The cyclicality of labor market flows: A multiple-shock approach

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June 2013

Preliminary Draft

Abstract

In this paper, we aim at providing a comprehensive view of the dynamics generated by different structural shocks and of the relative contribution of the job finding and separations rates conditional to each shock. Focusing on a simple three-variable Bayesian Structural VAR model including the vacancies, the job finding and separation rates, and using a sign restrictions approach, the structural shocks capture the possible shifts in the three conditions determining the labor market equilibrium in any matching models, namely the Beveridge curve, the job creation condition and the job destruction condition. We then identify a shock to the profitability of a match (the *aggregate shock*), a shock specific to the installed jobs (*job-specific shock*) and a shock to the efficiency of the matching process (*search shock*). The two former shocks generate a quite balanced contribution of the two transition rates to the unemployment volatility, whereas the search efficiency shock implies a disproportionate importance for the job finding rate. We find the same result on French data, which assesses the robustness of the pattern generated by these structural shocks. The difference between the two countries is more on the relative importance of the shocks. The search efficiency shock appears more significant in France, which at the end reinforces the predominant role of the job finding rate in this country.

Keywords: unemployment variability, job separation; job finding, Bayesian Var,
JEL classification: E24, J6

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1 Introduction

Despite the fact that this issue has been raised in the literature for quite some time, there is still no consensus view about what drives the dynamics of unemployment during recessions and what is the propagation mechanism of the shocks affecting the labor market. By examining the joint movements of unemployment and vacancies, determined by the job creation and job destruction rates and the effectiveness of the matching process, Blanchard and Diamond (1990) came to a conclusion that during the time of low economic activity the drop in employment is due to the increase in the separation rate[1]. On the other hand, simple analysis of variance decomposition of unemployment held by Shimer (2012) supports the idea of "acyclical" separation rate which cannot contribute a lot to the dynamics in unemployment. In other words the story told by Shimer (2012), as well as by Hall (2005), states that the unemployment rate rises during recessions because it is harder to find a job, not because the firms start to fire more[2]. However, based on the same unconditional variance decomposition exercise, this view has been challenged by Fujita and Ramey (2008) and Elsby et al. (2009) who show that the separation rate cannot be disregarded on the US data. This quite balanced view also prevails on the UK (Smith (2010)) and the French data (Hairault et al. (2012)).

On the other hand, Fujita (2011) and Canova, Lopez-Salido and Michelacci (2012) have recently taken another route by investigating the relative contribution of the job finding and separation rates to the unemployment volatility conditional to well-identified shocks. The unconditional features shown in previous papers could be a mix of quite different factors, since the response of the unemployment rate may differ depending on the source of the shock. Fujita (2011) gives a partial answer to this general issue. Using Bayesian Structural VAR with sign restriction approach he identifies only one type of shock that shifts the labor market equilibrium along the Beveridge curve. This aggregate shock generates a quite balanced contribution of the two transitions rates, though the job finding rate appears slightly dominant, which is close to the result given by the unconditional variance decomposition. Canova et al. (2012) focus attention on both investment-neutral and investment-specific technology shocks using long-run restrictions. For neutral shocks, their results on the relative contribution of the transition rates to the dynamics of unemployment are in line with the one of Fujita: an increase in hiring just after the shock drives the changes in unemployment rate whereas the adjustment of the job finding rate contributes the most in a year after the shock occurred.

In this paper, we aim at providing a more comprehensive view of the dynamics generated by different structural shocks and of the relative contribution of the job finding and separation rates conditional on each shock. We believe that this conditional approach is potentially of interest in

[1] See also Davis and Haltiwanger, 1990.

[2] See Shimer (2012) for a literature review on this topic.

order to reveal the structural characteristics of the labor market. In that sense, we provide an economic interpretation to the results arising from unconditional variance decomposition: are they common to all shocks, or do they hide a large heterogeneity across structural shocks? This is not at all the same structural interpretation of the relative role of the transition rates in the unemployment volatility. Considering inseparably the impact of all disturbances on the labor market fluctuations is particularly damaging as we are focusing on propagation mechanisms, especially when aiming to compare differences across countries: it is hard to say whether the differences observed on the unconditional variance decomposition are due to country-specific shocks or because the propagation mechanism differs for common shocks.

Whereas Fujita (2011) or Canova et al. (2012) focus on shocks arising from the good market conditions, either the aggregate supply or the aggregate demand, we extend the analysis in the direction of labor market shocks which effect either the job creation conditions or the job separation conditions. This approach is more consistent with the objective to identify the different shocks that could unveil some heterogeneity for the relative contribution of the transition rates to the unemployment volatility. Using sign restrictions to identify these structural disturbances are particularly well-suited to exploit the theoretical implications of the matching model in terms of responses in the separations and finding rates. The methods based on traditional contemporaneous zero and long-run restrictions for structural identification of empirical models would constrain our analyses because first, there is no reason to suppose a recursive structure for the model featuring the dynamics of the labor market and second, it is a questionable issue whether there is a permanent shock to the unemployment dynamics and our interest is concentrated only on the transitory ones. Thus we complete the study initiated by Fujita (2011) by identifying other structural shocks on US data and by proposing the same analysis on the French labor market, which is of particular interest to our research considering the huge difference in labor market institutions between these two countries. The next point of the paper is to quantify the relative contribution of the transition rates given a particular shock.

We start by decomposing the fluctuations of the main labor market variables conditional to a particular set of typical shocks that are responsible for most of disturbances in unemployment. Focusing on a simple three-variable Bayesian Structural VAR model including the vacancies, the job finding and separation rates, and using a sign restrictions approach, our identification strategy is based on the canonical search and matching model *la* Pissarides. We identify three types of shocks that are the most valuable in understanding fluctuations in unemployment: a shock to the profitability of a match (the *aggregate shock* considered in Fujita (2011)), a shock specific to the installed jobs (*job-specific shock*) and a shock to the efficiency of the matching process (*search shock*). These shocks capture the possible shifts in the three conditions determining the labor market equilibrium in any matching models, namely the Beveridge curve (BC), the job creation condition (JC) and the job destruction condition (JD): in that sense, we aim to identify the generic shocks hitting the labor market equilibrium. They can be then identified upon their different implications on the co-movements between the two transition rates and between vacancy and unemployment stocks. Once the empirical model is estimated and identified, we can reconstruct the historical time series conditional on each shock and examine the contribution of job finding and separation rates in the way as it was proposed in Shimer (2005).

We find that all three shocks imply a different propagation mechanism underlying the distinct role of separation and finding rate, leading to unveil some heterogeneity across labor market shocks. Typically, the aggregate shock and more surprisingly the job-specific shock generate a quite balanced contribution of the two transition rates to the unemployment volatility, whereas the search efficiency shock implies a disproportionate importance for the job finding rate. We find the same result on French data, which verifies the robustness of the pattern generated by these structural shocks. The difference between the two countries is more on the relative importance of the shocks. The search efficiency shock appears more significant in France, which at the end reinforces the predominant role of the job finding rate in this country.

