw their productivity from a log-normal distribution with mean μ_{z0} and standard deviation σ_{z0} truncated at bounds $\underline{Z} < \overline{Z}$. After birth, worker-specific productivity shock Z_{it} follows a Brownian motion with drift:

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

where the drift $\gamma(E)$ potentially depends on the employment state. For example, while employed $\gamma(E)$ may be positive indicating on-the-job human capital accumulation and while unemployed $\gamma(E)$ could be negative indicating a depreciation of skills while not working. The evolution of these productivities is subject to reflecting barriers at the same productivity bounds, $\underline{Z} < \overline{Z}$. We will 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 and receives a real wage $W_t = \tilde{W}_{it}/P_t$, where $\tilde{W}_{it}$ is the nominal wage and P_t is the price level. While unemployed, worker i receives a flow real income of $BZ_{it}^{\phi_B}$, 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. Conversely, when $\phi_B > 1$, employed high productivity workers will be, on average, closer to their value of non-employment. ϕ_B will be an important parameter in determining whether the elasticity of worker flows in response to labor market shocks differs across worker types.

[18] The fact that the value of non-employment is in real terms is consistent with the findings of Chodorow-Reich and Karabarbounis (2016). That paper finds that value of non-employment consists of the value of non-work time (measured in units of consumption) and unemployment insurance benefits. The value of non-work time includes the value of leisure or home production. Using a variety of empirical approaches, Chodorow-Reich and Karabarbounis (2016) find that most of the value of non-employment is due to the the value of non-working time (e.g., leisure). The value of leisure is not subject to nominal rigidities so assuming the value of non-employment is in real terms is consistent with their findings.

Search and Matching Technology. Job search is frictional and directed on both the worker and firm sides. 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 at 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 $\phi_K < 1$, vacancy posting costs will be proportionally smaller for high productivity workers. Conversely, when $\phi_K > 1$, it is more expense for firms to hire a high productivity worker. ϕ_k will be another 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 effort of workers. Each worker chooses search effort s subject to a flow convex cost function that depends on their search effort and employment status, denoted by $\mathcal{C}(s; Z, E) = \mu(E)^{1/\phi_s} \frac{s^{1+1/\phi_s}}{1+1/\phi_s} Z$, where $\mu(1) > \mu(0)$ and $\phi_s > 0$. Once formed, matches are subject to exogenous separation shocks at rate $\delta(Z_{it})$ that possibly varies (exogenously) 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 market 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 that $f(\theta)$ is increasing, $q(\theta)$ is decreasing, and that $f(0) = 0$ and $\lim_{\theta \downarrow 0} q(\theta) \to \infty$. We assume that firms and workers can only visit one market at a time.

Wage Determination within a Match. Once in a match, workers's wages are subject to three frictions. First, the adjustment of nominal wages is costly to workers where they can initiate a wage bargaining process with their employer subject to a randomly drawn fixed cost. At any point in time, with probability $\beta^+ \mathrm{d}t$, the worker can pay a stochastic cost $\psi^+ Z$ in units of output to increase the current wage. Similarly, with probability $\beta^- \mathrm{d}t$, the worker can pay $\psi^- Z$ units of output to start bargaining to negotiate a wage cut. With the remaining probability, bargaining costs are infinitely large. The cumulative distributions for ψ^+ and ψ^- are $\Psi^+(\psi)$ and $\Psi^-(\psi)$ with non-negative support, respectively. Upon bargaining, the new wage is set according to the Nash Bargaining solution, where the worker's bargaining power is denoted by τ and the outside option in case bargaining fails is the dissolution of the match. Second, in addition to costly bargaining, we also model opportunities for "free" wage increases where, with Poisson arrival rates of β^{Π}, workers receive nominal wage increases that are capped above by a "target inflation rate," denoted by π^*. Finally, neither firms nor workers can commit to staying in a match. This, given the worker's wage at any point in time, allows either party to endogenously dissolve the match through unilateral layoffs or quits.

It is worth noting that the nominal rigidities in this model only occur with respect to the wages of workers within a current match. As is standard in the literature, we assume that the 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.[19]

Money Supply. The central bank sets the nominal supply of money, M_t, where it grows over time at a constant rate of $\bar{\pi}$. As shown below, the nominal price of the homogenous consumption good will move one-to-one with M_t, and we will later model inflationary shocks as unexpected shocks to M_t.

Preferences and Payoffs. Workers born at time t have the following preferences over consumption C_{it} and money holdings M_{it}, and they discount the future at rate ρ:

$$\mathbb{E}_t \left[\int_t^{\infty} e^{-(\rho+\chi)(s-t)} \left(C_{is} - \mathcal{C}(s_{is}; Z_{is}, E_{is}) + \log\left(\frac{M_{is}}{P_s}\right)\right) \mathrm{d}s \right]. \tag{2}$$

Workers have access to complete financial markets. Given a history of all labor market decisions denoted by $\omega_i^t = \{\omega_{is}\}_0^t$ the budget constraint includes real income net of bargaining costs, denoted by $Y_{it}(\omega_i^t)$, consumption expenditures, and the cost of holding money $i_t M_{it}$, where i_t is the nominal interest rate. Upon death, the newborn worker inherits the deceased worker's money holdings. Let Q_t be the stochastic discount factor. By complete markets, the time-0 Arrow-Debreu budget constraint is given by:

$$\mathbb{E}_t \left[\int_t^{\infty} \frac{Q_s}{Q_t} \left(P_s C_{is} + i_s M_{is} - P_s Y_{is}(\omega_i^s) \right) \mathrm{d}t \right] \leq M_{it}. \tag{3}$$

The worker's problem is to choose a consumption stream, labor market decisions, and money holdings to maximize (2) subject to the budget constraint (3).

On the firm side, the value of being in a match with a worker at time t is given by:

$$J_t(Z_{it}, W_{it}) = \max_{\mathcal{T}} \mathbb{E}_t \left[\int_t^{t+\mathcal{T}} \frac{Q_s}{Q_t} \left(Z_{is} - W_{is} \right) \mathrm{d}s \right], \tag{4}$$

[19] All of the qualitative results in the paper would go through as long as the wages of new-hires and the value of non-employment are more flexible than the wages of job-stayers.

where $\mathcal{T} = \min\{\mathcal{T}_j, \mathcal{T}_h, \mathcal{T}_\delta\}$ is a stopping time describing the match duration before the firm, the worker, or nature dissolves it, respectively. Moreover, a vacant firm's value in submarket (Z, W) is:

$$V_t(Z, W) = -KZ^{\phi_K} + q(\theta(Z, W))J_t(Z, W). \tag{5}$$

We assume all firms are held by a measure zero set of risk-neutral households that do not trade with workers.

Markets. The aggregate supply of goods is given by market production and the value of non-employment, and the uses of goods can be for consumption, vacancy posting, or renegotiation costs. The market-clearing conditions for goods and money at each date, respectively, are:

$$\int_0^1 \left(C_{it} + \theta_{it} K Z_{it}^{\phi_K} + \mathbb{I}_{E_{it}=1} \mathbb{I}_{\tilde{W}_{it} \neq \tilde{W}_{it^-}} \psi_{it} Z_{it} \right) \mathrm{d}i = \int_0^1 \left(Z_{it} \mathbb{I}_{E_{it}=1} + B Z_{it}^{\phi_B} \mathbb{I}_{E_{it}=0} \right) \mathrm{d}i, \tag{6}$$

$$\int_0^1 M_{it} \mathrm{d}i = M_t. \tag{7}$$

Here, $\mathbb{I}_{\mathcal{X}}$ denotes the indicator function when condition $\mathcal{X}$ holds, and $x_{t^-} = \lim_{s \uparrow t} x_s$ represents the limit from the left. ψ_{it} is a random variable equal to ψ_{it}^+ if $\tilde{W}_{it} > \tilde{W}_{it^-}$ or equal to ψ_{it}^- if $\tilde{W}_{it} < \tilde{W}_{it^-}$.

Equilibrium Definition. An equilibrium for this economy is an allocation for all firms and workers, as well as a set of prices and government policies such that (i) given prices and firms' layoff strategies, the workers' strategies are optimal; (ii) given an employed workers' quit, wage renegotiation, and on-the-job search strategy as well as prices, the firms' layoff strategies are optimal; (iii) the free entry condition for vacancy posting holds in all open submarkets; and (iv) goods and money markets clear.

3.2. Equilibrium Characterization

In this section, we derive the conditions that characterize the equilibrium of this economy. 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.

Given a matching function, market tightness for all open submarkets is given by $q(\theta(z, w)) = \frac{Ke^{z\phi_K}}{J(z,w)}$. Due to linearity in consumption, the steady-state equilibrium real interest rate is given by $-\frac{\mathrm{d}(Q_t/P_t)}{Q_t/P_t} = \rho + \chi$, and inflation is given by $\frac{\mathrm{d}P_t}{P_t} = \frac{\mathrm{d}M_t}{M_t} = \pi^*$. With equilibrium prices and market tightness, we now describe the equilibrium conditions for workers and firms.

Unemployed Workers. The value of being unemployed is characterized by the following Hamilton-Jacobi-Bellman (HJB) equation for all $z \in (\underline{z}, \overline{z})$:

$$(\rho+\chi)U(z) = Be^{\phi_B z} + \underbrace{\gamma_u \partial_z U(z) + \frac{\sigma_u^2}{2}\partial_z^2 U(z)}_{\text{Law of motion of } z \text{ during unemployment}}$$

$$\underbrace{\max_{s_u, \hat{w}_u}\left\{-\mu_u^{1/\phi}\frac{s_u^{1+1/\phi}}{1+1/\phi} + s_u f(\theta(\hat{w}_u, z))\left(H(\hat{w}_u) - U(z)\right)\right\}}_{\text{Expected value of searching for a job}}, \tag{8}$$

with $\partial_z U(z) = 0$ at the boundaries $z \in \{\underline{z}, \overline{z}\}$ due to reflecting barriers at those points.

The optimal submarket choice $\hat{w}_u^*(z)$ is the solution to the following problem:

$$\hat{w}_u^*(z) = \arg\max_{\hat{w}_u}\left\{f(\theta(\hat{w}_u, z))\left[H(\hat{w}_u, z) - U(z)\right]\right\}, \tag{9}$$

in which a worker trades off the benefit of finding a job quickly with finding a job that pays a higher wage. The optimal search effort $s_u^*(z)$ is given by:

$$s_u^*(z) = \mu_u^{-1}\Big(f(\theta(\hat{w}_u^*(z), z))\left[H(\hat{w}_u^*(z), z) - U(z)\right]\Big)^{\phi}. \tag{10}$$

Here, μ_u^{-1} determines the level of search effort, while ϕ is the elasticity of search effort to the expected value of finding a job.

On-the-Job Bargaining. When a worker pays the bargaining cost, the newly renegotiated wage is characterized by the Nash bargaining solution:

$$w_b^*(z) = \max_{w_b}\left(J(z, w_b)\right)^{1-\tau}\left(H(z, w_b) - U(z)\right)^{\tau}. \tag{11}$$

From the optimal bargaining decision, we have the bargaining hazard $\beta(z, w)$ given by:

$$\beta(z, w) = \beta^+ \mathbb{I}_{\{w_b^*(z,w) > w\}}\Psi^+\left(\frac{H(w_b^*(z, w), z) - H(z, w)}{e^z}\right) \tag{12}$$

$$+\, \beta^- \mathbb{I}_{\{w_b^*(z,w) < w\}}\Psi^-\left(\frac{H(w_b^*(z, w), z) - H(z, w)}{e^z}\right). \tag{13}$$

Similarly, the new wage resulting from free adjustments, denoted by $w_{\pi^*}^*(w, z)$, maximizes the same bargaining objective but subject to the constraint: $w_{\pi^*} \in [0, 12\pi^*]$.

