The Role of Macro Expectations in the Labor Market

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Abstract

This paper studies the influence of households' macroeconomic expectations on labor market outcomes. I begin with a macroeconomic analysis, estimating a standard business cycle VAR specification that incorporates the Michigan Consumer Sentiment Index as a proxy for households' beliefs about the macroeconomy, along with wage indices for both newly hired workers and job stayers computed from the SIPP. I find that wages of new hires respond very slowly to shifts in households' expectations about the macroeconomy. I then turn to micro-level data from the New York Fed's Survey of Consumer Expectations to investigate whether changes in workers' expectations about the broader economy influence their labor market outlook. I find no evidence that workers expectations about the macro economy exert influence on (i) their expectation about wages of future job offers; (ii) their reservation wage or (iii) the number of job offers they expect to receive in the near future. I conclude there is a detachment between households beliefs about the macro economy and their beliefs about their own prospects in the labor market, therefore changes in households beliefs about the overall economy should have limited impact on their labor market outcomes.

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1 Introduction

How do households' expectations about the aggregate economy affect the labor market? In the standard Diamond (1982), Mortensen (1982) and Pissarides (1985) framework, better expectations about the future state of the economy (i.e. expectation of a higher productivity level) increase the surplus of a worker-firm match, firms then post more vacancies as the benefit of employing workers increases and workers bargain better wages as they perceive an increase in the their outside option to any particular offer they might receive. Recently, new evidence pointed out to the fact that workers hold very stable beliefs about their own prospects in the labor market. Mueller et al. (2021) use survey data to show that an unemployed workers' perceived job finding probability doesn't change during the spell of unemployment, moreover their beliefs seem to be insensitive to changes in macroeconomic conditions. In light of this evidence, Menzio (2022) proposes a search framework in which workers bargain as if their expectations about future productivity remain unchanged after a shock to aggregate productivity. That generates a degree of wage stickiness that has consequences for the dynamics of vacancy creation, market tightness and unemployment.

Interestingly, households expectations about the aggregate state of the economy are considered to be relatively volatile. Measures associated to households' beliefs regarding macro economic conditions seem to indicate that those beliefs are more volatile and exhibit more dramatic drifts than what would be justified by changes in economic fundamentals alone (i.g. changes in TFP). This observation, in fact, motivated a now big strand of the literature that studies expectation driven fluctuations[1].

How can we conciliate the evidences of households' enduring beliefs about their individual labor market prospects with the apparent volatility of their beliefs when it comes to the macro economy? These facts seem to suggest a disconnection between households' expectations about the aggregate economy and their expectation about their own labor market outcomes. This paper provides a formal investigation on how shifts in households' beliefs about the

[1] Angeletos et al. (2020),Bhandari et al. (2019)

aggregate economy affect the labor market. Are workers' beliefs about their labor market prospects detached from their beliefs about the macro economy? How could we make sense of this departure in a setting where workers gather information about the economy and have to form expectation about their labor market prospects? Is there evidence that wages do not respond to shifts in beliefs about the macro economy?

I first perform a macro empirical analysis on how the labor market, in particular wages, responds to shifts in households' expectations about the aggregate state of the economy. For that purpose, I use a VAR where I include the Michigan Consumer Sentiment Index (MCSI) as a proxy for households' current state of beliefs about the aggregate economy. Then I employ the max-share identification strategy by Uhlig (2004) to study the economy's reaction to the shock that explains most of the volatility of this proxy for beliefs. Previous works in the literature of expectation-driven fluctuations use the MCSI as proxy for households sentiment or confidence level[2], concepts that represent autonomous changes in households expectations about overall business conditions. Bhandari et al. (2019) show that the MCSI is highly correlated to an index that captures changes in households expectations about unemployment and inflation which are not explained by a rational projection based on available information about macro variables. Therefore, variations to the MSCI proxy for changes in expectations that are not explained by changes to fundamentals that could also influence wages, for example, TFP.

The VAR also includes standard macro aggregates and estimates of the level of wages of newly hired workers (new hires) and of worker remaining in the same job (job stayers), which I compute using data from the SIPP. It is essential to study the behaviour of wages of new hires and of job stayers separately, as Pissarides (2009) pointed out that the former should be the one to incorporate changes in economic fundamentals and expectations since wages of job stayers are, in general, pre-established and only occasionally renegotiated.

The main result from the macro analysis is that wages don't immediately respond to

[2]See for example Barsky and Sims (2012) and Angeletos et al. (2018)

the shock that moves beliefs, as would be predicted by a standard DMP model. This shock generates a business cycle like response from the economy, and wages of new hires do respond strongly to it, rising around 3% in the course of two years and a half, but the increase is very gradual, which I interpret as evidence that workers are not bargaining for better wages after a positive innovation to their beliefs, nor are they adjusting their wages down when their perceive a deterioration of macroeconomic conditions. I provide evidence that the identified shock is not related to shocks to productivity which would also impact wages.

Next I turn to survey data to investigate how workers behaviour and expectations about their labor market prospects change in response to changes in their beliefs about the macroeconomic. Specifically, I use panel data from the New York fed's Survey of Consumer Expectation to investigate the impact of changes in workers expectations about the unemployment level on (i) their expectations about future wage offers, (ii) their declared reservation wage, (iii) the number of job offers they expect to receive, (iv) the probability they attribute to the event of receiving at least one job offer. I control for recent experiences workers had in the labor market, using a specification similar to Conlon et al. (2018), which includes controls for deviations between expectations and actual outcomes obtained by workers with respect to, for instance, the number of offers they receive and the average wage of the offers received.