Aside from studying the dynamic effects of the whole set of shocks important to the fluctuations the unemployment, this paper certainly also provides a better identification scheme than in Fujita (2011). The unrestricted disturbances in the empirical model of Fujita (2011) might as well fulfill the sign restrictions imposed on the aggregate shock and thereby distort the identification strategy. Several studies pointed out this issue (Fry and Pagan (2009) and Paustian (2007)). By simulating data from estimated DSGE model, Wouters (2005) and Canova and Paustian (2011) show that the SVAR models with a minimum set of restrictions, i.e. with some shocks left unidentified, are not able to generate "true" impulse response. We indeed obtain a much higher importance of the aggregate shock in the variance of the unemployment rate than Fujita (2011) does.

The paper is organized as follows. In the first section, we present the empirical strategy with the identifying restrictions. We then present the results on US data in the next section. Section 3 is devoted to the French economy. The last section concludes.

2 Empirical methodology

2.1 Description of the data and of the Bayesian VAR methodology

To approximate the DGP of labor market time series we use unrestricted VAR which includes natural logarithm of respectively separation rate, finding rate and vacancies. Seasonally and working day adjusted data is averaged over quarters. The sample we use to study the US case is from 1976:1 to 2006:4; the separation and job finding rate are adopted from Fujita and Ramey (2006) and vacancies are proxied by the index of help-wanted advertisements released by the Conference Board. For the French case we use quarterly data from 1996:1 to 2010:4; the transitions rate are constructed by Hairault et al (2012) and the information on vacancies is produced by the French Public Employment Service. Despite the fact that we are working in a three dimensional VAR model, it is possible to deduce the behavior of unemployment using the gross flows as it was done for example in Fujita (2011)[3].

To interpret responses to shocks as short-term dynamics around a stationary (steady) state and to get rid of low frequency movements we detrend the data with quadratic trend which is almost the same as applying the HP-filter with $\lambda = 10^5$ that we present in the robustness check. The lag length is set up to 2 quarters for the US data as it is commonly done in the literature. For France to determine the lag length of the VAR model we use Akaike Information Criterion (AIC) and the Schwarz' Bayesian Information Criterion (BIC), which give us different conclusion on this matter. The BIC indicates that the dynamics of the labor market is well described by a VAR(1), whereas the AIC is in favor of VAR(2). While the lag length of 1 quarter may seem to be not sufficient enough to recover the regression coefficient consistent with the persistence of the data, the lag length of 2 quarters may lead to overparametrization and introduce noise that does not actually exist in the reality. So first, we present the results using 1 quarter lag length and discuss the second case in the robustness check.

The information on the structural disturbances cannot be directly retrieved from the VAR, since it is a reduced form model. So we proceed as follows. We use Bayesian methods to estimate the VAR based on the formulas provided by Uhlig (2005). From the reduced form residuals, we build innovations which are serially and contemporaneously uncorrelated and then we use theory to determine which of these orthogonal innovations have meaningful economic interpretation.

Let the structural VAR model be of the form:

$$A_0 Z_t = A(L) Z_{t-1} + \varepsilon_t,\ \varepsilon_t \sim N(0, I)$$

To identify the model we need to find a contemporaneous matrix A_0 such that $\varepsilon_t = A_0 u_t$, where u_t is the vector of reduced form residuals with variance-covariance matrix Σ. In order to obtain a candidate for A_0 we use eigenvalue-eigenvector decomposition of Σ and the orthonormal matrix Q which is obtained form the QR decomposition of a random matrix drawn from the standard independent distribution[4] in a way that $\left[PD^{1/2}Q\right] \varepsilon_t \varepsilon_t' \left[PD^{1/2}Q\right]' = \Sigma$. To choose among all sets of A_0 those that are structurally interpretable, we use the methodology proposed in Faust (1998), Canova and De Nicoló (2002), and Uhlig (2005) that consists in imposing sign restrictions directly on impulse responses in order to identify the model. The objective is to produce impulse responses that will conform the search and matching model.

[3] ??????? We found that it is not possible to recover the same responses with the steady state formula. The explanation is that this formula does not reflect the transition from one equilibrium state to another.

[4] See J. Rubio-Ramirez, D. Waggoner, and T. Zha (2010) for the description the method.

Once we have explored the space of identifications and selected 1 000 000 thousand candidates [5], we describe responses of labor market variables to one standard deviation change in all shock in turn. The question now is how to present these impulse responses. One of the problem of the sign restriction analysis as well as of all other methods of structural identification is that it does not provide a unique model [6]. Thus as it was argued by Fry and Pagan (2009) the median does not give us the information on sampling uncertainty but on the distribution across models. It means that we cannot be sure that there is a rotation matrix Q that would give us the impulse responses compatible with the medians found from the total distribution of draws. Hence in addition to the median we will also present the impulse response functions from one single model which minimizes the difference between its IRF and those of the median. To do so, we will use the methodology proposed by Fry and Pagan (2009).

2.2 Identification of the structural shocks

We use sign restrictions to identify the structural shocks we consider as essential to the understanding of the unemployment volatility. Our identification scheme is based on the canonical search and matching theory as presented in Pissarides (2000). We identify the structural shocks as specific shifts to the labor market equilibrium conditions, the job creation (JC), the job destruction (JD) and the Beveridge curve (BC). All these shocks affect labor market flows and unemployment, but in a very different way according to the nature of the shift. These are generic structural shocks in the sense that a large set of specific shocks shares the same characteristics. In this way, it ensures to recover these shocks even on the smaller French sample and it justifies the use of the methodology we apply since it is hard to recover the responses to the less pronounced shock using sign restriction approach. As it was argued in Paustian (BEJM, 2007), Canova and Paustian (2011, JME), Fry and Pagan (2007) two conditions should be satisfied in order to recover a right impulse response using sign restriction approach: a maximum number of restrictions should be imposed plus the variance of the shock under study must be sufficiently large. While the first condition is satisfied as we discussed above, it is worth to make some comments on behalf of the second one. The standard deviations of three shocks are 0.0315, 0.0076 and -0.0349[7], thus we can state that the relative strength of the variance signal are of the same order to provide successful inference.

[5] For each draw from the posterior distribution of parameters we search for 1000 draws of rotation matrices. However, if for a particular draw from posterior we have to reject more than 50 000 candidates of the rotation matrices to find the one that satisfies our restrictions, we would reject this draw and take another set of estimators. The number of 50 000 seems to us quite reasonable since with this threshold the total number of rejected draws from posterior was less than 5 %. Also it is 20 time greater than the standard deviation of the overall candidates of the rotation matrix drawn from the standard independent distribution computed without counting the rejected draws from posterior.

[6] Even if one uses Cholesky and obtains a unique contemporaneous matrix, the model is not uniquely identified unless we are ready to agree that there is only one possible recursive model compatible with the data.

