Ecole doctorale n° 405 : Economie, Management, Mathématiques et Physique (EM2P)

THESE DE DOCTORAT

pour obtenir le grade de docteur délivré par

l'Université de Cergy-Pontoise

Spécialité doctorale : Sciences économiques

présentée et soutenue publiquement par

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le 23 juin 2017

An Analysis of Dualism on the French Labour Market

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Remerciements

Je remercie l'Université de Cergy-Pontoise, l'école doctorale EM2P, le LABEX et plus particulièrement le laboratoire THEMA ainsi que ses membres pour le confort technique qu'il m'a assuré durant ma thèse. Ce fût un réel plaisir d'effectuer mon travail de thèse au sein de l'équipe du THEMA. En particulier, je tiens à remercier chaleureusement Lisa Collin, Imen Defferrard, Yolande Gustave et Cécile Moncelon pour leur professionnalisme irréprochable ainsi que pour le soutien qu'elles m'ont apporté pendant ces années. Toutes les quatre, vous constituez un pilier de ce laboratoire et apportez un appui si chaleureux et indispensable aux doctorants qu'il me semble impensable de ne pas le notifier. Vous apportez ce petit supplément de vie contribuant, sans aucun doute, au bon fonctionnement de ce lieu.

Je remercie l'équipe de la DISI, en particulier Laurent Fortin, pour son professionnalisme et sa rapidité d'action afin de régler mes problèmes informatiques au mieux et que je puisse travailler dans les meilleures conditions possibles.

Je remercie mes directeurs de thèse, Olivier Charlot et Franck Malherbet, d'avoir accepté d'encadrer mon travail.
Olivier, je te remercie pour ta disponibilité, ton soutien, ton humour et les conseils judicieux que tu m'as prodigués.
Franck, je te remercie pour tout ce que tu m'as appris et ce depuis ma première année de licence. Sans toi, je n'aurai jamais découvert cette thématique passionnante que constitue l'économie du travail.
J'ai beaucoup appris grâce à vous deux et c'est une fierté pour moi d'avoir bénéficié de votre encadrement. Je tiens à vous remercier sincèrement d'être restés à mes côtés jusqu'à la fin.

Je remercie les membres de mon jury de thèse, Thepthida Sopraseuth, Arnaud Chéron et François Fontaine d'avoir accepté d'en faire partie ainsi que pour leurs commentaires toujours bienveillants à mon égard.

Je remercie Fabian Gouret ainsi qu'Hélène Couprie pour leur disponibilité et leur aide. Ce fût un réel plaisir d'échanger avec vous et votre aide a été sincèrement précieuse.

Je remercie Pedro Gomes pour ses commentaires et conseils concernant mes différents articles. Ce fût un plaisir d'échanger avec toi.

Pierre Cahuc, ce fût un réel plaisir de travailler avec toi. Merci pour tout ce que j'ai pu apprendre à tes côtés.

Hélène Benghalem, merci pour nos discussions ainsi que nos échanges. Te rencontrer et travailler avec toi a été très enrichissant pour moi. J'espère que nos échanges ne s'arrêteront pas ici.

Je remercie l'UNEDIC pour le confort qui m'a été donné lors des semaines passées au sein de ses locaux. J'ai eu l'honneur de faire la connaissance d'une équipe chaleureuse, accueillante et bienveillante.

Idriss, merci pour tes remarques et conseils durant ce travail de thèse. J'espère que nous aurons l'occasion de continuer à travailler ensemble.

Je remercie mes collègues doctorants du THEMA pour tout ce que nous avons pu partager ensemble, au sein du 703 ou non : Ignacio, Mehdi, Lionel, Mi Lim, Ibrahima, Zéphirin, Arnaud, Louis, Delphine, Patrick, Hamed, Romain, Haza, Nathaniel, Jérémie, Céline, Marie, Erwan, Amélie, Cigdem, Roxane ...

Je remercie ma famille pour son soutien durant ce travail de thèse : mes parents, Sylvie et François, ma soeur Marjorie, Alexandre, Laura, ma grand-mère Yvonne, Didier et Françoise.

Je remercie mes amis pour tous les moments que nous avons pu partager et qui ont, sans aucun doute, contribué à la rédaction de ce manuscrit : Eléonore, Nicolas, Hugo, Carole, Angee, Elise, Michel, Roxane, Ezio, Sakio et Justine.

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La législation sur la protection de l'emploi est au sein de nombreux débats : les questions ayant trait à la protection de l'emploi ainsi qu'au recours à l'emploi temporaire font, par exemple, l'objet de rapports récurrents de l'OCDE depuis de nombreuses années[1]. Tout particulièrement, en France, il a été question, ces dernières années, « d'inverser la courbe du chômage ». Dans cette optique, plusieurs mesures mises en place ont été questionnées telles que la loi travail et la taxation des contrats à durée déterminée ayant pour objectif d'apporter des solutions au financement de l'assurance chômage.

Les débats sur le thème de la protection de l'emploi résultent de la confrontation de plusieurs logiques différentes : dans un monde en perpétuel changement, faut-il protéger l'emploi et comment y parvenir ? Si les risques liés à la perte d'emploi sont inhérents au fonctionnement du marché du travail et à son évolution, quelle est la meilleure manière d'offrir aux travailleurs une protection face aux risques ? Plus généralement, comment protéger les emplois des uns sans limiter l'accès à l'emploi pour les autres ?

La protection de l'emploi soulève donc de nombreuses questions car plusieurs logiques sous tendent les réponses à ces questions.
Premièrement, une logique d'assurance puisque protéger l'emploi peut être une demande légitime des travailleurs dans la mesure où ceux-ci sont averses au risque. Dans ce cadre, le débat porterait sur la meilleure manière d'obtenir cette protection en allouant justement les risques liés au marché du travail.
La seconde logique est liée au progrès technique et au besoin de flexibilité des entreprises. En effet, la protection de l'emploi permet de faire perdurer des emplois condamnés à disparaître et empêche la création d'emplois dans des industries émergentes. De plus, les entreprises ont un besoin croissant en flexibilité en ce qui concerne la gestion de leur main-d'œuvre afin d'améliorer leur réactivité face à un niveau d'activité variable. La crise apparue en 2008 peut également avoir donné naissance à de nouveaux besoins en poussant les entreprises à modifier leur fonctionnement lors de leurs ajustements de main-d'œuvre et en les rendant plus réticentes à créer des emplois de longue durée. Cette logique les conduit peut-être à contourner la législation sur la protection des emplois existante, rendant ces dispositifs de plus en plus inefficaces.
Enfin, les réponses à ces questions relèvent également de la logique classique des insiders vs. outsiders où les insiders (ceux largement protégés grâce à la législation sur la protection de

[1]Sur ces 13 dernières années, la législation sur la protection de l'emploi ainsi que le travail temporaire ont été discutés à au moins 10 reprises dans les travaux menés par l'OCDE. A titre non exhaustif, l'on peut citer les chapitres des rapports annuels « Perspectives de l'emploi de l'OCDE » suivants : 2004 chapitre 2, 2006 chapitres 6 et 7, 2007 chapitre 2, 2008 chapitre 2, 2010 chapitre 3, 2012 chapitre 2, 2013 chapitre 2, 2014 chapitre 4, 2015 chapitre 1 et 2016 chapitre 3.

l'emploi) sont en faveur d'une rigoureuse protection de l'emploi sans se soucier de l'effet que cette protection peut avoir sur l'emploi et notamment sur les outsiders, les individus en dehors du marché du travail.

L'enjeu est donc de taille. Globalement, il s'agit d'allouer justement les risques liés au fonctionnement du marché du travail et à l'évolution de la structure de l'économie entre travailleurs et firmes[2] et entre travailleurs de groupes différents (qualifiés/non qualifiés, migrants/locaux, hommes/femmes, jeunes/moins jeunes ...), aux intérêts souvent opposés. Idéalement, il s'agit de trouver le bon équilibre entre flexibilité et assurance afin de créer des emplois pérennes c'est à dire de protéger les emplois tout en laissant aux firmes un certain degré de flexibilité et en permettant aux différents groupes de travailleurs de conserver leur emploi et/ou de s'insérer sur le marché du travail. Au cœur de cela se trouve donc l'ambition de stimuler la création d'emplois par les firmes tout en maîtrisant la crainte (souvent formulée dans les débats, mais est-elle justifiée ?) qu'en agissant ainsi, l'on ne parvienne qu'à créer des emplois de très courte durée.

En France, le code du travail définit, en principe, des règles strictes concernant les relations contractuelles. La forme normale de relation de travail en France (ainsi que dans divers autres pays européens) est le contrat à durée indéterminée et toutes les autres formes de relations contractuelles possibles sont donc de l'ordre de « l'exception ». Ceci est stipulé dans l'article L1221-2 du code du travail (« Le contrat de travail à durée indéterminée est la forme normale et générale de la relation de travail »). Ce type de contrat n'a donc pas de durée prédéfinie mais est sujet à des coûts de licenciement en cas de séparation. Toutefois, l'employeur peut utiliser un contrat à durée déterminée lorsque celui-ci anticipe que la durée de l'emploi sera courte et ne constitue donc pas une création d'emploi pérenne, comme stipulé dans l'article L1242-1 du code du travail (« Un contrat de travail à durée déterminée, quelque soit son motif, ne peut avoir ni pour objet ni pour effet, de pourvoir durablement un emploi lié à l'activité normale et permanente de l'entreprise »). Ce type de relation de travail peut donc prendre fin sans coût mais la durée de ce type de contrat est définie par avance et notifiée lors de la rédaction de celui-ci. Le contrat à durée déterminée ne peut être utilisé que dans certains cas bien précis[3] et doit donc être considéré comme une exception. Dans sa définition la plus générale, ce type de contrat est donc soumis à de nombreuses règles quant à son motif de recours, sa durée

[2]Blanchard et Tirole (2008) montrent que, dans un cadre où les travailleurs sont averses au risque et les firmes neutres au risque et où l'Etat est en charge de verser les indemnités chômage aux travailleurs licenciés, une taxe sur le licenciement (devant être égale au montant des allocations chômage) induit les firmes à internaliser le coût engendré par un licenciement. L'idée sous-jacente est équivalente au système « d'experience rating » mis en place dans divers Etats des Etats-Unis.

[3]L'article L1242-2 définit les motifs de recours au contrat à durée déterminée.

maximale, son renouvellement (deux fois maximum sans dépasser la durée maximale prévue par la loi dépendant du motif de recours) et les délais de carence à respecter entre l'utilisation de deux contrats de ce type. La violation de ces règles engendre, en principe, une requalification du contrat de travail en contrat à durée indéterminée.

Ainsi, si le contrat à durée indéterminée est la forme normale d'emploi, la législation française sur l'emploi permet toutefois la cohabitation de deux types de contrats : le contrat à durée indéterminée et le contrat à durée déterminée. En théorie, cette cohabitation pourrait ne pas être problématique dans la mesure où le contrat à durée déterminée serait effectivement utilisé afin de pourvoir des emplois réellement temporaires par nature tels que les emplois saisonniers, les emplois engendrés par des fluctuations de court-terme de l'activité ou encore les emplois engendré par des besoins ponctuels des firmes. De même, l'existence de ces deux types de contrat ne poserait pas de problème d'efficacité si ceux-ci étaient utilisés préalablement à une embauche en contrat à durée indéterminée. Dans ce dernier cas, le contrat à durée déterminée serait vu comme un tremplin de début de carrière[4] et permettrait éventuellement de sélectionner les candidats (dans une logique de screening[5]). De plus, l'utilisation du contrat à durée déterminée peut également relever d'une logique de bien d'usage. Dans cette optique, un contrat à durée déterminée pourrait être conclu afin de laisser l'employeur et le salarié évaluer la qualité de l'appariement avant de s'engager dans une relation contractuelle à durée indéterminée[6]. Enfin, dans une logique de complétude des contrats, l'existence des contrats à durée déterminée permettrait de compléter des marchés qui n'existeraient pas si ces contrats n'étaient pas utilisables.

Toutefois, plusieurs éléments remettent en cause ces arguments. En premier lieu, au regard de la faiblesse du taux de conversion des contrats à durée déterminée en contrat à durée indéterminée (inférieur à 5% en France), il semblerait que la vision du contrat à durée déterminée comme tremplin de début de carrière ne concerne pas la majorité des contrats à durée déterminée en France ainsi que dans les pays où la protection de l'emploi est rigide. Les modèles théoriques confirment l'intuition qu'une législation sur la protection de l'emploi rigide amoindri l'intérêt pour les entreprises à convertir les emplois temporaires en emplois permanents et que ce taux de conversion diminue à mesure que la rigueur de la législation sur la protection de l'emploi augmente. Cahuc et Postel-Vinay (2002) ainsi que Blanchard et Landier (2002) montrent qu'une augmentation du degré de rigueur de protection de l'emploi va de paire avec

[4]Voir par exemple Booth, Francesconi et Jeff (2000), Booth, Francesconi et Jeff (2002), Farber (1999), Segal et Sullivan (1997).

[5]Faccini (2014).

[6]Pries et Rogerson (2005), Bucher (2010).

une diminution du taux de conversion des emplois temporaires en emplois permanents[7]. Cahuc, Charlot et Malherbet (2016) montrent, qu'en plus de limiter les conversions d'emplois temporaires en emplois permanents, une protection de l'emploi rigoureuse (c'est-à-dire des coûts de licenciement élevés sur les emplois permanents) engendre une augmentation de la part des contrats temporaires dans les embauches. En conséquence, il semble que, bien que pavée de bonnes intentions, la législation sur la protection de l'emploi ait pour effet principal de segmenter le marché du travail dans les pays où celle-ci est très rigide.

En second lieu, la vision du contrat à durée déterminée comme forme « exceptionnelle » de relation de travail ne semble pas si évidente, au regard de son utilisation massive par les firmes (près de 80% des embauches s'effectuent en contrats à durée déterminée en France) et il est aisément remarquable que le dualisme contractuel est un phénomène prenant de l'ampleur au fil du temps.

La vision du contrat à durée déterminée comme méthode de sélection des candidats ne paraît pas non plus juste au regard des chiffres communiqués mettant particulièrement en évidence que la majorité des emplois créés sont de très courte durée ainsi qu'au regard de la durée relativement longue, par rapport à la durée des contrats à durée déterminée, de la période d'essai dans le cas d'une embauche en contrat à durée indéterminée (pouvant atteindre 8 mois alors que 50% des contrats à durée déterminée dure moins d'un mois en France[8]).

Enfin, la logique de complétude des marchés peut être remise en cause puisque le sentiment dominant est plutôt que plus de nouveaux types de contrats sont créés, plus la possibilité est laissée aux employeurs de contourner la législation (plusieurs types de contrats à durée déterminée existent dont le contrat dit d'usage[9], contrat utilisé de manière extensive ce qui peut être un signe révélateur du contournement de la législation par les entreprises. Il est donc possible

[7] Voir aussi le rapport de l'OCDE 2016 « Perspectives de l'emploi de l'OCDE 2016 ».

[8] Données 2010-2012. Ce fait est visible sur le graphique 1 du chapitre 3.

[9] Devant le besoin de flexibilité croissant des firmes, un nouveau motif d'utilisation de contrats à durée déterminée a été instauré en France : les firmes peuvent utiliser des contrats à durée déterminée si l'emploi considéré est par « nature » temporaire. Ce type de contrat, connu sous le nom de « contrat d'usage », bénéficie d'une législation plus souple notamment en matière de durée et de renouvellement. En effet, ils ne sont pas sujets à une durée maximale, peuvent être renouvelés sans période de carence et enfin, ne sont pas concernés par les indemnités de fin de contrat. Les 20 secteurs d'activités où les firmes sont autorisées à utiliser de tels contrats sont listés dans le décret D1242-1 du code du travail mais peuvent aussi relever des conventions collectives des entreprises. La législation sur ce type de contrat a été renforcée en 2008 puisque ne sont plus réellement concernés par les contrats d'usage les secteurs d'activité mais les emplois. Précisément, tous les emplois de ces secteurs présents dans le décret D1242-1 ne peuvent être concernés par un contrat d'usage. Depuis cette date, l'emploi doit être lui-même considéré temporaire par nature. Il ne suffit donc plus pour une entreprise d'appartenir à un secteur autorisé à utiliser des contrats d'usage pour en conclure un. La législation française sur la protection de l'emploi semble donc a priori claire et concise et les entreprises soumises à des règles strictes en ce qui concerne la gestion de leur main-d'œuvre.

que l'existence du contrat à durée déterminée crée davantage de distorsions que n'engendre de bénéfices. En outre, dans cette optique, on peut faire remarquer que les contrats à durée déterminée ne viennent au mieux que compenser les distorsions créés par les coûts de licenciement, qui empêchent certaines transactions de se faire.

Les arguments actuels ayant pour objectif de promouvoir l'existence du contrat à durée déterminée peuvent donc être questionnés. Ceci est confirmé par les statistiques évaluant l'ampleur de l'utilisation des contrats à durée déterminée. Si l'on s'en tient à l'observation des stocks, l'on constate que la majeure partie des travailleurs possède un emploi permanent : en 2012, la DARES estimait à 87% la part des travailleurs en contrat à durée indéterminée (et une faible variation entre 2000 et 2012) et à 10% celle des travailleurs en contrats à durée déterminée (hors travailleurs de la fonction publique). Toutefois, si l'on se concentre sur les flux ayant lieu sur le marché du travail, la vision de ce marché devient toute autre. En effet, ces flux sont principalement constitués de contrats temporaires pour lesquels le recours est croissant et la durée de plus en plus brève, particulièrement ces dernières années : i) ces contrats représentent au moins 70% des embauches en France selon l'année considérée[10] ii) la durée de ces contrats se raccourcie au fil du temps puisque « entre 2000 et 2010, le nombre total de déclarations préalables à l'embauche (hors intérim) a progressé de 42% » et les contrats très courts sont fortement responsables de cette évolution puisque la progression des contrats de moins d'un mois dans les embauches est de 88% et celle des contrats à durée déterminée de moins d'une semaine de 120%[11]. Ces dernières années, s'est donc développé un phénomène préoccupant où la proportion de travailleurs en contrat à durée indéterminée a peu varié et où les embauches en contrat à durée déterminée de très courte durée ont fortement augmenté.

L'idée de protéger les travailleurs contre la perte d'emploi peut paraître louable mais la façon dont l'emploi est protégé ne semble pas efficace car cette protection ne s'applique qu'à certains travailleurs, laissant les ajustements de main-d'œuvre reposer sur quelques travailleurs uniquement, typiquement ceux particulièrement concernés par le dualisme, tels que les jeunes travailleurs et les peu qualifiés. Il semble donc que la logique derrière la protection de l'emploi soit plutôt celle opposant les insiders aux outsiders. En effet, ce dualisme se traduit notamment par une situation où gravitent des travailleurs en contrat à durée déterminée dont la situation se précarise au fur et à mesure du temps, particulièrement en raison du raccourcissement de la durée de leur emploi, autour de travailleurs en contrat à durée indéterminée, fortement protégés par la législation sur la protection de l'emploi. La capacité de la législation sur la

[10]Toutes les statistiques relatives à l'embauche en contrat à durée déterminée sur la période 1998-2012 sont disponibles dans le premier article.

[11]Benghalem (2016).

protection de l'emploi, telle que conçue aujourd'hui, à protéger efficacement les travailleurs est donc sérieusement questionnée. Certaines études viennent corroborer ce fait mettant même en évidence qu'une protection de l'emploi rigoureuse impacte négativement le sentiment de sécurité dans l'emploi.

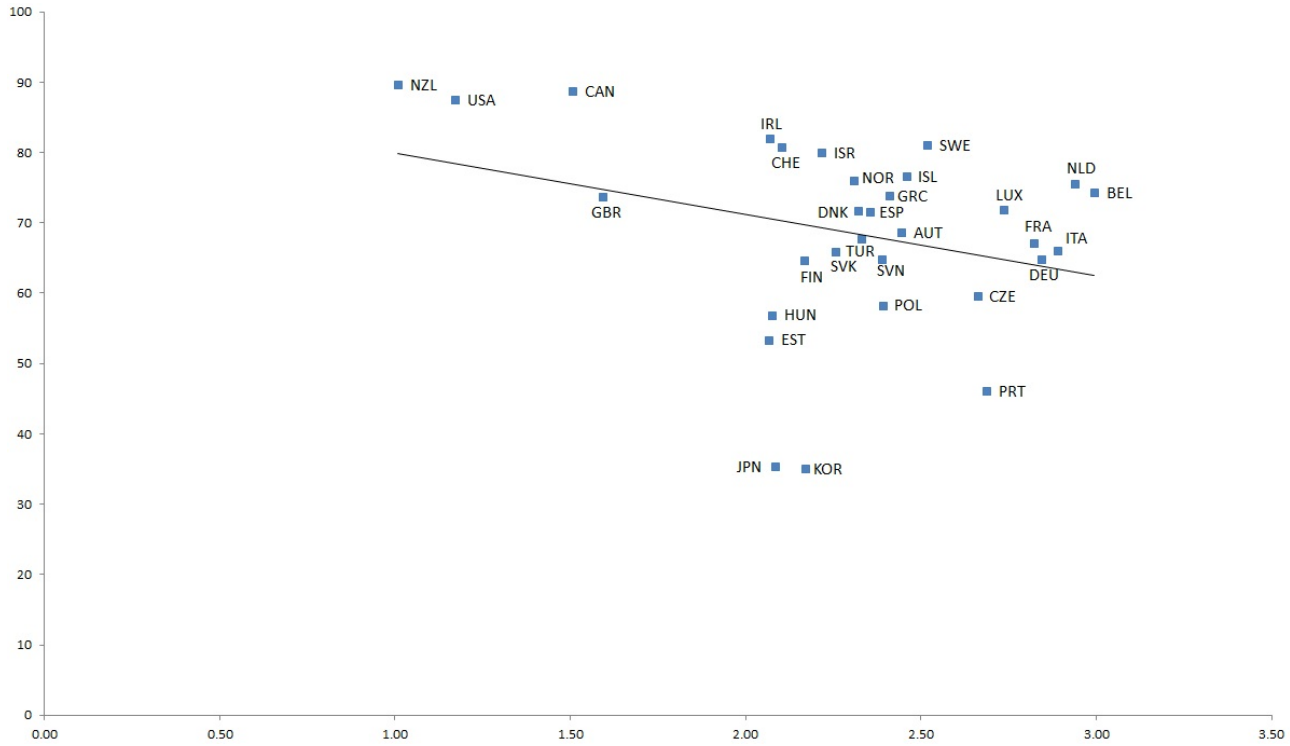
Postel-Vinay et Saint-Martin (2004) étudient la perception des employés quant à la protection de l'emploi dans plusieurs pays de l'OCDE. Leurs deux échantillons, portant sur 23 pays de l'OCDE, (l'ECHP, European Community Household Panel et l'ISSP, International Social Survey Programme) sont restreints aux travailleurs du secteur privé. A eux deux, ces échantillons contiennent trois mesures de la perception de la sécurité de l'emploi. Dans leur étude, ils évaluent le lien pouvant exister entre ces mesures et un indicateur de l'OCDE sur protection de l'emploi. Cet indicateur est construit grâce à trois paramètres : « 1. les dispositions fixant les conditions dans lesquelles un licenciement est « justifié » ou « abusif », et les sanctions prévues en cas de non-respect de ces règles de base ; 2. les procédures de notification que l'employeur doit respecter lorsqu'il entame le processus de licenciement ; 3. les dispositions relatives aux délais de préavis et aux indemnités de licenciement. La composante relative aux licenciements collectifs rend compte des délais et procédures venant s'ajouter à ceux qui s'appliquent en cas de licenciements individuels et à elle seule, ne reflète donc pas la rigueur globale de la réglementation visant les licenciements collectifs. Enfin, les dispositions relatives à l'emploi temporaire sont décrites au travers des restrictions imposées aux entreprises en termes de motifs ou de types de travail pour lesquels le recours aux CDD ou à l'intérim est autorisé et des limitations prévues en ce qui concerne la durée des contrats concernés ». Grâce à ces indicateurs, les auteurs mettent en évidence l'existence d'une corrélation négative entre rigueur de la protection de l'emploi et sentiment de sécurité dans l'emploi résistant à l'introduction de variables de contrôle telles que des variables de caractéristiques individuelles ou de l'emploi (contrat à durée indéterminée, temps partiel) ainsi que le pays considéré.