I find no evidence that changes in expectation about future unemployment plays a significant role in moving workers' expectation about wages of future offers or that it affects their reservation wage. It also plays no significant role in changing their expectation about the number of offers they expect to receive. I did find evidence these changes influence workers expectation of receiving at least one offer, at the 10% level of significance, but in the opposite direction of what one would in general expect (expectations of higher unemployment would increase their perceived chance of getting at least one job offer). Experiences in the labor market, on the other hand, seem to exert great influence on workers expectations and on their reservation wage. Workers that receive wage offers on average 1% higher than what they expected adjust their expectation about the wages of future offers up in 0.4%, a result

very similar to Conlon et al. (2018). They also adjust their reservation wage up in 0.2% in response to the same event. Moreover, each additional offer they receive on top of the number of offers they were expecting make workers expect 0.72 more offers in the future, and increase the percentage chance they attribute to the event of receiving at least one offer in 4.1%.

Overall, the results obtained using survey data suggest that worker' beliefs about their own prospects in the labor market are detached from their opinions about the aggregate economy. Rather, it seems like they update those beliefs based on experiences they have in the market. This supports the thesis that wages don't quickly adjust after a shift in households' expectation about the macro-economy due to the fact households' don't factor in for those changes when bargaining for wages in the labor market, a consequence of this detachment between beliefs about the aggregate economy and individual labor market prospects. But how to make sense of this apparent detachment? In the last part of the paper I propose a framework where workers do know that their value in the labor market is related to the aggregate state of the economy, but they don't directly observe neither the aggregate state of the economy nor their individual value. Workers obtain noisy signals about the aggregate state of the economy through news or other common available sources of information and they also obtain signals about their value in the labor market through the job offers they receive. This presents workers with a filtering problem where the weight they assign to the signal they receive about the macro economy relative to the signal they get from the labor market will depend on the relative dispersion of the signals they receive from each of these sources of information and of what they perceive to be the correlation between the aggregate state of the economy and their individual value in the labor market.

This is a work in progress, section 2 will describe the strategy and preliminary results of the macro analysis, section 3 presents the strategy and preliminary result of the investigation based on micro data, section 4 sketch the model that will be propose to rationalize the empiric results, and delineates the strategy to validate the model with using micro data. Section 5

offers some closure.

2 Macro Empirical Analysis

I first study the labor market response to a shock that shift expectations about the macro economy. The empirical strategy is to proxy households' aggregate state of beliefs about the macro economy using the Michigan Consumer Sentiment Index and then employ Uhlig (2004) max share approach to back up he shock that explains most of the volatility of this variable. Specifically, I study a VAR with the Michigan Consumer Sentiment Index (MCSI), standard macro variables: Output (Y), Investment (I), Consumption (C), Unemployment (u), Fed funds rate (R), Total Factor Productivity (TFP); and also proxies for labor market prices: an Index for the Wage of New Hires (W^{NH}), and an Index for the Wage of Job Stayers (W^{JS}). The VAR is estimated using quarterly data from Q1 of 1990 to Q2 of 2013.

2.1 The MCSI as a proxy for the state of beliefs.

The MCSI index is computed by the university of Michigan based on questions asked in the Michigan Survey of Consumer Expectation. Works in the field of expectation driven fluctuations use the MSCI as an indicative of the overall level of optimism or pessimism about the aggregate state of the economy. In principle, there is no direct theoretical mapping on how changes in households expectations should translate into changes to the MCSI, nonetheless Bhandari et al. (2019) showed that variation in the MCSI are highly correlated with variations in households' expectation bias about the future performance of the economy, formally establishing a relation between variations to the index and autonomous changes in households' expectations about the macro economy.

In their work, Bhandari et al. (2019) use survey questions about unemployment and inflation to document that households expectations are systematically biased as, on average, they expect inflation and unemployment going forward to be higher than what a rational

projection would predict, given the available information set. They show that this forecast bias varies greatly throughout the business cycle and that the principal component of the times series for the unemployment and inflation forecast bias greatly correlates (0.61) with the MSCI. Therefore changes to the MSCI are mostly capturing changes in households' expectation that are not explained by a rational projections of changes to macro variables, hence it mostly captures autonomous changes to beliefs. For this reason I use the MCSI as a proxy for the state of beliefs about the macro economy, an increase in the index value represents an increase in optimisms regarding expectation about macro variables (lower unemployment and inflation) that can be considered autonomous, i.e. not linked to changes in macro fundamentals that could impact wages through some mechanism other than expectations.

These autonomous changes in beliefs are interpreted as deviation from rational expectation by Bhandari et al. (2019), but other works argue that this doesn't have to be the case. For example, Barsky and Sims (2012) propose that the changes to the MCSI might be capturing new information households have that are not yet reflected on macro variables, therefore not in the information set of the econometrician. Benhabib and Spiegel (2018) points out that autonomous changes in beliefs might coordinate agents into a another rational equilibrium, in which case those changes could be regarded as rational. I note that it is not important to my analysis whether these changes in beliefs are rational or not, it is crucial that they are autonomous and not a result of some other shock that might affect wages via a channel other than expectation, like a shock to TFP. On that note, one should be concerned that these autonomous changes in beliefs might be frequently accompanied by other fundamental shocks to the economy. For example, a wave of pessimism might be triggered by a shock to TFP and that would undermine the identification of the effects of expectation into wages absent a clean identification strategy for the belief shock. As I will argue later, although the identification strategy employed in this exercise is not clean, I can provides evidence that the movements in autonomous beliefs, as captured by changes to the

MCSI, are at least not related to shocks to TFP and that the response of wages to the shock that moves the MSCI are not driven by productivity.