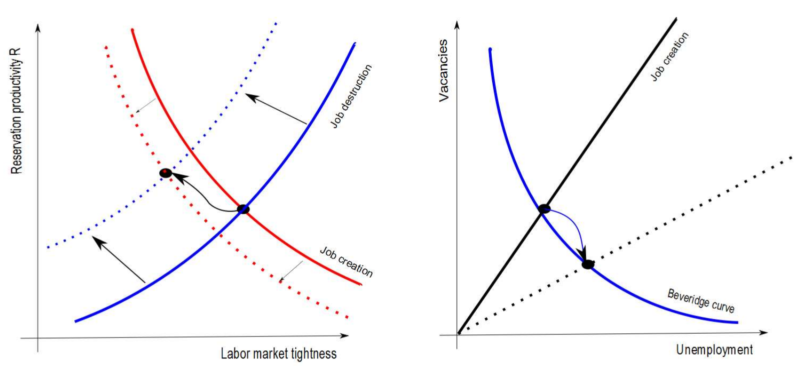
[7] The result represent the median of the distribution, thus it is again constrained the critics of Fry and Pagan.

2.2.1 The aggregate shock

We first identify a shock that affects the job surplus through the profitability margin arising from the good market, either on the aggregate supply side, whatever the type of productivity shocks, or on the aggregate demand side, whatever the type of demand shocks. We prefer to oppose this generic aggregate shock to more specific labor market shocks rather than disentangling it into different technology or demand dimensions, because this approach is more parsimonious and, from our point of view, of higher interest as far as it remains centered on the relative contribution of the transition rates to the unemployment volatility. This is the type of shock present in any quantitative DSGE model with labor market search frictions, as in Andolfatto (1996) and Merz (1996) and revived by Shimer (2005).

We define a negative aggregate shock as the one that decreases the job surplus, increases the separation rate and decreases the job finding rate. Both the job and destruction conditions are shifted away by this shock, as it affects the profitability condition of both new and installed jobs. Unemployment and vacancy then move along the Beveridge curve, leading to more unemployment and less vacancies. We assume that the direct impact of the aggregate shock on the separation rate dominates the indirect impact caused by the lowered labor market tightness and outside opportunities[8]. Thus we impose a negative response of the job finding rate and a positive one for the separation rate, whereas vacancies are supposed to decline. In Figure 2.1, the sign restrictions are motivated on the basis of the steady state adjustment in order to simplify the presentation. The instantaneous responses are consistent with the long run ones, and even traditionally considered as very close in the conditional steady state analysis initiated by Shimer (2005).

Figure 2.1: Aggregate shock



Although the aggregate shock could explain a large proportion of the unemployment volatility, obviously it is not enough to understand the swings in the number of unemployment workers

[8]While firms tend to close the job contract in response to the negative shock, there is less intention to separate from the side of the workers since there are less opportunities outside.

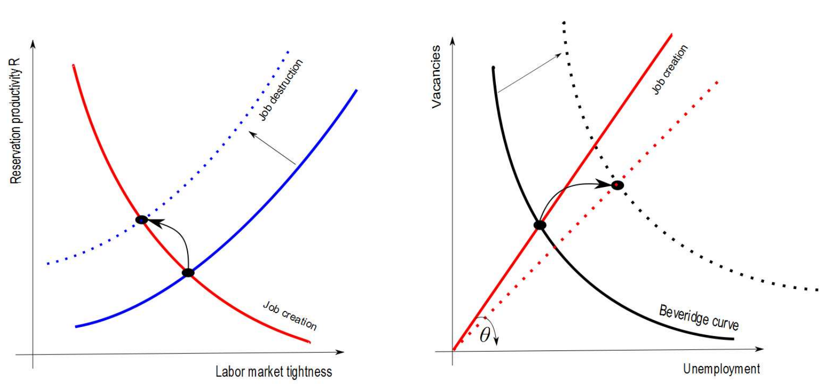
as well as posted vacancies by the firms. We are looking to identify two other shocks that shall complete the picture of disturbances of the labor market. We distinguish two types of labor market shocks that shift either the job destruction condition or the job creation condition.

2.2.2 The job-specific shock

The second shock we consider is identified as shifting the job destruction condition. It takes into account changes in the job separation probabilities unrelated to the job creation conditions. This is a shock in the surplus of installed jobs unrelated to the expected value of vacancies. It provokes an adjustment of the labor market tightness along the job creation condition. It also shifts the Beveridge curve as unemployment is changed due to high job destructions for the same level of vacancies. This shock is traditionally interpreted as a job-specific shock along the lines of Pissarides (2000). It captures changes in the net surplus of installed jobs due, for instance, to variations in the outside opportunities not related to the job finding rate or the emergence of new foreign competitors or a taste switch in favor of foreign firms.[9]

We represent the impact of a negative job-specific shock as the one that destroys jobs, leading to the lower labor market tightness and the job finding rate and increasing unemployment for a given number of job openings. Consistently with Figure 2.2, our identifying restrictions are such that the the initial co-movement between two transition rates is negative as for the aggregate shock, but the rightward-shift in (BC) leads to impose a positive response in vacancies as a key identifying restriction relative to the aggregate shock. A recession led by a negative job-specific shock is a period where there are more firings and less hirings at least during first three quarters after the impact, which push unemployment up, whereas the vacancies must be higher to compensate for the higher separation rate.

Figure 2.2: Job specific shock



[9]Let us note that it is not to a reallocation shock, which would come from the creation-destruction process, as in this case the job creation condition would be also shifted.

2.2.3 The search shock

Concerning the last shock, it is designed to capture any shift in the job creation conditions, which corresponds to a change in the efficiency or the cost of the search process. It provokes an adjustment of the separation rate along the job destruction condition and also shifts the Beveridge curve. Typically, it could come from a change in the composition of unemployed worker pool, in the search effort from unemployed workers, in the vacancy cost or in the matching efficiency. Whatever the underlying change, this generic search shock is the only one that affects in the same direction the job separation and job finding rates in the set of structural shocks we identify. Typically, a negative search shock implies a decrease in both transitions rates, as the decrease in the job finding probability lower the unemployment value and then decrease the separation rate. This shock shifts rightward the Beveridge curve and unambiguously increases unemployment. Consistently to Figure 2.3, we then impose a negative response for the two transition rates and a positive one for unemployment.[10] .

This restriction seems not consistent with the correlation pattern present in the data. We then conclude that the data is not in favor of the model used to generate the consistent sign restrictions. We impose unemployment rate and vacancies adjust along the job creation curve and the transition rates to move in the same direction for a year. Nevertheless after this period unemployment dramatic falls down while vacancies has a hump shaped response, indicating on the fact the there is no more positive co-movements between unemployment and vacancies for the whole horizon. If we restrict the data for more than a year, then there is a large number of rejected draws. Vacancies are *a priori* affected by the two contradictory dynamics, that is why we leave the response of vacancies unconstrained, to see the co-movements between vacancies and unemployment delivered by the data. Here again we want to stress out that we are not interested in particular shock but rather in all the disturbances on the labor market that would provoke a persistent rise in unemployment caused by the change in the job creation condition. Hence we are looking for shocks satisfying these characteristics regardless the reaction of the vacancies.