De plus, la présence d'un dualisme contractuel creuse les disparités entre les travailleurs en engendrant des effets néfastes sur ceux le subissant. En effet, ces derniers voient, entre autres choses, leur bien-être ainsi que leur santé se détériorer (Guadalupe (2003), Quesnel-Vallée,DeHaney et Ciampi (2010), Virtanen, Kivimäki, Ferrie, Elovainio, Honkonen, Pentti, Klaukka et Vahtera (2008)), bénéficient d'une formation moindre (Arulampalam et Booth (1998), Booth et al. (2002), Albert, Garcia-Serrano, Hernanz (2005)), sont perpétuellement dans un contexte d'insécurité de l'emploi (Houseman et Polivka (1999)) et font face à de nombreuses difficultés dans leurs accès aux marchés du logement et du crédit (Cahuc et Kramarz

(2005)). Les graphiques 1, 2[12] montrent le lien existant entre protection de l'emploi (degré de protection des travailleurs en emploi permanent contre le licenciement individuel et collectif) et la perception des individus (de 15 ans et plus) de leur état de santé pour divers pays de l'OCDE. Dans les pays où la protection des travailleurs en emploi permanent contre le licenciement est faible (Etats-Unis, Canada, Nouvelle-Zélande), le pourcentage de la population rapportant un état de santé bon ou très bon excède 80% alors que les pays fortement impactés par le dualisme contractuel et où la législation sur la protection de l'emploi est forte tels que la France, l'Italie ou l'Espagne atteignent à peine 70% (au Portugal, où l'indice de protection des travailleurs en emploi permanent contre le licenciement se situe entre celui de la France et de l'Espagne, moins de 50% de la population s'estime en bonne santé) (graphique 1). Cette tendance est confirmée lorsque l'on se focalise sur la proportion de la population s'estimant en mauvaise (très mauvaise) santé excepté que l'écart entre la France et l'Italie se creuse puisque bien qu'ayant un indice de protection des travailleurs en emploi permanent contre le licenciement assez similaire, la proportion de la population s'estimant en mauvaise santé en Italie excède de près de 5 points de pourcentage celle de la France (graphique 2).

La protection de l'emploi engendre donc des distorsions suggérant que son coût peut être élevé. Mais s'il existe des effets négatifs au niveau individuel, serait-il possible que son impact soit positif sur le plan agrégé ? Cependant, les effets de la protection de l'emploi et le dualisme en résultant semblent ambiguës en ce qui concerne le chômage. En effet, l'existence des contrats à durée déterminée augmente les créations d'emplois mais aussi les destructions alors que la législation s'appliquant aux contrats à durée indéterminée (coûts de licenciement élevés) induit moins de créations mais aussi moins de destructions d'emplois (Mortensen et Pissarides (1994)). L'effet global sur le chômage est donc incertain (alors même que le contrat à durée déterminée a été introduit avec pour objectif premier de réduire le niveau de chômage en incitant à la création d'emploi) et a peu de chance d'être important puisque ces effets vont dans des sens opposés. Au regard des données de l'OCDE, il apparaît que l'impact sur le taux de chômage soit négatif comme l'illustre le graphique 3 où une forte protection de l'emploi est positivement reliée à un fort taux de chômage, particulièrement dans les pays où le dualisme est important et qu'une forte protection de l'emploi semble impacter positivement la durée passée au chômage (graphique 4). La littérature existante sur ce sujet vient également corroborer ce fait. Bentolila, Cahuc, Dolado et Le Barbanchon (2012) montrent que la forte augmentation du chômage en Espagne comparée à la France est due à la part plus importante de contrats à durée déterminée en Espagne. Enfin, Sala, Silva et Toledo (2012) montrent que des coûts de licenciement élevés

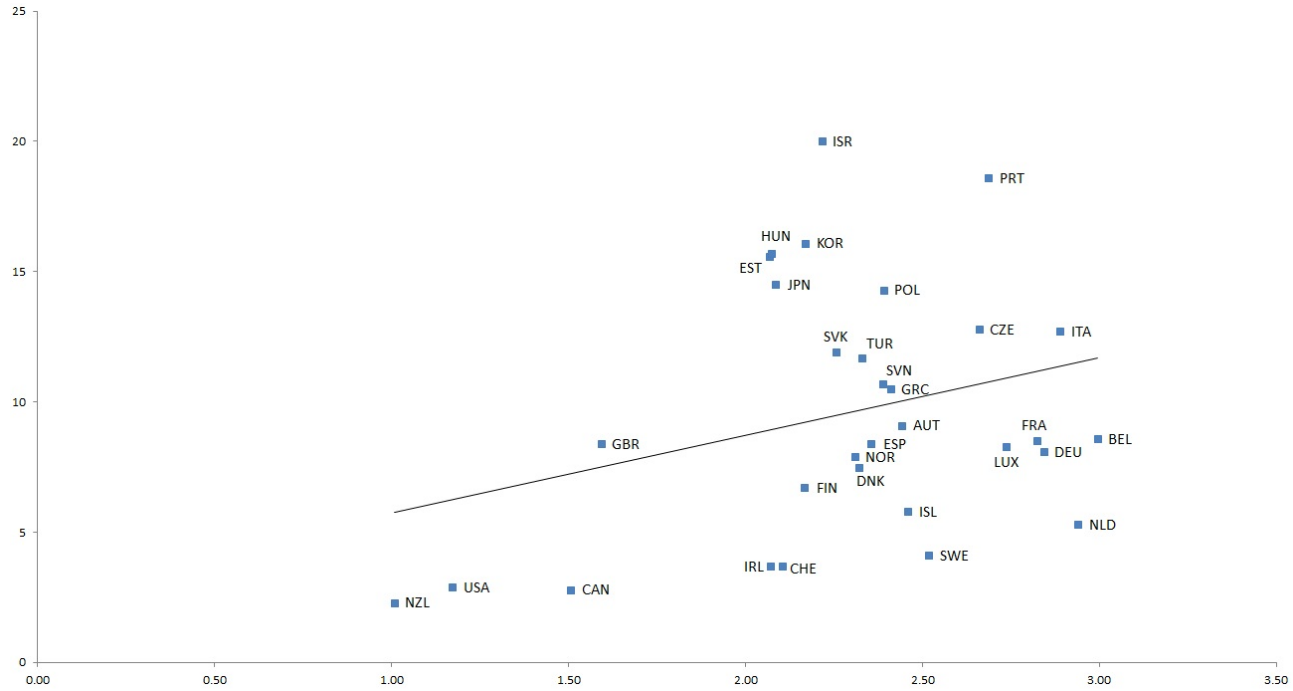
[12]Les graphiques présents dans cette introduction révèlent uniquement des corrélations sur données brutes et n'ont pas vocation à démontrer un effet causal.



Note : Données de l'OCDE. Pays de l'OCDE. Perception de l'état de santé de la population des 15 ans et plus en pourcent de la population, données de 2013. L'indice de protection de l'emploi (données de 2013 excepté pour le Royaume-Unis où l'année de collecte est 2014) (axe des abscisses) est compris entre 0 (le moins restrictif) et 6 (le plus restrictif).

FIGURE 1 – Protection des travailleurs en contrat permanent contre le licenciement (individuel et collectif) et bonne/très bonne perception de l'état de santé.

n'ont pas pour effet de stabiliser l'emploi dans un pays où le dualisme contractuel est prononcé, comme c'est le cas en Espagne. En effet, la protection de l'emploi stabilise les emplois pour les travailleurs en contrat à durée indéterminée mais elle engendre également davantage de création d'emploi en contrat à durée déterminée et, par ce biais, destabilise l'emploi (ceci est également vérifié par Cahuc, Charlot et Malherbet (2016)). Si l'on étudie le lien entre la rigueur de la protection de l'emploi et le taux d'emploi (graphique 5), il est immédiat de remarquer que les pays où la protection de l'emploi est forte tels que l'Italie, la France ou encore le Portugal, sont aussi ceux où le taux d'emploi est relativement faible par rapport aux pays où cette protection est moins marquée (comme au Canada ou en Grande-Bretagne). Par conséquent, l'effet de la protection de l'emploi au niveau agrégé est incertain voire négatif puisque son effet sur le chômage et l'emploi est douteux et que celle-ci pourrait avoir pour conséquence de déstabiliser l'emploi. Au regard des graphiques précédents, on peut aussi s'interroger sur l'existence d'une



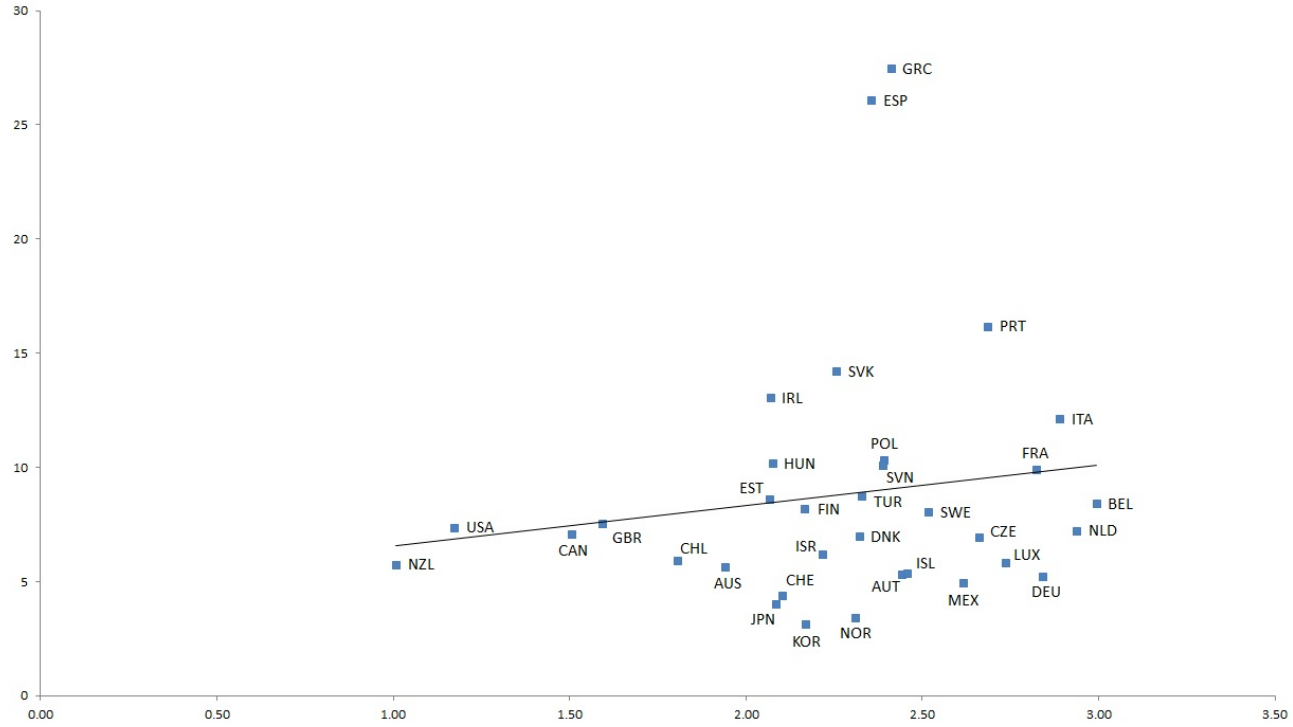
Note : Données de l'OCDE. Pays de l'OCDE. Perception de l'état de santé de la population des 15 ans et plus en pourcent de la population, données de 2013. L'indice de protection de l'emploi (données de 2013 excepté pour le Royaume-Unis où l'année de collecte est 2014) (axe des abscisses) est compris entre 0 (le moins restrictif) et 6 (le plus restrictif).

FIGURE 2 – Protection des travailleurs en contrat permanent contre le licenciement (individuel et collectif) et mauvaise/très mauvaise perception de l'état de santé.

causalité inverse : dans les pays à faibles taux d'emploi, la peur de perdre son emploi est plus intense qu'ailleurs, engendrant la demande accrue de protection de ceux qui craignent pour leur poste.

Il est également possible de questionner l'effet d'une protection de l'emploi rigoureuse sur le bien-être collectif et s'interroger sur la fonction objectif des décideurs publics. Si l'on considère deux groupes que sont les insiders et les outsiders, une protection de l'emploi rigoureuse augmenterait le bien-être des insiders et diminuerait celui des outsiders. Dans une logique utilitariste où existerait un planificateur social, cette manière de protéger l'emploi impacterait négativement le bien-être de toute une partie de la population mais l'effet sur le bien-être agrégé pourrait être positif si la pondération qui était attribuée aux insiders était suffisamment élevée. Toutefois, cela correspond à des préférences particulières et raisonner ainsi ne mène pas à une juste allocation des risques au sein de la population puisque l'on fait reposer ces risques sur une partie de cette population uniquement, se trouvant être la fraction de la population la plus fragile

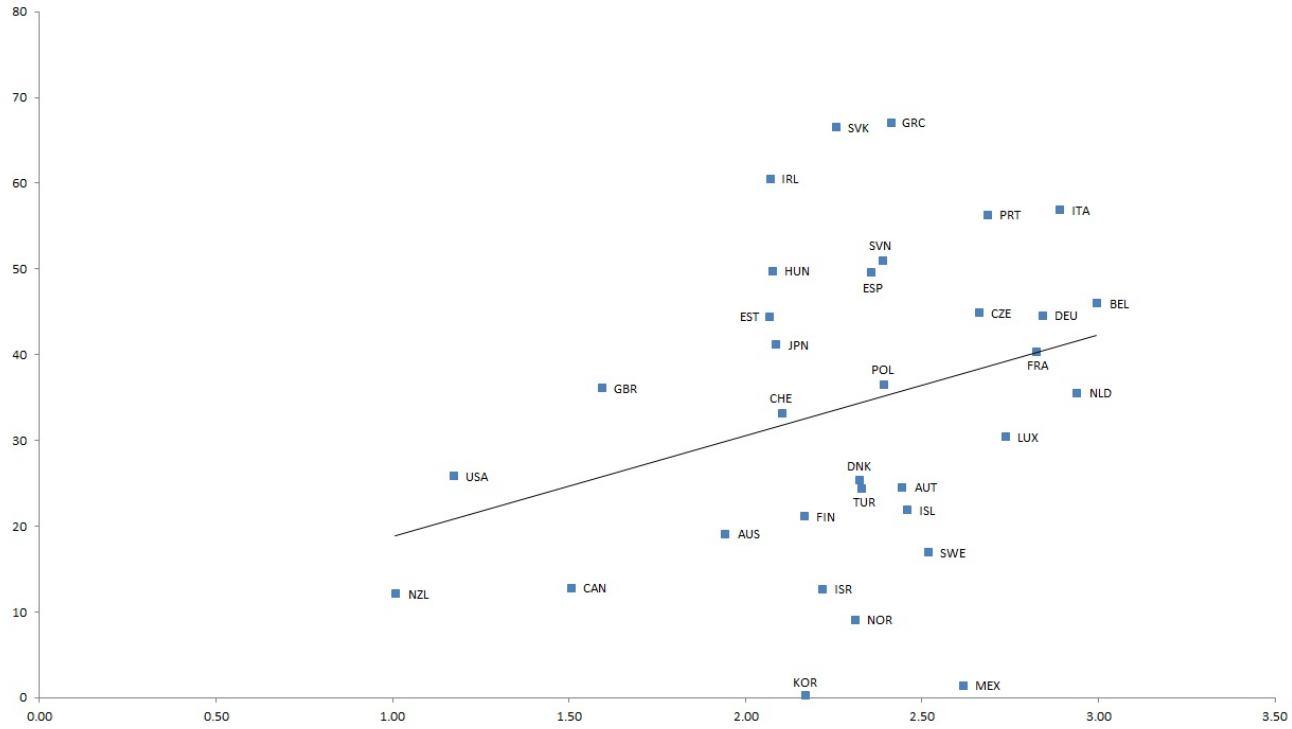
(les travailleurs jeunes et peu qualifiés notamment). De plus, les études existantes montrent un impact négatif de la législation sur la protection de l'emploi sur la production agrégée (e.g. Cahuc, Charlot et Malherbet (2016)) comme sur le bien-être agrégé de manière utilitariste par un planificateur bienveillant vis-à-vis de l'ensemble de la population (e.g. Mortensen et Pissarides (1994) et (1999)).



Note : Données de l'OCDE. Pays de l'OCDE. L'indice de protection de l'emploi (données de 2013 excepté pour le Royaume-Unis où l'année de collecte est 2014) (axe des abscisses) est compris entre 0 (le moins restrictif) et 6 (le plus restrictif) et taux de chômage (données de 2013).

FIGURE 3 – Protection des travailleurs en contrat permanent contre le licenciement (individuel et collectif) et taux de chômage.

Face à l'ensemble de ces problèmes, certaines réponses restent à trouver. En particulier, la crise apparue en 2008 a-t-elle aggravé ces problèmes ? De plus, la littérature traite du contrat à durée déterminée en général mais il en existe différentes sortes comme les contrats dits d'usage en France. Quel effet ce type de contrat peut-il avoir sur la rotation de la main-œuvre ? Comment ces contrats ont-ils pu interagir avec la crise de 2008 ?
La législation sur la protection de l'emploi impacte le niveau de chômage toutefois, une large part de la littérature s'accorde sur le fait que les destructions d'emplois impactent peu les fluctuations du taux de chômage ou tout au plus sont responsables de ses fluctuations à hauteur



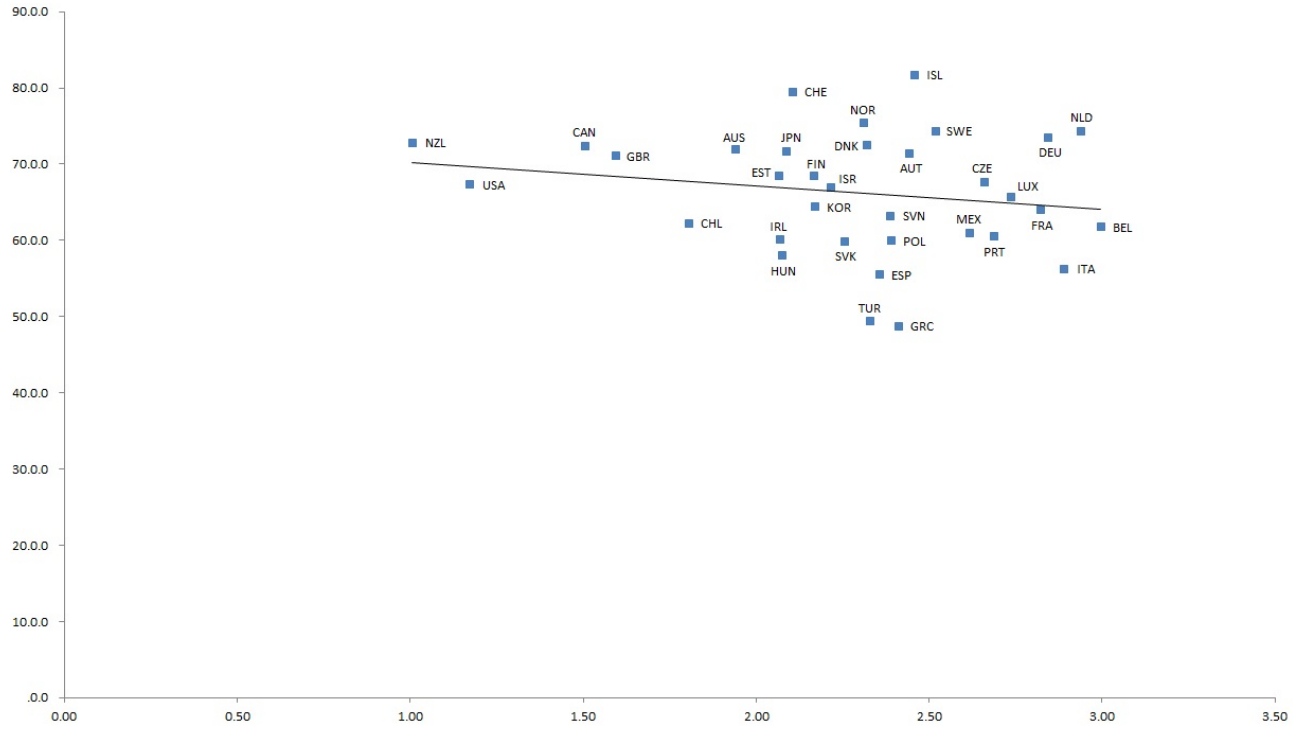
Note : Données de l'OCDE. Pays de l'OCDE. L'indice de protection de l'emploi (données de 2013 excepté pour le Royaume-Unis où l'année de collecte est 2014) (axe des abscisses) est compris entre 0 (le moins restrictif) et 6 (le plus restrictif). « Le chômage de longue durée recense les personnes au chômage depuis 12 mois ou plus. Le taux de chômage de longue durée illustre la proportion des chômeurs de longue durée dans le total des chômeurs » (données de 2013).

FIGURE 4 – Protection des travailleurs en contrat permanent contre le licenciement (individuel et collectif) et taux de chômage de longue durée.

de 50% (Shimer (2012), Petrongolo et Pissarides (2008), Fujita et Ramey (2009), Elsby, Hobijn et Şahin (2013)). Qu'en est-il dans le cadre d'un marché dual ?

Enfin, face à ces problèmes, diverses solutions ont été discutées et mises en place comme la taxation des contrats à durée déterminée (mesure également envisagée dans les rapports de l'OCDE). En effet, plusieurs solutions peuvent être envisagées afin de réduire le dualisme contractuel : rendre plus coûteuse l'utilisation de contrats temporaires, diminuer les coûts de licenciement sur les emplois permanents ou encore instaurer un contrat unique (afin d'homogénéiser les différentes législations portant sur les contrats temporaires et permanents)[13]. En France, le premier type de mesure a été considéré en 2013 puisqu'a été introduite une taxe sur les contrats à durée déterminée. Au regard de la rarissime évaluation de ce type de réforme dans la littérature, quel impact peut-on attendre d'une telle mesure ?

[13]Cf. « Perspectives de l'emploi de l'OCDE 2014 ».



Note : Données de l'OCDE. Pays de l'OCDE. L'indice de protection de l'emploi (données de 2013 excepté pour le Royaume-Unis où l'année de collecte est 2014) (axe des abscisses) est compris entre 0 (le moins restrictif) et 6 (le plus restrictif). Taux d'emploi, données de 2013.

FIGURE 5 – Protection des travailleurs en contrat permanent contre le licenciement (individuel et collectif) et taux d'emploi.

Une des contributions de cette thèse d'apporter des éléments de réponses à ces questions. Cette thèse est principalement de nature empirique, l'objectif principal étant d'analyser les manifestations et l'impact du dualisme contractuel sur les flux ayant lieu sur le marché du travail français. En second lieu, cette thèse permet d'évaluer les effets d'une réforme visant à réduire ce dualisme, la taxation des contrats à durée déterminée, mesure mise en place dans plusieurs pays européens, et souvent proposée pour solutionner le problème du dualisme.