2.2 Estimates of Changes in Wages

I evaluate the effect of a switch in aggregate beliefs on the labor market through its effect on unemployment, wages of workers being hired in the current period (wages of new hires) and wages of workers who are continuing in the same job (wages of job stayers). The reason for this separation, as previously explained, is that earlier works in the labor literature documented that wages of job stayers are relatively insensitive to changes in macroeconomic conditions as they are not renegotiated as those conditions change. It is the wage of new hires that reflects changes in economic conditions and expectations as those changes influence bargaining processes happening in the same period[3]. I use information about wages and workers from a dataset built and made available by Gertler et al. (2020a), based on data from the SIPP.

Starting from 1990, the SIPP provides data on wages for a nationally representative sample of workers, following a multiple panel structure where each new panel is introduced every 32-40 months (until 1993, a new panel was introduced every year, which provided additional data for that period) and follows 15.000-24.000 workers. Most important for this study is that the high frequency of the SIPP allows us to track changes in workers' employment situation every quarter so that I have a quarterly series for the VAR. The SIPP records information on job-specific earnings. The dataset used records information on hourly wages when available at the SIPP, otherwise job-specific earnings are converted to hourly wages by the estimate of working hours per week or month. The SIPP maintain consistent job ID's across interviews for most workers[4] so the dataset identifies when a job transition occurred, when the worker switched jobs after a period of unemployment or when there was

[3]See Pissarides (2009) for a discussion

[4]Even for the cases where it fails, Gertler et al. (2020b) are still able to estimate when the same job was kept of there a change of job in a particular period, refer to it for details.

a recall. The dataset provided by Gertler et al. (2020b) uses observation for men between ages of 20 and 60, dropping earnings lower than a minimum wage and top-coded earning.

I estimate an index for the wage level of new hires and another for the wage level of job stayers. The reason to build an index for the wage level of new hires is to take out composition effects that generate variations in the level of wages due to potential changes in the profile of worker being hired, an effect that is not of interest of this exercise[5]. It also allows me to control for sample composition effects (for new hires and job stayers), by working with first differences. To create the index of wages for New Hires, W_t^{NH} I compute, for each quarter:

$$\pi_t^{w,NH} = \sum_i \Delta w_{it} \times (\text{Sample weights}) \times \mathbf{1}(\text{New} = 1)$$

Where Δw_{it} is the first difference of wages and $\mathbf{1}(\text{New} = 1)$ is an indicator function selecting workers that have been hired in that particular quarter. I normalize the index to 100 in the first quarter of 1990, and so the index for wages of new hires is built as:

$$W_t^{NH} = 100 * \prod (1 + \pi_t^{w,NH})$$

Similarly, to build the index of wages of job stayers, I compute the mean wage change of workers that are not a new hire for each quarter:

$$\pi_t^{w,JS} = \sum_i \Delta w_{it} \times (\text{Sample weights}) \times \mathbf{1}(\text{New} = 0)$$

And then I define:

$$W_t^{JS} = 100 * \prod (1 + \pi_t^{w,JS})$$

I then include the series $\pi_t^{w,JS}$ and W_t^{JS} into the VAR.

[5]Although this composition effect is interesting on itself (see Gregory et al. (2021), for example)

2.3 The Shock that Moves Expectations

Having estimated the VAR:

$$B(L)X_t = \nu_t$$

Using quarterly data from 1990 and with the already mentioned set of variables:

$$X = [Y, I, C, h, u, R, TFP, MCSI, W^{NH}, W^{JS}]$$

We can use the MA(∞) representation of the VAR and express the residuals as a linear combination of the structural shocks to get:

$$X_t = B(L)^{-1}A\epsilon_t$$

Where ϵ_t is the vector of structural shocks and A the matrix that maps the shocks into the residuals (or conversely, give us the combination of residuals that form each shock). Uhlig (2004) max share identification strategy involves choosing the rotation matrix A such that the first shock in the vector of shocks explains the highest possible share of the variance of a variable x_t, over the frequency band $[\underline{\omega}, \overline{\omega}]$. We employ this strategy to pick a matrix A such that the first shock in the vector of shocks explains most of the volatility of the MCSI variable, over the business cycle frequency ($\underline{\omega} = 2\pi/32$ and $\overline{\omega} = 2\pi/6$).

Specifically, let $\phi(z) = e^1 B(L)^{-1}A\epsilon_t$ be the z transfer function associated with the MA(∞) representation of the variable MSI. The variance of MSI over the frequency band $[2\pi/32, 2\pi/6]$ can then be expressed as:

$$\sigma^2_{MSI} = \frac{1}{2\pi}\int_{2\pi/32}^{,2\pi/6} \phi(e^{-i\lambda})\phi(e^{-i\lambda})' d\lambda$$

By the same principle, the contribution of each residual to the overall variance of the MSI

is given by the matrix Ω^{MSI} such that:

$$\Omega^{MSI} = \frac{1}{2\pi} \int_{2\pi/32}^{2\pi/6} \phi(e^{-i\lambda})' \phi(e^{-i\lambda}) d\lambda$$

So the shock that explains most of σ^2_{MSI} is found by computing the q eigeinvector associated with the matrix Ω^{MSI} and then setting: $A = q\hat{A}$, where $\hat{A}$ is the Cholesky decomposition of the covariance matrix of the residuals ,Σ_ν.