As a result of a discussion above the restriction imposed on the contemporaneous matrix are presented in the Table 1. In the two cases where we identify the shocks that shift only either the job creation or the job destruction condition, we impose the response sign of the shifted transition rate over two periods to account for the asymmetry of the shocks. Moreover, in order to better identify the search shock, we impose that unemployment is increasing over two quarters.

[10]Let us note that this shock shares the same sign implications for the transition rates as a change in the reallocation process: a decrease in the speed of the creation-destruction process lowers both the job finding and separation rates, but in this case would decrease both unemployment and vacancy. We try to impose these restrictions, but co-movements between vacancies and unemployment as far as it is no more restricted display opposite patterns

Figure 2.3: Search efficiency shock

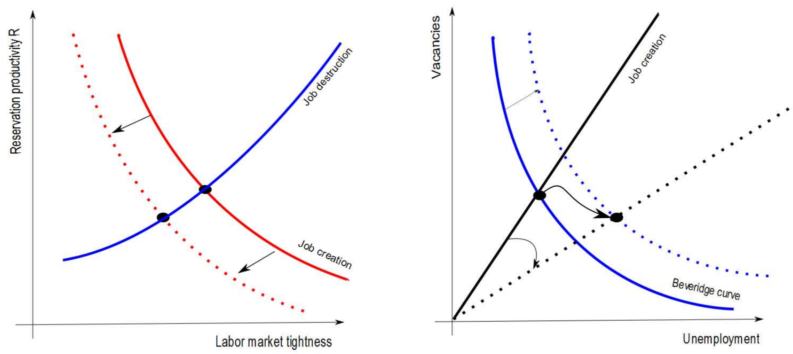


Table 1: Sign restrictions

	separation rate	finding rate	vacancies	unemployment	changes in unemployment
Aggregate shock	(>0)	(<0)	(<0)		
Job specific shock	(>0) 3 quarters	(<0)	(>0) 3 quarters		(>0) 3 quarters
Search efficiency shock	(<0)	(<0) 3 quarters			(>0) 3 quarters

3 Results on the US data

3.1 Impulse response functions to a negative aggregate shock

The recessionary aggregate shock (Figure 3.1) produces an instantaneous jump in the separation rate whereas the finding rate sequentially decreases forming hump-shape response and reaching its minimum around a year later. Since the matching process is taking time, the destroyed jobs push unemployment rate to go up. The finding rate stays persistently low consistently with the fact that the job demand condition does not have tendency to recover fast. This weakened labor demand explains the mutual adjustment of unemployment and vacancies along the Beveridge curve.

The number of hirings increases as the unemployment rises, since the latter dynamics enlarges the stock of the job seekers. The higher separation rate are indeed matter to nourish the level of people searching for a job; hiring gross flows are very sensitive to the unemployment stock which proves the fact the separation rate cannot be disregarded. Obviously, the change in the flows of separations reacts much less to the variations in the unemployment stock, and thus is led by the separation rate dynamics.

Not surprisingly the results are close to the one obtained in the benchmark specification of Fujita (2011), but the responses are of higher amplitude and much more precise in term of error bands. This can be explained by the fact that our identification of the aggregate shock is more

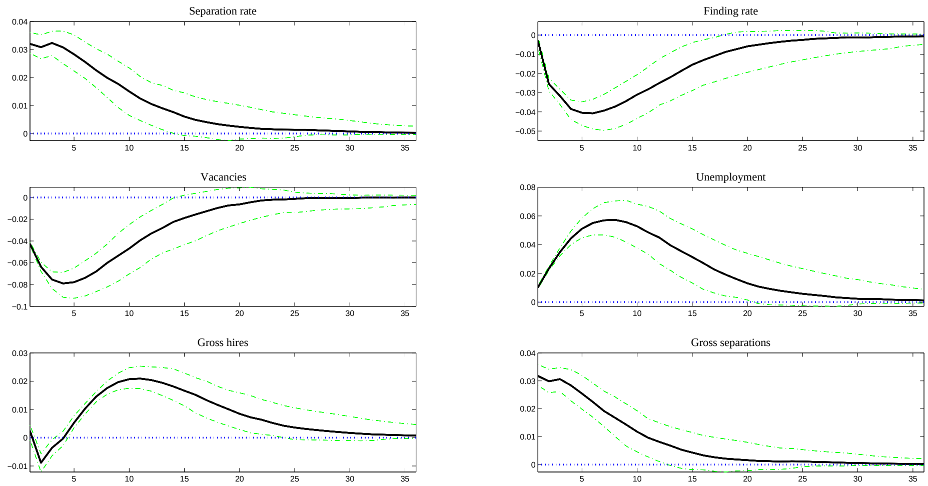


Figure 3.1: Impulse response function to the aggregate shock

precise, since it is based not only on the negative instantaneous correlation between vacancy and unemployment, but also on opposite signs for the separation and finding rates.

Although the impulse response functions provide us with valuable information on the propagation mechanism of the shock, it is hard to draw some concrete conclusions on the relative importance of the transition rates. In line with Fujita (2011), we qualify their relative effect by generating the impulse response function of unemployment while one of the transition rate is kept to be constant. We fix the response of one of them to be zero, as if the variations in the gross flows were driven by the changes only in separations or findings[11].

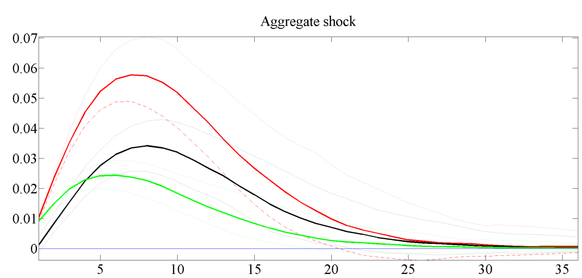


Figure 3.2: Counterfactual IRF of the unemployment rate conditional to the aggregate shock

In Figure 3.2, red solid line represents the median of the unemployment rate given that both transition rates reacts to a shock; green solid line stands for the response of unemployment while the finding rate is restricted from any changes after a shock; the black solid line shows the unemployment response having separation rate fixed. Figure 3.2 then reveals that both transition

[11] Even though the estimated matrix of coefficients stays unchanged...

rates are important in understanding the consequences of the aggregate shock on the labor market. However, in the impact period, the response of unemployment is only driven by the separation rate, whereas the job finding rate explains better the persistence of unemployment along the horizon. Although visually the separation rate seems to matter more at the beginning of the cycle, its effect is over-passed by the one of the job finding rate: during recessions certain jobs get destroyed, enlarging rapidly the unemployment stock, whereas the job finding rate impacts unemployment with lags.

3.2 Impulse response functions to a negative search shock

The search shock impacts first the job creation margin and therefore should give more weight to the finding rate in the unemployment variance, at least at the impact, but not necessarily in all the dynamics. Figure 3.3 displays that the negative shock to the efficiency of the job search initially hits the finding rate, decreasing vacancy and employment. The separation rate tends slightly to fall, affected by the decrease in the outside opportunity of workers. The dynamics of the separation rate is less pronounced and persistent. This shock then appears to act on unemployment through the job finding margin. The unemployment increases after this shock, but not enough to generate an increase in the hirings. After the search shock, the separation rate acts as a counter-cyclical force to stabilize unemployment.