The Game between Firms and Employed Workers. We restrict the strategies of a matched firm and worker to be Markovian, seeking a Markov Perfect Equilibrium in the game between the firm and the worker. Once a match is formed, at any point in time, the only payoff relevant variables for the firm and the employed worker are the worker productivity (z) and the real wage of the worker (w). Given these states, the firm's strategy is to choose whether or not to lay off the worker. We denote by $\mathcal{W}^{j*}(z)$ the set of wages where, in match with productivity z, the firm chooses to continue the match.[20] We let $w_l(z)$ denote the least upper bound of $\mathcal{W}^{j*}(z)$ and refer to it as the layoff threshold.

The strategy of matched worker with productivity z consists of (i) a search intensity $s_e^*(z,w)$ and a submarket $w_e^*(z,w)$ for on-the-job search, (ii) when to pay the bargaining cost, and (iii) the set of wages for which they do not quit, $\mathcal{W}^{h*}(z)$. The continuation set for the worker is described by a quitting threshold $w_q(z)$, defined as the greatest lower bound of 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 at productivity z as the intersection of wages for which the firms and the worker are both willing to continue the match, $\mathcal{W}^{h*}(z) \cap \mathcal{W}^{j*}(z)$. It follows that for monotonic strategies where $\mathcal{W}^{j*}(z)$ and $\mathcal{W}^{h*}(z)$ are both half-intervals with $w_q(z) < w_l(z)$, the continuation set at productivity z is the interval $(w_q(z), w_l(z))$.

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

$$\begin{aligned}\rho H(z,w) = e^w + &\underbrace{\partial_z H(z,w)\gamma_e + \frac{\sigma_e^2}{2}\partial_{z^2} H(z,w) - \partial_w H(z,w)\pi^*}_{\text{Law of motion of } (z,w) \text{ during employment}} \\ &\underbrace{-\delta(H(z,w) - U(z)) - \chi H(z,w)}_{\text{Separation and death shocks}} + \underbrace{\beta^\pi \left(H(z, w^*_{\pi^*}(w,z)) - H(z,w)\right)}_{\text{Value of free wage adjustment}} \\ &+ \underbrace{\beta^+ \mathbb{I}_{\{w_b^*(z,w) > w\}} \int \max\left\{H(w_b^*(z,w), z) - H(z,w) - \psi e^z, 0\right\} \Psi^+(\mathrm{d}\psi)}_{\text{Net value of costly upward wage adjustment}} \\ &+ \underbrace{\beta^- \mathbb{I}_{\{w_b^*(z,w) \le w\}} \int \max\left\{H(w_b^*(z,w), z) - H(z,w) - \psi e^z, 0\right\} \Psi^-(\mathrm{d}\psi)}_{\text{Net value of costly downward wage adjustment}} \\ &+ \underbrace{\max_{s_e, w_{jj}} \left\{ s_e f(\theta(z, w_{jj})) \left(H(z, w_{jj}) - H(z,w)\right) - \mu_e^{1/\phi_s} \frac{s_e^{1+1/\phi_s}}{1+1/\phi_s} \right\}}_{\text{Expected net value of on-the-job search}}, \end{aligned} \tag{14}$$

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

[20] We also require the continuation set to be a weakly dominating strategy to ensure the uniqueness of equilibrium (see Blanco, Drenik, Moser, and Zaratiegui, 2024)

and $\partial_w H(z, w_l(z)) = 0$.

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

$$\begin{aligned} \rho J(z,w) &= e^z - e^w + \partial_z J(z,w)\gamma_e + \frac{\sigma_e^2}{2}\partial_z^2 J(z,w) - \partial_w J(z,w)\pi^* \\ &\quad + \beta(z,w)\left(J(w_b^*(z,w),z) - J(z,w)\right) + \beta^\pi\left(J(z, w_{\pi^*}^*(z,w)) - J(z,w)\right) \\ &\quad - (\delta + \chi + s_e(z, w_{jj}^*(z,w)) f(\theta(z, w_{jj}^*(z,w)))). \end{aligned} \tag{15}$$

For $w < w_q(z)$ or $w > w_l(z)$, we have that $J(z,w) = 0$. The value matching and smooth pasting conditions are $J(z, w_l(z)) = J(z, w_q(z)) = 0$ and $\partial_z J(z, w_l(z)) = \partial_w J(z, w_l(z)) = 0$, respectively.

Finally, the boundary conditions for the firm and worker values at the reflecting barriers are given by $\partial_z J(z,w) = \partial_z H(z,w) = 0$ for $(z,w) \in [\underline{z}, \overline{z}] \times \mathbb{R}$.

4 Quantifying the Model

In this section, we calibrate the model parameters and discuss the behavior of workers and firms in the steady state of the model under these calibrated values.

4.1. Calibration

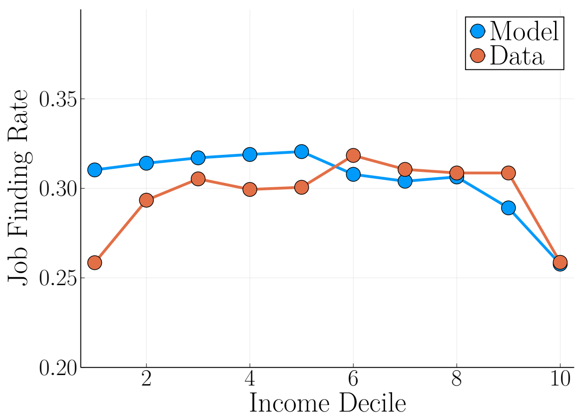
We calibrate the model using the simulated method of moments (SMM) approach and by matching several moments from the microdata. Table 2 and Figure 6 demonstrate the goodness of fit between the model and our targeted moments. Table 3 shows the assigned values for all parameters of the model under our calibration strategy.

Table 2: Comparison of targeted moments between model and data

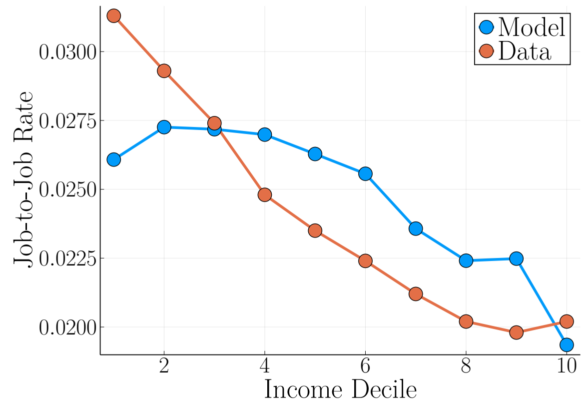
Moment	Data	Model
Frequency of on-the-job wage decreases	0.004	0.004
Frequency of on-the-job wage increases	0.063	0.069
Share $\Delta w_b \in (0,6)/(0,\infty)$	0.726	0.65
Share $\Delta w_b \in [6,11)/(0,\infty)$	0.144	0.177
Share $\Delta w_b \in [11,\infty)/(0,\infty)$	0.13	0.172
Search effort-wage elasticity	-0.36	-0.415
P90/P50 real wages (age 25)	2.12	2.065
P90/P50 real wages (ages 25-55)	2.57	2.522
Avg. 30-year wage growth	0.7	0.69
New wage-unemployment length elasticity	-0.006	-0.005

Notes: The table shows the set of moments (excluding the flows, the results for which are reported in Figure 6) that were targeted for calibration.

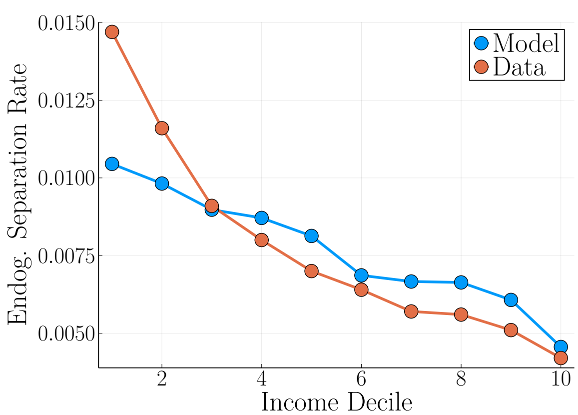
Figure 6: Targeted Moments: Flows in the Labor Market



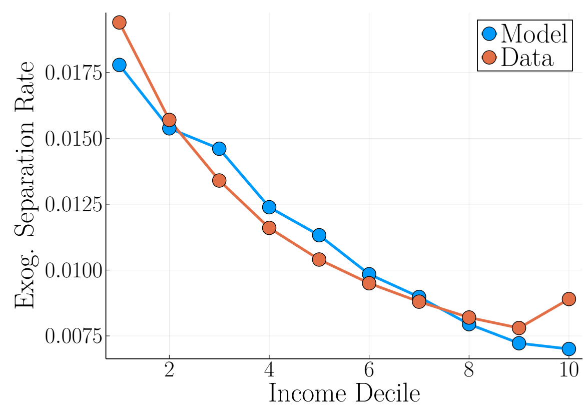
Panel A: U-E Rate



Panel B: E-E Rate



Panel C: Endogenous E-U Rate



Panel D: Exogenous E-U Rate

Notes: The figure shows the flows from employment to unemployment both in the data and as predicted by the calibrated model. These were targeted moments in the calibration. Panels A and B show the job finding rates of the unemployed and the employed workers, respectively (flows into employment). Panels C and D show the endogenous (quits and layoff) and exogenous separation rates, respectively (flows into unemployment).

