

Unemployment fluctuations and Job Polarization: Evidence from France and the US in the Great Recession *

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Abstract

We compute worker flows between employment in abstract, routine and manual tasks as well as unemployment and non-participation using French and US survey data between 2003 and 2016. Entries and exits from routine employment generate 57% of unemployment variance in France and 46% in the US. Job losses have been concentrated on routine occupations, the collapse in the routine job finding rate is still the main driver of the unemployment ramp-up in the Great Recession. We then explore how job polarization affects labor market dualism. In France, losses in routine jobs consist more particularly in massive losses of routine standard jobs, while in the recovery, workers find on average more frequently non standard (NWS) rather than standard jobs in routine occupations. The pattern is quite different in the US: while many routine jobs have been lost during the crisis, in the recovery, the job seekers who found a routine job are more likely to find a standard job. Our variance decomposition exercises echoes this result: job finding of routine NSW account for approximately 21% of French unemployment variance. In contrast, in the US, the contribution of routine standard work alone explains 20% of changes in US unemployment.

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1 Introduction

Job polarization is a common feature of developed economies. Over the last 30 years, employment growth has been fast, not only in high-paid jobs (abstract, non-routine, cognitive tasks requiring creativity, problem-solving), but also in low-paid jobs (manual, non-routine job requiring human interaction, service occupation). Employment growth has decreased significantly among middling jobs (routine, repetitive, specific activities accomplished by following well-defined instructions and procedures), and those involving tasks that can be replaced by machines ([Autor & Dorn \(2013\)](#); [Goos et al. \(2009\)](#); [Goos & Salomons \(2014\)](#)). Task-Biased Technological Change (TBTC) is considered as one of the main drivers for job polarization. This paper looks at job polarization along the business cycle by measuring cyclical changes in worker flows across task groups, in France and in the US. In doing so, we quantify the contribution of ins and outs of abstract, routine and manual jobs in unemployment fluctuations.

While it is now well understood that job polarization has far reaching consequences on labor market in the long-run, this phenomenon has also a strong cyclical counterpart, as TBTC affects labor market adjustments at business cycle frequency. Namely, in the US, job polarization takes place mainly during downturns: [Jaimovich & Siu \(2018\)](#) document that the bulk of job destructions corresponds to routine job losses which mainly occurred during the last three recessions in the US, and unlike other occupations, routine employment never goes back to its pre-crisis level. Besides, job polarization has accelerated over the last three recessions: in particular, [Autor \(2010\)](#) and [Brynjolfsson & McAfee \(2011\)](#) highlight that the polarization process has been accelerated by the Great Recession, as many more middle-paying jobs were shed relative to professional jobs and jobs in personal services. In addition, [Foote & Ryan \(2015\)](#) show that job losses during the Great Recession were mainly concentrated among middle-skill workers, the same group that has suffered the most from the disappearance of routine jobs.

Such findings raise several questions on the impact of job polarization on labor market fluctuations: first of all, how does job polarization affect worker flows and unemployment fluctuations? As a result of job polarization, and especially following a deep crisis such as the Great Recession, one expects a collapse in the creation of routine jobs and extensive job losses among routine occupations compared to others jobs. Thus, job polarization should have a sizeable impact on worker flows and labor market dynamics, but are unemployment fluctuations mainly led by the disappearance of job opportunities for routine workers, or rather by their massive job losses? Second, does job polarization affect labor

market fluctuations in the same way in the US and in other countries? Given the stark differences in labor market institutions across countries, job polarization - although pervasive - is likely to produce very different behaviors over the business cycles. Namely, job polarization alters labor market structures in response to technological change. However, the nature of labor market adjustments and the response to technological change depends on institutional settings. Again, very little is known on this topic. While many studies have documented the differences in labor market flows and unemployment dynamics between the US and other countries [e.g. Elsby et al., 2008], the link between labor market institution and job polarization has received little attention so far. The aim of this paper is to bridge this gap.

We study worker flows in France and the US, two countries with very different labor market institutions and employment practices. Using the French labor Force Survey (*Enquête Emploi*) and the US Current Population Survey data, we investigate labor market flows to highlight the cyclical consequences of job polarization on unemployment fluctuations. We focus in particular on the period covering the Great Recession, during which routine job findings and jobs losses changed dramatically in both countries. We also focus on the recent period because of data availability on the French labor survey. We document the impact of job polarization on labor market dynamics and measure the contribution of the various transitions involved in the job polarization process on unemployment fluctuations. In doing so, we illustrate the cyclical patterns of job polarization. We then explore the link between job polarization and labor market dualism: over the years, the growing importance of atypical forms of employment has become a major concern in France and other European countries (see e.g. Cahuc et al. (2016)), but once again, the relationship between this phenomenon and job polarization has not been investigated yet. While one may argue that this may be much less of a concern in the US, the business cycle behavior of part-time employment in this country, documented in e.g. Borowczyk-Martins & Lale (2016) suggests that a large part of the cyclical adjustments occur through the use of part-time work in the US. Thus, in both cases, firms use different types of non-standard forms of work to adjust their labor force over the business cycle, i.e. both enable firms to change the number of hours worked over the cycle instead of incurring the costs related to hiring and firing workers on 'regular' contracts. Accordingly, we thus group part-time employment and temporary contracts under the same terminology, and study the relationship between non standard work (NSW) and job polarization, as in OECD (2015)¹. Following this approach, we document the evolution of the use of NSW overall

¹OECD (2015) points out that a greater use of ICT and structural changes in employment due to growth in services and knowledge jobs foster atypical forms of work. In order to provide a comparable

and across task groups, and also the contribution of NSW to job findings and separations across task groups. Besides, we decompose labor market flows for each task group between standard and NSW. This allows us to investigate (i) whether unemployment fluctuations are led by transitions to and from standard or non standard work in France and the US (ii) and to which extent the disappearance of routine jobs is related to the ins and outs of standard or NSW (iii) whether job polarization exacerbates labor market dualism over the business cycle in France and the US.

Our main results are as follows.

1. Entries and exits from routine employment generate together approximately 57% of unemployment fluctuations in France and 46% in the US.

The job finding rate to routine jobs alone explains 35% of unemployment variations in France and almost 30% in the US. Separations from routine jobs to unemployment account for almost 22% of unemployment variations in France, and 16% in the US.

2. We explore the link between job polarization and NSW.

- During the Great Recession, in France, losses in routine jobs consist more particularly in massive losses of routine standard jobs, while in the recovery, workers find on average more frequently non standard rather than standard jobs in routine occupations. The pattern is quite different in the US: while many routine jobs have been lost during the crisis, in the recovery, job seekers who found a job were more likely to find a standard routine job.
- In France, the primary drive of unemployment changes lie in job finding rate of NSW routine work. The job finding rate of routine NSW accounts for approximately 21% of French unemployment variance. In contrast, in the US, the first contribution to unemployment changes lies in the cyclicity of standard work: contribution of routine standard work alone explains 20% of changes in US unemployment.

The paper is organized as follows. We relate to the literature in section 2 and present the data in Section 3 before decomposing the dynamics of unemployment and routine employment in Section 4. We then investigate the link between non standard work and job polarization in Section 5. Section 6 concludes.

measure across countries, NSW is defined by what it is not : any employment that is not full-time, permanent employment. NSW therefore includes in our study temporary contracts, and part-timers (whether on permanent or temporary contract).

2 Related literature

Our paper contributes to the understanding of job polarization over the business cycle by quantifying the contribution of ins and outs of employment across task groups to unemployment fluctuations. By comparing France to the US, we also shed light how the cyclicity of job polarization unfolds in a dual labor market.

In doing so, our paper contributes to several strands on the literature. The first one relates to labor market short-run adjustments to job polarization. Few papers look at job polarization in a short-run perspective ([Jaimovich & Siu \(2018\)](#), [Foote & Ryan \(2015\)](#), [Cortes et al. \(2014\)](#)). We subscribe to their view that job polarization, driven by long-run technological trends, can actually affect cyclical job losses. Indeed, in a standard search and matching model à la Mortensen Pissarides, job matches are maintained as long as the expected gains from the match are positive. As routine jobs are affected by a long-term decline in their productivity, any recession will move these jobs closer to the productivity threshold below which the job is dissolved. In recessions, firms first shed workers with poor long-term perspectives. We provide in this paper time-series of worker flows across task groups that can be used by researchers who are interested in developing models of job polarization with search and matching (such as [Albertini et al. \(2017\)](#)). None of the papers mentioned above quantify the contribution of workers' transition to the understanding of unemployment fluctuations using variance decomposition. This variance decomposition provides quantitative guidelines about the driving forces behind unemployment changes in the Great Recession. In addition, existing studies focus on US data, thereby discarding the issue regarding the effect of labor market institutions on job polarization. Our paper bridges this gap.

We also relate to the papers studying the cyclicity of worker flows in the US ([Shimer \(2012\)](#), [Elsby et al. \(2010\)](#)) or European countries ([Smith \(2011\)](#), [Le Barbanchon et al. \(2015\)](#)), with non standard work (whether part-time work, as in [Borowczyk-Martins & Lale \(2016\)](#), [Fontaine et al. \(2017\)](#); or temporary contracts, as in [Silva & Vazquez-Grenno \(2013\)](#), [Le Barbanchon et al. \(2015\)](#), [Limon \(2017\)](#)). We extend their work by looking at job polarization in France and in the US. We thereby illustrate the impact of this long-term phenomenon on short-run unemployment changes, especially in a dual labor market such as in France.

3 Data on worker flows

In this section, we present the data and classification used to measure job polarization in France and the US, and give an overview of the main features related to job polarization and labor market dynamics in both countries.

3.1 Labor Force Surveys

3.1.1 French Quarterly LFS, 2003-2016

We use the French LFS (*Enquête Emploi*) from 2003Q1 to 2016Q4. Each individual is surveyed each quarter, for six quarters in a row. The survey is designed to be representative of the French population, with more than 100,000 observations each quarter. We use the information on individual labor market status, occupation, hours worked, and labor contract (permanent vs. temporary). The survey was redesigned in 2003. Prior to 2003, the survey was annual, and individuals were surveyed each year for three years in a row. Since 2003, the survey is quarterly and thus better suited for our purpose, i.e. the measure of flows and transitions into and out of routine employment around the Great Recession. Accordingly, we use the French LFS from 2003Q1 to 2016Q4.

3.1.2 US CPS data

The Current Population Survey (CPS) Basic Monthly Data provides information on labor market status. The survey is conducted on a monthly basis. A housing unit in the CPS is interviewed for four consecutive months and then dropped out of the sample for the next eight months and is brought back in the following four months. We use the data on labor market status, occupation, and hours worked. The type of labor contract is not included in the survey: the distinction between permanent and temporary contract is not relevant in the US as firing costs are very low and independent of the type of labor contract. In order to have of sense of the long term trends in job polarization, using CPS monthly data, we look at employment stock by task in the US since the late 1970s in section 3.3. We then investigate US worker flows. In order to produce US time-series that are comparable with French quarterly labor market transitions, we consider period between 2003Q1 and 2016Q4 and compute quarterly transitions as in [Borowczyk-Martins & Lale \(2016\)](#). We compute quarterly transition probabilities by linking the 1st to the 4th (or 5th to 8th) interview of CPS respondents. We get monthly time series of quarterly

transition probabilities. We then obtain quarterly time-series by taking the average of the monthly values.