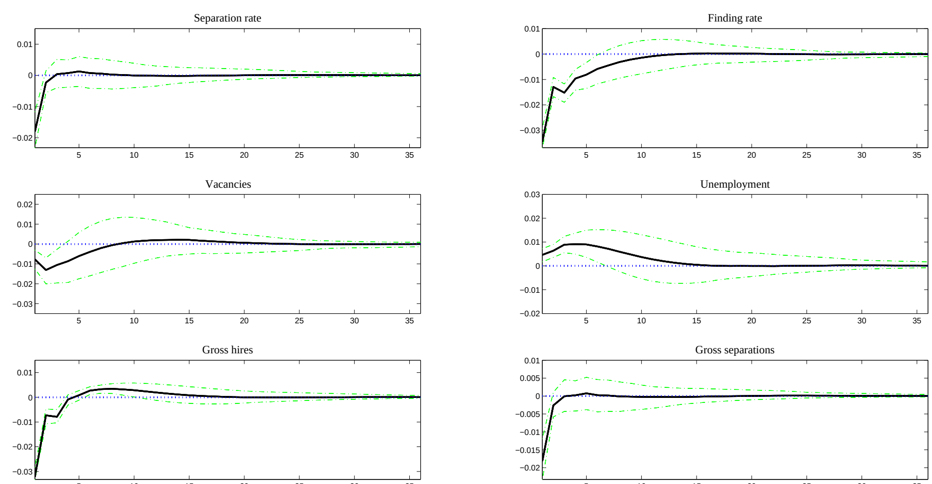


Figure 3.3: Impulse response functions to the search shock

The very different role played by the two transition rates after a search shock appears clearer when inspecting the counterfactual IRF built in the same way as described for the aggregate shock case. The unemployment dynamics generated by the finding rate only is so close to the true IRF (see Figure 3.6) that it is pretty clear that the increase in unemployment caused by a degradation in the search efficiency are the time of higher unemployment duration, and not of higher separations. This is a clear opposition with the aggregate shock, and in that sense, this result validates the need to adopt a conditional approach likely to unveil this structural heterogeneity.

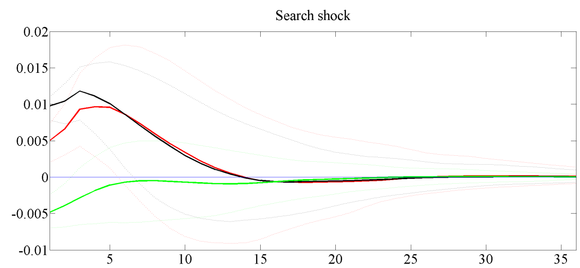


Figure 3.4: Counterfactual IRF of the unemployment rate conditional to the search shock. Red solid line represents the median of the unemployment rate given that both transition rates reacts to a shock, green solid line stands for the response of unemployment while the finding rate is restricted from any changes after a shock, the black solid line shows the unemployment response having separation rate fixed.

3.3 Impulse response functions to a negative job-specific shock

As can be seen in Figure 3.5, this shock blows up the unemployment stock through the impact on the separation rate. As expected the probability to lose a job rises in the response to the shock, but the probability of leaving the pull of unemployed gets significantly down at least for a year, which indicates that that both rates are quite important. The responses of unemployment when the separation or finding rates are fixed is very close to the one of aggregate shock case (Figure 3.6), but the relative contribution seems to be more equivalent now across the whole horizon: less of dominance of separation initially and less of dominance of finding rate further.

3.4 Quantifying the relative contribution of the transition rates for each shock.

The IRF analysis of the three shocks deliver a very different picture on the role of transition rates in fluctuations in unemployment. The aggregate shock reveals initial great role of separations, the job specific shock seems to imply a more or less balanced contribution of the transition rates and the search shock implies an uneven weight of the transition rates in the unemployment variations. This is why it is important to go further and assess quantitatively the contribution of the transition rates, by decomposing the variance of unemployment conditional to each shock identified in our VAR.

We simulate the VAR model introducing one orthogonal innovation at a time in a way that we can generate the conditional time series of each transition rate for each shock, as if there were only one shock hitting the economy. We then recover the unemployment rate using the steady state formula: $u_t = \frac{s_t}{s_t+f_t}$. For each shock, we get three conditional time series of unemployment, one when the two transition rates are active, the two other when we keep one of the transition rate

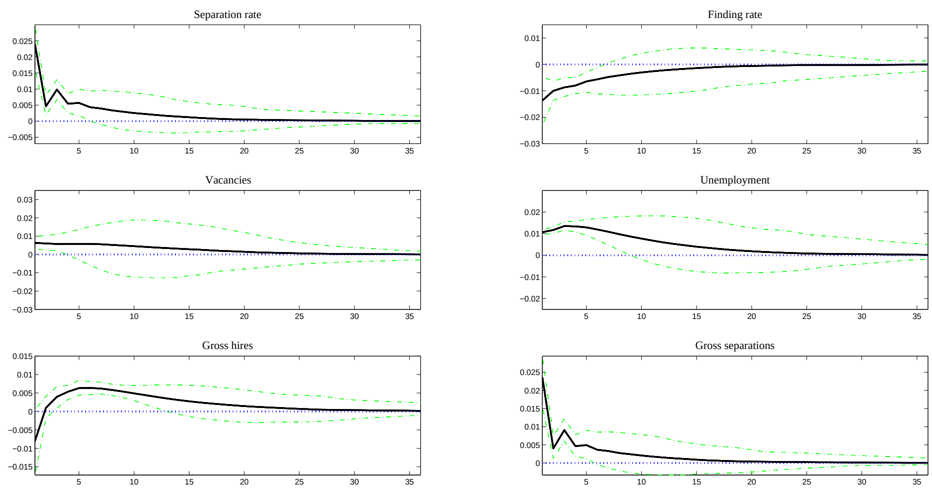


Figure 3.5: Responses to the job-specific shock

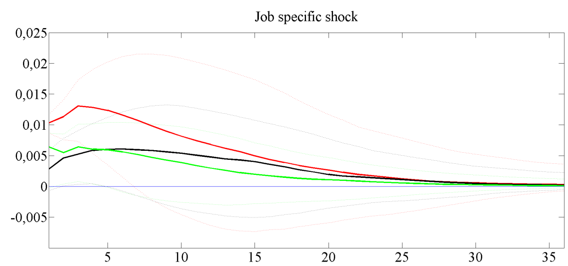


Figure 3.6: Counterfactual IRF of the unemployment rate conditional on all three shocks: red solid line represents the median of the unemployment rate given that both transition rates reacts to a shock, green solid line stands for the response of unemployment while the finding rate is restricted from any changes after a shock, thus revealing the contribution of the separation rate, the black solid line shows the unemployment response having separation rate fixed.