Table 3: Model Parameters

Parameter	Description	Value	Target
ρ	Discount factor	0.005	Annual discount rate of 6%
χ	Deat rate	0.004	85th perc. of experience dist.
γ_e	Productivity drift for employed	0.002	Avg. earnings growth between age 25 to 55
γ_u	Productivity drift for unemployed	-0.006	Avg. earnings loss per month of unemployment
σ	Std. dev. of productivity shock	0.04	P90-P50 wage ratio for workers aged 25-55
μ_{z0}	Mean of initial productivity	0.0	Normalization
σ_{z0}	Std. of initial productivity	0.55	P90-P50 wage ratio for workers aged 25
α	Elast. of the matching function	0.5	Standard value
$\tilde{K}$	Vacancy cost	5.0	Avg. job-finding rate
$\tilde{B}$	Unemployment income	1.49	Avg. endog. separation rate
δ_0	Exog. separation rate function	0.007	Avg. exog. separation rate by income
δ_1	Exog. separation rate function	0.02	Avg. exog. separation rate by income
δ_2	Exog. separation rate function	-0.97	Avg. exog. separation rate by income
μ_e	Search cost scale when employed	1.0e11	Avg. job-to-job rate
μ_u	Search cost scale when unemployed	1.0	Normalization
ϕ_k	Elast. of vacancy cost wrt. z	1.35	Avg. job-to-job rate by income
ϕ_b	Elast. of unemp. income wrt. z	0.88	Avg. job-finding rate by income
ϕ_s	Elast. of search cost	0.08	Elast. of search effort wrt. to wages
β_{Π^*}	Prob. of wage renegotiation due to $\bar{\Pi}$	0.083	Avg. arrival of 1 per year
β_+	Prob. of positive wage renegotiation	0.14	Frequency of positive wage changes
β_-	Prob. of negative wage renegotiation	0.007	Frequency of negative wage changes
λ_+	Prob. of free positive wage renegotiation	0.9	Dist. of on-the-job wage changes
η_+	Mean cost of positive wage renegotiation	0.4	Dist. of on-the-job wage changes
τ	Worker's bargaining power	0.5	Standard value
$\bar{\Pi}$	Trend inflation	0.002	Annual inflation rate 2016-2019
Π^*	Target inflation	0.002	Annual inflation rate 2016-2019

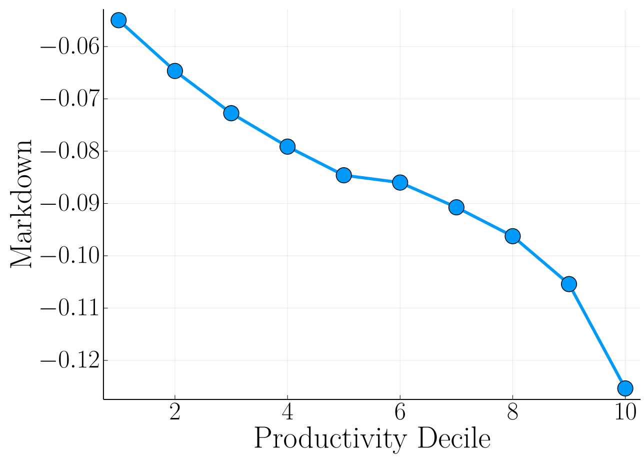
Notes: The table lists the calibrated values of model parameters and their targeted moments.

We discuss the properties and the mechanisms that allow the model to match these moments in detail in the second part of this section, but to set the stage, two parameter values are important enough to highlight immediately: the values of ϕ_K and ϕ_B, which determine how vacancy posting cost and home production of the unemployed scale with workers' productivities, respectively. Two observations about the values of these parameters are key for the results we describe below. First, the fact that in the calibrated model $\phi_K > 1$ implies that the vacancy cost of hiring more productive workers is higher *relative* to their productivity. Intuitively, this implies that, all else equal, there are fewer vacancies—in relative terms—for more productive workers which helps the model to match the lower job-finding rate of the higher income workers conditional on E-E transitions in Panel B of Figure 6.

Second, the value of $\phi_B < 1$ implies that home production of the unemployed scales less than one to one with their productivity. This means that more productive workers lose more—in relative terms—by staying in the unemployment state and all else equal and searching more intensely relative to others when unemployed. This higher search intensity among the more productive unemployed workers offsets the effect of fewer vacancies posted for higher productivity workers and helps the model to match the higher job-finding rate of the higher income workers conditional on U-E transitions in Panel A of Figure 6 as well as their lower endogenous separation rates (quits and layoffs) in Panel C of the same figure.

Furthermore, as a result of these two forces, our model also implies a negative relationship between markdowns and productivity, which is a non-targeted prediction of our model that aligns well with the findings of Chan, Mattana, Salgado, and Xu (2023) using Danish microdata. Figure 7 shows the average value of markdowns—defined as the log-difference between real wage and worker productivity—per productivity decile in the equilibrium our model. Higher productivity workers, on average, experience lower markdowns because, all else equal, they face lower job-finding rates and they are relatively more unproductive at home than in a job.

Figure 7: Equilibrium Markdowns by Productivity Decile



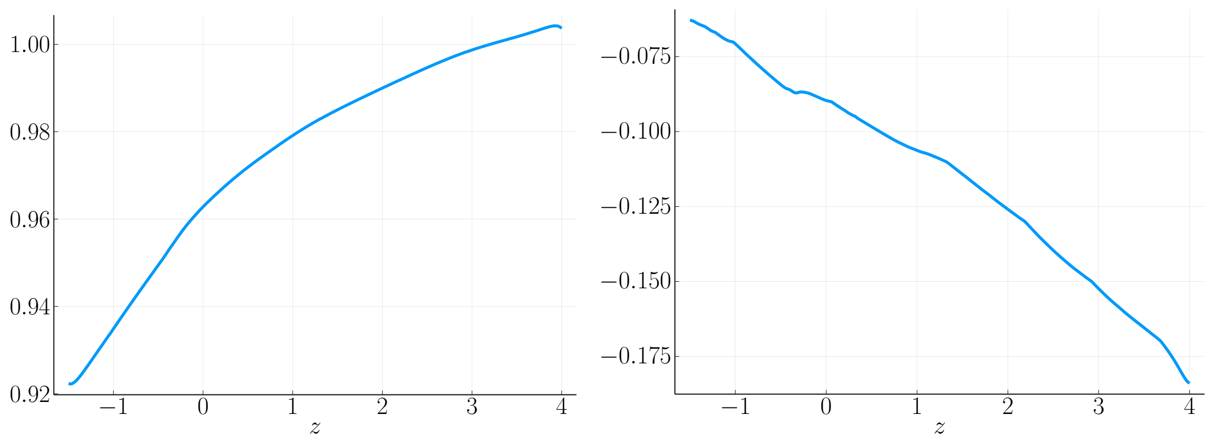
Notes: The figure shows the average markdowns, defined as the log-difference between the real wage and worker productivity, for each decile of productivity in the equilibrium.

4.2. Model Mechanisms

In this subsection, we describe the policy functions of the workers and firms that arise in the equilibrium under the calibrated parameters. In doing so, we plot outcomes based on the two main state variables of workers; i.e., either as functions of productivity—since the cost of hiring and workers' incentives to search differ by productivity—or as functions of their markdowns defined by the log-deviation of the real wage from productivity, $\hat{w} \equiv w - z = \ln(W/Z)$. Given that we already track the productivity of workers as a state, markdowns are a natural change of variables for wages, as they measure the gap between the wage at which a worker is willing to work and their productivity (which coincides with their marginal product of labor in this model). Moreover, noting that in a competitive model with no frictions, a worker's wage is equal to their marginal product of labor, the deviation of markdowns from zero captures the extent to which wages deviate from such a benchmark.

Job Finding Rates and Starting Wages Conditional on U-E Transitions. We start by discussing the policies of the unemployed. To recap their decisions, at any given point in time each unemployed worker with productivity z targets a particular wage by choosing a submarket and decides how intensely to search for a job. In choosing which submarket to target, these workers internalize that given their productivity, markets with lower markdowns (wages relative to productivity) have higher job-finding rates. This is why a worker would potentially be willing to target a submarket with a lower markdown (i.e., a wage farther below their productivity) if the job-finding rate is high enough.

Figure 8: Search Effort, Job Finding Rate, and Wages Conditional on U-E Transitions



Panel A: Search Effort   Panel B: Starting Markdowns

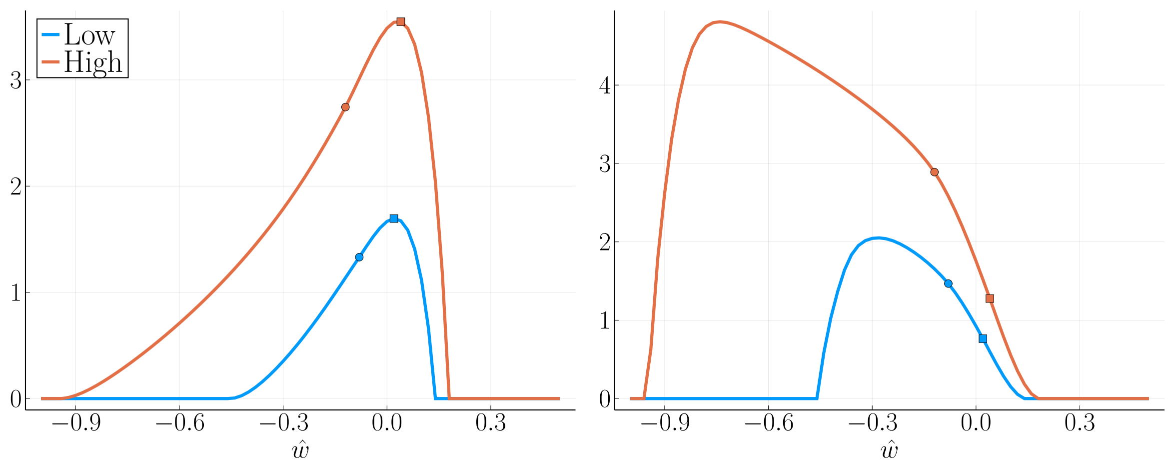
Notes: Panel A of the figure shows the equilibrium search effort of the unemployed workers as a function of their productivity. Panel B shows that starting markdowns (defined as log real wage minus productivity) of these workers conditional on finding a job.

Panel A of Figure 8 shows the search effort of the unemployed workers as a function of their productivity. The search effort is increasing in productivity because the cost of staying unemployed is higher for more productive workers. This last observation is an artifact of $\phi_B < 1$, which implies that the ratio between the productivity of unemployed worker at home vs. in a match gets larger as z increases.

Panel B of Figure 8 shows markdowns at which the unemployed workers start working conditional on finding a job. Despite higher search effort on the part of more productive unemployed workers, the starting markdowns are decreasing in productivity. This is because the market is thinner for more productive workers as the parameter $\phi_K > 1$ implies the cost of hiring more productive workers is higher relative to their productivity. This means that the more productive workers are willing to accept lower starting wages to mitigate the negative effects of these higher hiring costs on their job-finding rate. The result of these opposing forces is a relatively flat job-finding rate across the income deciles for the unemployed, as shown in Panel A of Figure 6.

Value Functions and Margins of Endogenous Separations. Having specified the search behavior of the unemployed, we now turn to the equilibrium strategies of employed workers and matched firms. Panel A of Figure 9 shows the normalized values of a low (high) productivity employed worker in blue (orange) as a function of their log markdown, $\hat{w} = w - z$. To make these comparable, we have subtracted the value of unemployment from the value of the employed and have normalized them by the worker productivity z. Thus, the plotted value shows the value gained above the value of unemployment per unit of productivity, $(H(w, z) - U(z))/z$, for different values of markdown, $\hat{w}$, within the match. Similarly, Panel B of the same figure plots the value of the firm matched to each of these workers per unit of worker productivity; i.e., $J(w, z)/z$ as a function of the markdown within the match, $\hat{w}$.

Figure 9: Normalized Values of Employed Workers and Matched Firms



Panel A: Employed Workers   Panel B: Matched Firms

Notes: Panel A shows the values of an high (low) productivity employed worker in orange (blue) net of their unemployment value and normalized by their productivity, $(H(w, z) - U(z))/z$, as a function of the markdown, $\hat{w} = w - z$. Panel B shows the value of the firm matched to each of these workers per unit of worker productivity, $J(w, z)/z$. In each plot, the circle marks the starting markdown of the match, and the square marks the maximum markdown that worker seeks within the match.