3.2 Measuring worker flows by task

We consider three labor market statuses : employment, unemployment (measured according to the ILO definition) and non-participation. When looking at employed individuals, their occupations are categorized into three groups, each corresponding to the main task performed on the job: abstract, routine or manual. If inactive, the US data does not record any past occupation. As a result, all US individuals categorized as non-participant are not assigned any task. We then treat French inactive individuals in the same way. In addition, for unemployed workers, even though French and US data provide information on their occupation in their most recent job, we decide to consider only one unemployment category, without distinguishing unemployment of workers with past occupation as abstract, routine or manual. We make this choice for 2 reasons: (i) past-occupation is not a 100% predictor of the occupation after re-employment ([Sahin et al. \(2014\)](#)), (ii) this choice reduces the size of the dynamic system which makes the interpretation of results more straightforward. In a nutshell, we classify individuals in each quarter into one of 5 mutually exclusive categories: employed in one of the 3 occupation groups (denoted A, R, M for non-routine Abstract, Routine, and non-routine Manual occupations, respectively); unemployed (U); or not in the labor force (N).

3.2.1 Identifying Abstract, Routine and Manual workers

US. We follow the literature by using occupational data to categorize workers into task groups. The occupation codes changed in 2011, when the CPS transitioned between the 2000 and 2010 classification systems. We use [Cortes et al. \(2017\)](#)'s mapping of each occupation code across the five occupation systems into the three task groups. [Cortes et al. \(2017\)](#) consider only individuals aged 16 and more. Occupations in farming, fishing, and forestry are excluded. Examples of occupation in each task include :

- Abstract (creative, problem-solving, and coordination tasks): Non-routine cognitive workers. Management, business, and financial operations occupations. Professional and related occupations.
- Routine (repetitive, codifiable job tasks) : sales and related occupations. office and administrative support occupations. production occupations, transportation

and material moving occupations, construction and extraction occupations, and installation, maintenance, and repair occupations.

- Manual (assisting or taking care of others requiring physical dexterity and flexible interpersonal communication): service occupations : ... Ushers, Lobby Attendants, and Ticket Takers ; Amusement and Recreation Attendants ; Embalmers ; Funeral Attendants ; Morticians, Undertakers, and Funeral Directors ; Barbers ; Hairdressers, Hairstylists, and Cosmetologists ; Makeup Artists, Theatrical and Performance ; Manicurists and Pedicurists ; Shampooers ; Skincare Specialists ; Baggage Porters and Bellhops ; Concierges ; Travel Guides ; Childcare Workers ; Personal Care Aides ; Fitness Trainers and Aerobics Instructors ; Recreation Workers ; Residential Advisors ; Personal Care and Service Workers, All Other

France. We repeat the US procedure on French data in order to ensure comparability across countries. As in [Jaimovich & Siu \(2012\)](#), we consider only individuals aged 16 and more. As for occupations, we apply the procedure used for US data. Occupations in farming, fishing, and forestry are excluded. Occupations are categorized into three groups, each corresponding to the main tasks performed on the job. We base our categorization on the two-digit occupational codes.² We aim at matching the same assignment of occupations to tasks as in [Jaimovich & Siu \(2012\)](#).

Abstract jobs are management, business, science, and arts occupations; this includes occupation codes 23 large business heads, 31 licensed professionals, 33 civil servant, executives, 34 scientific professional, 35 creative professional, 37 top managers and professionals, 38 technical manager, engineers, 42 teacher, and 43 health workers.³

Routine jobs are sales and office occupations; construction and maintenance occupations, and production, transportation, and material moving occupations; this includes occupation codes 45 mid-level professionals in the public sector, office worker, 46 mid-level professionals in the corporate sector, office workers, 47 technician, 48 foremen, supervisors, 52 civil servants, office workers, mid-level and low level, 53 security workers, 54 office workers in the corporate sector, 55 retail worker, 62 skilled industrial workers, 63 skilled

²[Harrigan et al. \(2016\)](#) argue that two-digit codes used in French data are economically meaningful. Each code is the aggregation of 10 to 20 four-digit sub-occupations with stark differences in the susceptibility of jobs to automation.

³One could argue that occupation 43 could also be considered to be part of manual non-routine jobs. We choose to consider them in the abstract group, as [Charnoz & Orand \(2015\)](#). These authors consider the same group of occupations in the abstract group and checked that these jobs are indeed characterized by abstract-intensive tasks. In addition, [Jaimovich & Siu \(2012\)](#) also consider medical occupations as part of non-routine cognitive jobs.

manual laborers, 64 drivers, 65 skilled distribution worker (dispatch, dockers, warehousemen, ...), 67 low skill workers, in manufacturing, food industries, press, ... 68 low skill laborers, craftsmen.

Manual jobs are service occupations. This includes occupation codes 56 Personal service workers and 22 heads of small businesses (selling food, tobacco, services, and other items)

3.2.2 Worker flows

We first rely on a 5-state Markov model of labor market adjustments: “A” abstract employment, “R” routine employment, “M” manual employment, “U” unemployed and “N” not in the labor force. Let us denote the corresponding stocks as $X_t = (A_t, R_t, M_t, U_t, N_t)$. Hence, stocks evolve as

$$X_t = \ell_t X_{t-1}$$

where ℓ_t denotes a square matrix of size 5, whose elements $\ell_{i,j}$ capture the probability of transition from labor status i to labor status j . Using quarter-to-quarter matched data, we compute gross flows across employment states. We then adjust the data along three dimensions. We first seasonally adjust gross flows using x12. As in [Elsby et al. \(2015\)](#), we then compute transition probabilities that are consistent with the observed changes in stocks (A, R, M, U, N) (correction for margin error). Finally, as gross flows provide transition probabilities observed at discrete points of time, in order to correct these measures for possible transitions occurring between consecutive surveys, we correct gross flows for time aggregation bias ([Shimer \(2012\)](#)). We then get instantaneous transition rates.

3.3 Evolution of employment by task in both countries

3.3.1 Employment shares

Figure 9 displays the evolution of employment shares of each task group as well as the unemployment rate. Figure 9 is consistent with empirical findings for the US ([Autor & Dorn \(2013\)](#), [Jaimovich & Siu \(2012\)](#)) and French data ([Albertini et al. \(2017\)](#)). Figure 9 shows that job polarization is at work in both countries: the shares of abstract and manual jobs are expanding, while the share of routine jobs in total employment declines over the period.

Notice that, in the Great Recession, during the unemployment ramp up, in both countries,

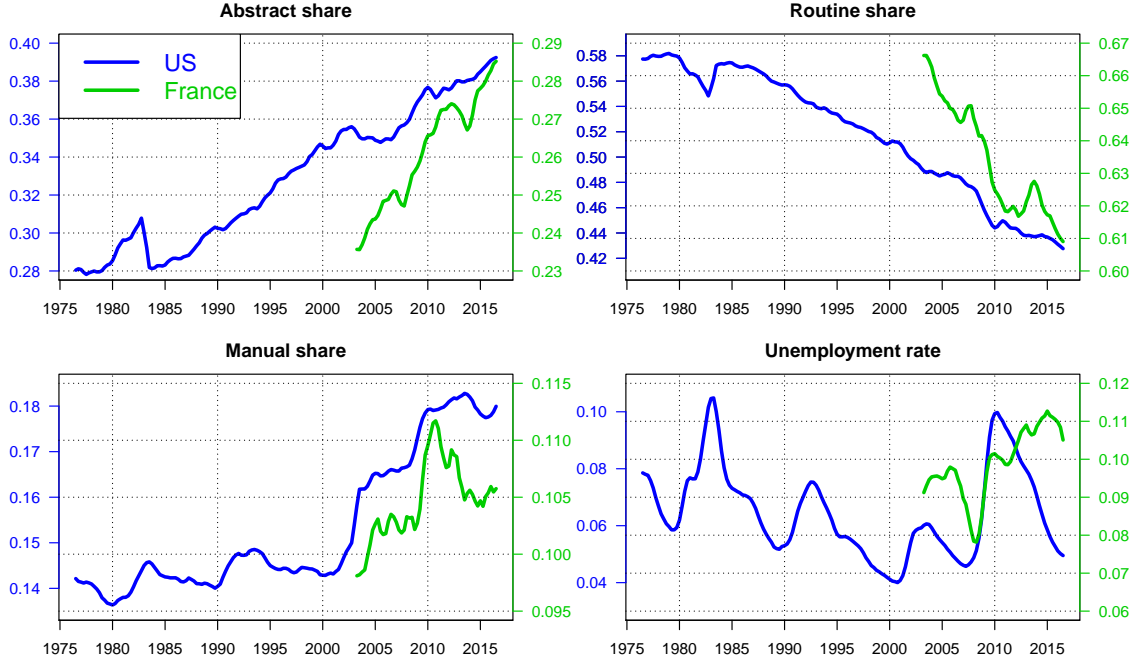


Figure 1: Employment shares: Job polarization at work

“FR” French quarterly LFS; “US”: US monthly data; $EA/\Sigma E$: share of Abstract jobs in total employment; $ER/\Sigma E$: share of Routine jobs in total employment; $EM/\Sigma E$: share of Manual jobs in total employment; $U/(\Sigma E+U)$: unemployment rate.

routine employment shares dramatically fall, which suggests that recessions do accelerate job polarization, as was noticed by [Autor \(2010\)](#) and [Jaimovich & Siu \(2018\)](#) in the US. Our French data confirms that the same phenomenon also occurred in France during the 2008 crisis. [Autor & Dorn \(2013\)](#) point out that, due to task-biased technological change, displaced workers employed in routine jobs re-allocate to manual jobs, which implies an increase in the share of manual jobs. Several elements suggest that this reallocation did not operate smoothly in the Great Recession. In the US, the expansion in the share of Manual jobs (of 2 percentage points between 2008 and 2010) seem small with regard to the fall in the share of routine employment (of 8 percentage points). Secondly, manual employment share actually fell after 2011 in France.

3.3.2 Number of job losses during the Great Recession

As a complement to the previous Figure, Table 1 reports the net employment losses by task after 2008. It shows not only that employment losses have been huge, but also that, consistently with the view that polarization accelerates during recessions, the bulk of job losses during recessions corresponds to routine job losses, while changes in manual jobs

were not sufficient to absorb the losses in routine jobs.

	US 2008Jan-2010Jan	France 2008Q1-2009Q4	France 2010Q1-2013Q4	France 2008Q1-2013Q4
ΔA	-493.40	220.85	-180.36	40.49
ΔR	-8,154.26	-651.19	-108.12	-759.31
ΔM	360.73	75.92	-112.12	-36.20
$\Delta A + \Delta R + \Delta M$	-8,286.92	-354.42	-400.60	-755.02

Table 1: Job polarization at work during the Great Recession: net changes in employment by task (in thousands) in France (2008Q1-2013Q4) and the US (2008M1-2010M1)

Interpretation: A negative figure indicates a net job loss, a positive one a net gain. For instance, between january 2008 and january 2010, in the US, the net variation in total employment corresponds to a loss of 8.28692 millions of jobs, among which 8.154 millions of routine jobs have been lost. Similarly, France lost 759,310 routine jobs between 2008Q1 and 2013Q4, to be compared to a total loss of 755,020 jobs.

Over the net loss of approximately 8.3 millions of jobs that has occurred in the US between 2008 and 2010, about 8.15 millions corresponds to routine job losses. As a result, the total number of routine jobs in the US has decreased by more than 12% within two years. In contrast, abstract employment experienced a much smaller drop (nearly -493.000 jobs) whereas manual employment kept increasing (+360.000 jobs). Similarly, in France, most of the net employment losses have been concentrated on routine jobs: around 5% of those jobs have been destroyed over the same period. While routine jobs have been particularly severely hit, abstract and manual employment kept growing in this country. Another noticeable difference with the US is that, while the drop in French employment was less steep, it extended over a longer period: France went through a second recessionary episode after 2010. In total, from the beginning of 2008 to the end of 2013, France lost more than 750.000 jobs in total, and about 759.000 routine jobs, to be compared to +40.000 abstract jobs and -36.000 manual jobs over the same period.

While the evolution of employment by task sheds light on job polarization at work, worker transitions improves our understanding of labor market adjustments (separation, finding) that drive routine job losses in the Great Recession.