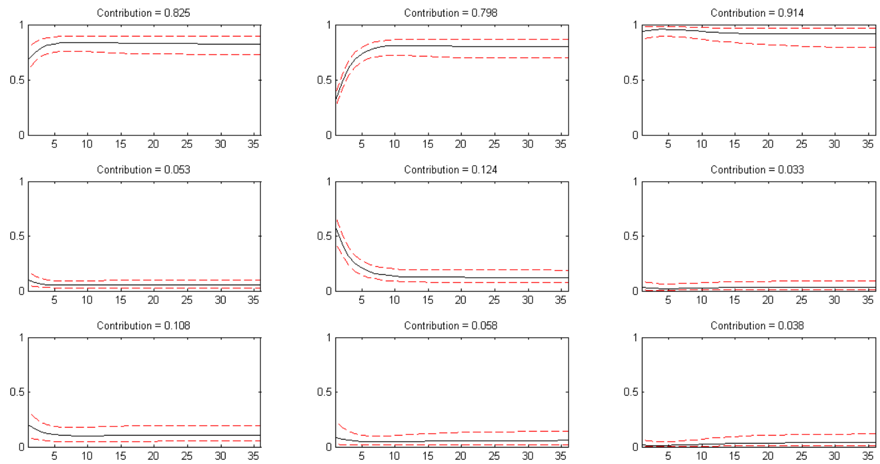
unchanged, setting it to its historical average (the hypothetical unemployment rate conditional to one shock): $u_t^s = \frac{s_t}{s_t+\overline{f_t}}$ and $u_t^f = \frac{\overline{s_t}}{\overline{s_t}+f_t}$. We can compute the contribution of the transition rates as $\beta^{s,f} = \dfrac{cov(u_t^{s,f}, u_t)}{var(u_t)}$. The results are presented in Table 3.4.

Table 2: Variance decomposition of unemployment rate across transition rates

	Aggregate shock	Job specific shock	Shock to the efficiency of the search process	Conditionally on all shocks
Contribution of the separation rate	0.393	0.05	0.496	0.37
Contribution of the finding rate	0.585	0.951	0.51	0.60

The results confirm the conclusion built on the basis of the IRF analysis. Moreover they underlines the importance of the aggregate shock in the US labor market fluctuations. To be completed....

Figure 3.7: Forecast error variance decomposition: The black solid line represents the median of the posterior distribution. The error band represents the 16th and 84th percentiles of the posterior distribution.



According to the forecast error variance decomposition presented in Figure 3.7, the aggregate shock dominates large proportion of vacancies variations at the short run as well as the long run. This outcome is consistent with the one found in Blanchard and Diamond (1989) where the same shock explains 0.97 of vacancy dynamics in the impact period and 0.86 after 12 years[12]. Also in Justiniano and Michellaci (2012) they report the contribution of aggregate activity shock to be 0.95 at the business cycle frequency[13]. Considering the labor market shocks, as we would expect, the relative contribution of the shock to the search effectiveness to the fluctuations in the job finding rate is twice higher than the one of the job specific shock, as in contrary to the case of the separation rate.

Nonetheless, to make some conclusions about the importance of the transition rates to the labor market condition we need to assess the significance of each shock to unemployment dynamics. Instead of variance-covariance decomposition we do the asymptotic decomposition, computing the regression coefficient between the actual unemployment approximated by its steady state formula and hypothetical time series obtained by rerunning the history of unemployment conditional on each shock[14]. As a result, the shocks that affect only one labor market condition curve at a time, operating through the transition rates, account for less than 20% of the unemployment fluctuations, leaving the rest to the aggregate shock. However we would expect the number to be higher at the short run, since more than 50% of the job finding rate variations are due to the shock to the search process at the impact period.

[12] *Not a good idea to compare to B&D because they study different period.*

[13] They do not introduce exactly the aggregate shock, but we can deduce its effect by summing up those of neutral and investment specific technology shock as well as the aggregate demand shock.

[14] Need to explain why here we proxy by the steady state formula to create hypothetical time series and to compute IRS we use the gross flows.

Therefore the labor market history of the US economy does not give a strong importance to the labor market shocks, but it remains that the relative contribution *significantly* differs across shocks. It clearly unveils that the different shocks at the origin of the unemployment fluctuations lead to strong heterogeneity in the role they give to the job finding rate or to the separation rate. This shows that the results of unconditional approach cannot be considered as a real feature of the labor market, but the result of mixing the true structural features of different shocks. In the case of the US economy, the search shock is not active enough over the analysed sample to significantly introduce a wedge between the characteristics of the aggregate shock and the unconditional ones. This last result is not a reason to dismiss the conditional approach we have adopted, as it can be considered as a particular feature of the sample period, whereas the heterogenous features of the shocks could be more robust or structural. That is why it is worth considering another country where potentially labor market shocks could matter more for the unemployment volatility.

4 The French economy

France may be considered as a good candidate to check for the robustness of the results presented for the US case. (Michellaci et Justiniano, 2011/ Elsby et al, 2012), as the French labor market is considered as opposed to the US one: more employment protection, more generous unemployment benefits, which lead to much less rotation rates. We first present the IRF's to the same structural shocks that we considered earlier, using the same identifying restrictions as for the US data. This is another important pay-off of our identification strategy to rely on generic restrictions, which can be applied whatever the country considered. We are particularly interesting in checking whether these shocks are featured by the same relative contribution of the transition rates, and eventually how to interpret the unconditional decomposition first proposed by Hairault et al. (2012) on French data. They show that the job finding rate matters more and explain two-third of the unemployment volatility, slightly more than the US economy. Thus the question we ask now is whether it is due to a different feature which characterizes the aggregate shock because of different propagation mechanisms in France or rather to a more important contribution of the search shock for instance.

4.1 The IRF of the structural shocks

Generally speaking, the dynamic effects of the one-standard deviation in each of three shocks do not differ much from the US case. The impulse response functions tell us almost the same story, except for some distinctions worth to be mentioned.

Concerning the aggregate shock, it must be noticed that the magnitude of the responses is weaker, which could be a sign of relative weakness of the aggregate shock, or rather of less power in France: the aggregate shock appears to be not as strong as in the US. The vacancies have no more hump-shaped response. They drop immediately to their minimum after the shock hits the economy and monotonously adjust to their steady state all along the horizon. This should explain lesser of inclination in the job finding rate and therefore in unemployment. Otherwise, both transition rates appear to contribute significantly to the unemployment dynamics after an aggregate shock.