Le premier article permet d'évaluer les flux d'emplois et de main-d'œuvre ayant lieu sur le marché du travail français en mettant en évidence l'importance des contrats à durée déterminée dans l'évolution de ces flux. Le second article, permet d'étudier l'impact du dualisme contractuel sur les fluctuations du taux de chômage en élargissant le modèle proposé par Hairault, Le Barbanchon et Sopraseuth (2015), en prenant en compte l'inactivité et en y introduisant de l'hétérogénéité (les individus les plus sujets au dualisme étant les jeunes, les non qualifiés ainsi que les femmes). Enfin, le troisième article (écrit en collaboration avec Pierre Cahuc,

Olivier Charlot, Franck Malherbet et Hélène Benghalem) propose une analyse de l'impact de l'introduction d'une taxe sur les contrats à durée déterminée visant à réduire le dualisme contractuel existant sur les marchés du travail de type européen.

Dans le premier article de cette thèse, j'utilise les données de la DARES sur les Déclarations des Mouvements de Main-d'œuvre ainsi que sur les Enquêtes sur les Mouvements de Main-d'œuvre afin d'évaluer l'ampleur des flux d'emplois et de travailleurs sur la période 1998-2012 et de mettre en évidence l'impact de la crise de 2008 sur ces flux ainsi que le potentiel renforcement du dualisme contractuel après cette date. Pour ce faire, je quantifie tout d'abord les flux d'emplois et de main-d'œuvre ainsi que le niveau de rotation des travailleurs ayant lieu sur le marché du travail français pour la période 1998-2012 en suivant la méthode proposée par Abowd, Corbel et Kramarz (1999). Enfin, je tiens compte des spécificités sectorielles en isolant les secteurs autorisés à utiliser les contrats dits d'usage afin d'étudier le comportement des firmes en terme d'embauche dans ces secteurs particuliers. Pour ce faire, j'établis une correspondance entre les deux nomenclatures sectorielles existantes (la Nomenclature d'activités françaises ayant été modifiée en 2008) afin d'étudier l'ensemble de la période considérée de manière cohérente et repère ces secteurs particuliers à l'aide de la nomenclature la plus désagrégée disponible dans les données[14]. Je détaille également l'évolution de ces flux d'emplois et de travailleurs en fonction de la taille des firmes. De plus, j'étudie l'évolution de la durée des contrats à durée déterminée sur cette même période. Enfin, je mets en œuvre un modèle économétrique visant à mettre en lumière les principaux déterminants de l'embauche en contrat à durée déterminée. Les principales conclusions de cet article sont les suivantes. Les secteurs à contrats d'usage jouent un rôle prédominant dans l'importance des flux de travailleurs observés ainsi que dans leur accélération à partir de 2008. De plus, depuis la crise de 2008, l'on observe une décroissance de la durée des contrats à durée déterminée. Cet article suggère donc que l'utilisation des contrats à durée déterminée par les firmes est procyclique et que la sortie de crise repose principalement sur des embauches à durée déterminée, contrats dont la durée est de plus en plus brève. Enfin, un modèle économétrique vient confirmer que la probabilité d'embaucher en contrat à durée déterminée est plus importante dans les secteurs où les firmes sont autorisées à utiliser des « contrats d'usage » ainsi que durant les années ayant suivi la crise survenue en 2008. Cet article étant principalement descriptif, son objectif premier est de décrire les flux ayant lieu sur le marché du travail français en établissant une comparaison entre ces flux avant et après la crise de 2008 puisque, à ce jour, l'impact de cette crise sur les flux

[14]La correspondance des nomenclatures et le repérage des secteurs autorisés à utiliser les contrats dits d'usage sont disponibles dans l'annexe 1.A.5.

d'emplois et de travailleurs reste assez méconnu. Le second objectif de cet article est de fournir des évidences empiriques utiles à la construction de futurs modèles théoriques et de mettre en lumière certaines particularités du marché du travail français pouvant intervenir dans la mise en place de politiques économiques plus adaptées au marché du travail français.

Dans le second article, j'utilise les données issues de l'enquête emploi sur la période 2003-2012 afin de mesurer les transitions d'état à état ayant lieu sur le marché du travail français ainsi que leur impact sur la volatilité du taux de chômage. A cette fin, j'utilise un modèle à trois états (en emploi, au chômage, inactif) ainsi qu'un modèle à quatre états (en contrat à durée indéterminée, en contrat à durée déterminée, au chômage, inactif) permettant de prendre en compte le dualisme contractuel caractérisant beaucoup de marchés du travail européens. Il est donc question, dans un premier temps, d'évaluer l'ampleur de ces taux de transition (en établissant une comparaison entre les pays, en tenant compte de l'hétérogénéité existante à travers les niveaux de qualification, l'âge et le sexe des travailleurs, ainsi qu'en étudiant les probabilités de transitions conditionnées au statut passé de l'individu) puis, dans un second temps, de mettre en évidence l'impact de ces différents taux sur les fluctuations du taux de chômage dans un modèle à trois états puis dans un modèle à quatre états. L'analyse proposée ici est à l'état stationnaire et les techniques mises en œuvre sont celles proposé par Shimer (2012) ainsi que Silva et Vázquez-Grenno (2013) (étendant la méthode proposée par Fujita et Ramey (2009) pour un modèle à trois états à un modèle à quatre états). Les principales conclusions de cet article sont que les fluctuations du taux d'embauche sont le principal déterminant des fluctuations du taux de chômage en France. De plus, lorsque l'on considère un modèle prenant en compte le dualisme contractuel, les transitions impliquant des contrats à durée indéterminée impactent davantage les fluctuations du taux de chômage que celles impliquant des contrats à durée déterminée même si l'impact des transitions du chômage vers un contrat à durée déterminée est non négligeable dans ces fluctuations. Enfin, l'on observe que ces résultats sont altérés lorsque l'on se focalise sur les travailleurs jeunes, de sexe féminin et non qualifiés, davantage susceptibles d'accéder à un contrat à durée déterminée.

Les deux premiers articles de cette thèse me permettent donc de quantifier les flux ayant lieu sur le marché du travail français, d'évaluer l'importance du dualisme contractuel, de quantifier ce phénomène et de mettre en lumière ses différentes manifestations. Une suite évidente de ces travaux est donc d'évaluer une mesure visant à réduire ce dualisme. Dans cette optique, le troisième article composant cette thèse a pour objectif d'analyser les conséquences de l'introduction d'une taxe sur les contrats à durée déterminée dans le but d'inciter les firmes à embaucher davantage en contrat à durée indéterminée et à augmenter la durée des contrats. Cette mesure a

récemment été mise en place, sous diverses formes, dans plusieurs pays européens. Concernant la France, une taxe sur les contrats à durée déterminée a été instaurée par l'Accord National Interprofessionnel signé en 2013[15]. Avant cet accord, le taux de cotisations patronales s'élevait à 4% quelque soit la nature du contrat. Depuis cet accord, ce taux a été relevé à 7% pour les contrats à durée déterminée dont la durée est inférieure à un mois, à 5,5% pour les contrats dont la durée est comprise entre 1 et 3 mois et à 4,5% pour un certain type de contrats à durée déterminée, dits « contrats d'usage », dont la durée est inférieure ou égale à trois mois. Ceci est valable dans le cas où l'embauche intervient dans le cadre d'un accroissement temporaire d'activité. Enfin, en cas de l'embauche en contrat à durée indéterminée d'un individu de moins de 26 ans, l'employeur bénéficie d'une exemption de cotisation à l'assurance chômage pour une durée de trois mois si l'entreprise compte plus de 50 salariés et de quatre mois si l'entreprise dénombre moins de 50 salariés. Dans cet article co-écrit avec Pierre Cahuc, Olivier Charlot, Franck Malherbet et Hélène Benghalem, nous estimons un modèle d'appariement sur des données françaises provenant de l'UNEDIC (Fichier National des Allocataires, FNA) s'appuyant sur le modèle proposé par Cahuc, Charlot et Malherbet (2016). Ce modèle est particulièrement riche puisqu'il permet, entre autre, i) d'expliquer le choix effectué par les firmes entre contrat à durée indéterminée et contrat à durée déterminée ii) d'évoluer dans un cadre où la durée des contrats est endogène iii) d'évaluer l'impact d'un système de taxation tel que celui décrit ci-dessus sur le type de contrat choisi par les firmes, la durée des contrats et la création d'emploi. Nous montrons que la taxation des contrats à durée déterminée peine à atteindre ses objectifs. En effet, cette taxe a pour incidence de réduire la durée moyenne des emplois ainsi que de diminuer la création d'emplois, l'emploi ainsi que le bien-être des chômeurs. Enfin, nous montrons qu'une réforme mettant en place un contrat à durée indéterminée sans coût de licenciement avant un certain niveau d'ancienneté induit des effets opposés.

Cette thèse est donc composée de trois parties. La première partie étudie les flux d'emplois et de travailleurs sur le marché du travail français en mettant en avant l'impact du dualisme contractuel sur ces flux. Notamment, le rôle de la crise de 2008 ainsi que de l'existence des contrats dits d'usage sur le dualisme est principalement questionné. Dans la seconde partie, je décompose les fluctuations du taux de chômage français enfin d'en mettre en évidence les sources principales dans un modèle tenant compte du dualisme contractuel (modèle reflétant donc davantage la situation des marchés du travail européens que la plupart des modèles existants issus de Shimer (2012)). Enfin, dans la troisième partie, j'étudie l'impact d'une politique visant à réduire la segmentation du marché du travail implantée dans divers pays européens, à savoir

[15]Cet accord a été modifié par celui conclu en 2017. Notamment, la taxe ne concerne plus que les contrats dits d'usage.

la taxation des contrats à durée déterminée. En dernier lieu, une conclusion générale vient passer en revue les divers éléments de réponse apportés aux questions posées par le dualisme contractuel et mettre en avant d'autres pistes pouvant être explorées suite à ce travail de thèse.

Chapter 1

The French Labour Market Before and After the 2008 Recession

Abstract[1]

This paper investigates job and worker flows on the French labor market during the 1998-2012 period using the *Déclarations des Mouvements de Main-d'œuvre* (DMMO) and *Enquêtes sur les Mouvements de Main-d'œuvre* (EMMO) datasets. Especially, it explores the way French firms handle the 2008 crisis. The more relevant fact is that the churning increases faster during the 2008-2012 period (up to 5 hirings and 4 separations for an annual job creation) compared to the two previous periods (1998-2001 and 2002-2007). Moreover, the recovery is mainly based on short-term contracts whose duration is shorter than before. In addition, fluctuations in the number of entries into short-term contracts especially come from some particular industries where the use of short-term contracts is less regulated. Moreover, I show that these fluctuations also depend on the size of establishments.

Key words: Job flows, Worker flows, Churning, Temporary jobs.

JEL classification: J41, J63.

[1]I thank Jekaterina Dmitrijeva for her usefull help concerning the use of the dataset. I am infinitely grateful to Fabian Gouret (THEMA) for his useful advice and support for the econometric analysis.

1.1 Introduction

In 2012, short-term contracts[2] represent more than 70% of hirings[3]. The spread of short-term contracts is an important phenomenon in countries with stringent employment protection such as France, Spain, Italy or Portugal[4]. The existence of dualism is now viewed as a serious problem since it could deteriorate welfare by increasing the frequency at which workers become unemployed, implying skill losses and discouraging training.

This paper is focusing on the French case where labour adjustments along business cycles are operated using contracts (i.e. the legislation governing the use of the different forms of contractual relationships) whereas in the United states, as shown by Borowczyk-Martins and Lalé (2016), labour adjustments rely on hours worked, especially part-time work. As a consequence, the goal of this paper is to analyze the extent of the adjustments which rely on fixed-term contracts and, particularly, I want to assess if the 2008 crisis has modified (or amplified) this phenomenon and then led to a greater substitution between fixed-term and long-term contracts. The two key points of this study are then:
1) first, to evaluate if the level of churning[5] is really impacted by the existence of short-term contracts and
2) secondly, if the 2008 crisis has amplified this phenomenon. More precisely, I want to examine to what extent workforce adjustments induced by the 2008 crisis are different from those observed before.

Moreover, my aim is to see whether those adjustments differ according to the establishment's size and industry. Indeed, in France, the legislation facilitates the use of short-term contracts in some industries where it has been assessed that some jobs are temporary by nature[6]. This kind of legislation that encourages firms to use more fixed-term contracts could impact worker flows. It is then interesting to compare job and worker flows taking place in these industries to those

[2]In this study, I consider short-term contracts as they are defined in the article L1242-2 of the French Labor code. Then, workers employed by temporary employment agencies are excluded from computation since the data does not allow to study this type of workers.

[3]See Table 1.3.

[4]Fontaine and Malherbet (2016) show that, in 2013, in France, 86% of workers are in long-term contracts, 9% in short-term contracts and around 2% of workers are concerned by temporary employment agencies and are apprentices. Nevertheless, they show that the share of temporary employment increased a lot since the 80's and that we observe a constant rise until the beginning of the 2000's.

[5]Churning is a synonym of "worker turnover in excess" and corresponds simply to the numerical difference between job and worker flows.

[6]Those particular short-term contracts are called *contrats d'usage*, in this study, I will call them customary contracts. Indeed, the use of those short-term contracts is facilitated in industries where such customary contracts are allowed, the legislation concerning those particular short-term contracts will be describe in the third section.

flows in industries where the use of short-term contracts is less facilitated. Moreover, the size of the firm could impact the type of job it offers (short-term or long-term contracts). Finally, I try to identify firms and workers characteristics that explain the fact to hire (be hired) with short-term contracts.

In order to evaluate the level of churning in France and the role played by the existence of short-term contracts and the 2008 crisis in the level of this churning, I follow the methodology of Abowd, Corbel and Kramarz (1999) which is a standard one widely used in this kind of literature[7]. The churning refers simply to the fact that, to create a job, the firm has to hire more than one worker because it separates from other workers at the same time. This explains why worker flows are higher than job flows. In particular, Abowd et al. (1999) assess that, over the 1987-1990 period, an annual job creation involves three hirings and two separations for each job created in a given year and that an annual job destruction engages one hiring and two separations. In order to actualize those figures, I compute the "creation and destruction rates to entry and exit rates ratios" (i.e. required number of entries and exits to create and destroy one job) for the 1998-2012 period and show how those ratios evolve splitting the dataset into three different periods.

I use a French administrative dataset extracted from the *Déclarations des Mouvements de Main-d'œuvre* (DMMO) and *Enquêtes sur les Mouvements de Main-d'œuvre* (EMMO). It covers the 1998-2012 period and is collected quarterly at the establishment level by the DARES[8]. This dataset has two advantages:
1) it contains a lot of worker and employer characteristics and
2) it is available for a long period.
First, to have employers and employees characteristics in the same dataset is an important thing since it allows to study jointly job and worker flows (and then quantify the level of churning). Indeed, for several years, these two types of flows have been discussed separately. The problem is that, to have a dynamic vision of the labor market, we need to investigate those flows together. These dynamics are complex because employers hire and fire employees simultaneously whatever their employment growth characteristic (i.e. if they grow, shrink or keep stable). Then, establishments can simultaneously grow and separate from some employees and establishments can simultaneously shrink and hire some workers (Burgess, Lane and Stevens (2000)). In order to study jointly job and worker flows, some papers combine several datasets (e.g. Blanchard and Diamond (1990)).

[7]Also see Davis, Haltiwanger and Schuh (1998).
[8]French Ministry of Labor.

Secondly, the length of the panel dataset I use is long enough to study labor market flows along economic cycles which is not always the case in other studies (e.g. Abowd and al. (1999)). As a result, the dataset used here covers a long period (1998-2012) which gives the possibility to study French firms behaviour along economic cycles and contains both information on employers and workers[9]. Moreover, it contains almost all the French establishments.

Using the first three years of the sample, I find approximately the same level of churning in French establishments than Abowd et al. (1999) but since 2008, the magnitude of churning increases due to a larger use of short-term contracts (up to 5 hirings and 4 separations for an annual job creation).

In order to clarify the two key points mentioned earlier, I first quantify job and worker flows and, secondly, I quantify worker turnover in excess induced by the coexistence of fixed-term and long-term contracts over a long period which allows to study the hiring policy of establishments along business cycles. Then, I evaluate if the 2008 crisis has changed something in worker flows between these two types of contract.

The main findings of this paper are that following the 2008 crisis, the importance of churning has dramatically increased, and that adjustments have increasingly relied on the use of short-term contracts of short duration: the creation (destruction) of one job involves almost 5 (4) hirings and 4 (5) separations over the 2008-2012 period (almost twice as much than before 2008). As a consequence, the number of entries into short-term contracts decreases strongly since 2008 and the recovery relies mostly on short-term contracts. Then, the use of short-term contracts seems to be procyclical.

I also study the duration of short-term contracts and observe that short-term contracts actually become more frequent, but that their duration is also impacted. Indeed, their duration decreases from approximately, 8 (2002-2007 period) to 6 months (2008-2012 period) (in establishments which have at least 50 employees). Moreover, the share of very short-term contracts (i.e. those that last at most one month) in entries has more than doubled between 2001 and 2012.

Finally, decomposing job and worker flows by industry, I found that this impressive rise of short-term contracts in entries and churning mainly comes from industries that are less regulated in their use of short-term contracts (in industries that can use customary contracts, the creation (destruction) of one job involves almost 9 (8) hirings and 8 (9) separations over the 2008-2012 period).

The last step of this paper consists in identifying firms and workers characteristics that explains hiring in short-term rather than in long-term contracts. To do that, I build a probabilistic linear

[9]Workers characteristics are limited to flows, there are few stock variables in the dataset.

model. This model confirms that the 2008 crisis and the possibility to use customary contracts positively impact the probability to hire in short-term contract.

Finally, it is worth emphasizing that while the paper is mainly descriptive, it may be interesting to provide some evidence describing the behaviour of labour market flows before and after the crisis in France. To the best of my knowledge, we still know very little about the impact of the crisis on job and worker flows. While I do not establish causal effects, the figures provided here may be of guidance to shape future theoretical models and to highlight certain features that may be of interest for economic policies.

The next section reviews previous papers that are linked to this study. The third briefly describes the employment protection legislation existing in France. The fourth presents the dataset and the methodology I used in line with Abowd et al. (1999). The fifth extends the results found by Abowd et al. (1999) and investigates the cyclical behavior of worker flows. The sixth section decomposes results of the previous section by industries and size categories. Finally, the seventh section extends the analysis studying the characteristics of firms and workers which explain the fact to hire (be hired) in short-term contract. Last section concludes.

1.2 Related literature

1.2.1 Empirical studies on job and worker flows

The founding empirical studies on job and worker flows[10] has been made by Davis and Haltiwanger and mainly concern the United States' labor market. Through their many studies and publications, they show that[11]:
1) the magnitude of job and worker flows is different. They show that the magnitude of job and worker flows is high in the United States and besides, workers flows are traditionally much larger than job flows, which is interpreted as evidence of excess worker reallocation, also named churning: 9.2% of gross job creation and and 11.3% gross job destruction per year during the 1972-1986 period according to Davis and Haltiwanger (1992) and 36.8% of worker reallocation and 20 to 30% job reallocation in annual average according to Davis and Haltiwanger (1998),
2) the magnitudes of job reallocation are high in all sectors (more than 10%). Indeed, they

[10]Job flows are defined as all jobs that are created and destroyed in an establishment between time t and $t-1$ and that contribute to its growth. Worker flows concern hirings and separations then, it corresponds to the movements of workers that occur in an establishment between time t and $t-1$.
[11]See mainly chapter 41 of the Handbook of Labor Economics, Vol. 3B.

explain that "results provide little support for the view that high rates of job reallocation arise primarily because of sectoral disturbances or economic-wide disturbances with differential sectoral effects" and that "a large fraction of gross job flows reflects within-sector reallocation activity rather than between-sector employment shifts",
3) the net growth rate of employment and the excess job reallocation depend on the size and age of firms[12]: the net growth rate of employment decreases with the age of the firm and rises with its size; the excess job reallocation decreases with age and size of firms,
4) those flows exhibit cyclical properties: job creation is less volatile than job destruction and the job reallocation is countercyclical. Moreover, the relative volatility of destruction in manufacturing industries is positively impacted by the fact that, in these industries, the employment growth is slower, capital intensity is larger, firms are older and bigger.

More recently, Davis, Faberman and Haltiwanger (2013) show that the job-filling rate for vacant positions decreases with the size of firms and increases with the turnover rate and that, in larger firms, the duration of vacancies is longer. In addition, they show that the job-filling rate is countercyclical and increases with the gross hires rate. As a consequence, employers seem to not only use vacancies to modify the rate at which they hire new workers. Indeed, they use on screening, advertising and so on to modify the job-filling rate. Moreover, Moscarini and Postel-Vinay (2012) study the contribution to job creation of firms according to their size along economic cycles. They show that, in the United States: "Large employers on net destroy proportionally more jobs relative to small employers when unemployment is above trend, late in and right after a typical recession, and create more when unemployment is below trend, late in a typical expansion". This result does not from a reclassification effect (reclassification of firms into larger or smaller size classes along economic cycles) and is observed in several countries.

Therefore, the high magnitude of job and worker flows and especially the high level of churning observed constitute a standard phenomenon since it is observed in a lot of countries. Indeed, Albaek and Sorensen (1998) use the "Integrated Database for Labour Market Research" (IDA) and show that in Danish manufacturing sector, job creation equals 12% and job destruction 11.5% while hirings equals 28.5% and separations 28% (mean average during the 1980-1991 period). Studying the Portuguese labor market, Centeno and Novo (2012) report almost 12% of job creation and destruction and 25% of hiring and separation. Finally, Contini and Revelli (1997) find clear evidences that worker flows are much higher than job flows whatever the country considered (Table 1.1)[13]. Indeed, they find that, in Canada, the gross worker turnover

[12]See also Bassanini (2010).

[13]They compare job creation and destruction rates to gross worker flows using their own computations and existing figures in literature for several countries.

is four times higher than the job flow turnover (around three times higher in France,Germany and Italy).

Table 1.1: Yearly job and workers flows

	Canada	France	Germany	Italy
Job creation	11.1	11.4	8.5	9.9
Job destruction	9.6	12	7.5	10
Gross job turnover	20.7	23.4	16	19.9
Gross worker turnover	80	59.5	43.8	67

Note: Rates in percent of total employment. Job and worker flows come from Contini and Revelli (1997) which melt their own computations with computations from other studies. Gross job turnover is the sum of job creation and destruction divided by total employment and gross worker turnover is the sum of hiring and separation divided by total employment.

Nevertheless, even if churning is important in all countries, some papers try to understand it and to highlight factors that can contribute to the evolution of job and worker flows. Those factors could be the firms' size or industry, the legislation governing labor markets (especially the presence of firing costs or the multiplicity of contract types), economic conditions (such as the 2008 crisis), the type of transitions undergone by workers on labor markets and so on. For instance, a recent paper of Haltiwanger, Hyatt and McEntarfer (2015) show that, in the United States, job-to-job transitions of workers reallocate them from low to high paying firms. In addition, they show that this type of reallocation is procyclical.

Moreover, the impact of the presence of fixed-term contracts on the level of churning is also questioned, mainly in European countries, where a lot of labor markets are subject to dualism. Exploiting the 2004 reform in Portugal which increases the protection gap between temporary and permanent workers (i.e. this reform increases the employment protection legislation for permanent workers), Centeno and Novo (2012) show that short-term contracts increase worker turnover in excess. Furthermore, they find evidence concerning the high substitution suspected between fixed-term and long-term contracts since, in establishments impacted by this reform, the share of fixed-term contracts has increased but also the worker turnover in excess of fixed-term contracts. At the same time, they record no change in the worker turnover in excess of long-term contracts. In addition, Abowd et al. (1999), using administrative data (*Déclarations des Mouvements de Main-d'œuvre* (DMMO)) on the period 1987-1990, show that during the 1987-1990 period, churning is an important phenomenon since an annual job creation involves three hirings and two separations for each job created in a given year and that an annual job destruction engages one hiring and two separations. Moreover, they assess that entries into

short-term contract represent 70% of total entries. Because those temporary contracts have a fixed term, a huge part of separations corresponds to the end of those short-term contracts.