2.4 Results of the Macro Analysis

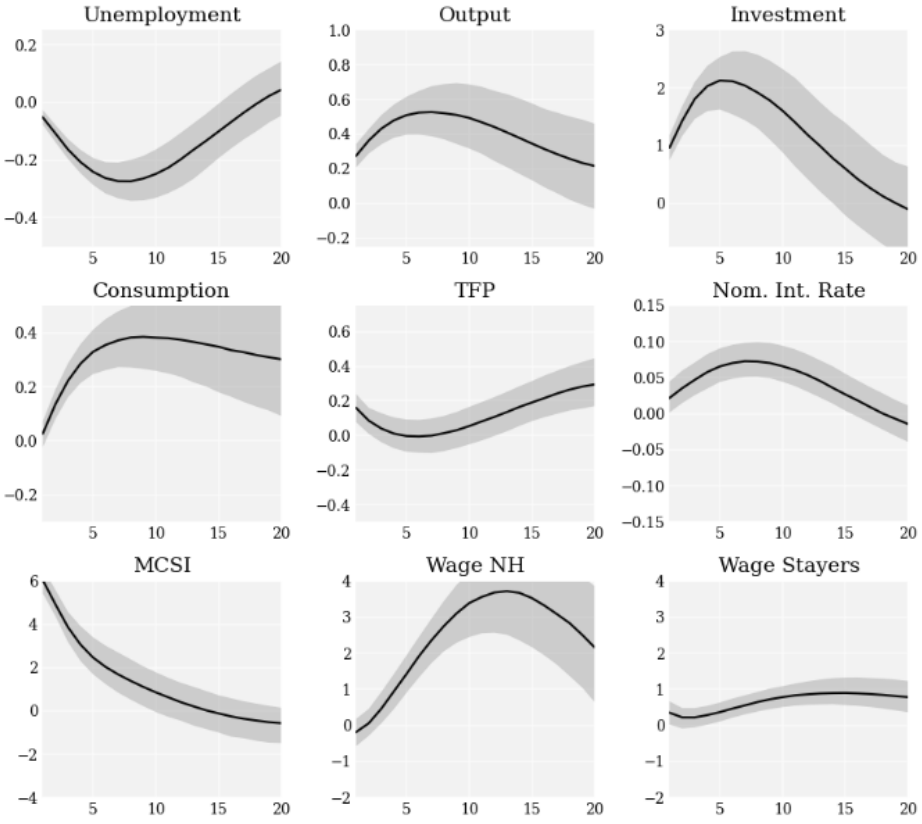
Figure 1 displays the IRF following the identified shock. The MCSI behaves as if there was an innovation to beliefs that dissipates over time, shooting up on impact and decaying slowly afterwards. Wages don't respond immediately to the big shift in beliefs, as would be predicted by standard DMP framework. Wages of New Hires ultimately do respond strongly to the shock, rising by almost 4% three years after the impact, but this increase is very gradual and so it doesn't seem to be a direct to the shift in aggregate beliefs. In fact, this shock that moves the MCSI triggers a business-cycle like response from the economy, with unemployment responding significantly over time, so that a big share of the increase in Wages of New Hires should be attributed to an increase in market tightness, which is also predicted by the standard DMP model.

Table 1 shows the estimated share of the variance of each variable in the VAR that is explained by the identified shock. Not surprisingly, this shock explains a huge share (75%) of the observed variance of the MCSI, as it is build to maximize this share. The table shows that this same shock also explains a great deal of the fluctuation of key macro variable, explaining close to 50% of the volatility of Output, Unemployment and Investment. This shows that fluctuations in sentiment are highly connected to fluctuations in macro aggregates. In fact, the results I obtain by looking at the 'Business Cycle Shock' by Angeletos et al. (2020), are very similar as the results obtained with the 'beliefs shock', in the sense that the former

also explains a high percentage of the volatility of beliefs and produces very similar IRF's. (Appendix)

Wages of New Hires are fairly connected with the 'beliefs shock' (35%), although the connection is a not as strong as the connection between the MCSI and the other macro aggregates, which is probably due to the fact the level of Wages of New Hires are estimated, so it also vary due to sample variation which is uncorrelated to everything else. Wages of workers staying in the same job appear to be disconnected from changes in beliefs or from macro movements in general.

Figure 1: IRF to the shock that explains most of the volatility of the MCSI



Previously I discussed concerns that movements in wages could be resulting from changes to productivity, as the identification strategy employed don't allow me to claim that the 'belief shock' recovered is orthogonal to productivity shocks that can also be affecting the economy, wages in particular. Nonetheless the results show that TFP is not really related

to the identified shock, not surprisingly as Angeletos et al. (2020) showed before that TFP is poorly related to the 'Business Cycle shock'. The shock tat moves beliefs explains only 13% of the volatility of TFP, also the IRFs shows that TFP doesn't respond to this shock on impact and that over time it also doesn't show a response that would justify the observed response of wages of new hires.

Unemp	Output	Invest.
47.76	45.95	52.07
[35.58, 58.81]	[33.64, 57.78]	[39.60, 63.24]
Cons.	TFP	Nom. Int. Rate
31.32	13.19	24.11
[20.00, 43.50]	[5.92, 25.42]	[12.58, 37.11]
MCSI	Wage NH	Wage Stayers
75.33	35.92	10.71
[63.80, 85.25]	[24.01, 48.71]	[5.00, 22.27]

Table 1: Share of the variance of each variable explained by the "belief shock"

As a last piece of evidence that the identified shock is unrelated to TFP, Table 2 show how much of the volatility of each macro variable can be attributed to the shock that explains most of TFP's volatility over the business cycle. Note that although the "TFP shock" explains 67% of the volatility of TFP, it seldom contributes to the volatility of any other variable, in particular, this shock plays almost no role in explaining volatility of beliefs.