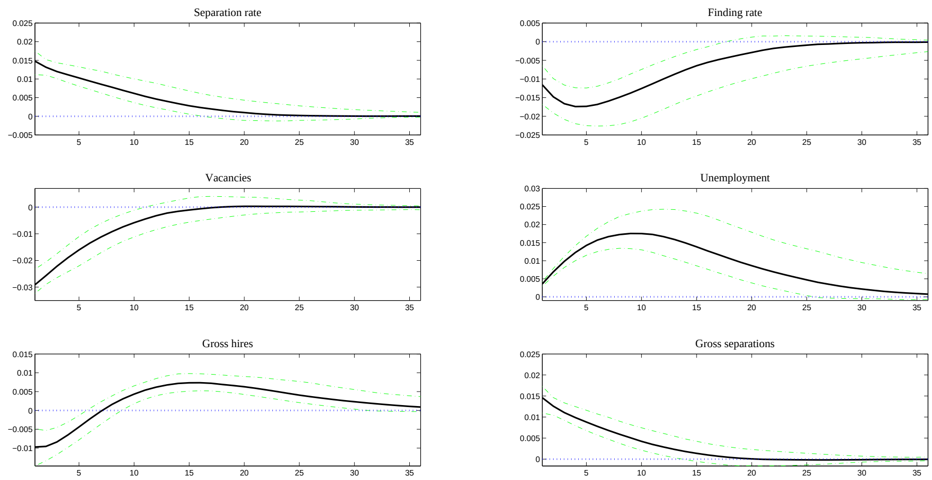


Figure 4.1: Impulse response function to the aggregate shock: French case.

The job-specific shock provokes relatively weak responses of the transition rates, and especially of unemployment. Hirings and separations are smoother than in the US case. On the other hand, the reaction of vacancies is more pronounced here. The sectoral shifts largely influence decisions of the firms to open new working positions.

Concerning the case of the shock that disturbs the search efficiency on the French labor market, we observe the least of the differences from the US case. It is even possible to see that the response in unemployment and in the job finding rate are more persistent in France after this shock. This is first empirical insights of more influence of this shock in France. This is all the more important that it still appears to display a strong asymmetry in the role of the transition rates, with an apparent overweight of the job finding rate.

4.2 The relative contribution of the finding and separation rates

We first compute the same counterfactual IRF where the transition rates are alternatively fixed to their steady state value. Except for the job-specific shock, the job finding rate clearly plays a disproportionate role in mainly explaining the reaction of unemployment. The same pattern as in the US economy is observed, with a very specific pattern for the search shock. There exists a main

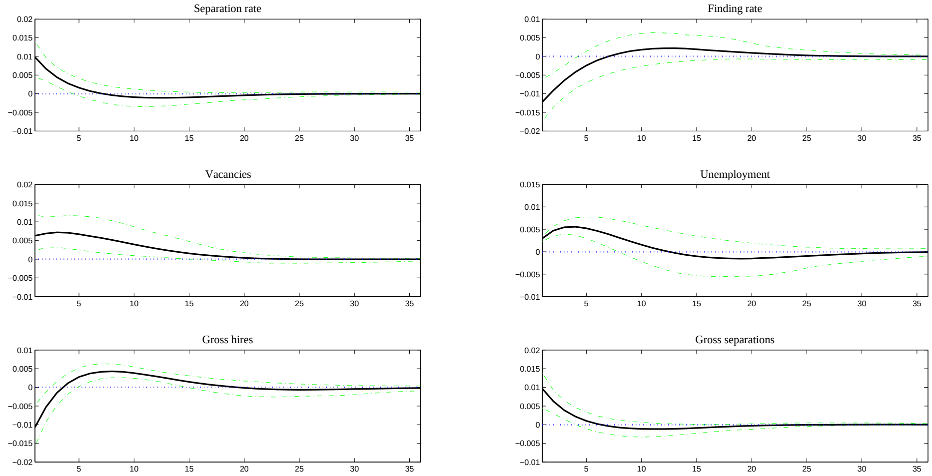


Figure 4.2: Impulse response function to the job-specific shock: French case.

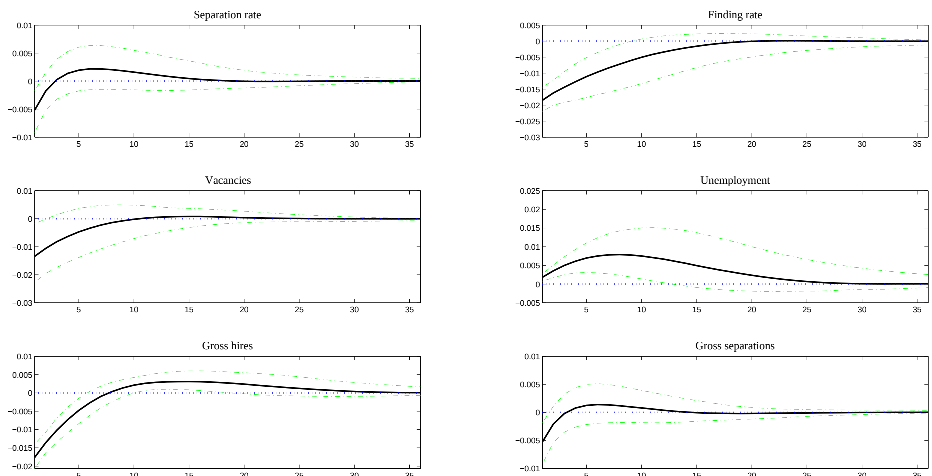
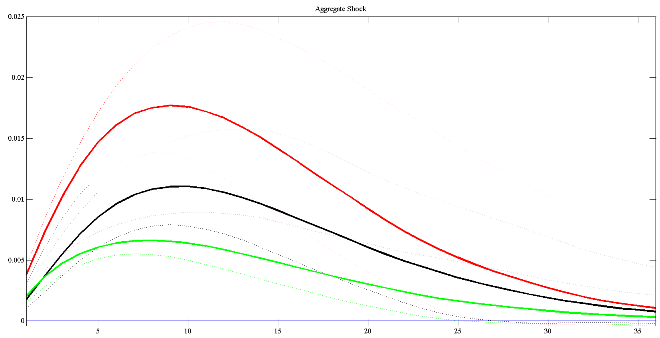


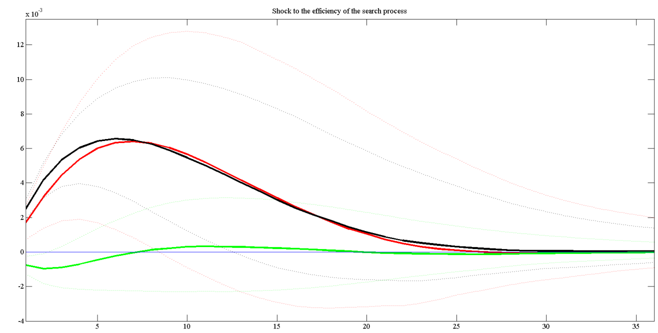
Figure 4.3: Impulse response function to the search shock: French case.

difference: in contrast to the US economy, the separation rate does not overweight the job finding rate importance at the first periods after the shock, in particular for the aggregate shock.