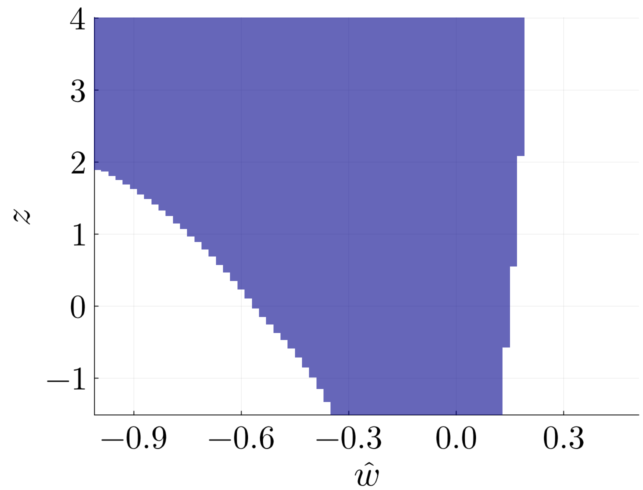
First, we see that all values are non-monotonic in markdowns. For low enough markdowns, when workers' wages are too far below their productivity, workers would gain from increasing their wages and gaining higher markdowns. It is important to note, however, that these values also encode the future possibilities of being laid off by the employer, should the wage starts to far exceed the worker productivity. It is for this reason that, somewhere near the markdown of zero, the value of the worker starts decreasing in markdowns as the worker's wage becomes too close to the wage at which the firm would end the match and lay off the worker. Thus, we would expect workers' values to decline to zero (i.e. $H(., z) = U(z)$) once for some low enough markdown, where the worker is indifferent between being employed and unemployed, and once at a high enough markdown, where the firm would end the match and the worker would transition to unemployment. These two points, therefore, bound the interval of markdowns in which the match continues. We refer to this interval as the continuation region.

Moreover, to further elaborate on the incentives of the workers, all plots mark the starting markdown of the match—i.e., the markdown at which the match initiates—with a circle, which correspond exactly to the markdowns at which the unemployed workers start working in Panel B of Figure 8. As discussed above, more productive workers are willing to accept lower starting wages to mitigate the negative effects of higher hiring costs on their job-finding rate. Furthermore, in each plot, we have also marked the highest markdown that the worker would seek within the match with a square. Such a wage is within the interior of the continuation region because of workers' tendency to avoid increasing their wages too far above their productivity, as this would increase the risk of being laid off by the firm.

A final observation about this figure is that the values of the more productive workers lie above those of the less productive workers, even beyond the normalization of the values by productivity. To explain why, it is important to observe that in a model where vacancy and home production are both scaled with productivity—i.e., $\phi_B = \phi_K = 1$—then both plots should exactly be the same (Blanco, Drenik, Moser, and Zaratiegui, 2024), meaning that both workers should earn the same value per unit of productivity. However, under our calibrated model, more productive workers gain more from their match per unit of productivity for two reasons: first, their relative productivity during unemployment is dampened by the fact that $\phi_B < 1$, and second, the fact that $\phi_K > 1$ implies that the chances of finding a new job from unemployment are lower. Put together, these two effects imply that less productive workers are more willing to quit—as seen by the higher lower bound on their continuation region in Figure 10. Such workers are relatively similarly productive when unemployed, and they have a higher chance of finding a new job.

Bargaining and Wage Adjustments on the Job. We now turn to the equilibrium strategies of the workers and firms in the context of on-the-job bargaining. In the model, employed workers have

Figure 10: Continuation Regions



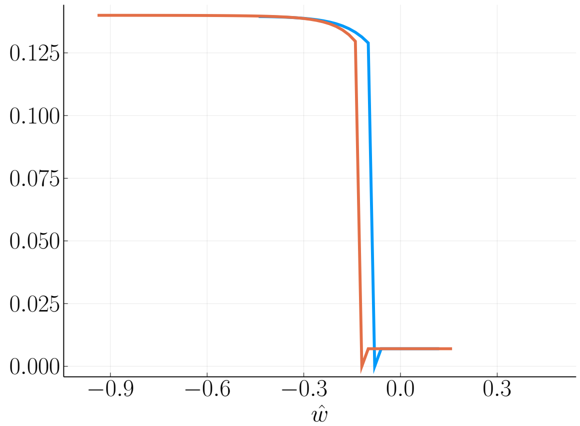
Notes: For every value of z on the y-axis, the corresponding shaded area in the figure shows the continuation set of a match; i.e., the set of markdowns for which both the worker and the firm are willing to stay within the match. Continuation regions are wider in matches with higher productivity and lower productivity workers have a higher quit threshold (the left boundary).

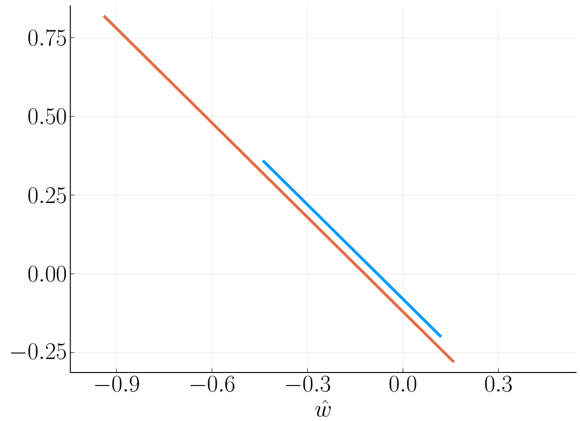
the option to pay a randomly drawn fixed cost to renegotiate their wage with their matched firm. Conditional on and after paying the menu cost is paid, the new wage is then determined by the Nash bargaining solution, which implies that the wage is a function of the worker's productivity at the time of bargaining.

Therefore, the decision to bargain wages for a given worker with productivity z and markdown $\hat{w}$ depends on the following cost benefit tradeoff. Such a worker understands that conditional on bargaining, the paid fixed cost will be sunk and can perfectly anticipate their wage change. Thus, the value that is gained by bargaining is independent by the draw of the fixed cost and depends on the differential value under the anticipated bargained markdown and the worker's current markdown. Naturally, this gain in value is smaller if the markdown is closer to the workers optimal markdown within the match. Moreover, since the fixed cost of bargaining, drawn at random by nature, is i.i.d. across workers, only a fraction of workers will find themselves with low enough costs to bargain for these additional value.

Panel A of Figure 11 shows the fraction of workers that bargain as a function of the worker's initial markdown (before bargaining) for two different workers with high (orange) and low (blue) productivity. Panel B shows the corresponding wage changes in percentage points. The bargaining rate decreases for both workers for negative markdowns as the value gained by bargaining decreases with higher markdowns. The sharp drop around the zero markdown is a consequence of the asymmetries in the menu cost distribution for wage increases and decreases.

Figure 11: Bargaining Rates and Wage Changes Conditional on Bargaining





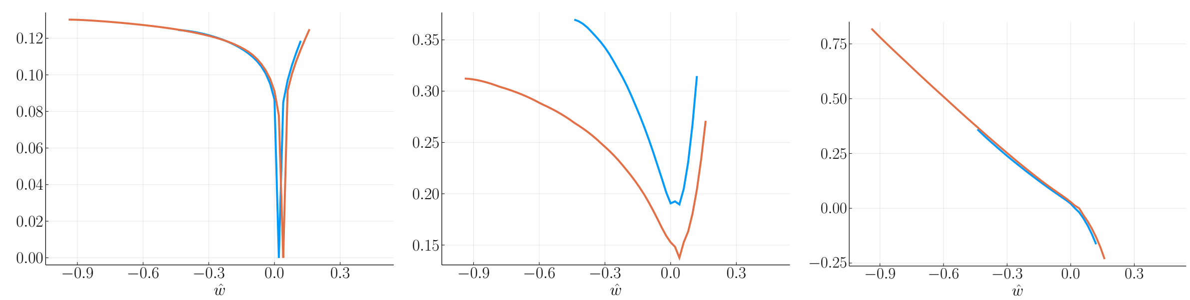
Panel A: Bargaining Rates Panel B: Bargained Wage Changes

Notes: Panel A of the figure shows the bargaining rates—i.e. the fraction of workers that bargain for a wage change—of a high (low) productivity worker in orange (blue) as a function of their markdown in the match. Panel B shows the corresponding wage changes (in percentage changes) for these workers conditional on bargaining.

These changes in bargaining rate are indicative of selection effects that are present in the model conditional on bargaining: workers with very low wages relative to their productivity are more likely to bargain for a wage increase.

Job Finding Rates and Starting Wages Conditional on E-E Transitions. In addition to bargaining, employed workers can also adjust their nominal wages by conducting on the job search and moving to a new match. Since search is costly, similar to bargaining, search effort varies across workers with the productivity depending on how far their markdown is from their optimal markdowns within the match. Panel A of Figure 12 shows the intensity with which a high (low) productivity worker searches as a function of their markdown in orange (blue). We see that search effort is at its lowest at the optimal markdown and sharply increases as the markdown falls either below or above this optimal level. Panels B and C of the same figure show the corresponding job-finding rates and wage changes for each productivity type as a function of the worker's current markdown, respectively. As described above, low productivity workers have higher job finding rates due to the lower vacancy cost of hiring them, which explains why the blue curve lies above the orange curve. Moreover, we see that for each productivity type, their job finding rate increases with the size of their markdown *gap*, which shows the selection effects that are present among job seekers in our model conditional on E-E transitions: The set of workers that seek new jobs is not random and is mostly represented by workers whose wages deviate further from their optimal markdowns.

Figure 12: E-E rates and Wage Changes Conditional on E-E Transitions



Panel A: Search Effort | Panel B: Job Finding Rate | Panel C: E-E Wage Changes

Notes: Panel A shows the search effort of a high (low) productivity employed worker in orange (blue) as a function of their markdowns within their current match. Panels B and C show the corresponding job-finding rates and wage changes (in percents), respectively.

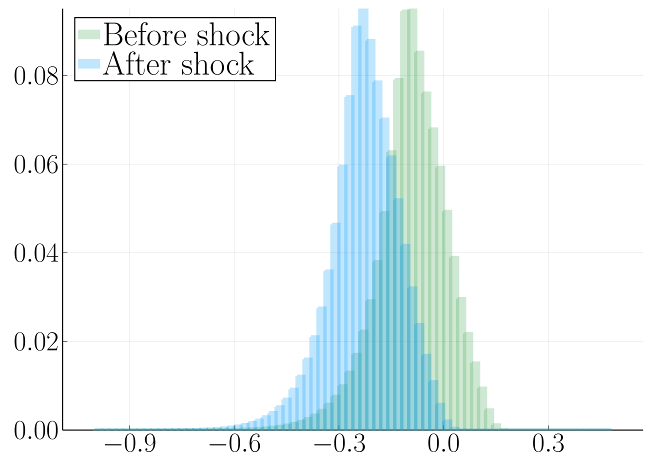
5 How Workers Respond to Temporary Changes in Inflation

In this section, we assess how labor market flows, wages and worker welfare respond to a temporary shock to the inflation rate. In particular, we feed into the model a monetary shock that generates a one-time unexpected increase in the price level of 13.5%. The 13.5% increase represents roughly the jump in the U.S. price level during the recent inflation period. As seen below, using our calibrated model, the unexpected inflation shock generates patterns for worker flows and wages that matches well the actual data highlighted in Section 2.

5.1. Wage Markdowns On Impact

Figure 13 shows the distribution of wage markdowns in the economy right before (in green) and right after (in blue) the temporary inflation shock. Given the nominal wage rigidity, an unexpected jump in the price level of 13.5% results in the wage markdown increasing for all workers by 13.5 percentage points upon impact. As a result, the entire distribution of wage markdowns shifts the left by 13.5% upon impact of the inflation shock. As seen throughout this section, the fact that wages are sticky means that workers become worse off on impact of the shock causing them to take costly actions to have their wages keep up with inflation.