In addition, the impact of the 2008 crisis on job flows has also been discussed in the United States. Indeed, the effect of recession periods on labor reallocation is questioned since, as explained by Foster, Grim and Haltiwanger (2016), recessions potentially redistribute resources from low to high productive firms. This phenomenon is usually called "cleansing" effect[14]. This is related to the Schumpeter's (1939, 1942) vision of economy named "creative destruction" and conveys the idea that during recessions, unproductive firms disappear in favor of more productive ones. This cleansing effect can depend on credit conditions[15] which could explain why the cleansing effect observed after some previous recessions is not at work[16]. Indeed, Foster et al. (2016) show that during recessions after 1980, reallocation and productivity have increased. However, they explain that it is not the case for the recession following the 2008 crisis: "in the Great Recession, job creation fell by as much or more than the increase in job destruction". Therefore, this crisis does not yield to higher reallocation such as some previous recessions because of a higher fall of job creation. As a consequence, this latest world economic crisis seems to have yielded to unprecedented impacts regarding labor market flows.

In light of previous studies, it seems important to assess if the job and worker flows and then, the level of churning are impacted by the use of short-term contracts in France and to clarify the impact of the 2008 crisis on this phenomenon. Indeed, the 2008 crisis could have differently impacted dual labor markets such as the French one. As a consequence, this paper aims to extend the study of Abowd et al. (1999)[17] taking into account the potential impact of the 2008 crisis and the impact of a new type of short-term contract (the customary contract) on the level of churning. Indeed, the level of churning could be amplified by the presence of dualism existing on Continental European labor markets and the 2008 crisis could have amplified this phenomenon if firms use more short-term contracts since the 2008 crisis. Indeed, according to a report of the *Cour des Comptes* : *"[...] The comparison with the 1993 crisis illustrates*

[14]This phenomenon is important to evaluate but this is beyond the scope of this study since I am mainly interested in the combined effect of the use of short-term contracts and the 2008 crisis on the way French firms adjust their workforce (especially in terms of the use of the different contract types existing in France and the duration of short-term contracts).

[15]Osotimehin and Pappadà (2016).

[16]As mentionned by Foster et al. (2016), "if credit markets are distorted in a recession, reallocation may be driven more by credit constraints and less by market fundamentals such as productivity, demand and costs".

[17]I am mainly interested in comparing my results to those of Abowd et al. (1999) who only use the DMMO dataset (i.e. firms with at least 50 employees). As a consequence, in the main text, I mainly present results obtained with the DMMO dataset. Nevertheless, I also compute the results for establishments with less than 50 employees (EMMO dataset) which are in appendix 1.A.2.

this evolution: even though at that time the major part of the adjustment has gone through economic layoff, in 2008, the shock has been handled thanks to a large decrease of temporary jobs (temporary work, short-term contracts), a type of contract which developed at the end of the 90's". I also take into account the impact of firms' size on the level of job and worker flows. Finally, I am also able to study the duration of short-term contracts which was not possible for Abowd et al. (1999)[18].

1.2.2 Theoretical insights

The theoretical literature on this topic mainly focus on the impact of employment protection legislation on job and worker flows. The goal of the employment protection is to prevent workers from firing and then to stabilize employment. Unfortunately, several studies show that in countries where the level of dualism is important, the employment protection legislation could lead to opposite effects since it actually stabilizes employment for workers with long-term contracts but destabilizes employment for workers hired with short-term contracts. Indeed Bentolila, Cahuc, Dolado and Le Barbanchon (2012) comparing France and Spain, explain that the largest rise of unemployment observed in Spain after the crisis could be attributed to its largest share of short-term contracts compared to France and that those opposite effects of employment protection legislation could have been amplified since the 2008 crisis.

The theoretical literature also emphasizes that higher firing costs do not necessarily stabilize employment in the presence of a dual employment protection legislation system (see Sala, Silva and Toledo (2012)) and may reduce the incentives to convert temporary jobs into permanent jobs[19]. Moreover, Cahuc, Charlot and Malherbet (2016) show that heightened employment protection for permanent jobs will have very small negative effects on aggregate employment. Actually, the employment protection legislation existing on long-term contracts (i.e. high firing costs) results in less job creation but also less job destruction whereas the existence of short-term contracts results in higher job creation and higher job destruction. These two opposite effects lead to an ambiguous impact on unemployment and could create worker turnover in excess. However, this small aggregate impact is the net consequence of two large counteracting effects: a strong decrease in the number of permanent jobs and a strong increase in the number of temporary jobs. This large reallocation of jobs conforms to empirical evidence provided by Centeno and Novo (2012). Globally, protection of permanent jobs has very small effects on

[18]The variable that gives the duration of contracts is only available in the recent version of the DMMO (EMMO) dataset.

[19]Cahuc and Postel-Vinay (2002), Blanchard and Landier (2002).

aggregate employment, but induces employment composition effects: it may lead to jobs with shorter duration.

Moreover, Cahuc and Postel-Vinay (2002), building a theoretical model where firms can convert temporary jobs to permanent ones, show that when firing costs are high, firms are not encourage to operate the conversion. Then, the possibility to use flexible contracts boosts job creation but also job destruction which increases the magnitude of flows on the labor market. Overall, in many studies, short-term contracts are found to create a worker turnover in excess.

1.3 The employment protection legislation in theory and in practice

The goal of the employment protection legislation is to stabilize employment but we have to make a distinction between what is written in the labour code, the case law, and what we observe in practice, which partly depends on how strictly the law is enforced[20]. In France, the law explains that the long-term contract is the usual employment form[21] and short-term contracts must remain an exception[22]. Then, in theory, the recourse to short-term contracts is strongly regulated in France. However, when we compute hirings and separations, we unambiguously observe that in practice short-term contracts are not only used as "exception"[23]. This is in part due to firms willingness to circumvent the legislation, as to the policymakers recognization that firms need more flexible contractual arrangements.

As a consequence, a new motive to use short-term contracts has been introduced in France[24]: firms can use short-term contracts if the job they offer is "temporary by nature". In this latter case, short-term contracts are called customary contracts. Those short-term contracts benefit from a less restrictive legislation: there does not exist a maximal duration, there is no waiting

[20]Which itself depends on the functioning of labour courts, the social/political pressure to enforce the law, the behaviour/power of labour inspection, lobbying and firms' incentives to circumvent the legislation.

[21]See article L1221-2 of the French Labor Code (*"Le contrat de travail à durée indéterminée est la forme normale et générale de la relation de travail."*).

[22]See the article L1242-1 of the French Labor Code (*"Un contrat de travail à durée déterminée, quel que soit son motif, ne peut avoir ni pour objet ni pour effet de pourvoir durablement un emploi lié à l'activité normale et permanente de l'entreprise."*). This view of the use of short-term contracts is common to other European countries such as Spain, Portugal or Italy.

[23]The use of short-term contracts is defined by the article L1242-2 of the French Labour Code. Usually, an employer can offer a temporary contract if and only if he needs to replace an employee (restrict to some cases), he faces a temporary increase of its production activity or he needs temporary seasonal workers.

[24]Other special kinds of short-term contracts have appeared over time, like the *CDD senior*, defined by articles L2212-1 and L1242-3 of the labour code, but is has not been used as intensively as the customary contracts.

period between two customary contracts (then, an employer can successively hire in customary contract) and there does not exist severance payment for this type of contract. The 20 industries which can use those customary contracts are listed in the decree D1242-1 of the french labour code, here are some examples : forestry activities, accommodation, food and beverage service activities, amusement and recreation activities and so on[25]. Moreover, the possibility to use a customary contract can be defined by collective bargaining agreement[26]. Nevertheless, the case law has changed over time. In 2008, the case law as become more restrictive: it establishes that even in industries where customary contracts can be used, firms cannot hire on all jobs in customary contracts. Its use is then restricted to jobs which by nature are temporary. But one may argue that the frontier between what is really temporary by nature or not is difficult to establish: it may vary over time, depending on the circumstances, tasks, customer needs, changes in the technology...

So in any case, this may be difficult to enforce. Then, the legislation governing the use of this kind of contracts remains confused because it is difficult to assess which job can clearly be concerned by this hiring motive. As a result, in France, it is clearly claimed that the employment protection legislation on long-term contract protects workers from firing and limits the use of short-term contract as we can see on Figure 1.1 and Figure 1.2 where indexes for France are strongly high. However, the practice may be different from the spirit of the law, since the share of short-term contracts in entries has increased from 5 to more than 8 percentage points (depending on the employment situation of establishments (growing, shrinking or stable workforce over the year)) between 1998 and 2012 (until 82.59% for shrinking establishments)[27].

This impressive rise in short-term contracts in entries could have played a role during the 2008 crisis, one of the objective of this paper is to clarify this fact. Therefore, I show that the churning is more important in industries that use customary contracts than in the others and that this is more pronounced since the 2008 crisis (the necessary worker flows for one job creation (destruction) is almost 4 times higher in industries that use customary contracts during the 2008-2012 period).

[25]See https://www.legifrance.gouv.fr (decree D1242-1 of the French labor code) for an exhaustive list of these industries.

[26]See the article L1242-2 (section 3) of the French labor code and the study http://www.acoss.fr/home/observatoire-economique/sources-et-methodologie/methodologie/contrat-dusage.html from the ACOSS.

[27]See Table 1.3 in section 1.5.

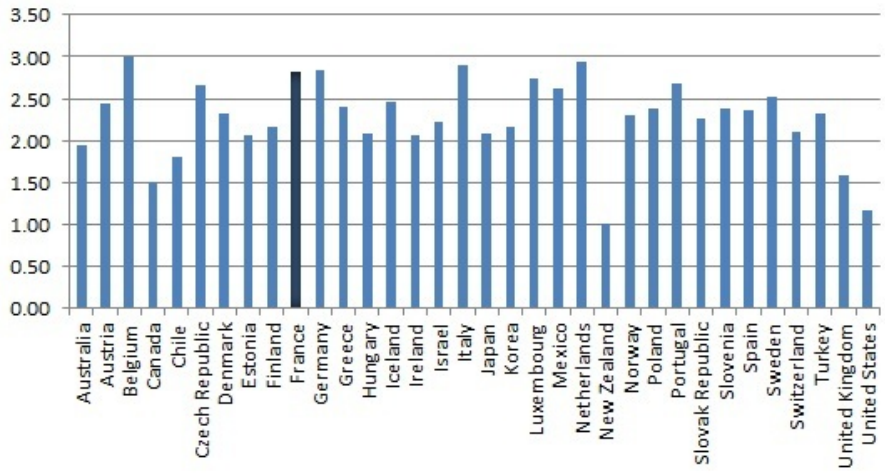


Figure 1.1: Protection of permanent workers against individual and collective dismissals in OECD countries

Note: Data come from "The OECD indicators on Employment Protection Legislation" (scale from 0 (least restrictions) to 6 (most restrictions), last year available). Evaluation of the indicator for the year 2013 except for the United Kingdom and Slovenia for which the indicator has been evaluated in 2014.

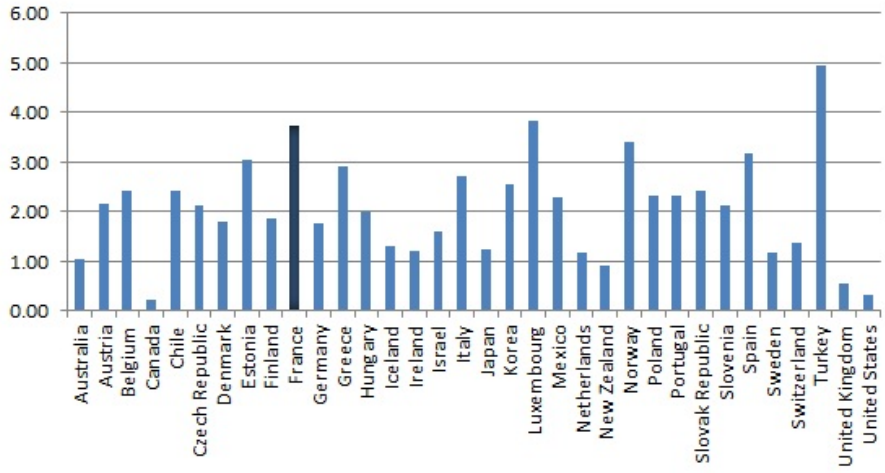


Figure 1.2: Regulation on temporary forms of employment in OECD countries

Note: Data come from "The OECD indicators on Employment Protection Legislation" (scale from 0 (least restrictions) to 6 (most restrictions), last year available). Evaluation of the indicator for the year 2013 except for the United Kingdom and Slovenia for which the indicator has been evaluated in 2014.

1.4 Data and methodology

1.4.1 The dataset

The focus of this paper is on France. I use the *Déclarations des Mouvements de Main-d'œuvre* (DMMO) and *Enquêtes sur les Mouvements de Main-d'œuvre* (EMMO), an employer-level dataset. The DMMO file exists since the 70's but it is operational only since 1987 whereas the EMMO file exists only since 1989. All the french establishments which employ at least 50 workers must complete this administrative document every month (DMMO), those with less than 50 employees are randomly selected (EMMO). My data cover the 1998-2012 period.

The DMMO file is monthly collected but the dataset is quarterly distributed. It gives information about all the French establishments which have at least 50 employees. The dataset is divided into two parts. The first one (the *Establishments file*) contains informations concerning these establishments like the *Siret* (the establishment ID), the type of industry and the geographic location (*région*, *département*, *commune*) of those establishments, the number of employees working at each establishment at the beginning and at the end of each quarter, the gender of these workers and so on. The second one (the *Movements file*) depicts the changes (entries and exits of workers) that occurred in each establishment during the quarter. In this latest file we can observe the "type" of each movement. The "type" is defined thanks to : the age of the worker concerned by this movement, his gender, his type of contract (short-term or long-term contract for instance) and so on. Therefore, this is an exhaustive dataset.

The EMMO file is a quarterly survey that contains the same information than the DMMO dataset but for the French establishments which employ less than 50 employees but at least 10[28]. This survey is built by carrying out an annual random draw of some establishments (using the location place, the industry and the size of establishments). When they are drawn, those establishments have to complete the EMMO form. One fourth of the sample is replaced every year. Finally, each establishment has a weight which corresponds to the number of establishments of this type which exist in the whole country.

1.4.2 Organization of the dataset

I want to extend the results found by Abowd et al. (1999) using a dataset that covers the 1998-2012 period. I build the dataset as following. First, I remove establishments which have

[28]The new version of the EMMO (since 2007) dataset contains establishments which have at least 1 employee but they are excluded from this study because I study the 1998-2012 period.

a missing value for at least one of the following variables : the number of workers at the beginning/end of the quarter and the number of entries/exits during the quarter. Those establishments are useless in our study because we could not compute the job or/and worker flows for those establishments, which is central here. Secondly, it seems that some establishments appear several times for the same quarter in the sample without any reason. This could be problematic since values from one line to another for the same quarter are not the same. I choose to remove those establishments not only for the problematic quarter but for the whole period (1998-2012) in order to minimize the number of problematic observations in the sample[29]. Finally, I remove establishments which have zero employee at the beginning and at the end of a quarter and which have zero entry and exit during the same quarter because it is impossible to know if those establishments are created or destroyed.

I also remove establishments which have entries or exits during a quarter 30 times larger than their mean size over the same quarter. I decide to exclude definitively those establishments from the sample (1998-2012) if they have, at least one time, entries or exits 30 times larger than their mean size. By doing so, we prevent us to overestimate entry and exit rates. Last but not least, first, I remove establishments for which the sector variable is not available and, secondly, I remove the agricultural industry. Finally, I decide to keep only establishments which are in the *Establishment file* and in the *Movement file*[30] in order to study only establishments which fully fill the form. The number of establishments coming from each data source (DMMO or EMMO) is reported in Table 1.2.

Table 1.2: Number of establishments used in the study, 1998-2012

	Number of establishments	Number of establishments that use customary contracts
Total	726,698	242,513
DMMO (50+)	495,744	144,859
EMMO (10;49)	230,954	97,654

Note: DMMO refers to establishments with at least 50 workers and EMMO refers to establishments whose workforce is between 10 and 49.

[29]Indeed, it is impossible to know if this is an administrative error or if the problem really concerns the establishment and then, potentially appears for several quarters.

[30]The main variables of interest are the following: the number of workers in each establishment at the beginning and at the end of each quarter, the weight of establishment, the industry, the type of contract and the duration of the contract.

1.4.3 Computations of job and worker flows

I use the same methodology as in Abowd et al. (1999). The main variables I use for computations are the *effectif de référence* of each establishment i which is the number of employees working in i when i was included in the DMMO/EMMO survey, the number of workers working in the establishment i at the beginning and at the end of the quarter, the industry (NAF code), the weight of establishments and the number of entries and exits during the quarter. In the movement file, I use the contract type (long-term or short-term-contract) and the duration of contracts.

I am interested both in job and worker flows. Concerning job flows, I will compute annual variables which will be called "year-to-year" and "quarterly-based" variables called "year-aggregated". For worker flows, I will compute entry and exit rates and decompose them by contract type (long-term and short-term). Because the way to compute those rates has been widely used in the literature, calculations are presented in appendix 1.A.1.

I aim at providing descriptive evidence mainly and results consist in graphical analysis and tables. I first compute job and worker flows for all establishments and then, I decompose the results by industry and the size of establishments (in terms of workforce). For tables, I choose to divide the sample into three periods. The sample is divided using the two more important recession dates, 2002 and 2008[31]. As a consequence, the three periods studied are 1998-2001, 2002-2007 and 2008-2012. Then, the first step consists in decomposing job and worker flows by period in order to have a general view of the magnitude of flows that take place on the French labor market and then I concentrate on the variation of entries and exits along economic cycles.

1.5 Job flows, worker flows and churning in France

1.5.1 A general overview

This section depicts job and workers flows on the French labor market during the 1998-2012 period. Results are reported in Table 1.3 and 1.4 only for establishments which have at least 50 employees (DMMO dataset)[32]. Not surprisingly, worker flows are always larger than job

[31] See also Reynald Majetti (2012). The section 1.5.2 describes workforce adjustments along economic cycles taking into account the two important recession dates, 2002 and 2008.

[32] Figures for the EMMO are reported in appendix 1.A.2 because the interpretation of figures is nearly the same. Note that for the EMMO establishments, results are possibly biased because to compute the year-to-year creation (destruction) rate, I have to select establishments that survive or responds to the survey for four successive quarters.

flows whatever the sample considered and churning is very important whatever the nature of the establishment growth (if it is growing, shrinking or stable).

Quarterly job creation and destruction rates are always positive whatever the establishment type, that is, if it is growing, shrinking or stable. As a consequence, it is obvious that even establishments that expand in a given year (year-to-year job creation rate positive) account for some job destruction (year-aggregated job destruction rate positive) during this year and that establishments which shrink in a given year (year-to-year job destruction rate positive) account for some job creation (year-aggregated job creation rate positive) during this year. In addition, establishments that do not expand in a given year (year-to-year growth rate equal to zero) create and destroy some jobs during this year (year-aggregated job creation and destruction rates positive[33]). This latest fact points out, as in Abowd et al. (1999), that stable establishments are not inert. Another point important to underline is that, if we compare year-to-year job creation and destruction rates I find for France to figures found by Davis and Haltiwanger (1992), we see that those rates are higher in France than in the United States, especially concerning the job creation rate[34].

If we look at the figures in Table 1.3, we observe that the year-to-year growth rate declines strongly during the 2002-2007 period and stays at this level during the last period whereas worker flows (entries and exits) sharply increase from one period to another and especially during the 2008-2012 period which indicates that churning is more and more important, especially since the 2008 crisis. This huge increase in entries and exits is entirely driven by short-term contracts (entry and exit rates for long-term contracts are almost stable whatever the employment situation of establishments). On the opposite, year-aggregated job creation and destruction rates are stable.

Furthermore, Table 1.3 also highlights the fact that more than 70% of total entries and exits concern short-term contracts (from 69% to 83% depending on the period and the characteristic of establishments (growing, shrinking or stable))[35] and, as noticed previously, that the increase of the total entry and exit rates is entirely explained by the increase of entry and exit rates into short-term contracts (indeed, the share of short-term contracts in entries increases up to 15 percentage points between the second and the last period). Moreover, the share of short-term

[33]Note that the year-aggregated destruction rate is always higher than the year-aggregated creation as in Abowd et al. (1999).

[34]However, we have to bear in mind that Davis and Haltiwanger (1992) study job and worker flows for the 1972-1986 period while, here, I exploit more recent data.

[35]Note that the sum of the entry (exit) rate into short-term contracts and the entry (exit) rate into long-term contracts is not equal to the total entry (exit) rate because I do not consider the other possible hiring (exit) motives (transfers between establishments for instance).

contracts in entries and exits is always larger in the shrinking category than in the growing or stable categories. As a consequence, the huge increase of the total entry rate during the 2008-2012 period is completely made of a boom of short-term contracts and results do not point at a substitution between short-term contracts and long-term contracts because entry and exit rates into long-term contracts are very stable at each period. However, results show that firms use entirely short-term contracts to modify the size of their workforce.

In addition, job flows are higher in smaller establishments (EMMO)[36]. Their behaviour regarding worker flows are nearly the same as in the DMMO since the entry rate strongly rises during the last period (especially for growing and stable establishments) and this increase only comes from a rise of hiring into short-term contracts (hiring into long-term contracts decreases during this period for all establishment categories which could give a small evidence of the existence of a substitution effect between short-term contracts and long-term contracts in those small establishments). As a result, the share of short-term contracts in entries rises sharply during the 2008-2012 period up to almost 82% in stable establishments compared to 73 to 75% over the two previous periods.

Table 1.4 contains the year-to-year creation (destruction) rate to the entry (exit) rate ratios. To obtain those ratios, I simply divide entry and exit rates by the year-to-year growth rate. I find figures in the first column of table 1.4 ("Necessary WF for one JC") using figures for growing establishments of table 1.3 and figures in the second column of table 1.4 ("Necessary WF for one JD") are calculated thanks to figures for shrinking establishments in table 1.3.

This table shows that the creation (destruction) of one job represents more for a firm that the hiring (separation) of one worker. I then find strong evidences of churning which explains why worker flows are always higher than job flows. If we consider the whole period (1998-2012), churning increases from one period to another. For the first period (1998-2001), I find figures close to those of Abowd et al. (1999)[37] but we can observe that the level of churning is increasing over time. Since 2008, the creation of one job requires nearly 5 hirings and 4 separations whereas during the 2002-2007 period, it required nearly 4 hirings and 3 separations. Remembering the figures in Table 1.3, we can assess that this increase of churning corresponds

[36]See Table 1.20 in appendix 1.A.2.1.

[37]Remember that, for the 1987-1990 period, they find that an annual job creation involves three hirings and two separations for each job created in a given year and that an annual job destruction engages one hiring and two separations.