3.4 Average quarterly transition probabilities

In order to get an idea of the respective importance of each type of labor market flows⁴, Table 2 reports the average quarterly transition probabilities in France and in the US from 2003 to 2016. First, the US labor market is characterized by a higher turnover than its French counterpart. This higher turnover affects all segments of the labor market. In Table 2, all US numbers (columns (2) and (4)) are higher than their French counterparts (columns (1) and (3)). In addition, the probability of leaving the current labor market state is larger in the US. For instance, the average quarterly probability of leaving non-participation amounts to 6% in France against 17.2% in the US. Second, the US job finding rate is twice as large as the French one. Third, probabilities of losing a job (whether abstract, routine or manual) are higher in the US than in France. These findings are consistent with previous evidence on US and French worker flows (Shimer (2012), Elsby et al. (2015), Le Barbanchon et al. (2015)).

Our originality lies in documenting ins-and-outs of task groups. Routine jobs account for the vast majority of job findings : 75% of job findings are in routine jobs in France and 55% in the US. As regards job-to-job mobility, our estimates of transition probabilities suggest that there is virtually none in France. This implies that all career changes from one task to the other implies an unemployment spell in France. In contrast, in the US, we observe more job-to-job mobility between Abstract and Routine employment ($p^{RA} = 2.8\%$, $p^{AR} = 3.2\%$ per quarter), as well as Manual and Routine employment ($p^{RM} = 1.6\%$, $p^{MR} = 4.4\%$ per quarter).

In the distribution of task groups, in both countries, abstract jobs are the most stable ones, with the lowest separation probability and the lowest probability of transition to non-participation. Manual employment lie at the other end of the distribution with the highest probability of exiting manual employment (with respect to abstract and routine jobs), higher probability of exiting to unemployment or non participation. Therefore, one consequence of job polarization may be that, while employment stability will remains globally unchanged at the aggregate level, as the former routine workers reallocate to abstract (more stable) or manual (less stable) jobs, job stability may decrease at the individual level for the former routine workers reallocating to manual/less stable jobs. In section 5, we investigate further into this topic by looking at the relationship between job polarization and non standard forms of work.

⁴The evolution of the transition probabilities over the time period considered is depicted in Appendix B and C.

	France	US		France	US
	(1)	(2)		(1)	(2)
(a) From Abstract jobs			(d) From Unemployment		
p^{AR}	0.2	3.2	p^{UA}	3.2	9.0
p^{AM}	0.0	1.0	p^{UR}	15.9	25.7
p^{AU}	1.1	1.7	p^{UM}	3.5	12.2
p^{AN}	1.4	2.4	p^{UN}	17.6	33.7
$\sum_{i \neq A} p^{Ai}$	2.8	8.3	$\sum_{i \neq U} p^{Ui}$	40.2	80.6
(b) From Routine jobs			(e) From Non-Participation		
p^{RA}	0.2	2.8	p^{NA}	0.4	2.2
p^{RM}	0.1	1.6	p^{NR}	1.3	4.1
p^{RU}	2.7	4.1	p^{NM}	0.4	3.2
p^{RN}	1.9	3.7	p^{NU}	3.9	7.7
$\sum_{i \neq R} p^{Ri}$	5.0	12.2	$\sum_{i \neq N} p^{Ni}$	6.0	17.2
(c) From Manual jobs					
p^{MA}	0.2	2.3			
p^{MR}	0.6	4.4			
p^{MU}	2.8	4.3			
p^{MN}	2.9	6.6			
$\sum_{i \neq M} p^{Mi}$	6.5	17.6			

Table 2: Average quarterly transition probabilities (2003 onwards)

Quarterly data, 2003Q1-2016Q4. Correction for seasonality and time aggregation bias. Example : “ p^{UR} ” job finding probability of a routine job (transition from U to R) is 15.9% per quarter in France and 25.7% per quarter in the US. “ $\sum_{i \neq U} p^{Ui}$ ”: probability of leaving the unemployment state within the next quarter.

4 The cyclicity of worker flows and job polarization

4.1 Empirical background

With estimates of transition rates in hand, our goal is now to decompose cyclical fluctuations in unemployment rate into contributions attributable to each of the flow hazards. To do so, we adapt the dynamic decomposition of [Elsby et al. \(2015\)](#) to our empirical model. The main advantage of this method relies on the fact that it is not based on a steady-state approximation. Given the relatively low level of worker flows on the French labor market, a non-steady state decomposition becomes even more relevant. We obtain the following β statistic indicating the share of unemployment variance that is accounted

for by the hazard rate from i to j :

$$\beta^{ij} = \frac{\text{Cov}(\Delta u_{t-1,t}, \Delta \tilde{u}_{t-1,t}^{ij})}{\text{Var}(\Delta u_{t-1,t})} \quad (1)$$

where, Δ is the first difference operator and $\tilde{u}_{t-1,t}^{ij}$ the counterfactual unemployment rate obtained when only one worker flows fluctuates. In order to compute $\tilde{u}_{t-1,t}^{ij}$, we proceed as follows. First, we compute labor market stock changes that are driven by contemporaneous but also *past* changes in transition rates. This recursive formulation of stock variations is at the heart of the non-steady state decomposition. Second, we expressed the variance of any given labor market stock as the sum of its covariance with any counterfactual obtained in the previous step. Lastly, as we are not interested by the decomposition of stock changes *per se* but rather the decomposition of the unemployment rate, we use a first-order Taylor expansion to approximate unemployment changes:

$$\Delta u_t = \frac{(1 - u_{t-1})\Delta U_t - u_{t-1}\Delta E_t}{L_t} \quad (2)$$

with E_t total employment stock and L_t the labor force (the sum of U_t and E_t). Finally, we should have $\sum \beta^{ij} \approx 1$ where the difference from unity is accounted for by approximation errors.

4.2 The prevalent role of fluctuations in routine employment in accounting for short-run changes in unemployment

Table 3 reports the results of our decomposition of unemployment fluctuations. First, the primary forces behind unemployment fluctuations are changes in the job finding rate (as in Shimer (2012), Elsby et al. (2015) Le Barbanchon et al. (2015)). The outs of unemployment account for approximately 45% of unemployment fluctuations in France and 49% in the US. As the job finding rate into routine jobs accounts for a large fraction of fluctuations in the job finding rate (77% in France, nearly 61% in the US), job polarization, by affecting the job finding rate into routine jobs, is a major driver of the cyclical behavior of unemployment.

In both countries, employment exits account for about 1/4 of unemployment fluctuations. Again, as exits from routine jobs account for a large fraction of total job separations, job polarization operates along the business cycle through changes affecting routine jobs. Notice that both countries differ along an interesting dimension: transition from/to manual

	France	US
(a) Job separation		
β^{AU}	5.8	5.0
β^{RU}	21.9	16.2
β^{MU}	-2.1	3.0
Total EU	25.7	24.1
(b) Job finding		
β^{UA}	6.6	7.3
β^{UR}	35.2	29.8
β^{UM}	3.9	11.9
Total UE	45.7	49.1
(c) Non Participation		
β^{NU}	14.5	11.1
β^{UN}	14.4	19.1
(d) Total		
Total U and E	71.4	73.2
Total U and N	28.9	30.2
Total A	12.4	12.3
Total R	57.1	46.0
Total M	1.8	14.9

Table 3: Variance decomposition of changes in the unemployment rate

Quarterly data, 2003Q1-2016Q4. Correction for seasonality and time aggregation bias. "A": Abstract employment. "R" Routine employment. "M" Manual employment. "U" Unemployment. "N" Non participation. Example : " β^{AU} " contribution of job separation from abstract job to unemployment is 5.8% in France. "Total EU" Total contribution of job separation to unemployment is 25.7% in France.

jobs account for nearly 15% of unemployment changes, versus less than 2% in France. This difference is suggestive that labor reallocation from routine to manual jobs, as stressed by Autor (2010), operate more within a business cycle frequency in the US than in France, thereby indicating more turnover in the reallocation process towards manual employment. Finally, flows between unemployment and non participation accounts for nearly 1/3 of unemployment fluctuations in both countries.

Table 8 in Appendix D.1 complements our analysis by presenting the variance decomposition of routine employment rate for the post-2003 period. In both countries, the results confirm that routine employment changes are primarily driven by direct transitions with unemployment. Fluctuations in the job finding rate to routine jobs explain 42% of routine employment changes in both countries. With a smaller contribution, 22% in France and 33% in the US, the job separation rate from routine jobs is the second driver of routine employment rate fluctuations. Finally, fluctuations in job-to-job transitions explain a marginal share of routine employment changes over the business cycle in France.

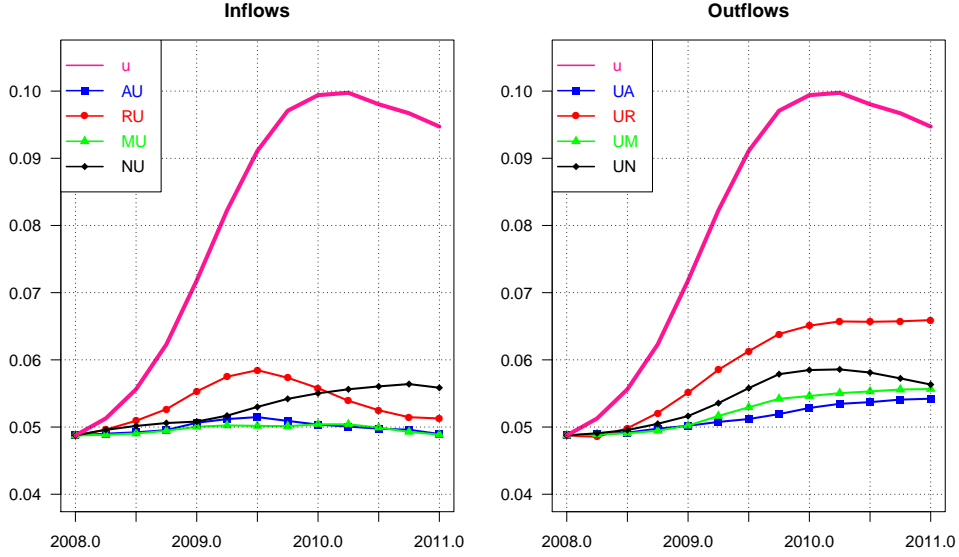


Figure 2: US unemployment during the Great Recessions: Counterfactual analysis

"u" observed unemployment rate. "Inflows" Unemployment inflows; "Outflows": Unemployment outflows. "AU" counterfactual unemployment changes if only transition from abstract employment to unemployment is allowed to fluctuate. "RU" counterfactual unemployment changes if only transition from routine employment to unemployment is allowed to fluctuate. ...

4.3 Unemployment changes during the Great Recession: counterfactual exercises

In this subsection, we investigate to what extent both the cyclical ramp-up in unemployment and the cyclical fall in routine employment described in section 3.3 were accounted for by changes in transition probabilities implying the three types of occupations. In particular, for the time window covering the Great Recession of 2008-09 in both countries under scrutiny, we construct counterfactual values of unemployment rate and routine employment per capita obtained when only one transition probability is allowed to fluctuate. In spirit, the exercise conducted is similar to Shimer (2012). With respect to Table ?? counterfactuals allows to focus on the episode of the Great Recession and provides a sense of the timing of the Great Recession by identifying the driving force of unemployment changes at various stages of the economic downturn.