Figure 13: Markdown Distribution Before and After Inflation Shock



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

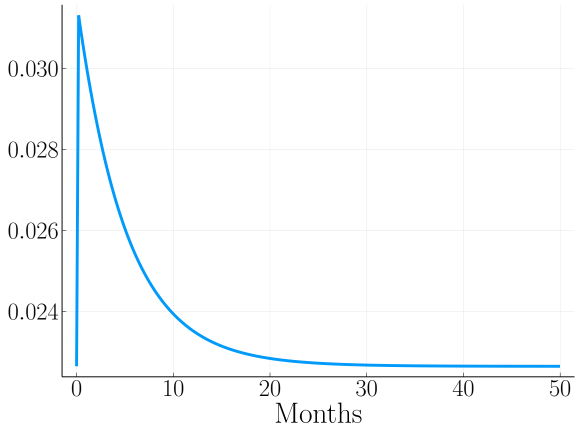
5.2. Worker Flows, Layoffs and Unemployment

Panel A of Figure 14 shows how E-E flows respond to the unexpected jump in the price level. On impact, the E-E rate jumps from about 2.4% per month to 3.2% per month. As shown above, the unexpected temporary increase in inflation causes wage markdowns to increase. In response to this, workers immediately start looking for a job at another firm; new hire wages are flexible and will rise in response to the inflation shock. The E-E rate remains elevated for about 18-months in response to a one-time shock to the price-level.[21] Panel B shows how E-E flows respond for individuals in different quartiles of the productivity distribution. Like the data shown in Table 1, the E-E rate in the model jumps more for lower productivity workers (first quartile) relative to higher productivity workers (fourth quartile). The reason for this is that lower productivity workers are more elastic in general; they are closer to their outside option and they face lower vacancy posting costs. Additionally, Panel C shows that the U-E rate did not respond to the inflationary shock; again this is consistent with the microdata from the CPS shown in Section 2. Both the returns to working in the home sector and the wages of new hire are set in real terms. As a result, a burst of inflation does not alter the relative return between working and not-working.

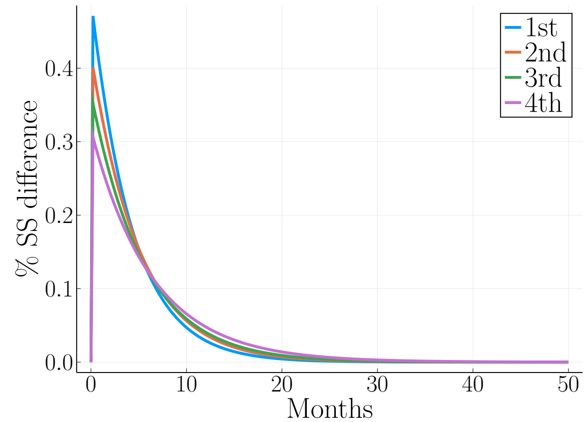
Panel D shows that the E-E flows come with additional job search costs faced by workers.

[21] On impact, some workers immediately quit to unemployment. These workers were close to the margin between working and not working. These workers then search for a new job from the unemployment pool. However, the movement of workers to unemployment is quantitatively small relative to the workers who search for a new job while remaining employed in their current match.

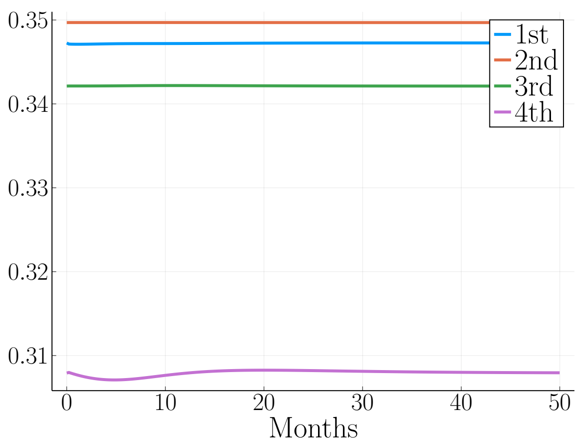
Figure 14: Response of E-E Rate, U-E Rate and Job-Search to Inflation Shock



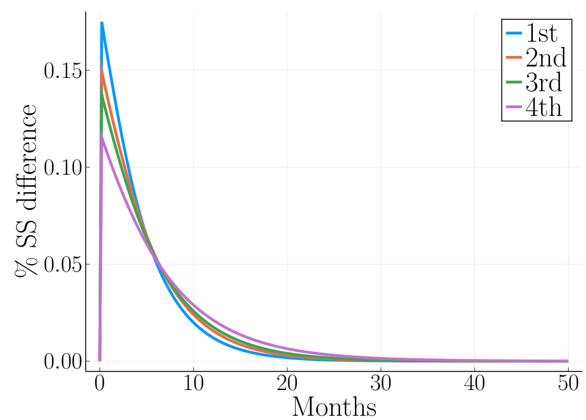
Panel A: E-E Rate, Overall



Panel B: E-E Rate, by Productivity Quartile



Panel C: U-E Rate, by Productivity Quartile



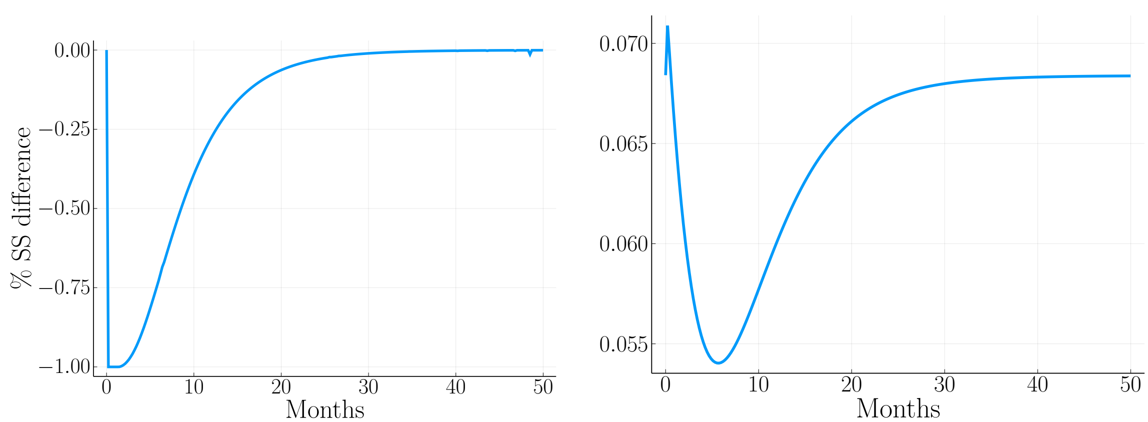
Panel D: Job Search, by Productivity Quartile

Notes: Panel A of the figure shows the time series path of the overall response of the E-E rate to the temporary inflation shock. Panels B-D show the time series response of the E-E rate, the U-E rate, and Job Search quartiles of the productivity distribution.

In particular, job search increased by 10% on impact for high productivity workers and by 16% on impact for low productivity workers. Notice, for low productivity workers, the increase in job search is front loaded. However, for higher productivity workers, their search effort remains elevated for longer periods of time; it takes them longer for their wages to keep up with inflation because they are relatively less elastic. In total, lower and higher productivity workers both substantively increase their search effort in response to a temporary burst in the price-level. Any accounting for the welfare costs of inflation on workers needs to account for the additional utility costs of searching for another job.

Figure 15 shows the response of firm layoffs (Panel A) and the overall unemployment rate (Panel B) in response to the inflation shock. In response to the inflation shock, the layoff rate falls sharply. As seen from Figure 13, the markdown distribution shifts to the left after the inflation shocks; workers are now much farther away from the threshold where firms would want to fire a work. The decline in firm layoffs causes the unemployment rate to fall, all else equal. Panel B of Figure 15 shows the time series response of the unemployment rate to the inflation shock. On impact, the unemployment rate rises very slightly as a few low productivity workers quit to unemployment in response to the burst in inflation. This effect is quantitatively very small. As firms start laying off less workers, there is a modest fall in the unemployment rate. The unemployment returns to baseline about three years after the inflation shock.

Figure 15: Response of Layoff Rate and Unemployment Rate to Inflation Shock



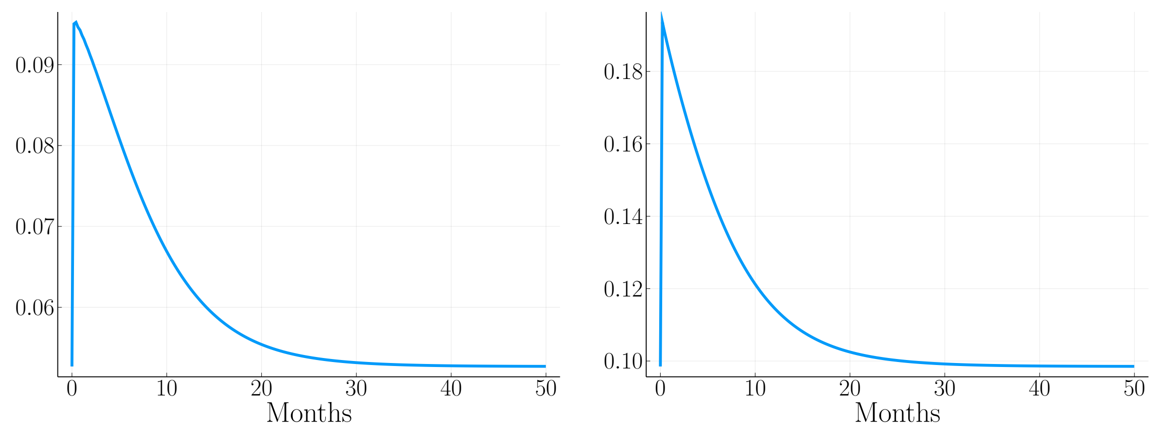
Panel A: Layoff Rate — Panel B: Unemployment Rate

Notes: Panels A and B of figure show the time series response of the percentage change in the layoff rate and the unemployment (relative to the steady-state) in response to the temporary inflation shock.

5.3. Wages

Panels A and B of Figure 16 shows the time series response of the wages of job-stayers and job-changers, respectively, to the unexpected increase in the price level. On impact, the wage growth of job-stayers increased by 4 percentage points (from 5% to 9%). For job-changers, wage growth increases by almost 10 percentage points on impact (from 10% to 20%). Job-changers essentially get all of the inflation shock passed through to their wage increase.[22] Again, these patterns are nearly identical to the magnitudes of wage changes of job-stayers and job-changers found in the ADP micro-data highlighted in Figure 4.

Figure 16: Wage Change For Job-Stayers and Job-Changers



Panel A: Job-Stayers   Panel B: Job-Changers

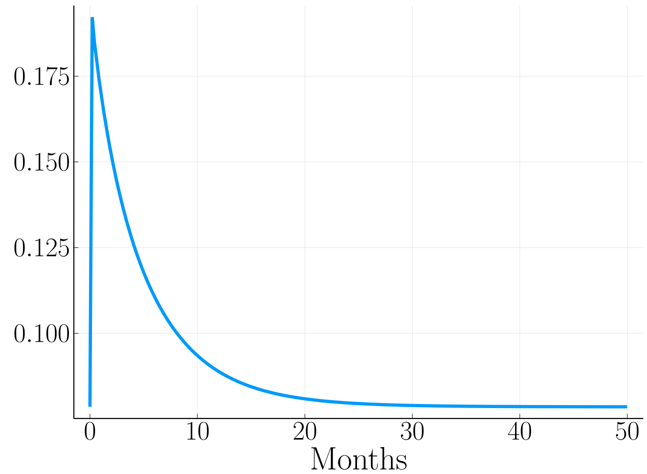
Notes: Figure shows the time series response to the temporary inflation shock on wage growth of job-stayers (Panel A) and the wage growth of job-changers (Panel B).