Table 1.3: Job and worker flows by contract types, DMMO 1998-2012

	Growing Establishments			Shrinking Establishments			Stable Establishments		
	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012
Job Flows									
Year-to-year growth rate	**18.21**%	13.32%	13.04%	**21.44**%	13.52%	13.39%		-	
Year-aggregated creation rate	14.02%	14.72%	14.20%	7.27%	7.27%	7.19%	6.56%	6.30%	6.46%
Year-aggregated destruction rate	6.58%	6.68%	6.87%	13.45%	13.14%	13.19%	8.99%	10.31%	9.86%
Worker Flows									
Entry rate	**52.62**%	53.57%	68.52%	**38.61**%	42.67%	59.90%	30.37%	24.51%	33.68%
Short-term contract	37.96%	36.95%	52.91%	29.05%	33.25%	49.47%	22.29%	18.50%	27.55%
Long-term contract	12.35%	12.98%	12.39%	8.19%	7.84%	8.66%	7.13%	5.12%	5.19%
Share of STC in entries	72.14%	68.96%	77.22%	75.25%	77.92%	82.59%	73.38%	75.45%	81.79%
Exit rate	**44.18**%	44.66%	60.74%	**44.86**%	49.55%	65.86%	30.27%	26.24%	34.96%
Short-term contract	29.38%	29.91%	46.36%	26.28%	30.92%	47.48%	19.35%	16.48%	25.65%
Long-term contract	10.90%	10.29%	8.85%	12.14%	11.70%	10.22%	7.65%	6.21%	5.35%
Share of STC in exits	66.51%	66.97%	76.33%	58.58%	62.40%	72.10%	63.92%	62.82%	73.38%

Note: STC refers to short-term contract. In growing establishments, during the 1998-2001 period, in annual average per 100 employees, 52.62 workers have been hired; 37.96 workers have been hired in short-term contract and 12.35 have been hired in long-term contract. Moreover, during the same period, in annual average per 100 employees, 44.18 workers exit establishments; 29.38 after a short-term contract and 10.90 after a long-term contract. The sum of entries (exits) into short-term contract and entries (exits) into long-term contract is not equal to the number of entries (exits) because I do not take into account other types of entries (exits) (as transfers from one establishment to another). In addition, during the same period, in establishments with increasing employment, the average increase of 18.21 jobs per 100 employees during the year t goes along with 14.02 job creation within this same year t (year-aggregated creation rate) and with 6.58 job destruction (year-aggregated destruction rate) per 100 employees within the same given year.

to a more important resort to short-term contracts[38]. The EMMO[39] reports the same evolution but the creation (destruction) of one job requires less hirings and separations.

Table 1.4: Required worker flows (WF) for one job creation (JC) and destruction (JD), DMMO

	Necessary WF for one JC			Necessary WF for one JD		
	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012
Hiring	2.89	4.02	5.25	1.80	3.16	4.47
Separation	2.43	3.35	4.66	2.09	3.67	4.92

Note: During the period 1998-2001, on annual average, the creation of one job requires 2.89 hirings and 2.43 separations and the destruction of one job requires 1.80 hiring and 2.09 separations. These figures are obtain using figures in bold (Table 1.3) that is to say, dividing the entry (exit) rate by the year-to-year growth rate.

To sum up, during the 1998-2012 period, all establishments report high job and worker

[38]In section 1.5.2.1, I will study the evolution of the number of short-term contracts in entries during the whole period.

[39]See Table 1.21 in appendix 1.A.2.1.

flows and this is more pronounced for worker flows. This is also true for establishments that do not report an increase of their workforce during a year t ("stable establishment" category). As a consequence, the choice to create or destroy jobs and to hire or fire workers seems to be complex and guided by specific needs. In addition, data exhibit the fact that entries and exits are mostly composed by short-term contracts and that all variations of entry and exit rates are due to variations of entry and exit rates into short-term contracts. Finally, since 2008, worker flows and then churning have sharply increased and this comes from the fact that firms use more and more short-term contracts to adjust the size of their workforce. Thereafter, it is important to determine the cyclical characteristics of short-term contracts.

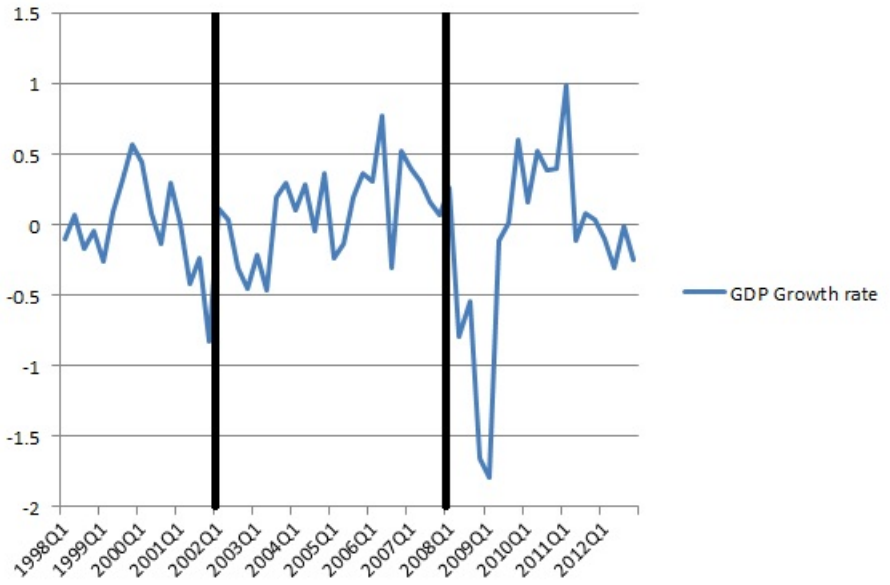
1.5.2 Evolution of contract types: what's new with the 2008 recession?

In this section, I study the cyclical characteristics of short-term contracts and long-term contracts. To do that, I use quarterly series which are deseasonnalized and HP filtered and keep in mind the evolution of two cycle indicators, the GDP growth rate and the unemployment rate. The behaviour of those indicators during the 1998-2012 period is presented in Figure 1.3.

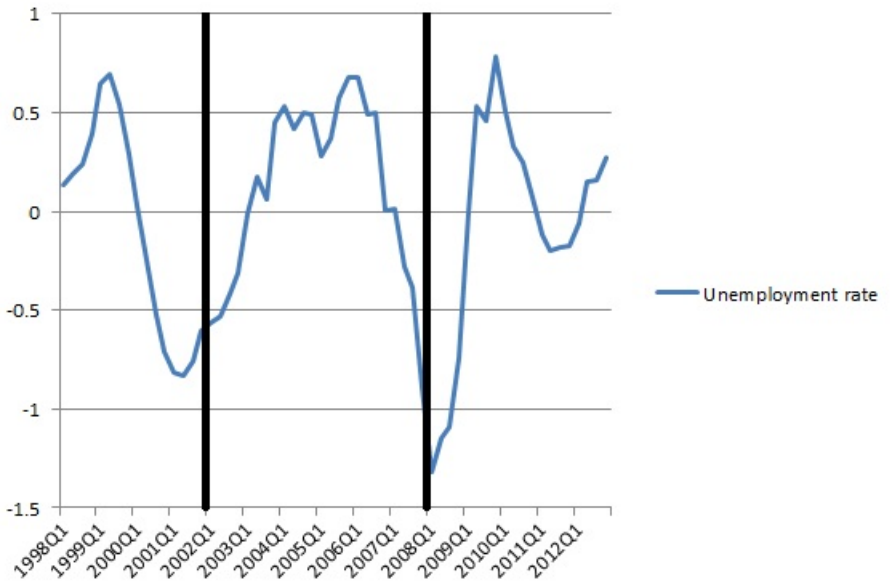
1.5.2.1 Cyclical characteristics of contracts

Figure 1.4 plots the quarterly number of entries and exits by contract types. It is obvious that fluctuations of global entries and exits are almost entirely made of short-term contracts while entries into long-term contracts are stable over the 1998-2012 period. This is in line with the previous section. Moreover, fluctuations are greater since 2008, the year during which the GDP growth rate falls strongly. As soon as the crisis hurts, hiring and especially hiring into short-term contracts decreases strongly. The behaviour of the number of exits is the same as the number of entries that is why I concentrate on entries (this corresponds to the fact that, in France, entries and exits are strongly driven by short-term contracts that is to say, entries are mainly made of entries into short-term contracts and then, exits mainly corresponds to exit from short-term contracts).

The number of entries into short-term contracts starts to recover in 2010, one year after the GDP growth rate started to recover. In addition, at the beginning of 2011, entries (short-term contracts) sharply increase and this coincides with a pic in the GDP growth rate. Those evolutions show that, at the beginning of 2009, as the economy starts to recover from the crisis firms that survive become more confident and start to hire again. However, the economy is still



(a) GDP rate



(b) Unemployment rate

Figure 1.3: Quarterly GDP and Unemployment rates, 1998-2012

Note: Detrended series using an Hodrick Prescott filter with standard smoothing parameter (1,600).

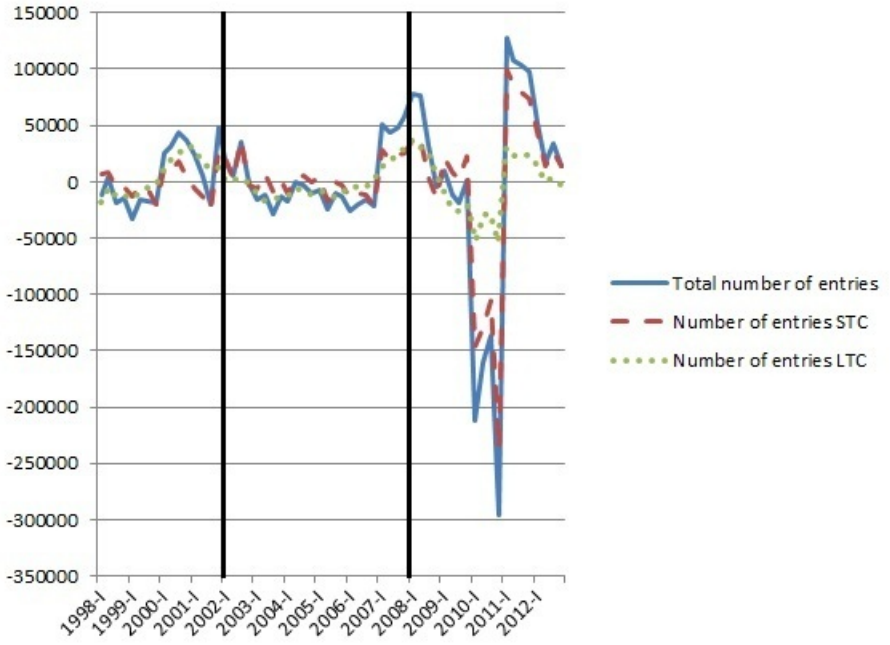
fragile so firms prefer short-term contracts than long-term contracts to keep a greater level of flexibility.

Those facts point out a procyclical nature of short-term contracts because the number of

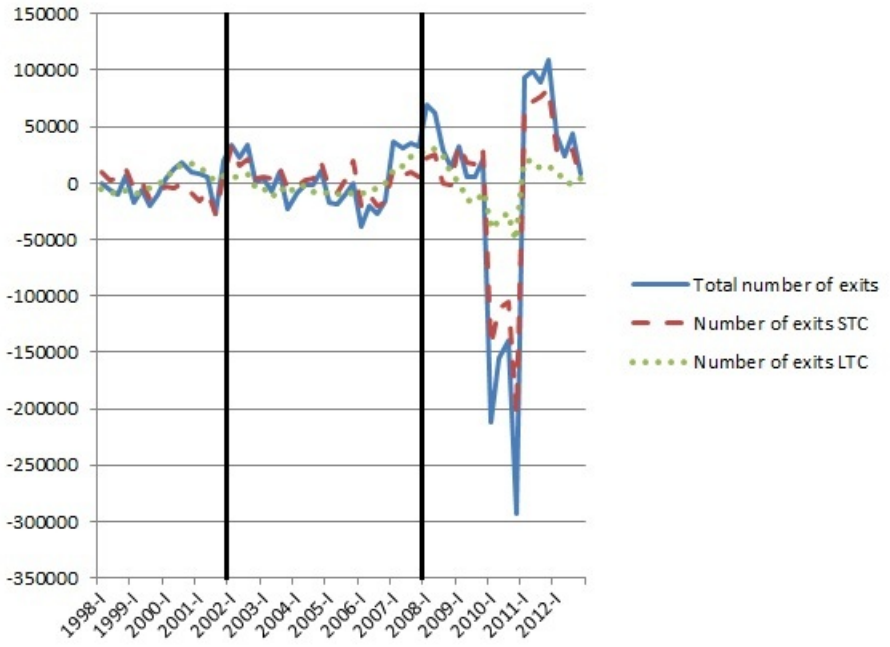
entries for this type of contract falls strongly at the beginning of the recession and increases sharply when the economy starts to recover. On the opposite, the number of entries into long-term contracts is almost stable over all the 1998-2012 period which indicates that it does not suffer from the variability of the GDP growth rate and that firms adjust their hiring policy to the economic cycle thanks to short-term contracts.

The decrease in the total number of entries is also mainly due to a decrease in the number of short-term contracts in the EMMO establishments[40] but the fall of the number of entries into long-term contracts is higher than in the DMMO. Overall, fluctuations in the number of entries is mainly driven by short-term contracts but the role of long-term contracts is less negligible when we concentrate on smaller establishments.

[40]See Figure 1.8 in appendix 1.A.2.1.



(a) Entries

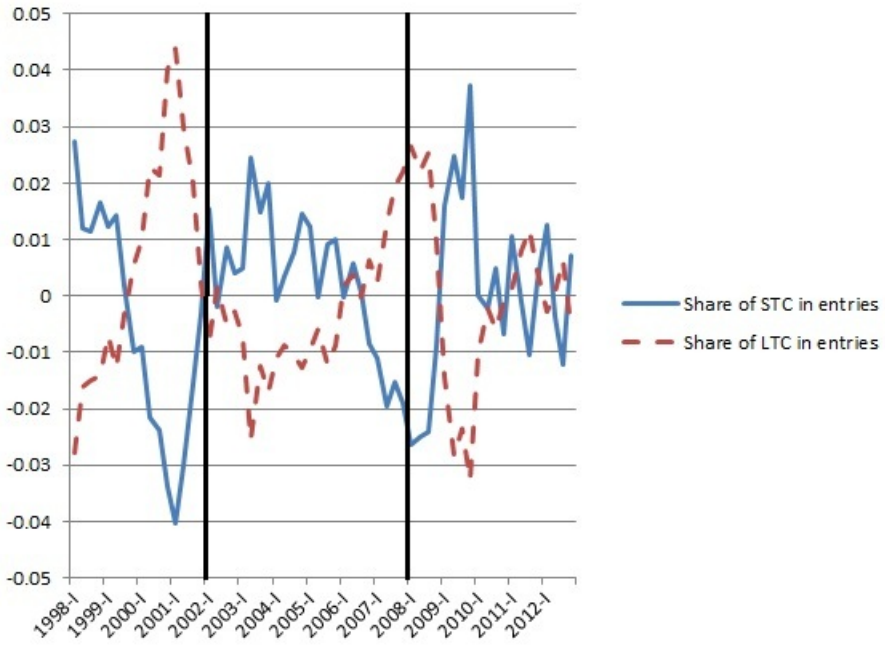


(b) Exits

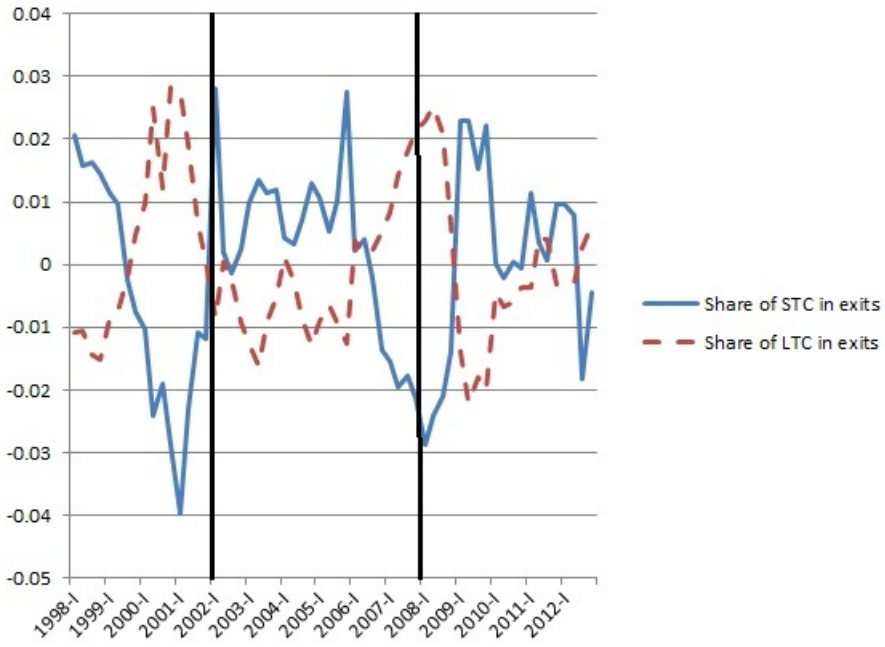
Figure 1.4: Number of entries and exits by contract type, DMMO 1998-2012.

Note: STC refers to short-term contract and LTC to long-term contract. Authors's computation. Detrended series using an Hodrick Prescott filter with standard smoothing parameter (1,600).

We now have evidence that establishments adjust their workforce mainly thanks to short-term contracts and that firms always keep the same level of insider workers (workers hired in long-term contracts). In order to clarify the cyclical characteristics of short-term contracts, it is interesting to observe the evolution of the share of short-term contracts and long-term contracts in entries and exits. Those series are plotted in Figure 1.5 and show that, when the economy enters into recession, the share of short-term contracts in entries start to rise strongly (while we saw on Figure 1.4 that the number of entries into short-term contracts decreases (as the total number of entries) strongly during the year 2009) and reaches its maximum value at the end of 2009 while the share of long-term contracts in entries decreases. This fact shows that, when the economy faces a recession, even if the number of entries (especially entries into short-term contracts) decreases strongly, firms which still need new employees hire them with short-term contracts rather than with long-term contracts. It is now interesting to study the evolution of the duration of those short-term contracts.



(a) Entries



(b) Exits

Figure 1.5: Share of short-term contracts and long-term contracts in entries and exits, DMMO 1998-2012.

Note: STC refers to short-term contract and LTC to long-term contract. Authors's computation. Detrended series using an Hodrick Prescott filter with standard smoothing parameter (1,600).

1.5.2.2 Evidence from the duration of short-term contracts

Another important aspect of the type of contract analysis lies in its duration. Because the duration of short-term contracts can be influenced by economic cycles, this section reports in details its behaviour during the 1998-2012 period. Table 1.5 presents the mean duration of short-term contracts by period. The first thing we can notice is that the mean duration of short-term contracts is around 7 months[41].

The mean duration of short-term contracts increases from the first period to the second one but strongly decreases during the 2008-2012 period[42]. Figure 1.6 confirms this fact. When the crisis hurts in 2008, the mean duration of short-term contracts decreases. More strikingly, when the GDP growth rate and the entry rate into short-term contracts start to increase in 2011, we observe that the mean duration of short-term contracts falls sharply. As the economy recovers, firms use more and more short-term contracts and, because future is uncertain, those short-term contracts are shorter than before.

Table 1.5: Mean duration of short-term contracts in months, DMMO 1998-2012

Type of exit	Period	Mean duration (in months)
Short-term contract	1998-2001	6.65
	2002-2007	8.96
	2008-2012	6.32

In order to study deeper this latest fact, I compute the annual number of short-term contracts that last at most one month ("very short-term contracts" hereafter). Because this variable is not available for all the sample, the table starts in 2001. Table 1.6 reports the proportions of entries that concern very short-term contracts[43]. The number of very short short-term contracts tends to increase from one year to another. The more striking thing is that, in 2011 when the GDP growth rate reaches its maximum value, very short short-term contracts exceeds 35% in

[41]Note that the mean duration of short-term contracts is possibly overestimated since it is not compulsory for establishments to report hirings whose duration is smaller than one month.

[42]The behaviour of the duration of contracts is nearly the same in the EMMO dataset except that the duration is lower (see Table 1.26 in appendix 1.A.2.3.).

[43]Note that these figures are surely underestimated because the variable used in the dataset is misinformed (and that, as mentioned earlier, it is not compulsory for establishments to report hiring (and then separation) for which the contract duration is below one month). The interest of this table is mostly to observe the behaviour of this kind of contracts. The problem of misinformation is stronger for the EMMO that is why I do not report figures for these establishments in appendix 1.A.2.

total entries and reaches 45% in total short-term contract entries. In 2012, one half of entries into short-term contracts is made of contracts with very short duration. Between 2001 and 2012 the share of very short-term contracts in total short-term contracts entries has doubled. This evolution also coincides with a decline of the unemployment rate. As a consequence, when the economy tries to recover, short-term contracts are more frequent but also shorter.

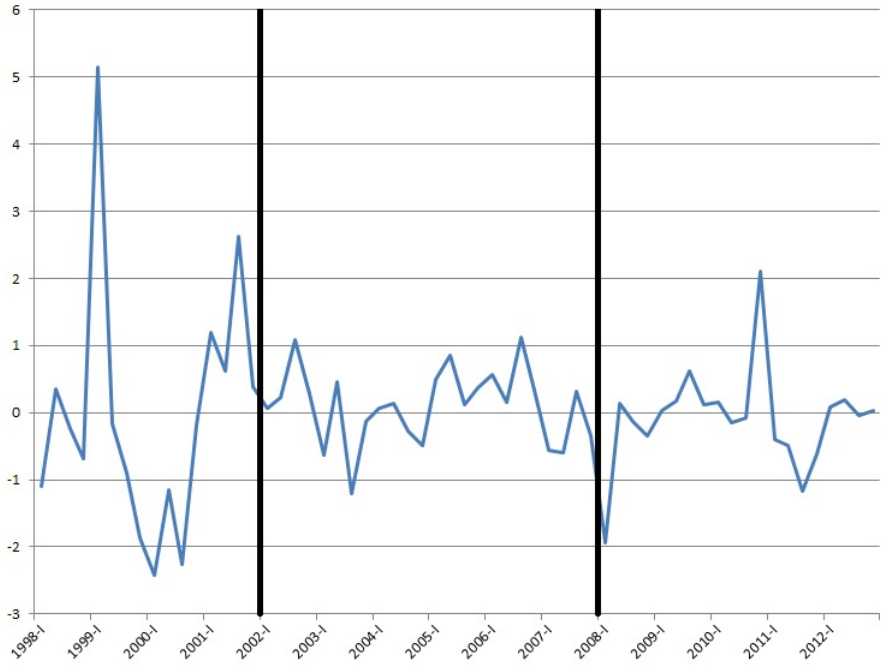


Figure 1.6: Mean duration of short-term contracts in months, DMMO 1998-2012.

Note: Authors's computation. Detrended series using an Hodrick Prescott filter with standard smoothing parameter (1,600).

Table 1.6: Share of entries into short-term contracts (STC) which last at most one month, DMMO 2001-2012

Year	Share of very STC in total entries	Share of very STC in total STC entries
2001	17.38%	25.60%
2002	20.31%	28.64%
2003	21.61%	29.94%
2004	23.41%	32.64%
2005	24.18%	33.49%
2006	24.13%	33.55%
2007	24.40%	34.34%
2008	25.88%	36.09%
2009	29.18%	37.46%
2010	26.55%	34.19%
2011	35.52%	44.99%
2012	39.85%	49.36%

1.6 Industry and size particularities

The objective of this section is to assess if the huge rise in the use of short-term contracts is specific to some industries or to some establishments. I then decompose results from the previous section by industry (comparing industries that can use customary contracts and those that can not) and by establishment size.

1.6.1 Decomposition by industry

Because the industry code changed in 2008, the first step was to match the two different nomenclatures of the dataset to create a common variable[44]. The objective is to identify establishments in some particular industries where the use of short-term contracts is facilitated by the law. Actually, in some industries, firms have the possibility to use short-term contracts without taking into account some legal constraints (on the duration and frequency). Those special short-term contracts are called customary contracts[45].

I use the decree D1242-1 and a study from ACOSS to identify these sectors in the dataset. This last source also finds three other activities for which the use of customary contracts is allowed by labor agreements : Non harbour cargo handling, Gambling and betting activities

[44]See appendix 1.A.5 for a complete examination of the match between the two industry codes.