Figure 2 displays the results in the US. In Figure 2, at the early stage of the recession, ramp-up in unemployment is characterized by a wave of inflows, especially from routine employment, and a decline in outflows, especially to routine jobs. Then, after the second quarter of 2009, while routine job losses receded, the contribution of unemployment outflows to routine employment becomes dominant. For instance, 3 years after the beginning of the Great Recession, the fall in the job finding rate to routine jobs alone is responsible for a 1.5-point increase in unemployment in the US. Clearly, flows involving

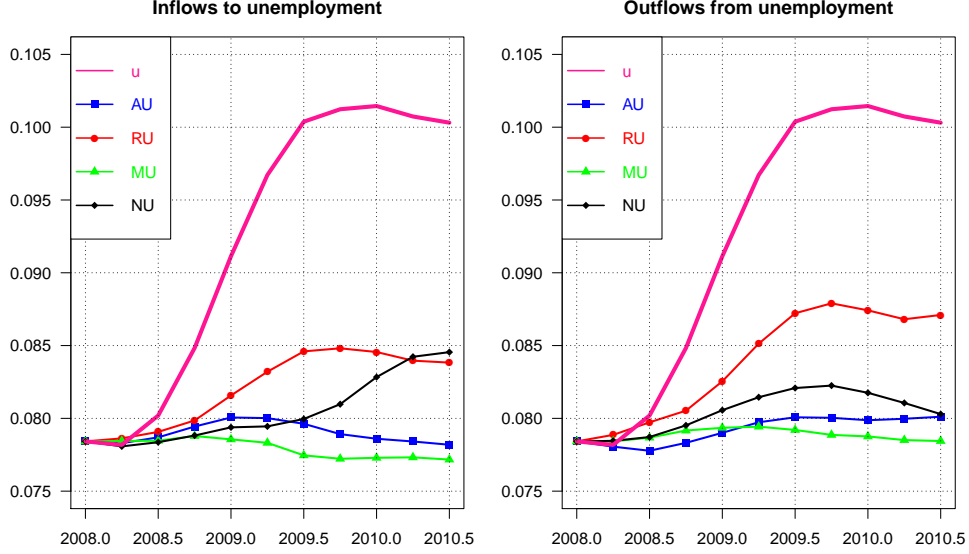


Figure 3: French unemployment during the Great Recessions: Counterfactual analysis

"u" observed unemployment rate. "Inflows" Unemployment inflows; "Outflows": Unemployment outflows. "AU" counterfactual unemployment changes if only transition from abstract employment to unemployment is allowed to fluctuate. "RU" counterfactual unemployment changes if only transition from routine employment to unemployment is allowed to fluctuate. ...

abstract/manual employment and unemployment are less influential for unemployment changes. The counterfactual exercise mirrors the results in Table 3: the job finding rate of routine jobs is a key driver of unemployment fluctuations. Figure 2 also suggests that job finding rate of routine job is a key driver of unemployment persistence. These findings echo [Elsby et al. \(2010\)](#)'s. We supplement their results by stressing the role of fluctuations in job finding and job separation rates by task.

Figure 3 plots the results of a similar counterfactual analysis for the French recession of 2008. Again, the counterfactual analysis is in line with our β decomposition. It reinforces the idea that the main driving force behind unemployment changes during this downturn episode comes from the flows implying unemployment and routine jobs. Overall, these two flows would generate an increase in French unemployment of about 1.6 points, representing around 74% of the observed increase in unemployment over this period. When only one of the two rates is allowed to fluctuate, we get that the changes in the job finding rate to routine jobs (resp. in the job separation rate from routine jobs), would generate a counterfactual unemployment rate of about 8.8 points (resp. 8.5) in 2010. The other important factor behind French unemployment variations during this episode is transition rates involving directly unemployment and non-participation, especially inflows from non-participants *NU* in the last 2 quarters of 2009, when unemployment kept increasing.

5 Job polarization and non standard work

We here explore the relationship between job polarization and non standard work (NSW). Indeed, job polarization alters labor market structures in response to technological changes. However, the nature of labor market adjustments and the response to technological change depends on institutional settings. Therefore, we study the evolution of employment not only by task as in the previous sections, but also, for each task group, by type of contractual arrangement. We then evaluate the average transition rates between the corresponding labor market states, and compute the contribution of each type of flow to unemployment fluctuations.

5.1 Definition and methodology

Firms use different types of non-standard work to adjust their labor force over the business cycle. In this perspective, part-time work and temporary contracts are two alternatives enabling firms to adjust their labor force/the number of hours worked over the business cycle, instead of incurring the costs and administrative constraints related to hiring and firing on ‘regular’ contracts. Accordingly, we group part-time employment and temporary contracts under the same terminology, and they will be labeled as “non standard work” (NSW), as in [OECD \(2015\)](#). With this definition, we get that NSW represents roughly a third of total employment in France, and about 20% of the workers in the US in the post-2003 period.

Following this approach, we document the evolution of the use of NSW across task groups, and also the contribution of NSW to job findings and separations across task groups. Besides, we decompose labor market flows between 8 labor market status: 3 task groups, each in NSW or standard work, unemployment and non participation. In this way, we perform a variance decomposition of unemployment to investigate whether job polarization exacerbates labor market dualism over the business cycle in France and the US.

5.2 Evolution of NSW by task and relationship with the business cycle

Let us first focus on the main features regarding employment by tasks and the divide between standard and non-standard work in France and the US.

Figure 4 displays employment growth by task in France. Between 2003 and 2016, abstract

and manual per capita employment expanded while the number of routine jobs declined: job polarization is at work. Notice that losses in middle-skill/routine jobs were primarily associated with standard employment while strikingly, the growth of routine non-standard jobs is positive over the sample period. In addition, nearly all the growth in low-skill/non-routine manual jobs was in non-standard employment. Abstract worker in non-standard employment also increases. This is not an uncommon phenomenon since growth in high-skilled occupations (abstract jobs) was entirely driven by non-standard employment in a few countries like Austria, Germany, Italy, the Netherlands and Switzerland (OECD 2017). Given the wage gaps between standard and non-standard workers and their impact on the distribution of earnings, job polarisation, by fueling labor market dualism, raises concerns about rising inequalities in France.

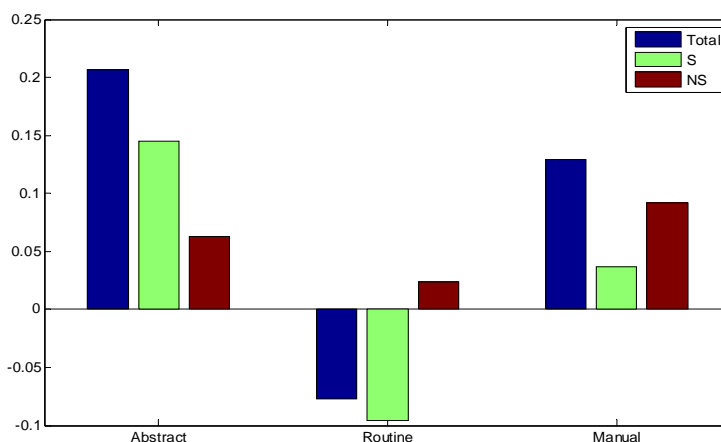


Figure 4: Employment growth by task in France between 2003 and 2016

“Total”: total employment growth. “S”: contribution of standard work in total employment growth. “NS”: Contribution of NSW in total employment growth. “S” + “NS” = “Total”. French LFS 2003Q1-2016Q4.

Figure 4 suggests that, in the US, employment changes mainly occurred in standard work arrangements, in all task groups. This might suggest that labor market dualism is not a concern in the US when we consider employment growth by task *in the long run*. However, when we consider the share of part-time workers in total employment *along the business cycle* (Figure 6), the cyclicity of NSW is striking. The share of NSW in total employment closely follows the unemployment rate, a phenomenon also found by [Borowczyk-Martins & Lale \(2016\)](#) in the US. Interestingly, France also displays the same feature. As a result, the study of cyclical changes in NSW constitutes an interesting issue when looking at unemployment fluctuations.

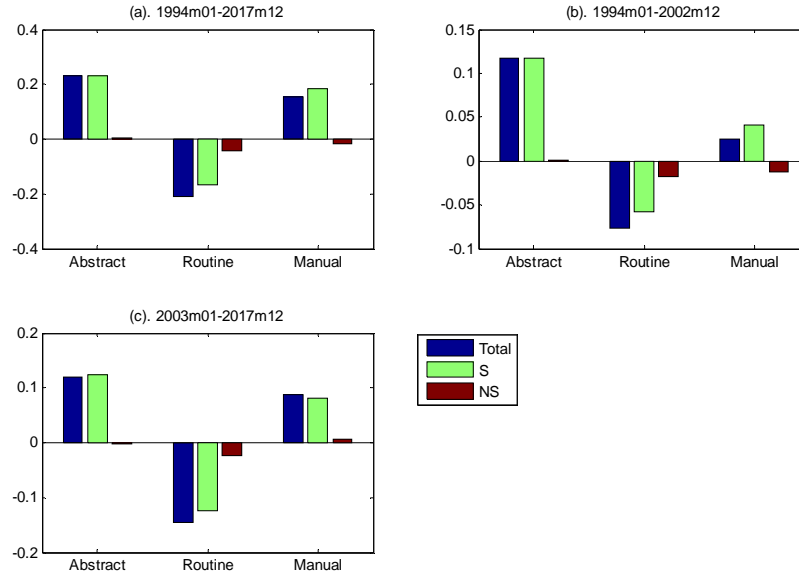


Figure 5: Employment growth by task in the US between 1994 and 2017

“Total”: total employment growth. “S”: contribution of standard work in total employment growth. “NS”: Contribution of NSW in total employment growth. “S”+“NS”=“Total”. US CPS 1994m1-2017m17.

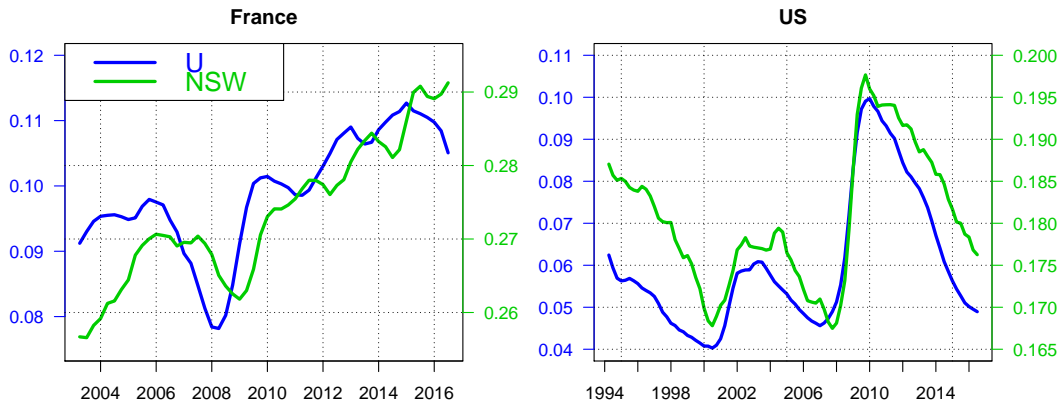


Figure 6: Share of NSW in total employment and unemployment rate

5.2.1 NSW and job losses during the Great Recession

The evolution of NSW and job polarization following the Great Recession is striking: Table 4 decomposes the net employment losses in France and the US following the Great Recession, not only by tasks as in subsection 3.3.2, but also by contractual arrangement.

	US 2008Jan-2010Jan	France 2008Q1-2009Q4	France 2010Q1-2013Q4	France 2008Q1-2013Q4
ΔAS	-930.23	104.07	-239.49	-135.42
ΔANS	436.83	116.78	59.13	175.91
$\Delta A = \Delta ANS + \Delta AS$	-493.40	220.85	-180.36	40.49
ΔR	-8,665.71	-599.03	-134.06	-733.09
ΔRNS	511.45	-52.16	25.94	-26.23
$\Delta R = \Delta RS + \Delta RNS$	-8,154.26	-651.19	-108.12	-759.31
ΔMS	-531.38	62.43	-82.18	-19.75
ΔMNS	892.11	13.49	-29.94	-16.45
$\Delta M = \Delta MS + \Delta MNS$	360.73	75.92	-112.12	-36.20
$\Delta A + \Delta R + \Delta M$	-8,286.92	-354.42	-400.60	-755.02
$\Delta NSW = \Delta ANS + \Delta RNS + \Delta MNS$	1,840.39	78.10	55.13	133.24

Table 4: Job polarization and NSW during the Great Recession: net change in employment by task and by contractual arrangement (in thousands) in France (2008Q1-2013Q4) and the US (2008M1-2010M1)

Interpretation: A negative figure indicates a net job loss, a positive one a net gain. For instance, between January 2008 and January 2010, in the US, the net variation in total employment corresponds to a loss of 8,286.92 millions of jobs, among which 8.154 millions of routine jobs have been lost. Similarly, France lost 759,310 routine jobs between 2008Q1 and 2013Q4, to be compared to a total loss of 755,020 jobs.