Why are the wage changes of job-changers increasing more than the wage changes of job-stayers? Job-changers are able to have their wage change keep up with inflation because the wages of new hires are assumed to be flexible. For job-stayers, workers have to an incur a costly renegotiation with their existing firm. Workers are willing to increase the wages of most of their workers by the steady-state trends inflation rate on average once per year. However, workers can pay an additional cost to try to renegotiate with their firm to get an additional wage increase. Figure 17 shows that the model predicts an increase in the fraction of monthly wage changes that occurs after the inflation shock. Data from the Atlanta Fed's Wage Tracker provides evidence that the frequency of wage changes for workers who remain on the job increased sharply during the inflation period.[23] When we compute the full welfare effects of inflation below we need to account for both the additional search costs (which drive E-E wage growth) and the additional renegotiation costs (which drive wage growth for job-stayers) incurred by workers.

[22]The wage increase for employed workers is not exactly 13.5% because the set of workers that experience wage increases after the shock is not randomly selected and depends on their initial productivity to wage ratio.

[23]See the dashed line in Appendix Figure B.2.

Figure 17: Frequency of Wage Increases of Job-Stayers in Response to Inflation Shock



Notes: The figure shows the time series response of the frequency of monthly wage changes for job-stayers in response to the temporary inflation shock.

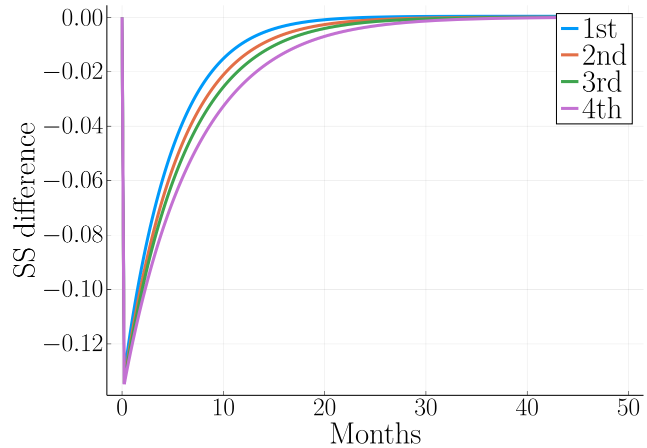
Figure 18 shows the time series pattern of real income growth in response to the temporary inflation shock for different productivity quintiles. Upon impact, real income falls by 13.5% for all workers.[24] Overtime, the real wage of low productivity workers recover faster than higher productivity workers given that lower wage workers are more elastic. The higher change in E-E flows of lower wage workers in response to the inflation shock results in higher real wage growth. Collectively, our model replicates both qualitatively and quantitatively the empirical patterns from the CPS micro data shown in Figure 5.

5.4. Worker Welfare

Figure 19 shows how workers' welfare and the values of firms change in response to the inflation shock. The welfare costs to employed workers have three components: (i) workers receive real wage declines due to sticky wages in response to the inflation increase (as seen in Figure 18), (ii) workers have to incur search costs to increase their wage at other firms (as seen in Figure 14, and (iii) workers have to incur renegotiation costs to increase their wage at their own firm (as seen in Figure 17. We measure the welfare costs and firm values in consumption equivalent units (in multiples of monthly real income before the shock); a welfare cost of 0.5 means a worker would be willing to give up a half of months of their real wage right before the shock to avoid

[24]For the workers in the lowest decade the real income growth is slightly less than 13.5%. The reason for this is, as noted above, a handful of low wage workers quit to unemployment after the inflation shock given they were roughly indifferent between working and not working. As these relatively low productivity workers exit the average wage of the remaining workers increases. As a result, the total measured wage loss for this group is slightly less than 13.5% due to a small shift in the composition of the employed.

Figure 18: Real Income Response to the Price Level Shock Across Productivity Quartiles

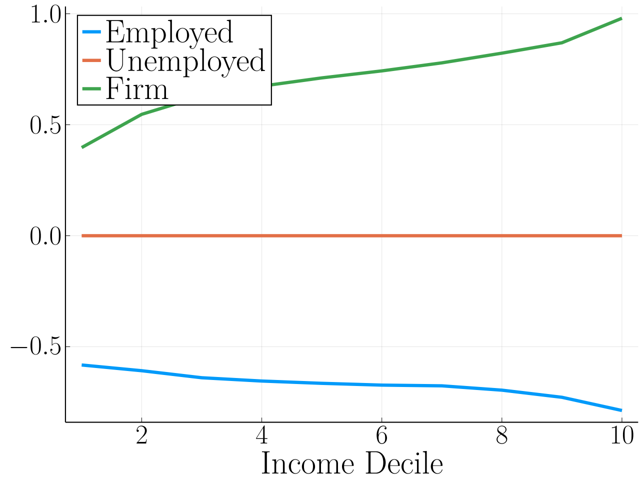


Notes: The figure shows the time series pattern of the percentage changes in real income in response to a temporary inflation shock for workers in different productivity quartiles. All differences are relative relative to the steady-state path.

the temporary increase in inflation. As seen from the figure, workers in each productivity decile are made worse off by the unexpected increase in the price level. However, the welfare loss is much larger for higher productivity workers relative to lower productivity workers. Not only higher income workers' real wages decline more in absolute terms right after the shock, they also lose a higher share of the that income in welfare because it takes them longer to adjust their wages to the inflation shock. In constrast, unemployed workers are not affected by the inflation shock at all because their income from home production is in real terms and wages of new hires are flexible.

Figure 19 also shows that firm values grew sharply in the immediate aftermath of the unexpected inflation shock, all else equal. The paper is not about what happened to firm values during the inflation period. For that analysis, one would have to take a stance on the underlying cause of the inflation shock and any potential nominal rigidities associated with the changing of firm output prices. What the figure does show, however, is that sticky wages and frictional labor markets imply that firms gain at the expense of workers in response to a rise in inflation. Upon impact of the shock, firms' net present values increase by roughly 40% and 100% of their worker's monthly real wage at the bottom and top deciles, respectively. Where do these numbers come from? As seen from Figure 13, markdowns fall once the inflation shock occurs, allocating a higher share of the surplus in continuing matches to firms. The implications of our model for firm value are consistent with the large rise in the profit rate experienced in the U.S. economy during the inflation period. As seen in Appendix Figure B.3, the U.S. profit rate increased

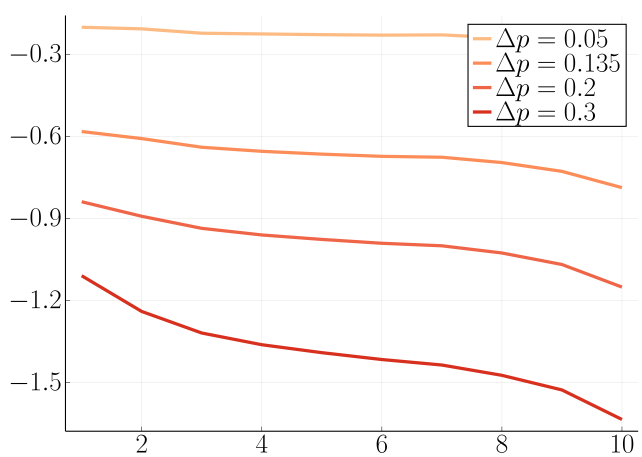
Figure 19: Firm and Worker Values



Notes: The figure shows the welfare cost of the unexpected inflation shock for workers as well as the change in corresponding firms' valuations for different deciles of worker income before the shock.

sharply in the 2021-2023 period; in fact, the U.S. profit to GDP ratio hit a 70-year in the middle of 2022.

Figure 20: Employed Worker Values



Notes: Figure shows the welfare loss for workers in different wage deciles in response of unexpected price level increases of various magnitudes. The welfare losses are in the share of monthly real income right before the shock. The four lines show the welfare losses for a 5%, 13.5% (our baseline shock), 20%, and 30% one time unexpected increase in the price level.

Finally, Figure 20 uses our model to analyze how worker welfare throughout the productivity distribution would evolve if the economy experienced unexpected temporary inflation shocks of various sizes. In particular, the figure is analogous to Figure 19 except we analyze an unexpected one-time increase in the price level of 5%, 13.5%, 20%, and 30%. All workers become monotonically worse off as the inflation rate increases, but the effects of higher inflation rates hit higher productivity workers disproportionally more.

5.5. Beveridge Curve

The Beveridge Curve plots the relationship between the monthly unemployment rate and the monthly vacancy rate. During the recent inflation period, the Beveridge curve in the United States shifted up and has dramatically steepened. Our model shows how a temporary burst of inflation can explain the recent Beveridge Curve dynamics. As seen in Panel A of Figure 21, the aggregate vacancy rate (in blue) jumped by about 20% after the inflation shock. The aggregate vacancy rate is a combination of vacancies filled by workers from unemployment (U-E vacancy rate) and vacancies filled by workers at other firms (E-E vacancy rate). The aggregate rise in vacancies is driven by the increase in vacancies filled by E-E flows. The increase in churn in the labor market as employed workers search for another jobs to increase their real wage results in firms posting more vacancies.[25]

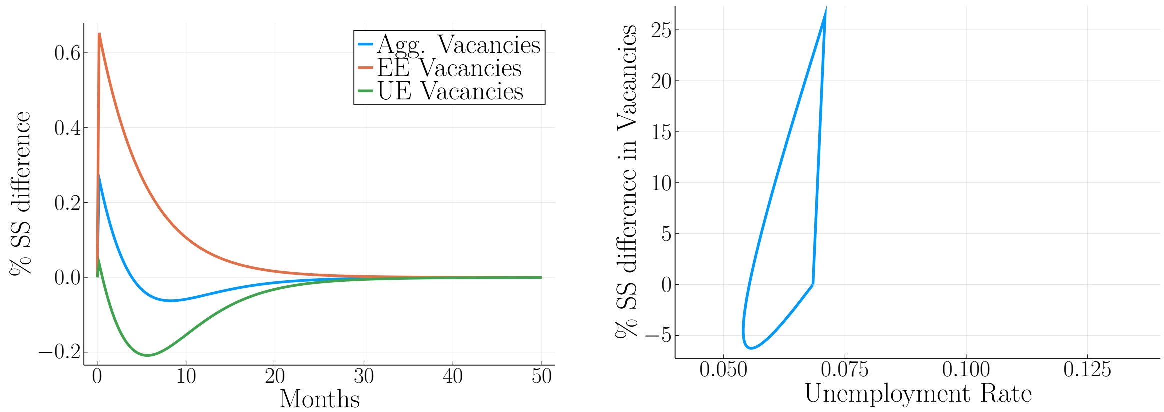
Panel B of the figure shows the dynamics of the Beveridge cure in response to the inflation shock. As the price level unexpectedly jumps, the Beveridge curve jumps up; there is a large increase in vacancies with little change in unemployment. Over the next few years, vacancies fall from their peak but are still higher than in steady state. At this time, the Beveridge Curve can appear upward sloping as opposed to its usual downward sloping shape. Unexpected inflation shocks can shift the Beveridge Curve upwards and steepen it because it generates a burst of E-E vacancies without much change in the unemployment rate. The importance of E-E flows in explaining shifts in the Beveridge Curve was highlighted by Cheremukhin and Restrepo-Echavarria (2023); our paper shows that an unexpected temporary increase in the inflation rate is a good laboratory to test their theory.