Unemp	Output	Invest.
6.78	5.92	5.31
[2.65, 17.08]	[1.84, 15.84]	[1.77, 15.59]
Cons.	TFP	Nom. Int. Rate
7.53	67.57	4.84
[2.30, 15.86]	[53.99, 80.03]	[1.34, 14.91]
MCSI	Wage NH	Wage Stayers
3.89	4.60	4.98
[1.25, 11.80]	[1.35, 13.93]	[1.56, 13.01]

Table 2: Share of the variance of each variable explained by the "TFP shock"

The main takeaway from the macro analysis is that wages don't quickly respond to

a shock that promotes a shift in aggregate beliefs. The response of the overall economy following this shock and the high share of the volatility of key macro variables explained by it are both evidence that shifts in beliefs do have at least predictive power about macro fluctuations. If that is the case why do workers don't bargain higher wages when a positive shock improve their expectations about the economy, or why don't they accept lower wages when in face of a negative shock? According to the standard theoretical framework, beliefs about the aggregate economy should affect workers' decisions by changing their beliefs about their own possibilities in the labor market. If workers believe that a better economic outlook will provide them with better outside options to any job offer they might have, they should require better wages to accept any job offer.

If beliefs about the macro economy are not affecting wage of new hires, it has to be that (i) workers are not mapping changes to the economic outlook to changes to their own prospects in the labor market, (ii) workers do update their beliefs about their prospects based on changes in their opinion about the macro economy, but they prefer not to act on it (no change in their reservation wage) or (iii) some constrain external to the workers prevent wages from changing even when they try to adjust their reservation wage. In what follows, I use survey data to investigate which of these possibilities are likely behind this observed detachment between wages and beliefs about the macro economy.

3 Micro Evidence of Workers Response to Macro Beliefs

I use data from the New York Fed's Survey of Consumer (SCE) expectation to investigate how workers behaviour and beliefs change in response to changes in their expectation about the macro economy. The survey assess households expectations about the macroeconomy and about their individual labor market outcomes. It also collects information about households behaviour in the labor market,The SCE contains information that allow me to evaluate how

workers expectations about the macro economy affects: (i) their expectation about wages of future job offers they might receive; (ii) their reservation wage; (iii) the number of job offers they expect to receive and; (iv) the probability they attribute to the event of receiving one job offer at least.

3.1 The Survey of Consumer Expectation

The New York fed's Survey of Consumer Expectation interviews a nationally representative sample of households, following a rotating panel structure. The core module of the survey is conducted monthly and contains questions that asses households' expectations about the macro-economy. The 'Labor Market Survey' special module is conducted every four months, it collects information about households' recent experiences and activities in the labor market, such as the number job offers did they receive in the last 4 months, the wage of those offers, whether they were actively looking for a job or not, what would be the minimum wage they would require to take a job (or change jobs), etc. It also contains questions about their expectations regarding their future labor market experiences. Around 1300 households receive questionnaires every moth and each household stays in the panel for twelve months. Since the Labor Market sub module is conducted every 4 months, I observe the same household 3 times at most for the purposes of this study. This work uses data from July 2014 to march 2020.

In the next subsection I will present the regression specifications and describe how I build all the variables employed in this micro analysis. Below is the example of a questions from the core module, used to assess households expectations about the macro-economy. The appendix lists all the questions used to build the all the variables.

Question Q4new - Expectations about unemployment

"What do you think is the percent chance that 12 months from now the unemployment rate in the U.S. will be higher than it is now?"

Below are examples of questions regarding workers' reservation wage and their expectations about the wage of future offers. From the Labor Market module:

Question R2W - Reservation Wage:

Suppose someone offered you a job today in a line of work that you would consider. What is the lowest wage or salary you would accept (BEFORE taxes and other deductions) for this job?

Question OO2a - Expected Average Offer

Think about the job offers that you may receive within the coming four months. Roughly speaking, what do you think the average annual salary for these offers will be for the first year?

3.2 Specifications and Results

The first set of regressions evaluate if changes in beliefs about the macro-economy affect workers' reservation wage and expectations about future wage offers. I proxy changes in beliefs about the macro economy with changes to the percentage change respondents attribute to the event that unemployment will rise in the future. Results are qualitatively unchanged if instead I use their opinion about the stock market (Appendix).

Worker recent experiences in the labor market can potentially simultaneously affect their beliefs about the macro economy, their expectations about future wage offers and their reservation wage, so it is important to control for those experiences. For that purpose, I employ a specification similar to Conlon et al. (2018):

$$Y_i = \beta_0 + \beta_1 \Delta \text{Prob.Unemp.Up}_i + \beta_2 \text{ShockWageOffer}_i + \beta_3 \text{ShockNumOffers}_i + \gamma' \mathbf{ChangeStatus}_i$$

Where the set of dependent variables, Y, includes:

Δlog Reservation wage: estimated as the change, from last period, to the log of the value of a worker's declared reservation wage (Question R2W in the example), measured in dollars per year.

Δlog Expected Average Wage of future offers.: defined as the change to the log of the value of the respondent expectation about the average wage of future offers she might receive (Question OOa2 in the example), also measured in dollars per year.

The control variables are:

ΔProb.Unemp.Up: change in the believed probability that unemployment will rise in the next 12 months (Question Q4new in the example).

ShockWageOffer: log average wage of 3 best offers received in period past 4 months (Question NL2, see appendix) minus the log of the expected average wage of offer elicited in the previous interview (Question OOa2).

ShockNumOffer: number of offers received in the lat 4 months (Question NL1, see appendix) minus number of offers the worker was expecting to receive in the same period, according to the previous interview (Question OO2new, see appendix).

Change Status: Vector registering the following transitions of employment status of the worker in the previous 4 months: employed to unemployed (EU); move of full time job to part time job (FP); unemployed to full time job (UF);unemployed to part time job (UP); part time to full time job (PF); out of the labor force to employed (OE); employed to out of the labor force (EO).