Over the net employment loss of 8.3 millions of jobs within two years that stroke the US following the beginning of the Great Recession, the job losses have been mainly concentrated on standard work (-10.1 millions of jobs), whereas NSW grew during this period (approximately +1.8 millions of jobs). Most of these changes are related to changes in routine employment: the bulk of job losses are in routine standard work (-8.6 millions of jobs), but at the same time, routine NSW kept expanding (approximately +500,000 jobs). Abstract and manual employment also share this pattern, with net losses in standard work and net gains in NSW. Overall, NSW increased for all task groups during this period. This is particularly noticeable given the huge drop of standard work.

A broadly similar picture emerges in France: the bulk of employment losses have been concentrated on routine standard work, leading to a more polarized, but also more dual employment structure. As the recession extended over a longer period than in the US, let us here consider the figures for the whole recessionary episode, i.e. from 2008 to end of

2013. During this period, France lost more than 750.000 jobs. This correspond to a net job loss of routine standard jobs of 733.000 jobs, but of only 26.000 losses of routine non standard jobs. While abstract employment increased (about +40.000) this corresponds to a net loss of 135.000 abstract standard jobs and a net gain of 175.000 abstract non standard jobs. Manual employment decreased by 36.000 jobs, both in standard (-20.000 jobs) and non standard (-16.000 jobs) work arrangements.

Table 4 suggests that abstract work actually expanded in the form of non-standard work. The expansion in US manual jobs also took the form of non standard work. The same conclusion carries through in France, with the exception that, in the aftermath of the second crisis in 2011, manual jobs did not expand.

5.3 Average quarterly transition rates with NSW

Tables 5 and 6 report average quarterly transition rates for France and the US respectively. This allows us to get an idea of the intensity of transitions by type of contractual arrangement for each task group. For France (Table 5), in all occupational groups, NSW is characterized by more turnover than standard work, with higher job finding rate and employment exits. Non-standard workers are 3 to 10 times as likely as standard workers to lose their job within 3 months. Non standard workers in routine jobs are characterized by the highest job finding rate and job separations. Non-standard work increases the risk of dropping out of the labor market. As for the so-called stepping stone effect, we actually observe little transformation of NSW to standard work: Each quarter, only 3.7% of non standard workers in abstract job become standar workers (4.3% in Routine jobs ; 2.1% in Manual jobs). However, this probability is higher than the probability of getting these jobs from unemployment. In each task, 70% to 80% of job findings are in NSW, it is the same ratio for job separation.

In the US, the job finding rate is actually larger in standard work than in non standard work for abstract and routine jobs. In contrast, for manual jobs, workers find a job in non standard work (with probability 8.7% per month) more easily than in standard work (with probability 5.4% monthly). Stepping stones are larger in the US than in France: Each quarter, 1 over 4 abstract jobs in NSW get a standard job, the probability of transformation from NSW to standard work is 25.4% in routine jobs, 21.4% in manual jobs, each quarter. This is much higher than the probability to get these jobs from unemployment. The highest probability of job finding lies in standard routine jobs (versus routine NSW in France). In contrast to the French labor market, the vast majority of job

	To:							
	AS	ANS	RS	RNS	MS	MNS	U	N
From:								
AS	97.8	0.7	0.2	0.0	0.0	0.0	0.4	0.9
ANS	3.7	89.0	0.1	0.6	0.0	0.1	2.9	3.6
RS	0.2	0.1	96.9	0.8	0.0	0.0	0.7	1.3
RNS	0.1	0.3	4.3	83.7	0.0	0.3	6.5	4.8
MS	0.0	0.0	0.4	0.2	94.3	2.2	1.2	1.7
MNS	0.0	0.2	0.2	1.2	2.1	87.7	3.8	4.8
U	0.7	1.8	2.6	12.7	0.4	2.2	62	17.6
N	0.1	0.3	0.3	1.2	0.0	0.3	3.0	94.8

Table 5: Average quarterly transition probabilities in France

“AS”: abstract standard work; “ANS”: abstract NSW; “RS” routine standard work, “RNS”: routine NSW, ... “U”: unemployed; “N”: non participation.

finding lies in standard work.

	To:							
	AS	ANS	RS	RNS	MS	MNS	U	N
From:								
AS	89.6	3.9	3.0	0.1	0.7	0.0	1.4	1.3
ANS	28.2	51.8	0.6	3.3	0.4	1.7	4.0	10.0
RS	2.7	0.0	85.5	5.0	1.1	0.0	3.6	2.1
RNS	0.6	2.0	25.4	49.6	0.7	2.8	6.8	12.1
MS	2.2	0.2	4.1	0.4	74.1	12.2	3.3	3.5
MNS	0.4	1.4	0.7	4.1	21.4	52.3	6.7	13.0
U	6.5	3.3	20.7	11.7	5.4	8.7	9.1	34.6
N	1.0	1.3	1.7	3.1	0.9	2.5	7.5	82

Table 6: Average quarterly transition probabilities in the US, 2003Q1-2016Q4

“AS”: abstract standard work; “ANS”: abstract NSW; “RS” routine standard work, “RNS”: routine NSW, ... “U”: unemployed; “N”: non participation.

5.4 β decomposition of unemployment variance with NSW

Column (1) of Table 7 reports the variance decomposition of unemployment fluctuations in France. The major forces behind unemployment changes lie in changes in the job finding rate of routine NSW that account for more than 20% of unemployment variance. The second biggest contribution lies in routine job losses in routine standard employment (12.6%). Job losses and findings in routine non standard work alone account for nearly a third of fluctuations in French unemployment. These results clearly suggests that fluctuations in NSW plays a key role in short run changes in French unemployment. Interestingly, the contribution of routine employment losses in standard work (12.6%) is larger than that of job finding in this type of job (9.1%), thereby suggesting that, along the business cycle, job losses are sharp in routine standard jobs, while job finding does

not respond as much, especially during expansions.

	France	US
	(1)	(2)
(a) Job separation		
β^{AS-U}	2.1	4.2
β^{ANS-U}	0.9	1.0
β^{RS-U}	12.6	13.3
β^{RNS-U}	7.7	2.8
β^{MS-U}	1.1	0.1
β^{MNS-U}	-0.7	2.8
Total separation	23.7	24.3
(b) Job finding		
β^{U-AS}	2.3	5.0
β^{U-ANS}	3.4	1.5
β^{U-RS}	9.1	20.4
β^{U-RNS}	21.3	8.8
β^{U-MS}	0.1	4.5
β^{U-MNS}	5.1	7.6
Total finding	41.2	47.8
(c) Non participation		
β^{NU}	18.6	11.7
β^{UN}	18.2	19.3
(d) Total		
Total U and E	64.9	72.1
Total U and N	36.8	31.0
Total A	8.7	11.7
Total R	50.7	45.3
Total M	5.6	15
Total ANS	4.3	2.5
Total RNS	29	11.6
Total MNS	4.6	10.4
Total NSW	37.7	24.5

Table 7: Variance decomposition of unemployment with NSW, 2003Q1-2016Q4

Quarterly data, 2003Q1-2016Q4. Correction for seasonality and time aggregation bias. "AS" standard abstract job, "ANS" non-standard abstract job, ... "U" unemployment, "N" non participation. Example : β^{AS-U} contribution of job separation from abstract standard job to unemployment is 2.1% in France.

In each occupational group, regarding job losses, the contribution of employment exits from standard jobs is larger than job losses in non standard work. This relates to the legal constraints on temporary work contract in France. As long as the term of the contract is not reached, separations from temporary contracts are not common (Cahuc et al., 2016). They occur without any penalty at the term of the contract. There are also legal constraints in the renewal procedure: temporary contracts can only be renewed once and

the maximum duration of a temporary job spell cannot exceed two years. The increased prevalence of temporary contracts can then reduce the fluctuations in the separation rate through a standard compositional effect, as the cyclicalities of the separation rate is very heterogeneous across temporary and permanent contracts. In addition, NSW also includes part-timers with permanent contracts. The contribution of separations also include, to some extent, the adjustment of hours along the business cycle (Fontaine et al. (2017)).

The picture that emerges from the decomposition of US unemployment variance is different from the French one (column (2) of Table 7). First, the total contribution of NSW to unemployment fluctuations is of a lower order of magnitude. Indeed, when NSW account for 24% of US unemployment rate changes, the same statistic is around 38% in France. Second, the 2 countries differ with respect to the contribution of the job finding. Overall, returns to standard employment generate around 30% ($\beta^{AS-U} + \beta^{RS-U} + \beta^{MS-U}$) of US unemployment changes while, in France, they account for barely 12%. Unambiguously, such patterns suggest that NSW is not a primary driver shaping US unemployment whereas it is in the French case. In both countries, entries and exits from routine jobs explain more than 40% of unemployment dynamics. The novelty of our approach is to underline that the cyclicalities of the job polarization process does not involve the same forms of employment on both sides of the Atlantic, especially as the job finding is concerned.

Third, with respect to job separation, the overall contribution of job losses is the same in both countries (around 24%), particularly with respect to employment exits from routine standard work (around 13% in both countries). Finally, in Table 3, we noticed that, the contribution of changes in manual jobs to unemployment variance is far larger in the US (15%) than in France (5%). Table 7 suggests that this is due job finding of manual standard jobs (β^{U-MS}) and separation from manual non standard employment (β^{MNS-U}), that are more responsive to the business cycle than in France.

5.5 Dualism in the aftermath of the 2008 crisis

Figures 7 and 8 show the counterfactual analysis for unemployment with our extended model. In the 2008 crisis, the return to routine standard jobs explains an important share of the total increase in observed unemployment in the US. From the job separation side, the dominant factor is job losses in routine standard jobs. The counterfactual unemployment obtained when this transition probability is the only one to change is hump-shaped indicating that separations of routine standard jobs work at the early stage of the recession. At its peak, this flow is responsible of a 0.5-point increase in US unemployment.

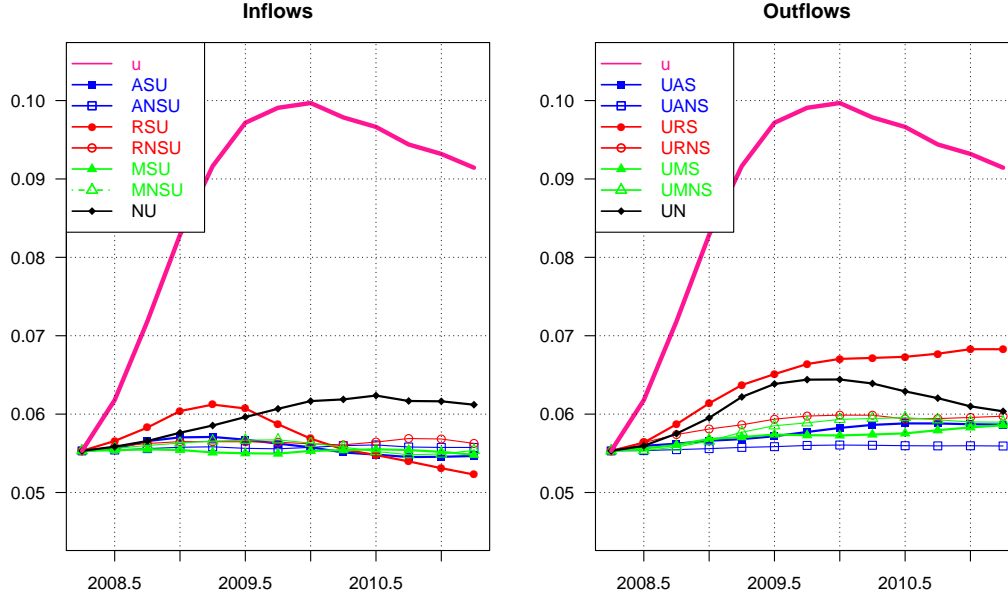


Figure 7: The 2008 crisis in the US: unemployment changes with NSW

"u" observed unemployment rate. "Inflows" Unemployment inflows; "Outflows": Unemployment outflows. "ASU" counterfactual unemployment changes if only transition from standard abstract employment to unemployment is allowed to fluctuate. "RNSU" counterfactual unemployment changes if only transition from routine non-standard employment to unemployment is allowed to fluctuate. ...