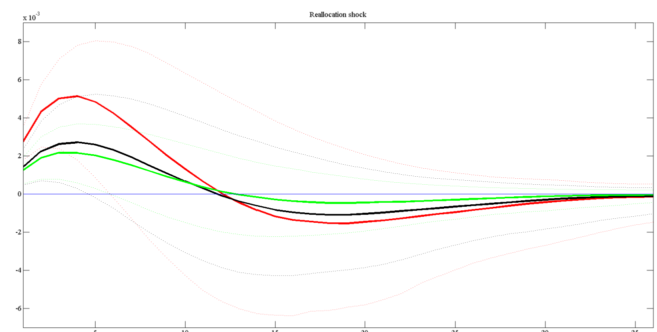
The results suggested by Figure 4.4 are confirmed on a more quantitative grounds by the beta coefficient, using the same method of simulation as presented above for the US economy. Globally, the heterogeneity across shocks in terms of relative contribution of the two transition rates appears in France of the same type as in the US: the aggregate and the job-specific shocks look very similar, and more balanced than in the case of the search shock, which is still largely characterized by the domination of the job finding margin. Besides from sharing the same diversity of unemploy-



a)



b)



c)

Figure 4.4: Counterfactual IRF of the unemployment rate conditional on all three shocks: red solid line represents the median of the unemployment rate given that both transition rates reacts to a shock, green solid line stands for the response of unemployment whenever the finding rate is restricted from any changes after a shock, thus revealing the contribution of the separation rate, the black solid line shows the unemployment response having separation rate fixed.

ment dynamics across the shocks, the conditional beta coefficients also look very similar for two countries. These features are then more transatlantic resemblances and it is of particular interest to establish these facts. We acknowledge that it remains to generalize them on more countries, but the resemblances are striking enough to be emphasized, in particular for countries with so many other different labor market institutions.

Overall, the relative contribution of the job finding rate appears higher than in the US, and, interestingly, for the French economy it differs more from the one generated by the aggregate shock. This is a clear but still indirect indication that the latter shock does not explain most of the unemployment volatility in the case of the French economy. The variance decomposition exercise reveals that the aggregate shock still plays a dominant role in the fluctuations of all the variables. But now the labor market shocks explains more than 30% of the unemployment volatility. Another interesting issue is that it takes in average 15 times less draws to find the rotation matrix that satisfies our restriction in the French data then in the US one.

The shock to the search efficiency is more powerful to explain the labor market volatility in France than in the US. We can clearly see that the shock affecting the search process matters much more for the labor market conditions in France than in the US. This is quite obvious when considering the relative contribution of each shock to the history of the unemployment rate over the sample period. Especially, the beginning of the last decade is dominated by the search shocks. The job finding rate explains most of the fluctuations in unemployment during this period We show this by comparing the hypothetical time series of the unemployment rate with the actual unemployment rate approximated by its steady state formula. Figure 4.5). This exercise can help us to distinguish the historical domination of each shock that we consider in this paper. According to the IRF analysis the early millennium rise in unemployment was basically due to the negative shock to the efficiency of the search process and clearly not due to the aggregate one or the shock to the job-specific since the hypothetical unemployment rate driven only by the separation rate actually went down. The slowdowns in the unemployment dynamics that started in 1998Q3 and in 2005Q2 can be easily explained by the effect of the aggregate shock. In both cases the initial decrease in the unemployment rate was due to the change in the job destruction condition and after approximately half a year the fluctuations in the job finding rate starts to dominate the one of the separation rate. The same situation we observe during recession started in the second half of 2008. However the period of five years that proceeded the creation of the European Union is hard to analyse. It seems that the unemployment dynamics were driven by all three types of shocks that were changing frequently their signals to the economy during this period.

Table 3: Variance decomposition of unemployment rate

	Aggregate shock	Job-specific shock	Search shock	Conditionally on all shocks
Contribution of the separation rate	0.411	0.41	0.128	0.3431
Contribution of the finding rate	0.593	0.591	0.87	0.6621

The relative contribution of the transition rates given by the unconditional approach is then particularly not a structural feature of the French labor market, as it depends on the type of shocks that affects the economy. What is structural is the relative contribution that characterizes each structural shock. Moreover, it appears as a robust transatlantic feature. On the contrary, the relative importance of the structural shocks is specific to the US and French labor market: especially, shocks to search efficiency are more present in France, which eventually explains why the job finding rate appears to explain more the unemployment volatility in this country.

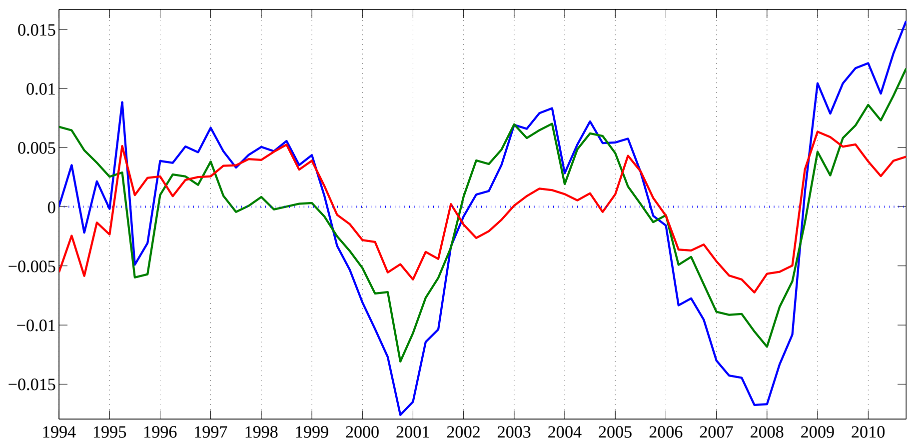


Figure 4.5: Steady state unemployment rate 1994Q1-2011Q4, quarterly average of monthly data detrended by the HP filter with "λ" $=10^5$. The blue line is the actual steady state unemployment rate, the green line is hypothetical unemployment rate when the separation rate is fixed at its historical average, the red line is the hypothetical steady state unemployment rate when the finding rate is fixed.

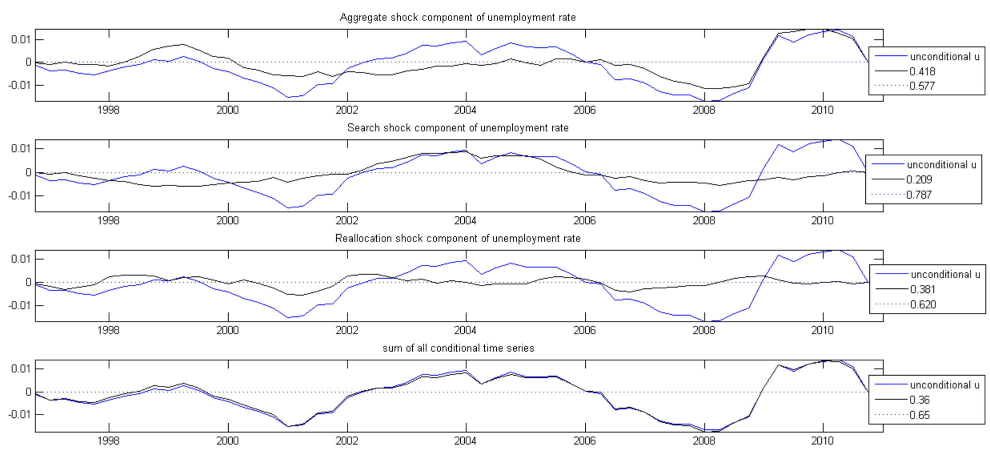


Figure 4.6: History of the shocks