[45]Remember that the use of short-term contracts is defined by the article L1242-1 of the French Labour Code and sectors which can use those customary contracts are reported in the decree D1242-1.

and Organisation of trade fairs, trade shows and conventions. Using this study and the Table in appendix 1.A.3, I identify 5 sectors which use this kind of short-term contracts : Accommodation; Food and beverage service activities (39), Education (44), Health and social activities (45), Firm service activities (47) and Sports activities and amusement and recreation activities; Gambling and betting activities; Printing (50)[46].

Table 1.7: Job and worker flows by contract types in industries that can not use customary contracts, DMMO 1998-2012

	Growing Establishments			Shrinking Establishments			Stable Establishments		
	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012
Job Flows									
Year-to-year growth rate	18.41%	12.99%	12.60%	21.60%	13.16%	12.82%		-	
Year-aggregated creation rate	13.41%	13.77%	12.95%	6.75%	6.70%	6.41%	6.22%	5.85%	5.83%
Year-aggregated destruction rate	6.26%	6.28%	6.32%	12.47%	12.00%	11.83%	8.69%	9.76%	8.87%
Worker Flows									
Entry rate	38.39%	37.88%	36.60%	26.97%	26.68%	29.06%	20.34%	16.78%	17.21%
Short-term contract	25.44%	22.89%	23.05%	19.25%	18.66%	20.59%	14.23%	11.44%	12.05%
Long-term contract	10.52%	11.10%	10.00%	6.39%	6.22%	6.84%	5.03%	4.38%	4.18%
Share of STC in entries	66.27%	60.43%	62.99%	71.38%	69.94%	70.87%	69.96%	68.18%	70.03%
Exit rate	30.32%	29.66%	29.54%	33.01%	32.99%	34.20%	21.24%	18.55%	18.46%
Short-term contract	17.86%	16.61%	17.81%	16.85%	16.64%	19.01%	11.70%	9.62%	10.42%
Long-term contract	9.18%	9.04%	7.03%	10.39%	10.24%	8.45%	6.48%	5.65%	4.50%
Share of STC in exits	58.91%	56.02%	60.28%	51.06%	50.43%	55.58%	55.09%	51.85%	56.42%

Note: STC refers to short-term contract. In growing establishments, during the 1998-2001 period, in annual average per 100 employees, 38.39 workers have been hired; 25.44 workers have been hired in short-term contract and 10.52 have been hired in long-term contract. Moreover, during the same period, in annual average per 100 employees, 30.32 workers exit establishments; 17.86 after a short-term contract and 9.18 after a long-term contract. The sum of entries (exits) into short-term contract and entries (exits) into long-term contract is not equal to the number of entries (exits) because I do not take into account other types of entries (exits) (as transfers from one establishment to another). In addition, during the same period, in establishments with increasing employment, the average increase of 18.41 jobs per 100 employees during the year t goes along with 13.41 job creation within this same year t (year-aggregated creation rate) and with 6.26 job destruction (year-aggregated destruction rate) per 100 employees within the same given year.

If we look at Tables 1.7 and 1.8, we observe that the strong rise in worker flows involving short-term contracts we observe in the previous section during the 2008-2012 period mainly comes from industries which use customary contracts. For growing and shrinking establishments, the entry rate exceeds 100% during the 2008-2012 period. Indeed, over this period, in growing establishments, the entry rate is more than 3 times higher in establishments that use customary contracts than in those that can not and the entry rate into short-term contracts is more than four times higher. However, the share of short-term contracts in worker flows

[46]I identify only 5 industries in the dataset instead of 20 (the number in the decree D1242-1) because of the match between the two industry codes (*NAF rév.1* and *NAF rév.2*). Those 5 industries contain several industries because the match of the two industry codes implies to group some sectors.

Table 1.8: Job and worker flows by contract types in industries that use customary contracts, DMMO 1998-2012

	Growing Establishments			Shrinking Establishments			Stable Establishments		
	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012
Job Flows									
Year-to-year growth rate	17.67%	14.03%	13.80%	21.02%	14.42%	14.44%		-	
Year-aggregated creation rate	15.53%	16.72%	16.29%	8.49%	8.53%	8.51%	7.41%	7.43%	7.73%
Year-aggregated destruction rate	7.34%	7.48%	7.73%	15.95%	15.97%	15.74%	9.84%	11.76%	11.95%
Worker Flows									
Entry rate	88.90%	87.47%	124.55%	68.99%	83.31%	119.33%	57.80%	46.14%	71.37%
Short-term contract	69.87%	67.30%	105.34%	54.61%	70.33%	104.83%	44.51%	38.22%	62.99%
Long-term contract	17.02%	17.04%	16.57%	12.92%	11.92%	12.31%	12.68%	7.20%	7.49%
Share of STC in entries	78.60%	76.94%	84.58%	79.15%	84.43%	87.85%	77.01%	82.83%	88.26%
Exit rate	79.53%	77.05%	115.49%	75.81%	91.62%	126.80%	55.23%	47.77%	72.64%
Short-term contract	58.76%	58.60%	96.43%	50.89%	67.22%	102.05%	40.49%	35.69%	60.48%
Long-term contract	15.28%	13.01%	12.06%	16.71%	15.39%	13.66%	10.90%	7.77%	7.30%
Share of STC in exits	73.88%	76.05%	83.49%	67.13%	73.37%	80.49%	73.32%	74.71%	83.25%

Note: STC refers to short-term contract. In growing establishments, during the 1998-2001 period, in annual average per 100 employees, 88.90 workers have been hired; 69.87 workers have been hired in short-term contract and 17.02 have been hired in long-term contract. Moreover, during the same period, in annual average per 100 employees, 79.53 workers exit establishments; 58.76 after a short-term contract and 15.28 after a long-term contract. The sum of entries (exits) into short-term contract and entries (exits) into long-term contract is not equal to the number of entries (exits) because I do not take into account other types of entries (exits) (as transfers from one establishment to another). In addition, during the same period, in establishments with increasing employment, the average increase of 17.67 jobs per 100 employees during the year t goes along with 15.53 job creation within this same year t (year-aggregated creation rate) and with 7.34 job destruction (year-aggregated destruction rate) per 100 employees within the same given year.

is always higher in industries that use customary contracts but this share is still high even in establishments that are not allowed to use this kind of short-term contracts (almost 70% on the whole period). In addition, the share of short-term contracts in entries reaches almost 90% during the last period in stable establishments that use customary contracts[47].

[47]EMMO report the same behaviour except that the effect is less pronounced for stable establishments. See Tables 1.22 and 1.24 in appendix 1.A.2.2.

Table 1.9: Required worker flows (WF) for one job creation (JC) and destruction (JD), industries that can not use customary contracts, DMMO 1998-2012

	Necessary WF for one JC			Necessary WF for one JD		
	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012
Hiring	2.08	2.92	2.90	1.25	2.03	2.27
Separation	1.65	2.28	2.34	1.53	2.51	2.67

Note: During the period 1998-2001, on annual average, the creation of one job requires 2.08 hiring and 1.65 separation and the destruction of one job requires 1.25 hiring and 1.53 separation. These figures are obtain using figures in Table 1.7 that is to say, dividing the entry (exit) rate by the year-to-year growth rate.

Table 1.10: Required worker flows (WF) for one job creation (JC) and destruction (JD), industries that use customary contracts, DMMO 1998-2012

	Necessary WF for one JC			Necessary WF for one JD		
	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012
Hiring	5.03	6.23	9.02	3.28	5.78	8.26
Separation	4.50	5.49	8.37	3.61	6.36	8.78

Note: During the period 1998-2001, on annual average, the creation of one job requires 5.03 hiring and 4.50 separation and the destruction of one job requires 3.28 hirings and 3.61 separations. These figures are obtain using figures in Table 1.8 that is to say, dividing the entry (exit) rate by the year-to-year growth rate.

Tables 1.9 and 1.10 give the level of churning depending on the use of customary contracts. Not surprisingly, the required worker flows for one job creation (destruction) is almost stable in industries that can not use customary contracts. On the opposite, we observe a permanent rise in the required number of worker flows for one job creation (destruction) in industries that use this kind of short-term contracts. Indeed, the creation of one job during the 2008-2012 period requires 9 hirings and 8 separations[48] that is to say more than four times higher than in industries that can not use customary contracts.

As mentioned in section 1.5, since 2011, short-term contracts are more frequent but also shorter. As shown by Tables 1.11 and 1.12, this fact is especially true for industries allowed to use customary contracts. The share of short-term contracts that last less than one month in entries increases slowly in industries that can not use this kind of short-term contracts (even

[48]The EMMO dataset reports the same behaviour (see appendix 1.A.2.2) that is to say the churning is less important in industries that can not use customary contracts but the impact of those industries on the level of churning is more limited than in the DMMO dataset.

Table 1.11: Share of entries into short-term contracts (STC) which last at most one month in industries that can not use customary contracts, DMMO 2001-2012

Year	Share of very STC in entries	Share of very STC in STC entries
2001	11.32%	17.96%
2002	12.74%	19.72%
2003	12.69%	19.42%
2004	13.87%	21.73%
2005	14.12%	22.32%
2006	12.71%	20.23%
2007	12.26%	20.21%
2008	12.21%	20.44%
2009	15.86%	23.58%
2010	15.61%	23.36%
2011	19.10%	28.42%
2012	19.67%	28.71%

Table 1.12: Share of entries into short-term contracts (STC) which last at most one month in industries that use customary contracts, DMMO 2001-2012

Year	Share of very STC in entries	Share of very STC in STC entries
2001	25.48%	34.27%
2002	28.58%	36.73%
2003	30.76%	38.81%
2004	33.03%	41.44%
2005	33.49%	41.61%
2006	34.77%	43.22%
2007	35.25%	43.87%
2008	36.89%	45.32%
2009	37.21%	44.12%
2010	33.65%	39.73%
2011	44.62%	52.22%
2012	50.12%	57.64%

if the rise is more important since 2011) while this share increases strongly especially at the end of the period (up to 50% in total entries and almost 60% in total short-term contracts entries)[49]. Figure 1.7 corroborates this fact. Actually, the cyclical variation of the number

[49]We have to keep in mind that these figures are possibly underestimated because our dataset could be incomplete since it is no compulsory for establishments to report hirings that last less than one month.

of very short-term contracts is mainly linked to the one of establishments that use customary contracts, especially since 2009.

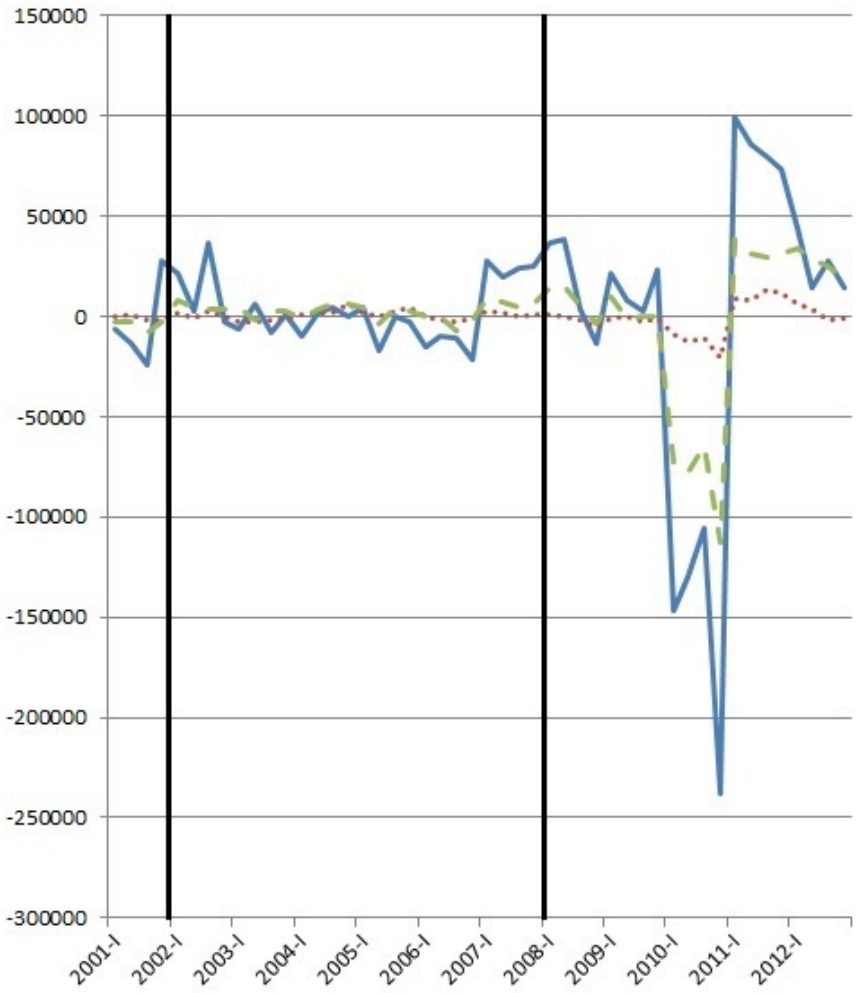


Figure 1.7: Number of entries into short-term contracts which last at most one month according to the use of customary contracts, DMMO 2001-2012.

Note: Plenty line: total number of entries into short-term contracts. Dashed line: number of entries which last at most one month in industries that use customary contracts. Dotted line: number of entries which last at most one month in industries that do not use customary contracts. Authors's computation. Detrended series using an Hodrick Prescott filter with standard smoothing parameter (1,600).

It is now interesting to compare the mean duration of short-term contracts between these two sample (establishments that use customary contracts and those who can not). Tables 1.13 and 1.14 show that the mean duration of short-term contracts is significantly weaker in industries that use customary contracts. Nevertheless, these tables exhibit the same evolution that

the one observed in Table 1.5 as the mean duration of short-term contracts rises during the second period (2002-2007) and declines during the last one (2008-2012).

If we compare those results with figures for the EMMO (Tables 1.27 and 1.28 in appendix 1.A.2) we observe that the mean duration of short-term contracts is nearly the same in the two samples. Moreover, the mean duration of short-term contracts constantly rises in the first sample while it decreases during the last period in establishments that use customary contracts.

Table 1.13: Mean duration of short-term contracts in months in industries that can not use customary contracts, DMMO 1998-2012

Type of exit	Period	Mean duration (in months)
Short-term contract	1998-2001	7.11
	2002-2007	9.82
	2008-2012	7.32

Table 1.14: Mean duration of short-term contracts in months in industries that use customary contracts, DMMO 1998-2012

Type of exit	Period	Mean duration (in months)
Short-term contract	1998-2001	5.96
	2002-2007	7.85
	2008-2012	5.41

As a consequence, cyclical characteristics of short-term contracts mainly come from industries that use customary contracts. Moreover, the shortening of the duration of short-term contracts is also due to the existence of customary contracts. In those industries, firms intensely use this kind of contracts and then contribute to destabilize employment.

1.6.2 The impact of the size of establishments on job and worker flows

This section investigates the role of the size of establishments (in terms of the workforce) both in job creation and destruction and in hirings and separations. I define five size categories in order to decompose Tables 1.3 and 1.20. Then, I use both the DMMO and the EMMO datasets. Results are reported in Table 1.15 for growing establishments,in Table 1.16 for shrinking establishments and in Table 1.17 for the stable ones.

The first thing we can notice is that job creation and destruction are higher is small establishments. Job flows are at least 2 times larger for this category. This fact is not surprising because in this category, new establishments appear and disappear frequently[50]. The level of worker flows depends on the employment type of establishments. Indeed, for the growing ones, worker flows seems to not depend on the size of the establishment (except for the [250;599] category which reports an entry rate near 80% during the 2008-2012 period) whereas in the shrinking ones, overall, the [50;119] category exhibits the higher rates and the 600 and more workers category reports the smaller. In stable establishments, job flows decreases as the establishment size increases. On the whole, worker flows are smaller in larger establishments.

In shrinking establishments, entry and exit rates are constantly rising and, in the three samples (growing, shrinking and stable), entry and exit rates increase between the second and the third period and that increase is mainly driven by a rise in entries (exits) into short-term contracts. Consequently, the share of short-term contracts in entries (exits) systematically increases during the 2008-2012 period. Nevertheless, there are some exceptions concerning larger establishments (600 and more workers) in the shrinking and stable categories. In shrinking establishments, the entry rate into long-term contracts rises from 4.49% to 23.76% between these two periods and then, decreases the share of short-term contracts in entries from 72.96% to 52.67%. In stable establishment, the decrease of the share of short-term contracts in entries is around 5 percentage points.

Table 1.18 depicts the necessary worker flows for the creation (destruction) of one job. Overall, the creation (destruction) of one jobs requires more worker flows during the 2008-2012 period that during the two previous periods. Moreover, churning is less important in small establishment and reaches its larger values in establishments whose workforce is between 250 and 599 workers (up to almost 8 hirings and 7 separations during the 2008-2012 period). Overall, the level of churning is higher for job creation than for job destruction.

[50] Unfortunately, the dataset does not allow to control for the birth and the death of establishments.

Table 1.15: Job and worker flows by size categories, growing establishments, DMMO and EMMO 1998-2012

	Growing establishments														
	10;49			50;199			120;249			250;599			600+		
	98-01	02-07	08-12	98-01	02-07	08-12	98-01	02-07	08-12	98-01	02-07	08-12	98-01	02-07	08-12
Job flows															
Year-to-year growth rate	35.97%	34.28%	36.03%	19.83%	14.46%	14.29%	16.46%	11.27%	11.12%	14.31%	10.89%	9.83%	15.49%	9.77%	10.30%
Year-aggregated creation rate	20.28%	20.16%	22.28%	15.32%	15.67%	15.26%	13.39%	13.34%	12.95%	10.81%	12.36%	11.09%	8.36%	9.13%	9.80%
Year-aggregated destruction rate	12.83%	13.56%	14.40%	7.47%	7.36%	7.69%	5.95%	5.78%	6.19%	4.89%	4.98%	5.08%	3.02%	3.83%	4.52%
Worker flows															
Entry rate	50.67%	53.06%	62.09%	49.69%	55.97%	71.06%	49.55%	51.89%	58.17%	73.91%	48.35%	78.39%	40.44%	31.14%	44.60%
Short-term contract	32.49%	33.60%	43.86%	34.02%	38.72%	54.74%	35.79%	36.35%	43.66%	61.94%	32.73%	64.07%	25.02%	18.78%	32.23%
Long-term contract	16.92%	17.69%	16.15%	13.63%	13.98%	13.29%	11.51%	12.04%	11.35%	10.18%	11.24%	10.64%	9.08%	8.37%	8.76%
Share of STC in entries	64.12%	63.32%	70.64%	68.46%	69.17%	77.04%	72.22%	70.06%	75.05%	83.80%	67.70%	81.74%	61.86%	60.29%	72.26%
Exit rate	42.02%	45.57%	54.05%	40.98%	46.97%	63.36%	41.50%	43.40%	50.16%	67.31%	39.49%	71.84%	29.30%	25.01%	38.88%
Short-term contract	22.69%	25.62%	35.07%	25.64%	31.41%	48.39%	27.60%	29.28%	37.12%	50.95%	26.29%	55.67%	19.86%	15.40%	29.01%
Long-term contract	14.60%	14.35%	11.82%	11.52%	11.05%	9.42%	10.12%	9.82%	8.03%	11.81%	8.93%	9.21%	6.44%	6.21%	5.91%
Share of STC in exits	54.01%	56.23%	64.88%	62.56%	66.87%	76.38%	66.52%	67.47%	74.00%	75.70%	66.58%	77.49%	67.76%	61.56%	74.61%

Note: STC refers to short-term contract. During the 1998-2001 period, in establishments whose workforce is between 10 and 49 workers, in annual average per 100 employees, 50.67 workers have been hired; 32.49 workers have been hired in short-term contract and 16.92 have been hired in long-term contract. Moreover, during the same period, in annual average per 100 employees, 42.02 workers exit establishments; 22.69 after a short-term contract and 14.60 after a long-term contract. The sum of entries (exits) into short-term contract and entries (exits) into long-term contract is not equal to the number of entries (exits) because I do not take into account other types of entries (exits) (as transfers from one establishment to another). In addition, during the same period and the same size category, the average increase of 35.97 jobs per 100 employees during the year t goes along with 20.28 job creation within this same year t (year-aggregated creation rate) and with 12.83 job destruction (year-aggregated destruction rate) per 100 employees within the same given year.

Table 1.16: Job and worker flows by size categories, shrinking establishments, DMMO and EMMO 1998-2012

	Shrinking establishments														
	10;49			50;199			120;249			250;599			600+		
	98-01	02-07	08-12	98-01	02-07	08-12	98-01	02-07	08-12	98-01	02-07	08-12	98-01	02-07	08-12
Job flows															
Year-to-year growth rate	47.42%	42.45%	43.50%	23.09%	15.35%	14.98%	18.85%	11.68%	12.08%	19.18%	11.03%	11.03%	17.39%	10.17%	11.59%
Year-aggregated creation rate	14.01%	14.34%	14.88%	8.22%	8.34%	8.41%	6.56%	6.24%	6.47%	5.48%	4.84%	5.20%	3.12%	3.23%	3.68%
Year-aggregated destruction rate	19.83%	20.24%	21.26%	14.56%	14.00%	13.86%	13.14%	12.75%	12.80%	11.26%	10.99%	11.68%	8.46%	8.93%	10.29%
Worker flows															
Entry rate	38.95%	45.05%	48.99%	42.42%	47.04%	64.90%	38.00%	38.95%	49.35%	32.75%	34.12%	53.87%	19.40%	22.64%	53.07%
Short-term contract	26.30%	30.51%	36.05%	31.73%	36.42%	53.83%	29.57%	30.34%	40.97%	24.14%	26.72%	46.57%	13.81%	16.52%	27.95%
Long-term contract	11.74%	13.08%	11.45%	9.49%	9.06%	8.91%	7.28%	7.10%	7.10%	6.28%	5.92%	6.00%	4.09%	4.49%	23.76%
Share of STC in entries	67.53%	67.73%	73.59%	74.80%	77.41%	82.95%	77.81%	77.90%	83.01%	73.72%	78.32%	86.44%	71.17%	72.96%	52.67%
Exit rate	42.52%	49.71%	53.67%	48.54%	53.67%	71.12%	44.94%	46.29%	56.28%	38.15%	41.12%	60.21%	25.09%	28.84%	43.50%
Short-term contract	21.99%	27.53%	33.40%	28.44%	33.84%	52.01%	26.71%	28.35%	39.50%	22.04%	24.83%	42.78%	12.71%	15.54%	26.44%
Long-term contract	15.01%	15.69%	12.63%	13.77%	12.97%	10.93%	11.60%	10.99%	9.34%	9.60%	9.69%	9.05%	6.80%	7.35%	8.06%
Share of STC in exits	51.72%	55.38%	62.23%	58.58%	63.06%	73.14%	59.44%	61.24%	70.19%	57.77%	60.37%	71.05%	50.65%	53.89%	60.78%

Note: STC refers to short-term contract. During the 1998-2001 period, in establishments whose workforce is between 10 and 49 workers, in annual average per 100 employees, 38.95 workers have been hired; 26.30 workers have been hired in short-term contract and 11.74 have been hired in long-term contract. Moreover, during the same period, in annual average per 100 employees, 42.52 workers exit establishments; 21.99 after a short-term contract and 15.01 after a long-term contract. The sum of entries (exits) into short-term contract and entries (exits) into long-term contract is not equal to the number of entries (exits) because I do not take into account other types of entries (exits) (as transfers from one establishment to another). In addition, during the same period and the same size category, the average increase of 47.42 jobs per 100 employees during the year t goes along with 14.01 job creation within this same year t (year-aggregated creation rate) and with 19.83 job destruction (year-aggregated destruction rate) per 100 employees within the same given year.