6 Alternate Mechanisms

Our quantitative analysis above assumed that the only shock to hit the economy was an unexpected temporary expansion of the money supply with no other nominal or real rigidity

[25] The vacancy rate for U-E workers falls slightly because the overall unemployment rate declined.

Figure 21: Vacancies and Beveridge Curve



Panel A: Vacancy Rate

Panel B: Beveridge Curve Dynamics

Notes: Panel A shows the time series response of total vacancies, E-E vacancies and U-E vacancies in response to the temporary increase in the inflation rate. Panel B shows the dynamics of the Beveridge Curve in response to the inflation shock.

aside from the labor market frictions. Such a shock generated a one-time unexpected increase in the price level holding all else equal. This allowed us to trace the causal effect of a temporary rise in inflation on labor market flows, wages, and well-being. In this section, we discuss whether other shocks – such as ones that generate a "hot labor market" – can quantitatively replicate the labor market patterns highlighted in Section 2.

There is growing evidence that the inflation observed in the United States between 2021 and 2023 was not caused by rising wages from an overheated labor market. For example, both Lorenzoni and Werning (2023b) and Bernanke and Blanchard (2024) provide evidence that the burst of inflation starting in mid-2021 in the United States was the result of shocks to prices holding wages fixed. One piece of evidence supporting their conclusion is that the large rise in aggregate prices predated the modest nominal wage increase. Instead, these authors conclude that the observed inflation resulted from some combination of (i) increased aggregate demand coming from the large stimulus enacted during the pandemic and (ii) restricted aggregate supply coming from energy price increases, sectoral reallocation, and pandemic-induced supply constraints. However, there is a belief among some academics and policymakers that these same types of shocks were causally responsible for the dynamics of labor market flows and wages documented above. A hot labor market story due to increasing aggregate demand is conceptually different from the framework developed in our paper. In our paper, a burst of inflation causally reduces worker well-being when there are nominal wage rigidities and frictional labor markets. Conversely, the hot-labor market story leads to increasing worker well-being at least in the short-run.

Was the 2021-2023 labor market "hot"? As seen from Figure 5, worker real wage growth was negative during this period (Panel A) and worker's median *cumulative* real wage growth between 2021 and 2024 was still negative both in absolute terms and relative to trend (Panel B). Was the employment rate substantively higher in the 2021-2023 inflation period compared to 2016-2019 pre-period? Table 4 shows the average employment rate for different demographic groups in both the January 2016 to December 2019 period (pre-period) and the April 2021 to May 2023 period (inflation period). As seen from the table, the employment rate was unchanged between the periods for three of the four demographic groups. Women with a bachelor's degree experienced a slight increase in their employment rate over this time period but this is a continuation of a trend that pre-dated 2020. If a hot-labor market is defined by rising real wages and/or increasing employment rates then the actual data from the US economy during recent years is inconsistent with this definition.

Table 4: Employment to Population Ratio Over Time, 25-55 Year Olds

Education	2016M1-2019M12	2021M9-2022M12
Men: Less than Bachelors	0.789	0.781
Men: Bachelors or More	0.899	0.900
Women: Less than Bachelors	0.617	0.617
Women: Bachelors or More	0.754	0.774
All	0.744	0.752

Notes: The first four rows of the table shows the average employment rate for men and women with less than a Bachelor's degree and men and women with a Bachelor's degree or more in different time period. The last row shows the average employment rate pooling men and women of all education levels. Column 1 shows the average employment rate during the January 2016 to December 2019 pre-period while Column 2 shows the average employment rate during the April 2021 to May 2023 inflation period. Sample focuses on those aged 25-55 from the monthly CPS files.

Yet, the fact that vacancies increased relative to unemployment has been suggested by some as evidence that the labor market during the post-pandemic period was hot.[26]. We next use

[26]See, for example, Benigno and Eggertsson (2023) and Autor, Dube, and McGrew (2024)

our structural model to assess how the labor market would respond when we feed in a series of other shocks that could directly cause a hot labor market. In particular, we study a discount rate shock (decline in ρ), a productivity shock (increase in Z_{it} for all workers), and an increase in matching efficiency. For this analysis, we assume the same labor market frictions as in our baseline model. However, we hold the price level constant throughout our analysis. We choose the size of the respective shocks so that they generate a rise in vacancies similar to what we generated in our baseline model after the price level shock. The goal of the exercise is to explore what happens to worker wages and other labor market flows in response to such shocks. We provide the full details of this exercise in the online appendix; here we only summarize the results.

This exercise leads to a few key predictions that are inconsistent with the data. First and foremost, all three of the hot labor market shocks predict there should have been an increase in the job-finding rate of the unemployed. However, as shown in Panel B of Figure 14, there was no increase in the job-finding rate in the United States during the recent inflation period. Likewise, all three of these hot labor market shocks has worker wages and/or well-being increasing; hot labor markets are good for workers. Finally, these models struggle quantitatively to match the large rise in E-E movements as well as the large differential wage response between job-stayers and job-changers.[27] The causal effect of inflation on the labor market matches these flows. To summarize, our mechanism can explain additional features of the data above and beyond what is predicted by a hot labor market story suggesting that inflation itself is an important driver of labor market dynamics during the last few years.[28]

Given that real wage growth was negative, employment rates were relatively constant, and the job-finding rate of the unemployed did not increase, the U.S. labor market did not appear overly hot during the 2021-2023 period. The only evidence of the labor market being hot is the increase in the vacancy-to-unemployment ratio. As discussed in Cheremukhin and Restrepo-Echavarria (2023), an increase in E-E flows can cause the vacancy-to-unemployment ratio to increase, all else equal. Our model shows how a burst of inflation can generate an increase in E-E flows

[27]It should be noted that the model in Autor, Dube, and McGrew (2024) is able to generate the wage of job-changers increasing relative to job-stayers as the hot labor market causes workers to reallocate towards higher productivity firms which generate additional wage gains; however their model does have worker well being increasing and firm market power decreasing during the 2021-2024 period.

[28]Recent work by Bagga, Mann, Sahin, and Violante (2023) highlights how the shifting ability to work from home can generate many of the labor market patterns during the 2020s. The increasing E-E flows in their paper come from workers sorting to jobs that offer work-from-home opportunities. Given that working from home is an amenity to workers, their model predicts that the wages of job-changers should fall if they are seeking work from home opportunities. This prediction is inconsistent with the data in Figure 4.

and correspondingly increase the vacancy-to-unemployment ratio (Figure 21). This does not necessarily imply a hot labor market. Recently, researchers have been studying labor market flows in Argentina around their devaluation in 2002 which increased the inflation rate to over 30%; the labor market in Argentina was not hot in the 2002-2004 period as the unemployment rate remained elevated relative to historical levels during this period. Despite the relatively weak labor market, Albertini, Poirier, and Trupkin (2019) find that the Beveridge Curve was steeper in Argentina during the 2000-2004 period than during the 2008-2018 period. That paper also documents that the vacancy-to-unemployment ratio was increasing during the period of high inflation. Blanco and Drenik (2023) show that the E-E rate increased and real wages fell in Argentina during the 2002-2004 period when inflation was rising. Labor market flows and wage dynamics during the 2002-2004 inflationary period in Argentina were similar to the labor market flows and wage dynamics in the 2022-2024 inflationary period in the United States. This provides some suggestive evidence of the potential causal role of high inflation itself on labor market dynamics and worker well-being.

Finally, by a variety of other metrics, it does not appear the U.S. labor market has been hot during the last few years. As noted in the introduction, survey evidence by Stantcheva (2024) show that workers do not like the inflation that has occurred since 2021. Separately, Gallop surveys Americans annually to measure their life satisfaction. The percentage of Americans who report that they are "very satisfied with their life" averaged 51% in 2021 and 2022, 50% in 2023, and 49% in 2024.[29] For reference, the share reporting that they were very satisfied with their life was 57% and 56% in 2018 and 2019. The 2024 share reporting they were very satisfied with their life was the lowest in the United States since the Great Recession. If the labor market was hot, one might conjecture the level of life satisfaction would be increasing during the recovery from the pandemic. Instead, the current level of life satisfaction is at levels similar to the Great Recession. Collectively, these broad survey results suggest that the current inflation period may be causally reducing the welfare of American workers which is opposite of the predictions of what happens in a hot labor market.

7 Conclusion

In this paper, we develop a model of how worker labor market flows – and subsequently worker welfare – adjust to a pure inflationary shock. Our quantitative model finds that the the large

[29]See, for example, "Less Than Half of Americans Very Satisfied With Own Lives" (Brenan, 2024, https://news.gallup.com/poll/610133/less-half-americans-satisfied-own-lives.aspx).

inflation in the United States during the 2021-2023 period causally reduced the welfare of all workers throughout the wage distribution; however the losses were greatest for high wage workers. Specifically, we find workers in the bottom, median and top wage deciles experienced a decline in welfare of 58%, 66% and 79% of their monthly real income, respectively. The welfare costs come from the fact that real wages initially declined and from the fact that workers subsequently took costly actions to offset the initial real wage losses. Our findings provide a model-based rational for why workers currently report that they dislike inflation in the current labor market environment.

Our model incorporates nominal wage rigidities into a framework with heterogeneous workers and frictional labor markets with many types of endogenous worker flows (quits, layoffs, and on-the-job search). The nominal wage rigidities along will a lack of two-sided commitment on the part of workers and firms results in inefficient separations initiated by both workers and the firms. In this environment, a burst of inflation, all else equal, reduces real wages on impact. In order to have their real wage keep up with inflation, workers can search for another job where they could contract over an updated real wage or they could try to take steps to renegotiate their wage with their existing firm. Both of these actions are costly to the worker. As a result, the true welfare costs of inflation on worker well-being needs to incorporate both the initial real wage decline as well as the costly actions incurred by workers to have their real wages keep up with inflation. Collectively, the framework provides a new perspective on the link between inflation, labor market flows, and worker welfare.

Our quantitative model also explains why the Beveridge Curve steepened during the recent inflation period. In particular, we illustrate how inflation can cause a large rise in vacancies – through increased job-to-job transitions – creating the appearance of a tight labor market without any additional labor market shocks. As a result, the increase in the vacancy-to-unemployment ratio need not be a signal that the labor market is “hot”. We go further in showing that shocks that directly cause a hot labor market (like increasing aggregate demand) result in increasing real wages, increasing employment rates, and/or increasing job-finding rates. However, during the 2021-2024 period in the U.S., real wages fell sharply, employment rates remained unchanged and the job finding rate was constant relative to a 2016-2019 benchmark period. These findings suggest that the labor market was not particularly hot by other metrics during the inflation period despite an increasing vacancy-to-unemployment rate. Our model, however, matches quantitatively all of these empirical patterns with just a shock to inflation.

Finally, we show that the inflation redistributes match surplus from workers towards firms.

The decline in real wages for workers is matched by an increase in profits on the part of firms. In this case, our model can also explain why the ratio of corporate profits to GDP was at historically high levels during the 2021-2023 inflation period.

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Online Appendix

A Data Description

Our main data sources are the Annual Social and Economic Supplement (ASEC) and Current Population Survey basic monthly files fielded by the US Census Bureau.