The picture is very similar for the 2001 recession, except for the role of job separation from routine standard jobs. Indeed, the latter contributes only marginally to the increase in US unemployment in 2001.

Figure 8 repeats the exercise for the French economy. The counterfactual value of unemployment generated by worker flows implying both manual and abstract employment are flat confirming that they are not of primary importance in explaining the cyclical ramp-up in French unemployment. From the job separation side, both separations of routine standard and non-standard jobs contribute to push French unemployment up, the influence of the former being higher at the end of the recessionary episode. As indicated by our unemployment variance contribution, the primary factor behind unemployment variations is job finding to routine jobs. More specifically, over the 0.9-point increase due to job finding rate to routine jobs, 0.6-point (around 2/3) can be accounted for by the fall in job finding from routine non-standard employment. The latter seems to be particularly important in explaining the persistence of the unemployment increase.

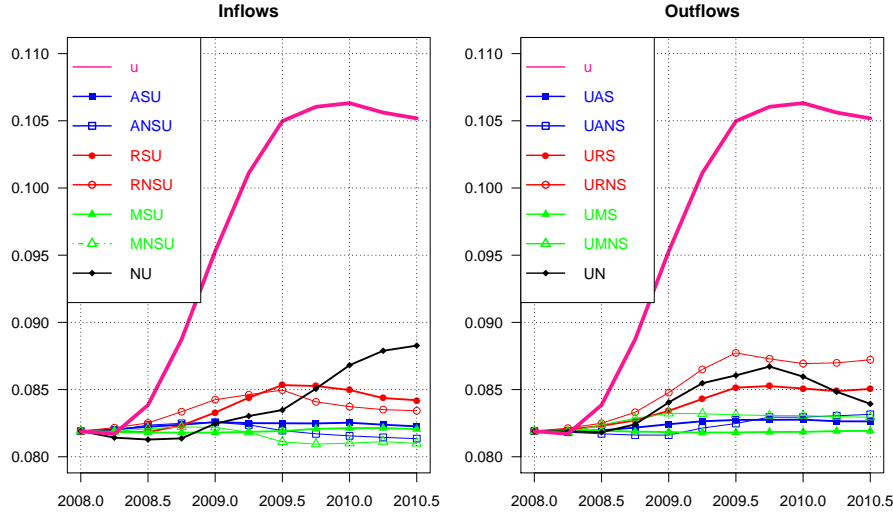


Figure 8: The 2008 crisis in France: unemployment changes with NSW

”u” observed unemployment rate. “Inflows” Unemployment inflows; “Outflows”: Unemployment outflows. ”ASU” counterfactual unemployment changes if only transition from standard abstract employment to unemployment is allowed to fluctuate. ”RNSU” counterfactual unemployment changes if only transition from routine non-standard employment to unemployment is allowed to fluctuate. ...

6 Conclusion

Using French and US survey data, we document how ins and outs of employment shape the job polarization process in both countries. We then explore the effects of job polarization on short-run unemployment. We find that, in both countries, unemployment changes are mainly driven by changes in routine worker flows. In the 2008 crisis, unemployment ramp-up was first driven by massive losses in routine employment. As employment exits subside, the persistent increase in unemployment is due to inflows from non participation and declining of unemployment outflows to routine employment. We then explore how job polarization affects labor market dualism. The variance decomposition of French unemployment suggests that job polarization exacerbates labor market dualism along the business cycle: NSW plays a key role in short run changes in French unemployment. The contribution of routine employment losses in standard work is larger than job finding in this type of job, thereby suggesting that, along the business cycle, job losses are sharp in routine standard jobs. In the US, the contribution of routine standard work is a major driver of US unemployment.

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A Per capita employment by task

A look at per capita employment in each task group (Figure 9) allows to examine in a more subtle way the cyclical behavior of job polarization. In the US, the Great Recession is characterized by an unprecedented fall in routine jobs, as well as an unemployment peak. While in the aftermath of the Great Recession, inactivity soars in both countries,

French unemployment did not go back to pre-crisis levels, unlike the US. According to the European Cycle Research Institute, France went through a second recessionary episode between April 2011 and November 2012. This has driven all jobs downward. However, at the onset of 2014, abstract and manual jobs start recovering while routine jobs keep falling, at a time when unemployment remains far above pre-crisis level.

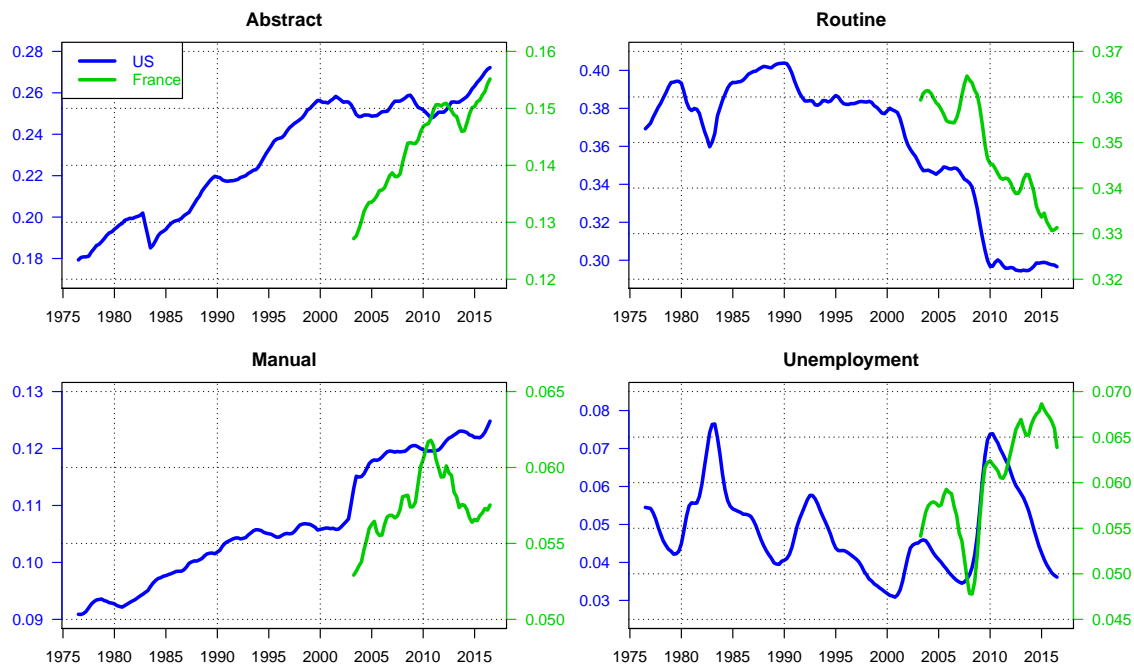


Figure 9: Employment per capita: Job polarization along the business cycle

“FR” French quarterly LFS; “US”: US monthly data; EA : per capita employment in Abstract jobs; ER : per capital employment in Routine jobs ; EM : per capita employment in Manual jobs; U : per capita unemployment.

In any case, as can be seen on the previous figures, the Great Recession has led to important changes in the structure of employment by task in both countries: in the first quarter of 2008, routine employment per capita was equal to approximately 36% in France and 34.5% in the US. It fell to (respectively) 34.5% in France and 30% in the US in 2010. Let us now have a look at routine job losses during the Great Recession.

B Selected transitions probabilities in the US: 5-state model

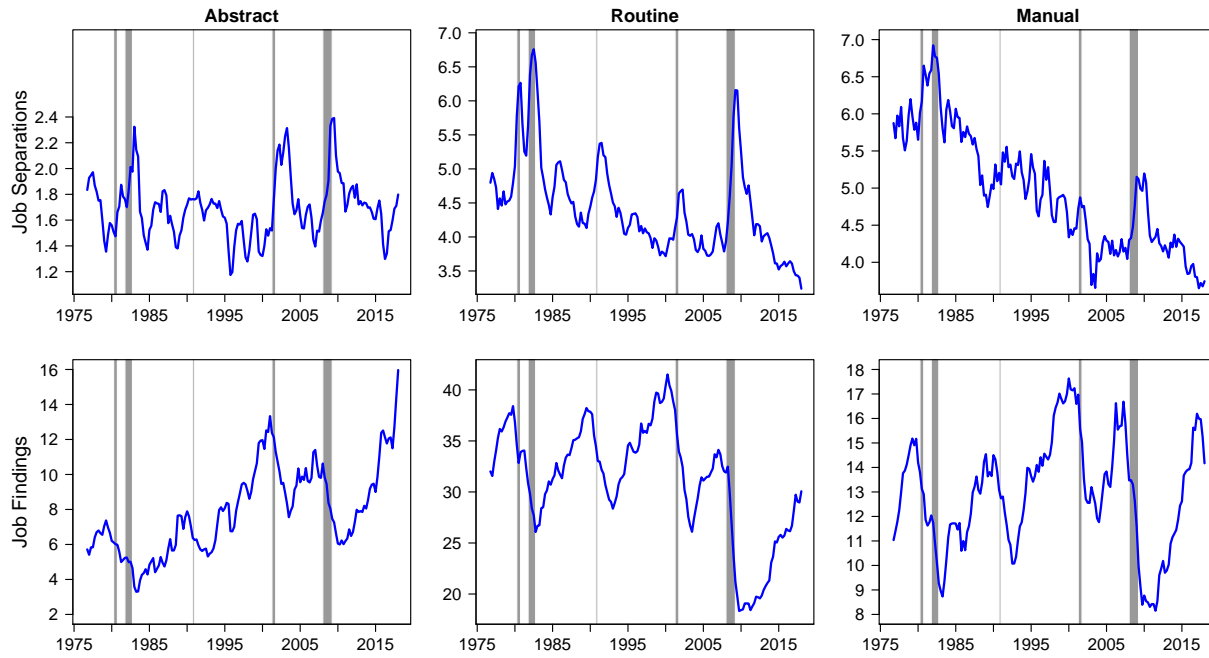


Figure 10: US quarterly transition probabilities: between employment and unemployment

NBER Recessions in shaded areas. US CPS data, 1976Q1-2018Q2.