Table 1.17: Job and worker flows by size categories, stable establishments, DMMO and EMMO 1998-2012

	Stable establishments														
	10;49			50;199			120;249			250;599			600+		
	98-01	02-07	08-12	98-01	02-07	08-12	98-01	02-07	08-12	98-01	02-07	08-12	98-01	02-07	08-12
Job flows															
Year-to-year growth rate		-			-			-			-			-	
Year-aggregated creation rate	13.35%	13.52%	15.64%	7.44%	6.44%	6.48%	5.31%	5.15%	5.73%	4.93%	5.06%	4.86%	2.99%	2.80%	4.50%
Year-aggregated destruction rate	14.38%	14.55%	15.34%	9.17%	9.90%	9.04%	8.68%	10.28%	11.00%	7.51%	9.84%	10.15%	9.71%	9.67%	8.62%
Worker flows															
Entry rate	42.09%	46.73%	53.75%	32.34%	25.27%	36.59%	31.52%	20.72%	23.59%	32.00%	19.40%	22.25%	36.60%	11.40%	15.12%
Short-term contract	28.64%	31.94%	40.35%	24.74%	18.61%	29.71%	23.75%	16.06%	18.84%	13.45%	14.71%	17.65%	23.25%	8.82%	10.93%
Long-term contract	12.24%	13.04%	11.62%	6.79%	5.81%	5.98%	7.07%	3.80%	3.97%	17.34%	3.59%	3.73%	5.12%	2.16%	2.97%
Share of STC in entries	68.05%	68.35%	75.07%	76.50%	73.65%	81.19%	75.35%	77.53%	79.86%	42.03%	75.85%	79.30%	63.53%	77.35%	72.30%
Exit rate	41.06%	46.20%	52.94%	32.54%	26.67%	37.46%	32.12%	23.02%	26.03%	21.45%	21.59%	24.36%	36.26%	14.24%	17.22%
Short-term contract	22.57%	27.15%	35.00%	21.41%	16.52%	27.63%	20.59%	14.50%	17.33%	11.03%	13.22%	16.06%	21.41%	8.06%	10.41%
Long-term contract	13.85%	13.80%	11.46%	8.04%	6.72%	6.05%	7.84%	5.05%	4.37%	7.54%	4.54%	4.19%	5.50%	3.12%	3.09%
Share of STC in exits	54.97%	58.75%	66.12%	65.81%	61.93%	73.76%	64.11%	63.00%	66.60%	51.40%	61.23%	65.94%	59.04%	56.59%	60.45%

Note: STC refers to short-term contract. During the 1998-2001 period, in establishments whose workforce is between 10 and 49 workers, in annual average per 100 employees, 42.09 workers have been hired; 28.64 workers have been hired in short-term contract and 12.24 have been hired in long-term contract. Moreover, during the same period, in annual average per 100 employees, 41.06 workers exit establishments; 22.57 after a short-term contract and 13.85 after a long-term contract. The sum of entries (exits) into short-term contract and entries (exits) into long-term contract is not equal to the number of entries (exits) because I do not take into account other types of entries (exits) (as transfers from one establishment to another).

Table 1.18: Required worker flows (WF) for one job creation (JC) and destruction (JD) by size categories, DMMO and EMMO 1998-2012

		Necessary WF for one JC			Necessary WF for one JD		
		1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012
10;49	Hiring	1.41	1.55	1.72	0.82	1.06	1.13
	Separation	1.17	1.33	1.50	0.90	1.17	1.23
50;199	Hiring	2.51	3.87	4.97	1.84	3.06	4.33
	Separation	2.07	3.25	4.44	2.10	3.50	4.75
120;249	Hiring	3.01	4.60	5.23	2.02	3.33	4.09
	Separation	2.52	3.85	4.51	2.38	3.96	4.66
250;599	Hiring	5.16	4.44	7.98	1.71	3.09	4.88
	Separation	4.70	3.63	7.31	1.99	3.73	5.46
600+	Hiring	2.61	3.19	4.33	1.12	2.23	4.58
	Separation	1.89	2.56	3.77	1.44	2.84	3.75

Note: During the period 1998-2001, in establishments between 10 and 49 workers, on annual average, the creation of one job requires 1.41 hiring and 1.17 separation and the destruction of one job requires 0.82 hiring and 0.90 separation. These figures are obtain using figures in Tables 1.15 and 1.16 that is to say, dividing the entry (exit) rate by the year-to-year growth rate.

1.7 Why employer use short-term contracts ?

The objective of this section is to study deeper the use of short-term contracts by French firms. I then identify French employers and employees' characteristics that determine the fact to hire/be hired with short-term contracts instead of long-term contracts[51].

As noticed by Matos and Parent (2016), only few papers answer this question considering the firm side. A better understanding of the reasons which explain the use of short-term contracts by firms could enable to drive economic policies in order to achieve their goal, that is to say, to stabilize employment. Portugal and Varejão (2009), using longitudinal firm-level data and matched employer-employee data, find that firms with a larger share of high-skilled

[51]Indeed, a lot of papers concentrate on the identification of workers characteristics explaining why they are hired temporarily. Varejão and Portugal (2005) show that typical workers who get a short-term contract are generally females who have less than 35 years old and few education. Moreover, Fernández and Ortega (2008) show that the fact to be immigrant is also an important characteristic to describe workers who obtain short-term contracts.

positions, where training is more frequent, which are young and have a younger workforce less frequently hire with short-term contracts. Moreover, Matos and Parent (2016), using a matched employer-employee dataset, show that young firms and especially startups use more short-term contracts than the others.

I use the DMMO and the EMMO datasets but for the 2001-2012 period[52] in order to shed the light on the characteristics of firms which could explain why they hire with short-term contracts instead of long-term contracts and, most of all, to confirm the role played by the existence of customary contracts on the high resort to short-term contracts by firms (and its behaviour over time) found in the previous section.

The dataset is so big that logit and probit estimates have difficulties to converge. Thus, I use a probabilistic linear model[53]. This model might have the problem to have predictions outside $[0, 1]$ but I am mainly interested in the coefficients which remain unbiased (see Angrist and Pischke (2009) for a defense of this procedure)[54]. The model estimated is then

$$y_{ijt} = X_{ijt}\beta + \epsilon \tag{1.1}$$

where i is the subscript corresponding to the worker and j the subscript for the establishment at time t,

$$y_{ijt} = \begin{cases} 1 & \text{if the establishment hires the worker in short-term contract} \\ 0 & \text{otherwise (i.e. it hires in long-term contract)} \end{cases}$$

X is the vector of independent variables and β the associated coefficients.

The independent variables then melt workers and firms' characteristics and are listed below:

- Establishments' characteristics
  - A first set reflects the size of the establishment in terms of workforce (> 600 employees is the base group).
  - A second set describes establishment employment variation, i.e. if it is growing, shrinking or stable in terms of workforce (the shrinking category is the base group).

[52] Missing information for the region variable makes the use of the period 1998-2000 impossible).

[53] In appendix 1.A.5, I give the results obtained using a non-linear least squares model estimating the share of short-term contracts in hirings in firms instead of the probability to hire in short-term contract.

[54] Indeed, I use each hiring in establishments independently during the period 2001-2012, that is to say, I do not aggregate entries by firms. This implies to use a dataset bigger than 30 million observations.

- A dummy industry variable which is equal to 1 if the establishment can use customary contracts and 0 otherwise.
- A dummy variable which is equal to 1 if the establishment has a at least one temporary worker (*intérimaire*) in its end-of-quarter stock and 0 otherwise.
- A dummy variable which is equal to 1 if the year is equal or above 2008 and 0 otherwise.

- Worker's characteristics
  - The age of the worker concerned by the hiring ($<$ 25 years old is the base group).
  - The occupation of the worker[55] concerned by the hiring (unskilled blue-collar workers is the base group).
  - The gender of the worker concerned by the hiring. This dummy is equal to one for women, 0 otherwise.

The control variables are the date, the region of establishments and the origin of the data (DMMO or EMMO)[56].

Table 1.19 shows that establishments which can use customary contracts are 10.07 percentage points more likely to use short-term contracts to hire employees. Then, the legislation existing on this particular type of contracts seems to have a real impact on the magnitude of the use of short-term contracts which confirms the suggestive evidence in section 1.6.1. In addition, the probability to enter into a short-term contract is almost 6.75 percentage points higher during the year following the 2008 crisis[57]. Those facts suggest, as in section 1.5, that the possibility to use customary contracts and the 2008 crisis positively impact the probability to hire in short-term contract.

Moreover, as the age of the worker increases, the probability to be hired in short-term contract decreases (until 3 percentage points for workers older than 55 years old). If we look at workers' occupation, we can notice that this probability declines compared to the unskilled blue-collar workers. Indeed, the probability to be hired in short-term contract decreases by almost 34 percentage points if the worker is hired as manager. This is less pronounced for white-collar workers since the probability to be hired in short-term contract decreases only by 3.31

[55] Using the French code *Professions et Catégories Socioprofessionnelles*.

[56] In appendix 1.A.4, I show that results are qualitatively the same when I introduce industry dummies to control for industry cyclicality.

[57] The impact of the 2008 crisis is more pronounced when I take into account industry cyclicality as we can see in appendix 1.A.4.

percentage points[58]. Concerning the size of the establishment, establishments between 10 and 120 employees are however less likely to use short-term contracts compared to establishments with more than 600 employees. Finally, a woman is more than 7 percentage points more likely to be hired in short-term contract.

[58]Concerning the impact of workers occupation, results are stronger when I take into account industry cyclicality as we can see in appendix 1.A.4.

Table 1.19: Estimates of the effect of firms and workers' characteristics on the probability to hire (be hired) in short-term contract

	Estimate
The establishment uses workers from temporary employment agencies	-.0340***
	-0.0002
Employment situation of the establishment (Shrinking establishments omitted)	
Growing	-.0536***
	(.0001)
Stable	-.0073***
	(.0003)
Size of the establishment (>600 omitted)	
>=10;<50	-.0040***
	(.0006)
>=50;<120	-.0100***
	(.0002)
>=120;<250	.0003***
	(.0002)
>=250;<600	.0008***
	(.0002)
Establishments can use customary contracts	.1007***
	(.0002)
Age of the worker (<25 years old omitted)	
25-39 years old	-.0940***
	(.0002)
40-54 years old	-.0759***
	(.0002)
Older than 55 years old	-.0298***
	(.0004)
Worker's occupation (Unskilled blue-collar workers omitted)	
Entrepreneurs, liberal professionals	-.5598***
	(.0030)
Managers	-.3426***
	(.0003)
Intermediates	-.1185***
	(.0002)
White-collar workers	-.0331***
	(.0002)
Skilled blue-collar workers	-.0988***
	(.0003)
Gender (male omitted)	.0740***
	(.0002)
Recession (years < 2008 omitted)	.0675***
	(.0004)
Intercept	.6090***
	(.0008)
Region Dummies	YES
Date fixed-effect	YES
Firm fixed-effect	YES
Data source Dummies	YES
Observations	30,389,551
R^2	.15

Standard errors in parenthesis
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

1.8 Conclusion

In this paper, I have shown that churning is very high in France and has increased during the 2008-2012 period. I also point out that this increase mainly comes from a higher resort to short-term contracts. Fluctuations in the number of entries into short-term contracts show that the use of this kind of contract is procyclical. Actually, in the quarters following the 2008 crisis, the number of entries into short-term contracts falls strongly and the recovery is based on a greater resort to those contracts especially very short-term contracts. As a consequence, since 2009, establishments use more and more short-term contracts when they hire and those contracts are shorter than before this date. However, this evolution is mainly attributable to industries which face less legal constraints to use short-term contracts. In addition, the size of establishments seems to play a role in the worker turnover in excess since it sharply increases in large establishment during the 2008-2012 period.

Last but not least, and in line with my previous findings, I show that the probability to hire in short-term contract is positively impacted by the fact to be an establishment allowed to use customary contracts. In the current economic context, that is to say the willingness to reform the French labor market taxing, for instance, the use of short-term contracts[59], it seems important to take into account the existence of the customary contracts and the need for firms for more flexibility.

[59]The French Interprofessional Agreement of July 2013 increases the employer's contribution to unemployment insurance for short-term contracts (between 1 day and 3 months) but this agreement does not really target customary contracts (since the extra taxation for this kind of contract is only about 0.5 percentage point while it is between 1.5 and 3 percentage points for the other short-term contracts depending on their duration). This tax was canceled in 2017 except for customary contracts but the extra taxation is so small and the possibilities to circumvent taxation so numerous that we can not expect real changes in firms' hiring policy.

1.A Appendix

1.A.1 Computation of job and worker flows

1.A.1.1 Computation of job flows

First, I define the annual average size of the establishment i between the beginning and the end of each year (year-to-year computation) as:

$$Z_{i,t} = \frac{1}{2}.(X_{i,t}) + \frac{1}{2}.(X_{i,t-1}) \tag{1.2}$$

where $X_{i,t-1}$ is the number of employees working in establishment i at the beginning of the year (first quarter) and $X_{i,t}$ is the number of employees working in establishment i at the end of the year (last quarter).

The year-to-year job creation rate in i is simply defined as:

$$C_{i,t} = \frac{X_{i,t} - X_{i,t-1}}{Z_{i,t}} \tag{1.3}$$

in growing establishments where $X_{i,t} > X_{i,t-1}$.

The year-to-year job destruction rate in establishment i is computed as:

$$D_{i,t} = \left| \frac{X_{i,t} - X_{i,t-1}}{Z_{i,t-1}} \right| \tag{1.4}$$

in shrinking establishments where $X_{i,t} < X_{i,t-1}$.

Another way to compute those annual flows when we have quarterly data is to sum the quarterly rates for each establishment. Consequently, the "aggregated job creation rate" is defined as the sum of the quarterly rates,

$$c_{i,t} = \sum_{q=1}^{4} \frac{(X_{i,t,q} - X_{i,t,q-1})}{Z_{i,t,q}} \tag{1.5}$$

where q is the subscript of the quarter and $Z_{i,t,q} = \frac{1}{2}.(X_{i,t,q}) + \frac{1}{2}.(X_{i,t,q-1})$.

The "aggregated job destruction rate" is defined in the same way:

$$d_{i,t} = \sum_{q=1}^{4} \left| \frac{(X_{i,t,q} - X_{i,t,q-1})}{Z_{i,t,q}} \right| \tag{1.6}$$

1.A.1.2 Computation of worker flows

These flows are only computed in "year-to-year". Here are the hiring and separation rates:

$$HR_{i,t} = \frac{\sum_{q=1}^{4} H_{i,t,q}}{Z_{i,t}} \tag{1.7}$$

$$SR_{i,t} = \frac{\sum_{q=1}^{4} S_{i,t,q}}{Z_{i,t}} \tag{1.8}$$

where $H_{i,t,q}$ is the number of workers who are hired by the establishment i during each quarter q of the year t and $S_{i,t,q}$ is the number of workers who leave the establishment i during each quarter q of the year t.

I decompose those rates by contract type (short-term and long-term contracts):

$$H_{i,t,CT} = \frac{\sum_{q=1}^{4} H_{i,t,q,CT}}{Z_{i,t}} \tag{1.9}$$

$$S_{i,t,CT} = \frac{\sum_{q=1}^{4} S_{i,t,q,CT}}{Z_{i,t}} \tag{1.10}$$

where $H_{i,t,q,CT}$ is the number of workers who are hired in contract whose type is CT (short-term or long-term contract) by the establishment i, during each quarter q of the year t and $S_{i,t,q,CT}$ is the number of workers who leave the establishment i while they were working in contract whose type is CT, during each quarter q of the year t. Exits from long-term contract corresponds to layoff, redundancy, resignation, pre-retirement and retirement. I exclude the *rupture conventionnelle* motive which appears in 2008 in order to prevent my result for some bias.

1.A.2 Tables and graphics with the EMMO dataset

In this section of the appendix, I report figures for establishments whose workforce is between 10 and 49 employees. Remember that the EMMO is not an exhaustive dataset and that respondents are randomly selected in the population. Especially, remember that results could be biased downward because computation requires to follow establishments along four consecutive quarters and then implies that the establishment must respond and survive for these four consecutive quarters.

1.A.2.1 Job and worker flows

Table 1.20: Job and worker flows by contract types, EMMO 1998-2012

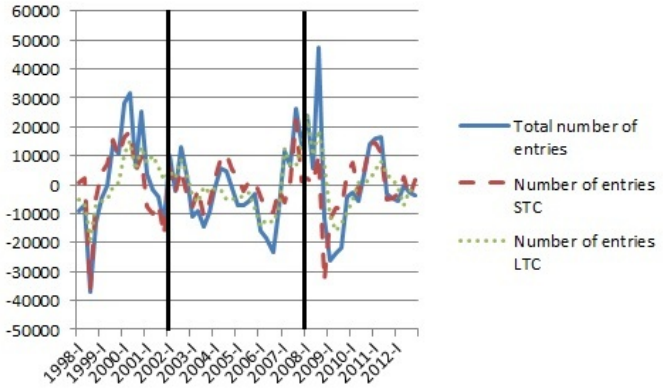
	Growing Establishments			Shrinking Establishments			Stable Establishment		
	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012
Job Flows									
Year-to-year growth rate	35.77%	34.13%	35.95%	47.19%	42.37%	43.58%		-	
Year-aggregated creation rate	20.17%	19.98%	22.18%	13.90%	14.21%	14.96%	13.32%	13.41%	15.55%
Year-aggregated destruction rate	12.74%	13.45%	14.39%	19.74%	20.11%	21.23%	14.32%	14.41%	15.20%
Worker Flows									
Entry rate	50.58%	52.89%	61.93%	39.08%	44.84%	48.72%	42.37%	46.44%	53.40%
Short-term contract	32.40%	33.51%	43.74%	26.43%	30.30%	35.78%	28.92%	31.67%	39.99%
Long-term contract	16.93%	17.67%	16.14%	11.75%	13.10%	11.43%	12.25%	13.04%	11.66%
Share of STC in entries	64.06%	63.35%	70.63%	67.64%	67.58%	73.45%	68.25%	68.19%	74.88%
Exit rate	41.96%	45.46%	53.96%	42.65%	49.49%	53.36%	41.30%	45.91%	52.61%
Short-term contract	22.63%	25.55%	34.95%	22.08%	27.35%	33.14%	22.82%	26.91%	34.66%
Long-term contract	14.62%	14.35%	11.85%	15.07%	15.71%	12.61%	13.85%	13.77%	11.50%
Share of STC in exits	53.95%	56.20%	64.77%	51.76%	55.26%	62.11%	55.25%	58.62%	65.87%

Note: In growing establishments during the 1998-2001 period, in annual average per 100 employees, 50.58 workers have been hired; 32.40 workers have been hired into STC and 16.93 have been hired into LTC. Moreover, during the same period, in annual average per 100 employees, 41.96 workers exit establishments; 22.63 after a STC and 14.62 after a LTC. The sum of the hired into STC and hired into LTC is not equal to the number of workers hired because I do not take into account other types of entries/exits (as transfers from one establishment to another). In addition, during the same period, in establishments with increasing employment, the average increase of 35.77 jobs per 100 employees during the year t goes along with 20.17 creations within this same year t (year-aggregated creation rate) and with 12.74 job destructions (year-aggregated destruction rate) per 100 employees within the same given year.

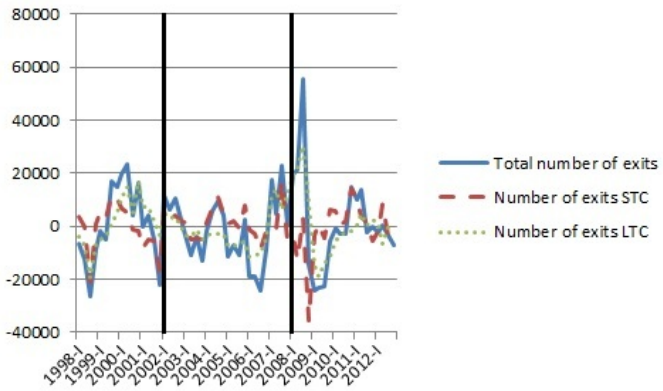
Table 1.21: Required worker flows (WF) for one job creation (JC) and destruction (JD), EMMO 1998-2012

	Necessary WF for one JC			Necessary WF for one JD		
	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012
Hiring	1.41	1.55	1.72	0.83	1.06	1.12
Separation	1.17	1.33	1.50	0.90	1.17	1.22

Note: During the period 1998-2001, on annual average, the creation of one job requires 1.41 hiring and 1.17 separation and the destruction of one job requires 0.83 hiring and 0.90 separation. These figures are obtain using figures in table 1.20 that is to say, dividing the entry/exit rate by the year-to-year growth rate.



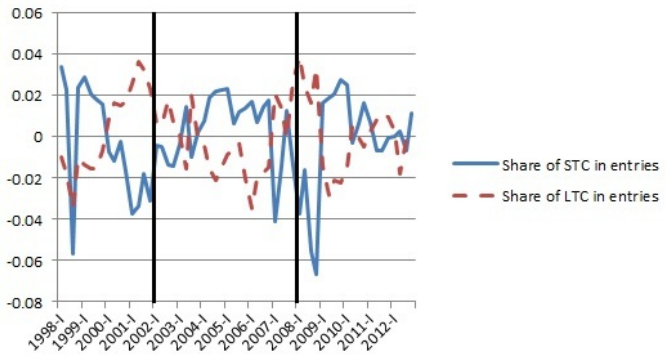
(a) Entries



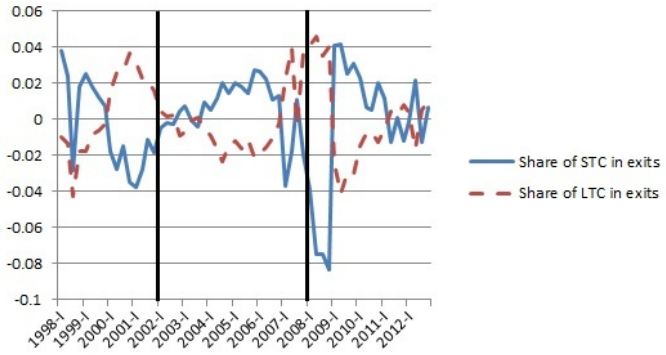
(b) Exits

Figure 1.8: Number of entries and exits by contract type, EMMO 1998-2012.

Note: STC refers to short-term contract and LTC to long-term contract. Authors's computation. Detrended series using an Hodrick Prescott filter with standard smoothing parameter (1,600).



(a) Entries



(b) Exits

Figure 1.9: Share of short-term contracts and long-term contracts in entries and exits, EMMO 1998-2012.

Note: STC refers to short-term contract and LTC to long-term contract. Authors's computation. Detrended series using an Hodrick Prescott filter with standard smoothing parameter (1,600).

1.A.2.2 Job and worker flows according to the use of customary contracts

Table 1.22: Job and worker flows by contract types in industries that can not use customary contracts, EMMO 1998-2012

	Growing Establishments			Shrinking Establishments			Stable Establishments		
	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012
Job Flows									
Year-to-year growth rate	36.54%	35.13%	37.00%	47.92%	42.74%	46.12%		-	
Year-aggregated creation rate	18.26%	17.95%	19.52%	12.30%	12.50%	13.46%	12.35%	12.11%	13.13%
Year-aggregated destruction rate	10.99%	12.05%	12.42%	17.48%	17.87%	17.74%	12.97%	13.23%	12.55%
Worker Flows									
Entry rate	40.16%	40.16%	41.10%	29.19%	32.10%	30.91%	33.92%	36.83%	36.59%
Short-term contract	24.55%	23.50%	26.13%	18.75%	19.93%	20.65%	21.69%	23.84%	24.62%
Long-term contract	14.37%	14.72%	12.77%	9.49%	10.58%	8.62%	10.98%	11.20%	10.07%
Share of STC in entries	61.13%	58.53%	63.57%	64.23%	62.08%	66.82%	63.95%	64.72%	67.28%
Exit rate	32.34%	33.72%	34.25%	32.15%	36.00%	34.30%	32.78%	36.09%	35.74%
Short-term contract	15.70%	16.64%	18.52%	14.51%	16.77%	17.93%	16.07%	19.25%	19.85%
Long-term contract	12.57%	12.26%	9.70%	12.86%	13.50%	10.13%	12.49%	12.20%	9.87%
Share of STC in exits	48.54%	49.35%	54.09%	45.13%	46.58%	52.27%	49.03%	53.34%	55.54%

Note: In growing establishments during the 1998-2001 period, in annual average per 100 employees, 40.16 workers have been hired; 24.55 workers have been hired into STC and 14.37 have been hired into LTC. Moreover, during the same period, into annual average per 100 employees, 32.34 workers exit establishments; 15.70 after a STC and 12.57 after a LTC. The sum of the hired into STC and hired into LTC is not equal to the number of workers hired because I do not take into account other types of entries/exits (as transfers from one establishment to another). In addition, during the same period, in establishments with increasing employment, the average increase of 36.54 jobs per 100 employees during the year t goes along with 18.26 creations within this same year t (year-aggregated creation rate) and with 10.99 job destructions (year-aggregated destruction rate) per 100 employees within the same given year.