Table 3 show the results of this first set of regressions. There is no evidence that changes in the believed probability that unemployment will rise has any effect on neither workers reservation wage nor in their expectation about the wage level of offers they might receive.

There is strong evidence that workers experiences in the labor market do exert influence in their behaviour and expectations. The first column show that workers that receive offers with an average wage 1% higher than what they were expecting readjust their reservation wage by 0.2%. Moreover, they adjust their expectation about wages of future offers up by 0.4% in response to this same event (second column of the table), a result in line with Conlon et al. (2018).

Workers also adjust their expectations and reservation wage in response to some changes to their employment status. When moving from employment to unemployment they reduce their reservation wage by 19.2% although their expectations regarding future wage offers doesn't seem to be affected. Moving from unemployment to a part time job make workers adjust their (annual) reservation wage and expectations about wage of offers down in 22.7% and 18.1%, respectively, which seem to hint that workers, on average, seek for a full time position and adjust their expectations and reservation wage if they decide to settle for a part time position. Moving to a part time position from a full time job make workers readjust their expectation a out wage offers down 16.6% but doesn't impact their reservation wage.

Next, I investigate how do changes in expectations about future unemployment affect workers expectations about the number of job offers they will receive and their belief about the probability of receiving one offer at least in the next 4 months. For that purpose, I use the following set of specifications:

$$Y = \beta_0 + \beta_1 \Delta\text{Prob.Unemp.up} + \beta_2 \text{ShockWageOffer} + \beta_3 \text{ShockNumOffers} + \\ + \beta_4 \mathbb{1}[\Delta\text{Searching}] + \gamma' \mathbf{ChangeStatus}$$

Where now the dependent variable variables are:

ΔExpected number of offers: change, from last interview, to the number of offers the respondent expect to receive in the next 4 months (question OO2new, see appendix).

Table 3: Changes in Reservation Wage and Expected Wage Offer

	Dependent variable:	
	Δ log Reservation wage	Δ log Expected Av. Wage of Offers
ΔExp.Unemp.Up	-0.022	-0.006
	(0.031)	(0.027)
ShockWageOffer	0.202***	0.400***
	(0.038)	(0.032)
ShockNumOffers	−0.006*	-0.001
	(0.004)	(0.003)
EU	−0.192**	-0.037
	(0.076)	(0.065)
FP	-0.018	−0.166***
	(0.065)	(0.055)
UF	0.064	0.034
	(0.041)	(0.035)
UP	−0.227**	−0.181**
	(0.099)	(0.084)
PF	0.006	0.071*
	(0.043)	(0.037)
OE	0.071*	0.022
	(0.042)	(0.036)
EO	0.102	0.071
	(0.098)	(0.084)
Constant	0.025***	0.010
	(0.008)	(0.007)
Observations	547	547
R^2	0.091	0.250
Adjusted R^2	0.074	0.236
Note:		*p<0.1; **p<0.05; ***p<0.01

ΔProbability of receiving one offer: change in the percentage chance the respondent attributes to the event of receiving at least 1 job offer in the next 4 months (question OO2u and OO2e, see appendix).

The control now include all those used in the previous specification, with the addition of:

$\mathbb{1}$[**ΔSearching**]: Dummy value that assumes one if workers answer to question JS6: 'Have you donne anything in the last 4 weeks to look for a job', changes from 'No' to 'Yes'.

Table 4 shows results for this second set of regressions. From column 1 we can see that there is no evidence that changes in workers opinion about unemployment influence their expectation about the number of job offers they might receive. As before, evidence points out that these expectations are greatly influenced by workers' recent experiences in the labor market. Each additional offer workers receive on top of the number of offers they did expect makes them adjust their expectations about the number of offers they will receive in the future by 0.719 (at 1% significance level). Also, workers who report to have started actively looking for a job in the last 4 weeks do increase the number of offers they expect to receive by 0.76 (at 1% significance level).

There is evidence, at the 10% significance level, that changes in workers expectation about unemployment affect their beliefs about the probability they will receive at least one job offer in the next 4 months (Column 2). The obtained coefficient, however, is small and points out to a positive correlation between expectations about the aggregate unemployment and beliefs about the chance of getting a job offer, which is hard to rationalize. A 10% increase in a worker's expectation that unemployment would lead to 1% increase in the change he believes he will obtain at least one job offer in the near future. This apparent strange result could be caused by the fact a lot of workers attribute 100% chance of getting at least one job offer when first interviewed, so this number can only go down afterwards, which might bias the estimation.

Overall, the evidence obtained from the micro data supports the hypothesis that workers don't adjust their reservation wage in response to changes in their opinion about the ag-

Table 4: Expected Number of Offers

	Dependent variable:	
	Δ Expected number of offers	Δ Probability of receiving one offer
ΔExp.Unemp.Up	0.092	0.101*
	(0.505)	(0.053)
ShockWageOffer	-0.546	0.090
	(0.578)	(0.061)
ShockNumOffer	0.719***	0.041***
	(0.059)	(0.006)
ΔSearching	0.758***	0.192***
	(0.227)	(0.024)
EU	1.133	0.546***
	(1.215)	(0.135)
FP	-0.386	-0.120
	(0.994)	(0.110)
UF	2.747***	-0.234***
	(0.652)	(0.068)
UP	-0.378	-0.224*
	(1.327)	(0.125)
PF	-0.731	-0.234***
	(0.754)	(0.079)
EO	2.943**	0.127
	(1.213)	(0.134)
OE	-0.089	-0.139**
	(0.629)	(0.067)
Constant	0.196	-0.017
	(0.127)	(0.014)
Observations	636	690
R^2	0.231	0.239
Adjusted R^2	0.217	0.227