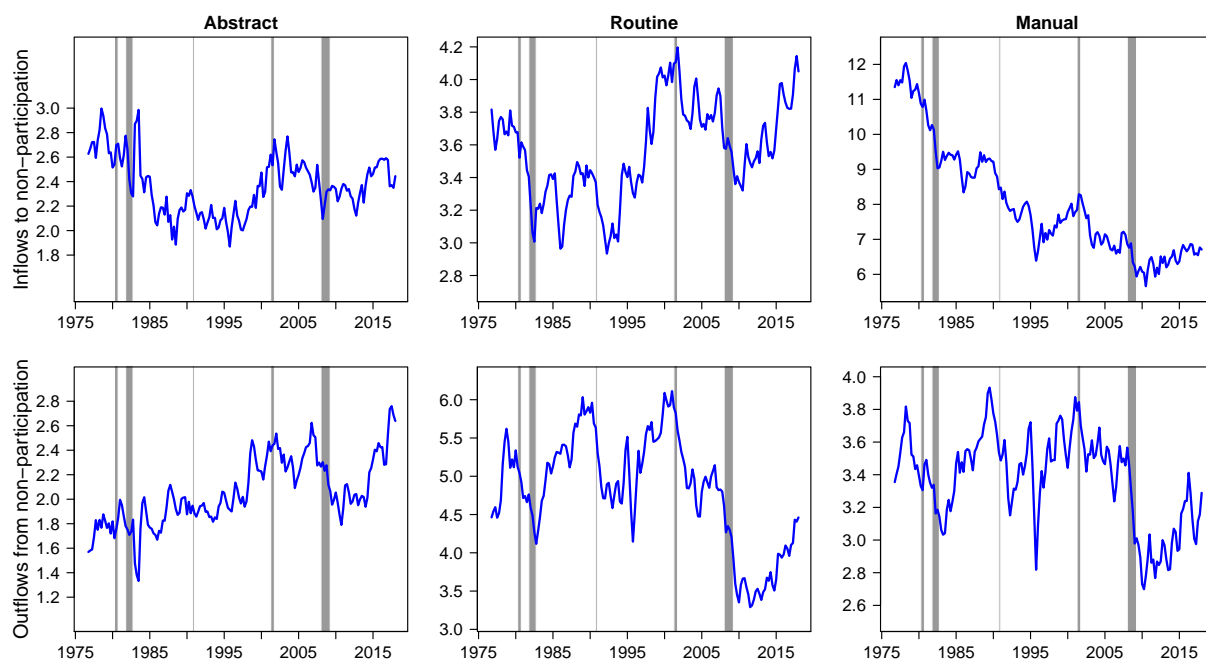


Figure 11: US quarterly transition probabilities: between employment and non-participation

NBER Recessions in shaded areas. US CPS data, 1976Q1-2018Q2.

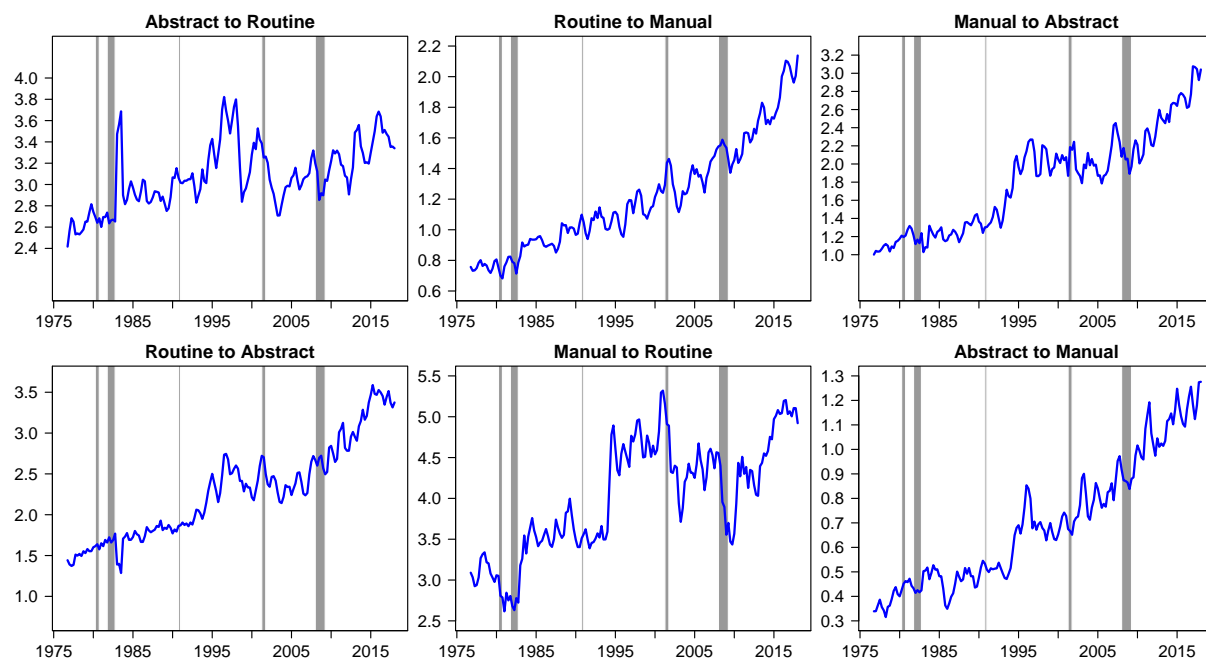


Figure 12: US quarterly transition probabilities: job-to-job transitions

NBER Recessions in shaded areas. US CPS data, 1976Q1-2018Q2.

C Selected transitions probabilities in France: 5-state model

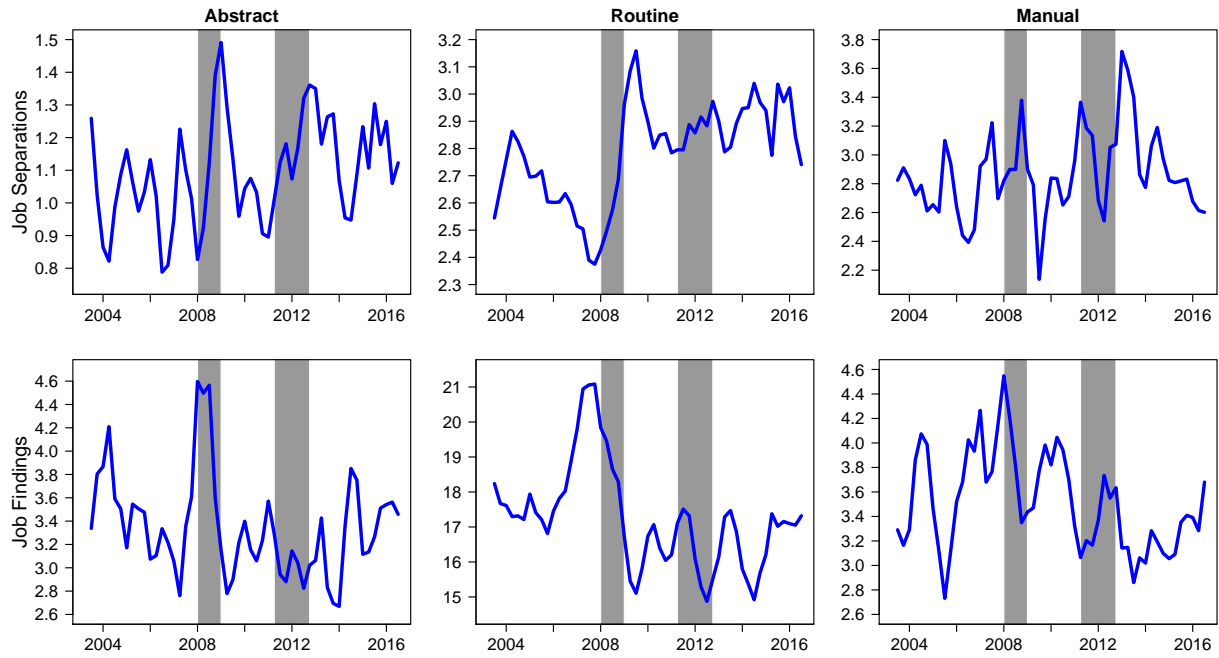


Figure 13: French quarterly transition probabilities: between employment and unemployment

Recessions in shaded areas. French LFS, 2003Q1-2016Q4.

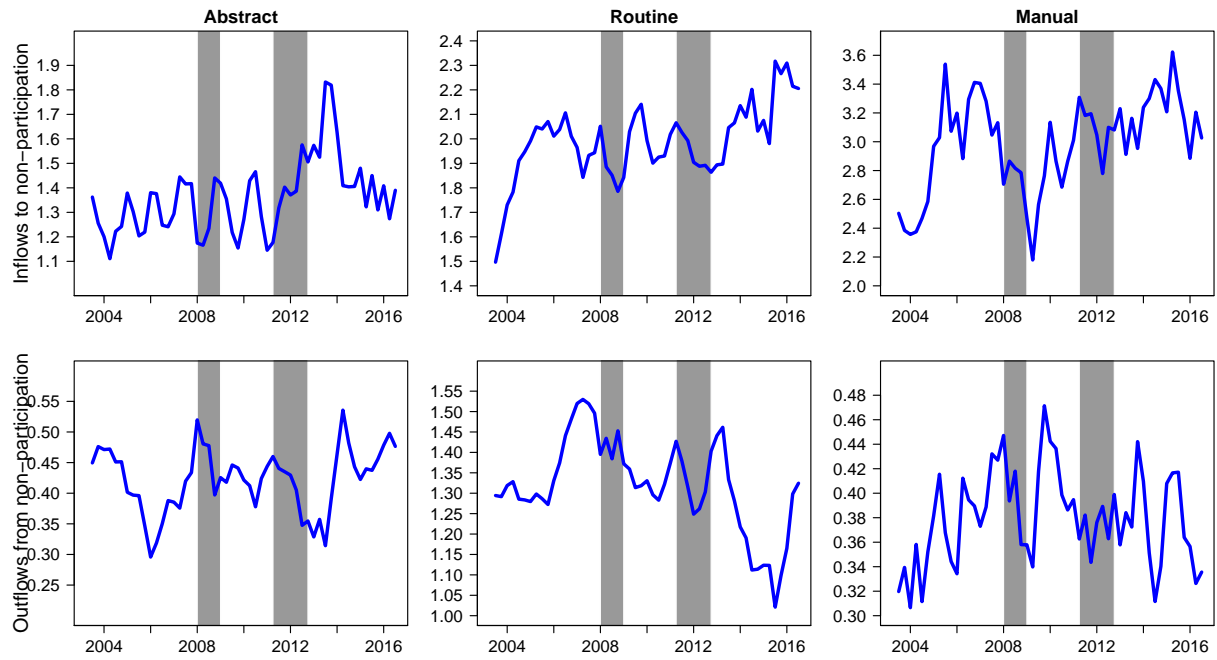


Figure 14: French quarterly transition probabilities: between employment and non-participation

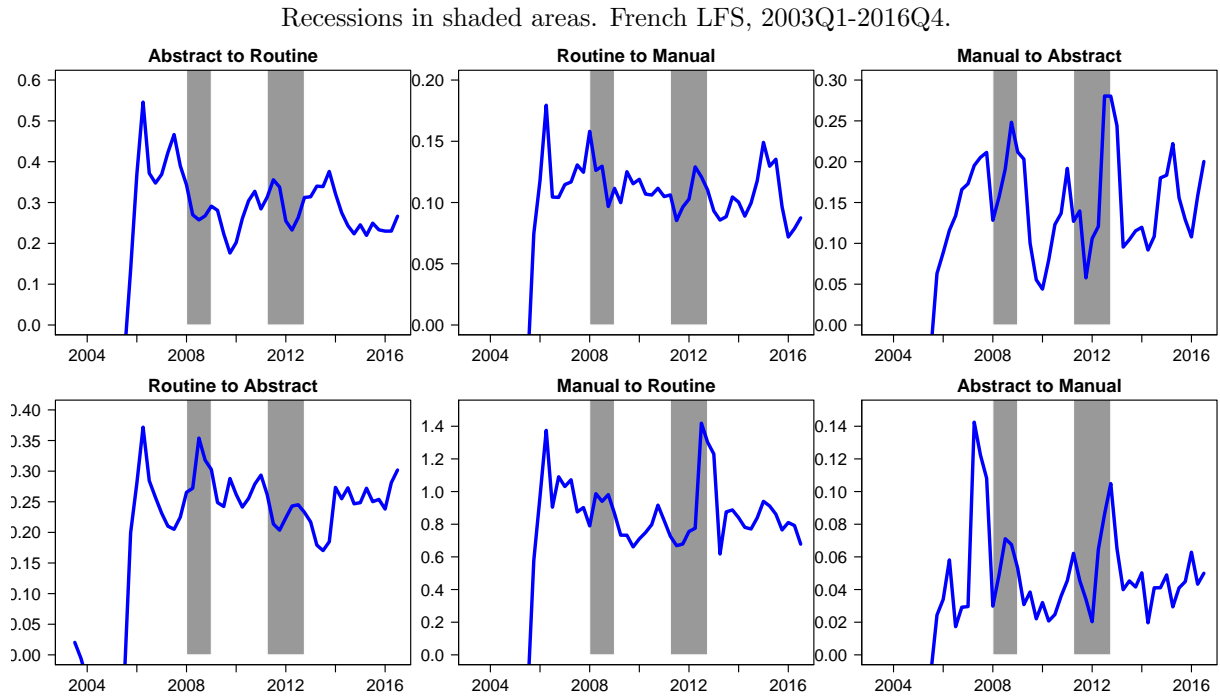


Figure 15: French quarterly transition probabilities: job-to-job transitions

Recessions in shaded areas. French LFS, 2003Q1-2016Q4.