A.1. CPS Monthly Files

We use the Outgoing Rotation Group (ORG) which follows workers over 16 months. Workers enter the sample for 4 months, then rotate out for 8 months, and are observed once again for 4 months. This is called a 4-8-4 sampling scheme. We leverage this short panel to observe individual labor market flows by skill level (education) and initial earnings decile. We also use the ORG to take repeated cross-sections at a monthly frequency to observe changes in real weekly earnings during the recent inflationary period. Sample selection and estimation of labor market flows and earnings are described below.

A.1.1. Sample Selection. For the years 2015 to 2024, we select all individuals from ages 25 to 55, inclusive. We exclude all government employees, self-employed workers, and unpaid family members. This leaves us with 4,077,904 worker-month observations. This is the main sample we use in all the subsequent analyses.

A.1.2. Measure of Earnings. In months 4 and 8, all employed workers in the week of the survey are asked about their usual weekly earnings. We use full-time workers' reported nominal weekly earnings as our wage measure. The CPS top codes individuals with nominal weekly earnings of higher than 2884 U.S. dollars. This top coding procedure changed in April 2023. To maintain consistency throughout our sample, we top code all workers with earnings of more than 2880 nominal U.S. dollars. All our measures of the wage distribution exclude top-coded workers in the right tail of the earnings distribution. Each month, we use the associated price index (CPI-U) published by the BLS to convert nominal earnings to real and create a cross-sectional real earnings distribution over time.

A.1.3. Labor Market Flows. The CPS basic monthly files report the employment status - employed or unemployed - of each individual in the labor force. We directly observe changes in employment status for each individual across adjacent months which provides us with a measure of gross flow from employment to unemployment (EU) and unemployment to employment (UE). In addition, we also observe a change in employers across adjacent months which allows us to measure EE flows. There are several technical issues that warrant discussion here. Fujita, Moscarini, and Postel-Vinay (2024) show that the CPS systematically underestimates EE flows since 2007 due to changes in survey methodology which induce selection on both unobservable and observable worker characteristics that are correlated with EE transitions. We use their published aggregate EE series to discipline our EE rates by earnings deciles and education group. Our raw EE estimates by various groups underestimate true EE flows, so we use a constant scaling factor to scale our EE flows by deciles to hit the aggregate EE rate. We use the following equation to determine our scaling factor:

$$EE = \frac{\alpha}{10} \sum_{d=1}^{10} EE_d \tag{A.1}$$

The decision of a constant scaling factor across deciles warrants discussion. If the elasticity of E-E probability varies with earnings then the scaling factor should be different. According to both Autor, Dube, and McGrew (2024) and our model, returns to search effort, in expectations, are decreasing in current earnings. Therefore, search effort, and in turn, EE rates are more elastic at the bottom of the earnings distribution which implies that a constant scaling factor underestimates the true EE rate for low earners and overestimates EE rates for high earners. Thus, our estimates which show that EE rates increased more for low earners relative to high earners is a conservative lower bound. Similar issues persist with estimating EU and UE flows using microdata in the CPS. We follow the seminal work of Shimer (2005) to infer the EU and UE using aggregate gross worker flows. Of course, data is observed in discrete time at a monthly frequency so we estimate the job finding rate (UE rate) by:

$$\lambda_t = 1 - \frac{U_{t+1} - U^s_{t+1}}{U_t} \tag{A.2}$$

where U represents the stock of unemployed workers at a given point in time and U^s represents the stock of short-term unemployed workers (unemployed for <= 4 weeks). The separation rate (EU) rate is estimated using:

$$\delta_t = \frac{U^s_{t+1}}{E_t(1 - \frac{1}{2}\lambda_t)} \tag{A.3}$$

where E is the stock of employed workers at a given point in time.

A.2. ASEC

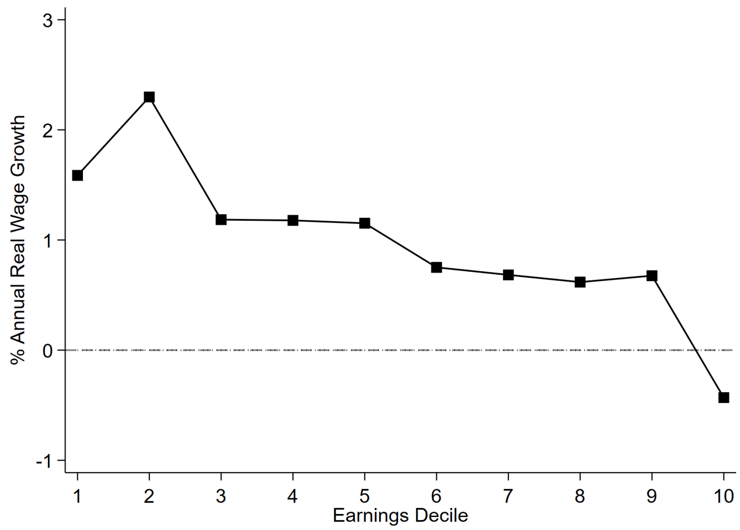
We use the ASEC, fielded in March of each year, to validate our findings from the monthly files. In each sampling year, we observe respondents' total pre-tax wage and salary income for the previous calendar year and the number of weeks worked. We use this information to construct a measure of nominal weekly earnings and then deflate the earnings by the average price index of the reported earnings year. We assign each individual a weekly earnings decile and then link the workers in the ASEC to the monthly files. Unlike the earnings measure in the CPS monthly files which provides a contemporary measure of earnings and may be contaminated by endogenous worker flows, the ASEC provides a measure of earnings in the previous calendar year and allows us to observe transition rates in the current year.

B Additional Descriptive Results

In this section of the appendix, we show additional results as referenced in Section 2.

B.1. Real Wage Growth By Decile, 2016-2019

Figure B.1: Average Annual Real Wage Growth By Decile, 2016-2019



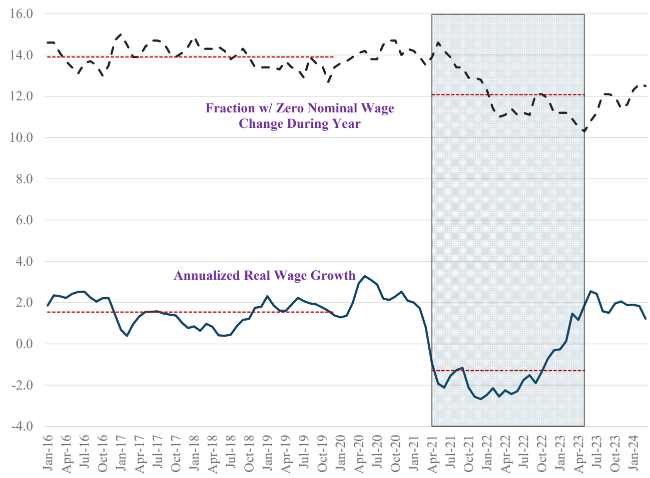
Notes: Figure shows average real wage growth by weekly earnings decile during the 2016 to 2019 period. Data comes from the outgoing rotation sample of the CPS. The sample includes those aged 25-55 (inclusive). Nominal wages are computed as average weekly earnings. Real wages are computed by deflating the average nominal wage in each decile-month by the corresponding monthly CPI. Real wage growth for each decile during this period is the percentage change in the average monthly real wage in 2019 for each decile relative to the average monthly real wage in 2016 for each decile divided by 3.

Appendix Figure B.1 shows the average annual real wage growth by decile during the 2016-2019 period. The data come from the outgoing rotation of the CPS. The sample includes all employed individuals aged 25-55 (inclusive). In particular, for each month during this period, we define deciles based on the reported weekly earnings of respondents. Within each decile-month, we compute nominal weekly earnings. We then create measures of real weekly earnings in each decile-month by deflating by the corresponding monthly CPI. To compute average real wage growth between 2016-2019 we do the following. First, we average real weekly earnings across all months in 2016 for each decile. This is our measure of 2016 weekly earnings. Second, we average real weekly earnings across all months in 2019 for each decile. This is our measure of 2019 weekly earnings. Finally, we take the growth rate between the 2016 and 2019 measures for each decile and divide by three.

B.2. Atlanta Fed Wage Tracker Index

Appendix Figure B.2 shows the average annualized real wage growth (solid line) and the share of workers who received no nominal wage increase during the year (dashed line) from the Atlanta Fed's Wage Tracker Index. The Atlanta Fed series reports median nominal real wage growth each month. We create a measure of real wage growth by deflating the series by the corresponding monthly CPI inflation. The Atlanta Fed Wage Tracker Index uses CPS microdata to measure trends in various wage measures based on the methodology developed in Daly, Hobijn, and Wiles (2012).

Figure B.2: Average Annual Real Wage Growth and Share of Workers Receiving No Wage Increase, Atlanta Fed Wage Tracker



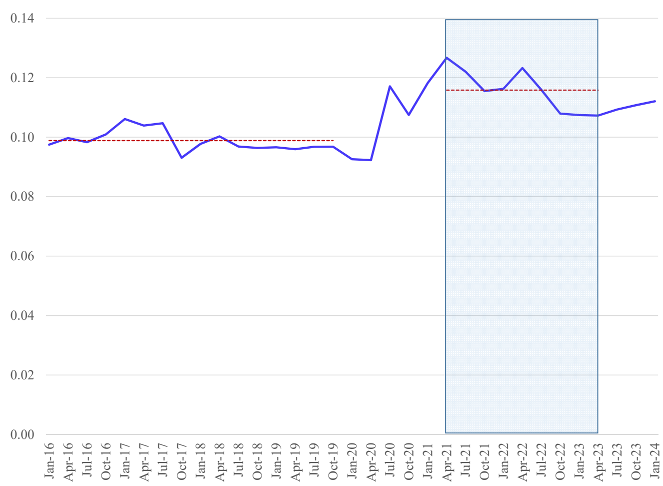
Notes: The solid line in the figure shows the average annualized real wage growth for each month between January 2016 and June 2024. The dashed line shows the share of workers receiving no nominal wage increase during the year. The shaded area is the inflation period. The dashed red lines show the series average over the 2016-2019 period and the inflation period, respectively. Data comes from the Atlanta Fed's Wage Growth Tracker. The Atlanta Fed's Wage Growth Tracker uses CPS data to create measures of wage growth based on the methodology of Daly, Hobijn, and Wiles (2012).

B.3. Corporate Profits

Appendix Figure B.3 shows the corporate profit rate to GDP ratio in the United States between 2016 and 2024 (quarterly). As seen from the figure, the corporate profit to GDP ratio jumped from about 10% in the 2016-2019 period to 11.6% during the inflation period. The corporate profit to GDP ratio during the inflation period is the highest it has been since 1950. Between 1950 and 2020, there were only 9 quarters where the corporate profit to GDP ratio exceeded

11% and there were no quarters where the ratio exceeded 12%. The current corporate profit to GDP ratio is at historically high levels. The rise in the corporate profit to GDP ratio is consistent with the prediction of our model where firm labor market power increased during the inflationary period because nominal wages are sticky. The rise in the corporate profit to GDP ratio at face value is inconsistent with other theories suggesting firm labor market power decreased during the post-pandemic period due to the labor market being tight.

Figure B.3: Corporate Profits to GDP Ratio



Notes: Figure shows the U.S. corporate profits (after tax, without inventory valuation adjustment and capital consumption adjustment) relative to nominal GDP. Data from the U.S. Bureau of Economic Analysis retrieved from FRED, Federal Reserve Bank of St. Louis.

C Alternate Mechanism Analysis

Coming soon...