Note: *p<0.1; **p<0.05; ***p<0.01

gregate state of the economy (in particular, the labor market). Moreover there is evidence this inaction is caused by the fact that their expectation about the aggregate economy are detached from their expectations about their individual labor market outcomes, i.e. households are not mapping changes to their expectations about the macro-economy to their beliefs about their prospects in the labor market. Can we make sense of these facts in a search model where workers form beliefs about the labor market and behave rationally according to them? I will propose a search model where workers learn about their prospects using information from

4 A Search Model With Beliefs Formation

In this section I propose a framework where a worker's prospects in the labor market, that is the mean value of the distribution he draw wages from and the probability he will receive a job offer, is a function of that worker's value for the market, which is a hidden state for the worker. This individual value correlates with the aggregate state of the economy, which is also a hidden state of which the worker receives signals of. Given his experiences in the labor market and the signals he receives about the aggregate state of the economy, the worker forms beliefs about his market prospects and decides the reservation wage.

Workers will put more or less weight into the signal he obtains from the aggregate economy, when forming their expectations about their prospects, depending on how accurate the worker knows the signal he receives about the aggregate economy is relative to the signals he obtains from the labor market, and also depending on how much he believes his individual value correlates with the aggregate state of the economy.

For simplicity, in this preliminary work, I won't consider learning coming from the arrival rate of job offers, so that wage offers received from firms will be the only signal from the labor market) that workers will get about their value. In what follow I describe the filtering problem workers will face in this setting, when provided with a signal about the aggregate economy

and a wage draw from the market. Through this filtering problem, workers will update their expectations about wages of future offers. In the future, I will present a full model that will allow for the characterization of workers' reservation wage decision, by adapting McCall (1970) framework to feature the filtering problem. In the current preliminary version of this work I will sketch the signal structure and characterize the filtering problem workers face when updating their expectations.

4.1 A Filtering Problem

There is an aggregate state of the economy, A, which represents the economy wide perceived mean surplus of firm-workers matches that can be formed in the current period. This perceived mean surplus incorporates expectations about future productivity that could in principle deviate from a rational projection, although that won't play any role in this partial equilibrium setting. Assume that A follows:

$$A' = \rho A + (1-\rho)\bar{A} + \varepsilon_A$$

Where $\varepsilon_A \sim N(0, \sigma_A)$

Upon meeting a firm, workers i of type h receives a wage offer: $w_i \sim F(h, \sigma_w^2)$. Where:

$$h' = \rho h + (1-\rho)\gamma\bar{A} + \varepsilon_h + \eta\varepsilon_A$$

Where h is the mean value the market is willing to pay to a specific type h of worker. Workers' type could vary due to skill level, occupation, sector of work, and other characteristics. Note that, in the steady state, h is a share γ of the perceived mean aggregate surplus, as in a standard matching model, but it can vary idiosyncratically. It does correlate with

the aggregate state of the economy, A, according to η.

Workers, then, receive a wage offer according to:

$$w_i = h + \varepsilon_{iw}$$

Where $\varepsilon_{iw} \sim N(0, \sigma_w)$ captures idiosyncrasies of a particular match such as characteristics of the firms, perceived match quality by the firm, etc.

Finally, the worker also receives a signal about the aggregate state of the economy:

$$s_i = A + \varepsilon_{is}$$

Here $\varepsilon_{is} \sim N(0, \sigma_{is})$, represents the noise associated to the process of gathering information about the macro economy from news, observation, networking, etc.

We have a Hidden Markov State problem, where w and s are observed but A and h are not. I assume for simplicity that the variance of h and A are the same and so:

$$\sigma_h^2 + \eta^2 \sigma_A^2 = \sigma_A^2 \quad \Rightarrow \quad \sigma_h^2 = (1 - \eta^2)\sigma_a^2$$

I Assume $\sigma_A, \sigma_w, \sigma_h$ and σ_{is} are known. Workers start the period with a prior on the mean of the (A,h) distribution, ($\hat{A}$, $\hat{h}$). After receiving a wage offer and a signal about the aggregate economy, the prior belief of Worker about his idiosyncratic value h, is then:

$$\hat{h}^F = \kappa\Big[\Big(\frac{\sigma_A^2 + \sigma_s^2}{\eta} - \eta\sigma_A^2\Big)(w - \hat{h}) + \sigma_w^2(s - \hat{A})\Big]$$

Where κ is also function of variances and co-variances, but does not influence the relative importance of the two signals.

The solution to this filtering problem show that when the variance of the 'wage signal', σ_w^2, becomes bigger, the relative importance of the aggregate signal increase, and the opposite happens when the variance of the noise about the aggregate state, σ_s^2, increases. Also the wage signal increases in relative importance when the perceived covariance, which is scaled by η, between the aggregate surplus and the value of that type of worker increases.

4.2 Validating the Model

The reduced form micro investigation brought evidence that workers put a much higher importance on signals they receive from the labor market versus signals they receive about the aggregate economy, when forming their expectations about wages and the arrival rate of job offers. The next step of this work in progress is to estimate σ_A, σ_{is} and σ_w so to verify how much of this relative importance of labor market signals can be explained by this filtering process, given a reasonable calibration of η.

Data available in the SCE allow for the estimation of the (perceived) variance of wage offers, σ_w^2. Specifically, in question OO2b from the labor market survey workers have to elicit the percentage chance attribute to the event that the best wage offer they will believe will be: (1) below 80% of their expected best wage offer; (2) between 80% and 90% of their expected best wage offer; (3) between 90% and 100% of their expected best wage offer; (4) between 100% and 110% of their expected best wage offer; (5) between 110% and 120% of their expected best wage offer; (6) More than 120% of their expected best wage offer.