D Routine employment

D.1 β decomposition of routine employment

	France	US
(a) Unemployment		
β^{RU}	22.1	32.6
β^{UR}	42.2	42.2
(b) Non-Participation		
β^{RN}	6.0	-5.4
β^{NR}	17.1	15.9
(c) Job-to-Job		
β^{RA}	2.1	0.9
β^{AR}	6.0	4.7
β^{RM}	-1.5	-0.7
β^{MR}	3.9	9.9

Table 8: Variance decomposition of changes in Routine employment, 2003Q1-2016Q4.

D.2 Routine employment counterfactuals

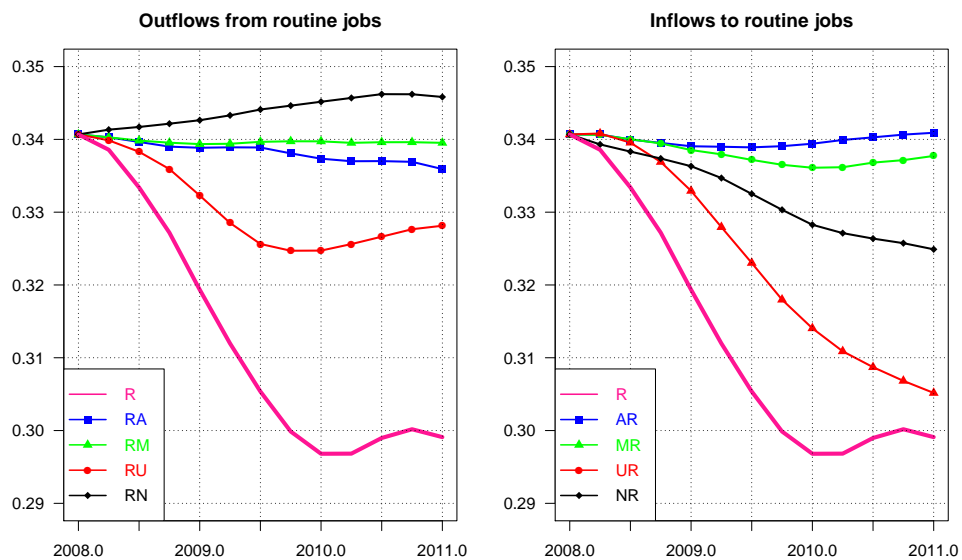


Figure 16: US routine employment during the Great Recession: Counterfactual analysis

"u" observed unemployment rate. "Inflows" Unemployment inflows; "Outflows": Unemployment outflows. "AU" counterfactual unemployment changes if only transition from abstract employment to unemployment is allowed to fluctuate. "RU" counterfactual unemployment changes if only transition from routine employment to unemployment is allowed to fluctuate. ...

Figure 16 shows that the transition rate from routine jobs to unemployment, p^{RU} , explains a fairly small part of the decline in routine employment compared to the contribution of

the transition rate from unemployment to routine jobs, p^{UR} . Over the 4-points decline in routine employment rate during the Great Recession, the latter transition rate is responsible for nearly as much as a 3.5-points fall. Overall, this suggest that the severe fall in routine employment that has followed the beginning of the Great Recession was more due to a collapse in the routine job finding rate than the consequence of the massive destructions of routine jobs in the beginning of the downturn episode in the US.

As regards the cyclical fall in French routine employment, Figure 17 confirms that job-to-job transitions are not of primary importance in explaining the decline in routine employment. Again, the job separation rate from routine employment and the job finding to routine jobs are the primary drivers behind the evolution of French routine employment during the Great Recession. Thus, the increase in routine job separation rate and the persistent fall in job finding to routine jobs account for the bulk (around 75%) of the disappe:

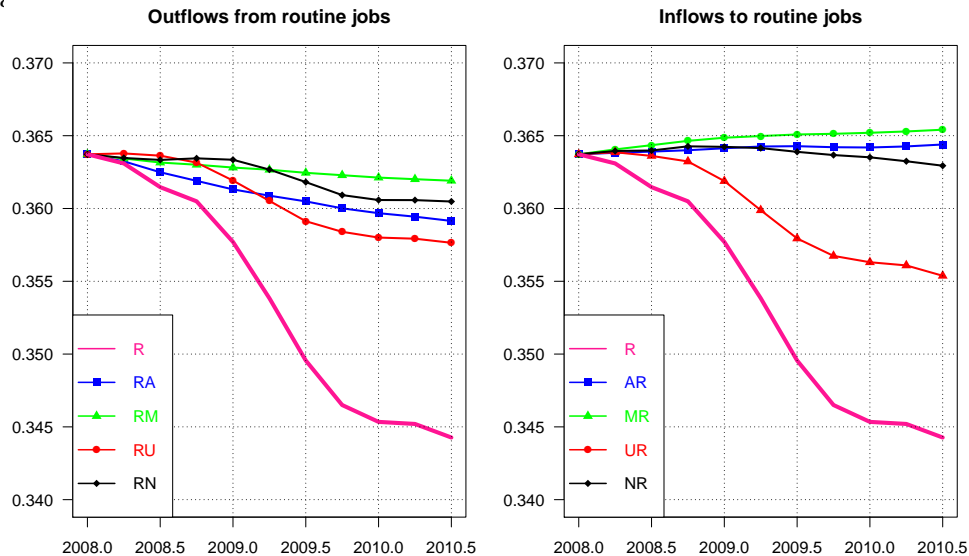


Figure 17: French routine employment during the Great Recessions: Counterfactual analysis

"u" observed unemployment rate. "Inflows" Unemployment inflows; "Outflows": Unemployment outflows. "AU" counterfactual unemployment changes if only transition from abstract employment to unemployment is allowed to fluctuate. "RU" counterfactual unemployment changes if only transition from routine employment to unemployment is allowed to fluctuate. ...

E Non Standard Work

E.1 Evolutions of NSW

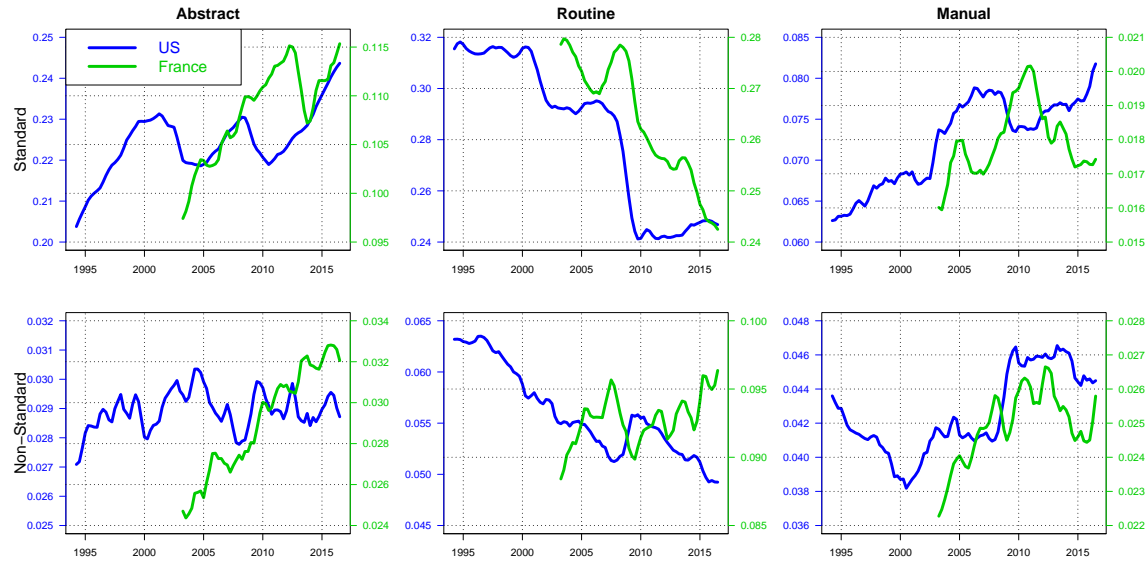


Figure 18: Per capita employment in France and in the US

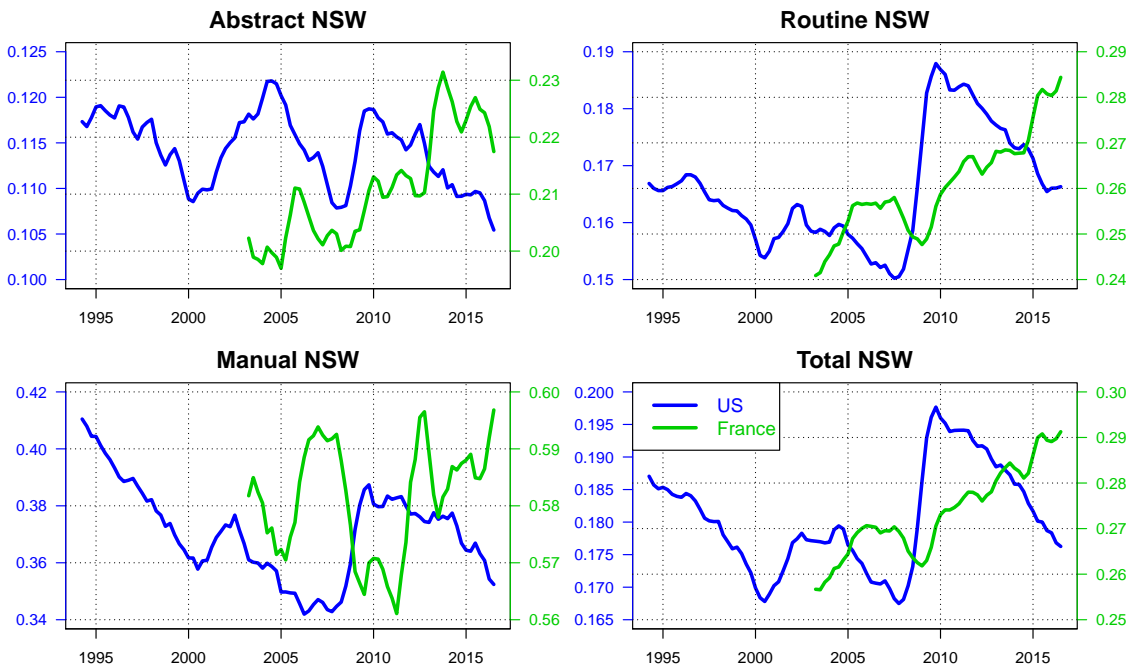


Figure 19: Share of NSW in total employment in France and in the US

French LFS 2003Q1-2016Q4. US CPS data 1994Q1-2018Q2.