With some structure, we can also estimate households' prior distribution about the unemployment level, which is informative about σ_A, σ_{is}, given the proposed framework. The main goal is to use these estimations to validate if the model can rationalize the relative low im-

portance of households opinions about the aggregate economy when they form expectations about future wage offers they might obtain.

5 Conclusion and next steps

This paper studied how households' beliefs about the aggregate economy influences the labor market. Using macro data, which includes estimates of the level of wages and a proxy for the state of beliefs about the macroeconomic, I show that wages (including wages of new hires) don't immediately respond to a shock that shifts expectation about the macro economy, in contrast to what would be predicted by a standard DMP model. I then use data from the SCE to investigate how workers behaviour and expectations change in response to changes in their beliefs about the macro economy. I found no evidence that changes to workers beliefs about future unemployment exert any influence on workers' reservation wage, workers' expectations about the number of offers they will receive in the near future or their expectations about the wage level of those offers. Rather workers expectations and decisions seem to be influenced by their experiences in the market, e.g. the number of job offers they receive and the wage of those offers.

Based on those findings I propose a framework where workers have to form beliefs about their labor market prospects. Workers prospect are summarized by their value in the market, which is a hidden state for the workers. Each worker receives signals about his/her value through wage offers they receive in the market. Moreover, workers also know that their value is correlated with the aggregate state of the economy, so that noisy signals they receive about the macro economy, through observation or newspapers, are also informative about his/her value. I show that in this simple setting the importance workers will give to signals about the aggregate state of the economy relative to signals obtained from the labor market will depend on how noisy workers perceive each signal to be.

I delineate a strategy to evaluate how far the proposed filtering mechanic can go into

explaining the low influence workers' expectations about the aggregate economy exert on their beliefs about their labor market prospects.

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A Questions from the Survey of Consumer Expectations

Below questions from the SCE used to build the variables employed in the regressions for the micro analysis.

Question Q4new - Expectations about unemployment *"What do you think is the percent chance that 12 months from now the unemployment rate in the U.S. will be higher than it is now?"*

Question R2W - Reservation Wage *Suppose someone offered you a job today in a line of work that you would consider. What is the lowest wage or salary you would accept (BEFORE taxes and other deductions) for this job?*

Question OO2a - Expected Average Offer *Think about the job offers that you may receive within the coming four months. Roughly speaking, what do you think the average annual salary for these offers will be for the first year?*

NL1 - NL1 (Added November 2014) *How many job offers did you receive in the last 4 months (since July 2016)? Remember a job offer is not necessarily a job that you accepted.*

NL2 - NL2 (Added November 2014) *Thinking about the 3 best job offers that you received in the last 4 months, What was their annual salary? And were they for a full-time or a part-time job? Note the best offer is the offer you would be most likely to accept.*

OO2new - OO2new (Added March 2015) *Over the next 4 months, how many job offers do you expect to receive? Remember that a job offer is not necessarily a job you will accept.*

OO2u - OO2u (shown if Q12new =1 and Q10 is code 1,2, or 5) (Added November 2014) *What do you think is the percent chance that within the coming four months, you will receive at least one job offer? Remember that a job offer is not necessarily a job you will accept.*

OO2e - OO2e (shown if Q10 codes 3,4,7,8 or 9 and not codes 1,2 or 5) (Added November 2014) *What do you think is the percent chance that within the coming four months, you will receive at least one job offer from another employer? Remember that a job offer is not necessarily a job you will accept.*

Q10 *What is your current employment situation?*

☐ *Working full-time (for someone or self-employed) (1)*

☐ *Working part-time (for someone or self-employed) (2)*

☐ *Not working, but would like to work (3)*

☐ *Temporarily laid off (4)*

☐ *On sick or other leave (5)*

☐ *Permanently disabled or unable to work (6)*

☐ *Retiree or early retiree (7)*

☐ *Student, at school or in training (8)*

☐ *Homemaker (9)*

☐ *Other (please specify)(10)*

B Other Proxy for Households Expectations About the Macro Economy

Here I run the same first two specifications from section 3, except that I replace the variable that captures households' expectation about the macro economy. Below is the results when instead of using their opinion about the chance that unemployment will rise I use the change in the percentage chance households attribute to the event of the stock market going up in the next year.

Table 5: Changes in Reservation Wage and Expected Wage Offer (Stock Market Proxy)

	Dependent variable:	
	Δ log Reservation Wage	Δ log Expected Av. Wage of Offers
	(1)	(2)
Δ Exp.StockMarket.Up	0.055	0.020
	(0.035)	(0.030)
ShockWageOffer	0.204***	0.401***
	(0.038)	(0.032)
ShockNumOffers	-0.006*	-0.001
	(0.004)	(0.003)
EU	-0.192**	-0.037
	(0.076)	(0.065)
FP	-0.026	-0.169***
	(0.064)	(0.055)
UF	0.065	0.034
	(0.041)	(0.035)
UP	-0.225**	-0.180**
	(0.098)	(0.084)
PF	0.013	0.073**
	(0.043)	(0.037)
OE	0.068	0.022
	(0.042)	(0.036)
EO	0.090	0.066
	(0.099)	(0.084)
Constant	0.026***	0.011
	(0.008)	(0.007)
Observations	547	547
R^2	0.094	0.251
Adjusted R^2	0.077	0.237
Residual Std. Error (df = 536)	0.169	0.145
F Statistic (df = 10; 536)	5.559***	17.919***
Note:		*p<0.1; **p<0.05; ***p<0.01