Table 1.23: Required worker flows (WF) for one job creation (JC) and destruction (JD), industries that can not use customary contracts, EMMO 1998-2012

	Necessary WF for one JC			Necessary WF for one JD		
	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012
Hiring	1.10	1.14	1.11	0.61	0.75	0.67
Separation	0.88	0.96	0.93	0.67	0.84	0.74

Note: During the period 1998-2001, on annual average, the creation of one job requires 1.10 hiring and 0.88 separation and the destruction of one job requires 0.61 hiring and 0.67 separation. These figures are obtain using figures in Table 1.22 that is to say, dividing the entry (exit) rate by the year-to-year growth rate.

Table 1.24: Job and worker flows by contract types in industries that use customary contracts, EMMO 1998-2012

	Growing Establishments			Shrinking Establishments			Stable Establishments		
	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012
Job Flows									
Year-to-year growth rate	34.27%	32.49%	34.52%	45.62%	41.73%	39.83%		-	
Year-aggregated creation rate	23.47%	22.98%	25.41%	16.67%	16.91%	16.74%	15.18%	15.57%	18.83%
Year-aggregated destruction rate	15.59%	15.48%	16.76%	23.69%	23.69%	25.56%	16.74%	16.27%	18.85%
Worker Flows									
Entry rate	69.97%	73.83%	91.14%	58.75%	68.45%	74.34%	59.52%	63.98%	77.74%
Short-term contract	47.04%	49.97%	68.31%	41.70%	49.61%	57.50%	43.59%	45.94%	61.98%
Long-term contract	21.69%	22.52%	20.97%	16.25%	17.69%	15.51%	14.86%	16.38%	14.20%
Share of STC in entries	67.22%	67.68%	74.96%	70.98%	72.48%	77.34%	73.23%	71.81%	79.73%
Exit rate	59.86%	64.78%	81.61%	63.53%	74.51%	80.77%	58.60%	63.83%	77.15%
Short-term contract	35.57%	40.21%	57.89%	37.11%	47.05%	54.95%	36.48%	40.87%	55.91%
Long-term contract	18.40%	17.78%	14.94%	19.50%	19.73%	16.21%	16.63%	16.68%	14.00%
Share of STC in exits	59.42%	62.07%	70.93%	58.41%	63.15%	68.04%	62.25%	64.02%	72.48%

Note: In growing establishments during the 1998-2001 period, in annual average per 100 employees, 69.97 workers have been hired; 47.04 workers have been hired into STC and 21.69 have been hired into LTC. Moreover, during the same period, in annual average per 100 employees, 59.86 workers exit establishments; 35.57 after a STC and 18.40 after a LTC. The sum of the hired into STC and hired into LTC is not equal to the number of workers hired because I do not take into account other types of entries/exits (as transfers from one establishment to another). In addition, during the same period, in establishments with increasing employment, the average increase of 34.27 jobs per 100 employees during the year t goes along with 23.47 creations within this same year t (year-aggregated creation rate) and with 15.59 job destructions (year-aggregated destruction rate) per 100 employees within the same given year.

Table 1.25: Required worker flows (WF) for one job creation (JC) and destruction (JD), industries that use customary contracts, EMMO 1998-2012

	Necessary WF for one JC			Necessary WF for one JD		
	1998-2001	2002-2007	2008-2012	1998-2001	2002-2007	2008-2012
Hiring	2.04	2.27	2.64	1.29	1.64	1.87
Separation	1.75	1.99	2.36	1.39	1.79	2.03

Note: During the period 1998-2001, on annual average, the creation of one job requires 2.04 hiring and 1.75 separation and the destruction of one job requires 1.29 hiring and 1.39 separation. These figures are obtain using figures in Table 1.24 that is to say, dividing the entry (exit) rate by the year-to-year growth rate.

1.A.2.3 Duration of short-term contracts in the EMMO

In this section of the appendix, I report the mean duration of short-term contracts for establishments whose workforce is between 10 and 49 workers. As I mentioned earlier, this duration could be overestimated since it is not compulsory for establishments to report hiring (and then separation) for which the contract duration is below one month.

Table 1.26: Mean duration of short-term contracts in months, EMMO 1998-2012

Type of exit	Period	Mean duration (in months)
Short-term contract	1998-2001	4.44
	2002-2007	5.43
	2008-2012	5.29

Table 1.27: Mean duration of short-term contracts in months, industries that can not use customary contracts, EMMO 1998-2012

Type of exit	Period	Mean duration (in months)
Short-term contract	1998-2001	4.55
	2002-2007	5.48
	2008-2012	5.53

Table 1.28: Mean duration of short-term contracts in months, industries that use customary contracts, EMMO 1998-2012

Type of exit	Period	Mean duration (in months)
Short-term contract	1998-2001	4.32
	2002-2007	5.39
	2008-2012	5.13

1.A.3 The probabilistic linear model with industry dummies

Table 1.29: Estimates of the effect of firms and workers' characteristics on the probability to hire (be hired) in short-term contract with industry dummies

	Estimate
The establishment uses workers from temporary employment agencies	-.0343***
	-0.0002
Employment situation of the establishment (Shrinking establishments omitted)	
Growing	-.0546***
	(.0002)
Stable	-.0238***
	(.0004)
Size of the establishment (>600 omitted)	
>=10;<50	-.0252***
	(.0006)
>=50;<120	-.0369***
	(.0003)
>=120;<250	-.0082***
	(.0003)
>=250;<600	-.0070***
	(.0003)
Age of the worker (<25 years old omitted)	
25-39 years old	-.0995***
	(.0002)
40-54 years old	-.0895***
	(.0002)
Older than 55 years old	-.0455***
	(.0004)
Worker's occupation (Unskilled blue-collar workers omitted)	
Entrepreneurs, liberal professionals	-.6547***
	(.003)
Managers	-.4322***
	(.0003)
Intermediates	-.2612***
	(.0003)
White-collar workers	-.1320***
	(.0002)
Skilled blue-collar workers	-.1611***
	(.0003)
Gender (male omitted)	.0595***
	(.0002)
Recession (years < 2008 omitted)	.1109***
	(.0004)
Intercept	.9881***
	(.0008)
Industry Dummies	YES
Region Dummies	YES
Date fixed-effect	YES
Firm fixed-effect	YES
Data source Dummies	YES
Observations	26,238,567
R^2	.1851

Standard errors in parenthesis
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

1.A.4 The non-linear least squares model

In this section, I propose an alternative regression which corresponds to a non-linear regression model. I use both the DMMO and the EMMO datasets. The dependent variable is now the share of short-term contracts in hirings in each firm j. In order to insure that this share is between 0 and 1, I make a logistic transformation of the share as in Barlet, Duguet, Encaoua and Pradel (2000) which is a standard way to proceed[60]. Such as the probabilistic linear model, I propose two versions of this model: the first one(Table 1.30) allows to estimate the impact of customary contracts on the share of short-term contracts in hirings and the second one (Table 1.31) take into account industry cyclicality.

The estimated equation is the following:

$$y_{jt} = \frac{\exp(X_j\beta + u)}{1 + \exp(X_j\beta + u)} \tag{1.11}$$

where y is the dependent variable (the share of short-term contracts in entries in total entries in establishment j at time t), X_j is the vector of independent variables and β the associated coefficients.

Because the DMMO/EMMO dataset contains few stock variables, the dependent variable is the share of entries for short-term contracts in total entries. The independent variables are mainly a set of dummy variables:

- A first set reflects the size of the establishment in terms of workforce (> 600 employees is the base group).
- A second set describes establishment employment variation, i.e. if it is growing, shrinking or stable in terms of workforce (the shrinking category is the base group).
- A dummy industry variable which is equal to 1 if the establishment can use customary contracts and 0 otherwise.
- A dummy variable which is equal to 1 if the establishment has at least one temporary worker (*intérimaire*) in its end-of-quarter stock and 0 otherwise.
- The share of men in the workforce at the end of the quarter.
- A dummy variable which is equal to 1 if the year is equal or above 2008 and 0 otherwise.

[60]See Davidson and Mackinon (1993). For an alternative and more recent procedure, see Papke and Wooldridge (1996).

The control variables are the date, the region of the establishments and the origin of the data (DMMO or EMMO). As for the probabilistic linear model, I also compute the regression with industry dummies in order to take into account industries' characteristics.

Table 1.30 shows that establishment's characteristics play a role in the level of short-term contracts in hirings. All coefficients are statistically significant at 1% level.

Being allowed to use customary contracts increases the share of short-term contracts by 2.71 percentage points. This result reinforces the result of section 1.7 that indicates that employers intensively use this type of short-term contract. Secondly, we can notice that the presence of workers from temporary employment agencies in the workforce of the establishment plays a negative role on the share of short-term contracts in hirings (it decreases the share by almost 1.75 percentage points). Moreover, the share of men in the workforce strongly decreases the share of short-term contracts in hirings (around 30 percentage points). In addition, the employment growth category of establishments impacts their share of short-term contracts in hirings since to be in the growing or stable category reduces it compared to the case where establishments are in the shrinking category (almost 1.85 percentage points for establishments in the growing category). This confirms results found in section 1.5.1 where the share of short-term contracts in entries rises faster in the shrinking category than in the growing one. Furthermore, smaller establishments have a higher share of short-term contracts. An establishment with a workforce between 10 and 50 employees (between 50 and 120 employees) has a share of short-term contracts which is 1.76 (2.41) percentage point higher than establishments with more than 600 employees. Overall, to include industry dummies conveys the same idea but results are stronger. The only thing which seems uncertain is the impact of the 2008 crisis. Indeed, in the first specification of the model (Table 1.30), its impact is negative while in the second specification (Table 1.31), it has a positive impact on the share of short-term contracts in hirings.

Table 1.30: Estimates of the effect of firms' characteristics on the share of short-term contract in firms' hirings

	Estimate	Marginal effect
The establishment uses workers from temporary employment agencies	-.1951***	-.0175
	(.0033)	
Share of men in the workforce at the end of the quarter	-1.7003***	-.3002
	(.0122)	
Employment situation of the establishment (Shrinking establishments omitted)		
Growing	-.1160***	-.0185
	(.0029)	
Stable	-.0687***	-.0021
	(.0049)	
Size of the establishment (>600 omitted)		
>=10;<50	.2336***	.0176
	(.0092)	
>=50;<120	.1764***	.0241
	(.0067)	
>=120;<250	.1845***	.0127
	(.0070)	
>=250;<600	.1689***	.0058
	(.0075)	
Establishments can use customary contracts	.2332***	.0271
	(.0035)	
Recession	-1.4820***	-.1900
	(.0066)	
Intercept	.0024	
	(.0019)	
Region Dummies	YES	
Date fixed-effect	YES	
Firm fixed-effect	YES	
Data source Dummies	YES	
Observations	1,691,340	
R^2	.1009	

Standard errors in parenthesis

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.31: Estimates of the effect of firms' characteristics on the share of short-term contract in firms' hirings with industry dummies

	Estimate	Marginal effect
The establishment uses workers from temporary employment agencies	-.2111***	-.0265
	(.0034)	
Share of men in the workforce at the end of the quarter	-1.4856***	-.3608
	(.0034)	
Employment situation of the establishment (Shrinking establishments omitted)		
Growing	-.1026***	-.0218
	(.0028)	
Stable	-.0779**	-.0032
	(.0046)	
Size of the establishment (>600 omitted)		
>=10;<50	.3696***	.0365
	(.0097)	
>=50;<120	.1772***	.0315
	(.0070)	
>=120;<250	.2210***	.0208
	(.0073)	
>=250;<600	.2202***	.0103
	(.0078)	
Recession	.7909***	.1172
	(.0068)	
Intercept	.1030***	
	(.0034)	
Industry Dummies	YES	
Region Dummies	YES	
Date fixed-effect	YES	
Firm fixed-effect	YES	
Data source Dummies	YES	
Observations	1,561,955	
R^2	.1524	

Standard errors in parenthesis

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

1.A.5 Industry code

In this section of the appendix, I report the link I established in the DMMO/EMMO dataset between the old industry variable code (*NAF rév. 1*) and the new one (*NAF rév. 2*) (used since 2009 in the DMMO/EMMO dataset). Industries in bold are those that use customary contracts.

Number	**Name**	**Code NAF rév. 1**	**Code NAF rév. 2**
1	Agriculture	01Z	01
2	Forestry and logging	02Z	02
3	Fishing and aquaculture	05Z	03
4	Mining of coal and lignite	10Z	05
5	Extraction of crude petroleum and natural gas	11	06
6	Mining of metal ores	13Z; 12Z	07
7	Other mining and quarrying	14Z	08
8	Manufacture of food products	15A; 15B	10
9	Manufacture of tobacco products	16Z	12
10	Manufacture of textiles	17Z	13
11	Manufacture of wearing apparel	18Z	14
12	Manufacture of leather and related products	19Z	15
13	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	20Z	16
14	Manufacture of paper and paper products	21Z	17
15	Manufacture of coke and refined petroleum products	23Z	19

16	Manufacture of chemicals and chemical products, Manufacture of basic pharmaceutical products and pharmaceutical preparations	24A; 24B	20; 21
17	Manufacture of rubber and plastic products	25A; 25B	22
18	Manufacture of other non-metallic mineral products	26Z	23
19	Manufacture of basic metals	27Z	24
20	Manufacture of fabricated metal products, except machinery and equipment	28B	25
21	Manufacture of computer, electronic and optical products	30Z; 32A; 32B; 33A; 33B	26
22	Manufacture of electrical equipment	31A; 31B	27
23	Manufacture of machinery and equipment n.e.c; Repair and installation of machinery and equipment	29A; 29B; 29C	28; 33
24	Manufacture of motor vehicles, trailers and semi-trailers	34Z	29
25	Manufacture of other transport equipment	35A; 35B	30
26	Manufacture of furniture; Other manufacturing	36A; 36B; 36C	31; 32
27	Electricity, gas, steam and air conditioning supply	40A; 40B	35
28	Water collection, treatment and supply	41Z	36
29	Sewerage; Remediation activities and other waste management services	37; 90	37; 38
30	Construction of buildings; Civil engineering; Specialized construction activities	45Z	41; 42; 43
31	Wholesale and retail trade and repair of motor vehicles and motorcycles	50Z	45

32	Wholesale trade, except of motor vehicles and motorcycles	51A; 51B; 51C; 51D	46
33	Retail trade, except of motor vehicles and motorcycles; Repair of computers and personal and household goods	52A; 52B; 52C	47; 95
34	Land transport and transport via pipelines	60A; 60B	49
35	Water transport	61Z	50
36	Air transport	62Z	51
37	Warehousing and support activities for transportation; Travel agency, tour operator and other reservation service and related activities	63Z	52; 79
38	Postal and courier activities; Telecommunications	64Z	53; 61
39	**Accommodation; Food and beverage service activities**	**55Z**	**55; 56**
40	Insurance, reinsurance and pension funding, except compulsory social security	66Z	65
41	Activities auxiliary to financial services and insurance activities	67Z	66
42	Real estate activities	70Z	68
43	Scientific research and development	73Z	72
44	**Education**	**80Z**	**85**
45	**Health and social activities**	**85A; 85B**	**75; 86; 87; 88**
46	Public administration and defence; compulsory social security	75Z	84

47	**Firm service activities**	**74A; 74B; 74C**	**69; 70; 71; 73; 74; 78; 80; 81; 82**
48	Financial service activities, except insurance and pension funding	65Z	64
49	Computer programming, consultancy and related activities	72Z	62
50	**Sports activities and amusement and recreation activities; Gambling and betting activities; Printing**	**22Z; 92A; 92B**	**18; 58; 59; 60; 90; 91; 92; 93**
51	Activities of membership organizations	91Z	94
52	Personal service activities	93Z	96
53	Rental and leasing activities	71Z	77

Chapter 2

Unemployment Dynamics in Dual Labor Markets: the Case of France

Abstract[1]

This paper investigates transition rates that take place on the French labor market and makes comparison with other countries (mainly Spain). I use the French labor force survey for the 2003-2012 period to compute transition rates in a three-state (employment, unemployment and inactivity) and a four-state (splitting employment into permanent and temporary) model. The main results are that: (i) the fluctuations of the job finding rate explain a larger part of unemployment variability than the job separation rate does, (ii) considering the four-state model, transition rates involving permanent jobs account more than those involving temporary jobs in explaining unemployment fluctuations and (iii) temporary jobs account more in the job finding rate than in the separation rate. Focusing on young, women and unskilled workers who are more likely to be employed on short-term contracts may however alter this result.

Key words: Transition probabilities, Job finding rate, Job separation rate, Unemployment, Temporary jobs.

JEL classification: E24, E32, J64.

[1]I am infinitely grateful to Pedro Gomes for his usefull comments and the time he granted me during the T2M conference (2017, Lisbon).

2.1 Introduction

Many European countries have chosen to follow defensive strategies limiting job destructions to fight the increase in unemployment experienced since the 70's, and to attenuate the lack of job creation, the very same countries have relied on the introduction of a dual employment protection legislation with heavily protected permanent contracts and unprotected short-term contracts since the 80's. While a defensive strategy could be justified if variations in unemployment were indeed led by the changes of the job destruction rate over the business cycle, the justification of the aforementioned combination of high firing costs and short-term contracts is more questionable: while firing costs protecting regular jobs reduce job creations and job destructions, the introduction of more flexible labour contracts increases both job creation and job destruction, which partly (if not totally) undoes what employment protection legislation was initially meant to do. For sure, dual employment protection legislation affects labour market flows in various ways, and in many cases, opposite ways, but how does it affect the behavior of unemployment over the business cycle?

In this paper, I aim at answering this question. To this aim, I try to provide a full picture of mobility on a dual labour market such as the French one, and then to study the contribution of the various labour market flows to unemployment dynamics over the period 2003-2012.

Starting with Shimer (2012) there has been a renewed interest for the study of labour market flows and their contribution to unemployment fluctuations. According to Shimer (2012), unemployment dynamics is mainly led by changes in job creation in the United States. Many studies have then followed to examine if the result holds for other countries, and in particular, for more regulated (European) labour markets[2]. Recently, a few papers have tried to quantify the role of each type of contract in unemployment dynamics for France (Hairault, Le Barbanchon and Sopraseuth (2015)) or Spain (Silva and Vázquez-Grenno (2013)).

However, the results of the two papers are not fully comparable: Hairault et al. (2015) uses a three-state model that does not take inactivity into account, while Silva and Vázquez-Grenno (2013) use a four-state model. I here aim at building a four-state model for the French case (where the states will be permanently employed, temporary employed, unemployed and inactive). The advantage is that this makes the results more comparable with Silva and Vázquez-Grenno (2013), and besides, it may be justified to take inactivity into account on the ground that (i) workers taking temporary jobs may be more prone to become inactive (ii) inactive individuals who take a job may be more likely to take a short-term contract rather than a permanent contract and (iii) more generally, a discouraged worker effect may be at work over

[2]Petrongolo and Pissarides (2008), Elsby, Hobijn and Şahin (2013), Fontaine (2016).

the business cycle. Moreover, I use the French labour force survey and not its retrospective calendar as in Hairault et al. (2015). Finally, I complement the existed literature studying unemployment fluctuations for young, women and unskilled workers, workers who are supposed to be more impacted by temporary employment.

In this paper, I use the French Labour Force Survey (LFS hereafter) for the period 2003-2012 to quantify the contribution of each transition rates in a typical three-state model, in a four-state model and in a three-state model *à la* Hairault et al. (2015). I use two methods to decompose unemployment fluctuations. First, I use the method implemented by Shimer (2012) which consists in creating counterfactual unemployment rates allowing only one transition rate to vary over time and keeping the others at their sample average. The second method I use is the one of Silva and Vázquez-Grenno (2013) that extends the methodology of Fujita and Ramey (2009). As noticed by Hairault et al. (2015), results obtained using these two methods are quantitatively equivalent (under comparable detrending methods). This is also the case in this paper.

The main findings of this paper are that, considering a three-state model, the contribution of the job finding rate (unemployment to employment transitions) to unemployment fluctuations is dominant (nearly 43%). Splitting employment into permanent and temporary, I find that the contribution of the separation rate is exclusively made of flows between permanent jobs and unemployment (31.3% for permanent jobs vs. 5.6% for temporary jobs) and that, even if temporary jobs account more in findings (13%) than in separations, the contribution of the job finding rate is mainly made of unemployment to permanent job transitions (24%). Then, as in Hairault et al. (2015), I find that permanent jobs account more in explaining unemployment dynamics than temporary jobs do. Finally, I show that if we concentrate on young, women and unskilled workers, some results are changed. For instance, the contribution of the job separation rate involving temporary jobs is higher for younger workers than in the general case (9.6% vs. 5.6%)) and the contribution of the job finding rate involving temporary employment is higher for unskilled workers than in the general case (19.1% vs. 13%). Moreover, focusing on women, I show that the contribution of the job finding rate is very high (almost 60%) and that the contribution of the transition from inactivity to employment to unemployment dynamic is higher than in the general case which is mostly due to transitions from inactivity to permanent jobs.

I proceed as follow. The next section reviews the literature on this topic. The third section presents the dataset and the methodology followed to exploit it. The fourth section depicts the French labor market flows and makes comparisons with some other countries. The fifth

decomposes unemployment dynamics in a three-state model and in a four-state model. Last section concludes.

2.2 Related literature

Unemployment dynamic has been intensely debated in the literature. Previous studies investigate first those transitions using two-sate (employment and unemployment) and then three-state (employment, unemployment and inactivity) models. More recently, the dual particularity of European labour markets has been taken into account and interest for four-state models started to emerge. In this section, I make a review of the literature existing on this topic. Table 2.1 summarizes the results from the articles cited below.

Blanchard and Diamond (1990) quantify the impact of aggregate activity shocks and found that employment to unemployment flows are countercyclical while unemployment to employment flows seem to be acyclical. During the last two decades, some papers study inflows and outflows from unemployment but their cyclical behaviour is still disputed. Shimer (2012) uses CPS data for the 1948-2010 period and models a continuous time environment to correct the time aggregation bias[3]. He studies the contribution of the separation and job finding rates in two-state (employment and unemployment) and three-state (employment, unemployment and inactivity) models building counterfactual unemployment rates holding all the transition rates except one fixed at their sample average. In a two-state world, he finds that for the 1948-2010 (1987-2010) period the job finding rate explains 77% (90%) of unemployment fluctuations and that "fluctuations in the employment exit probability are quantitatively irrelevant during the last two decades". In the three-state case, the transition rate from unemployment to employment explains one half of unemployment fluctuations while the employment to unemployment transition rate only accounts for less than one quarter. Flows involving inactivity do not seem to be negligible since the unemployment to inactivity rate accounts for 17% in unemployment fluctuations and the inactivity to unemployment rate accounts for almost 12%.

Since the contribution of Shimer, the role of the separation rate in unemployment fluctuations has been strongly discussed in the literature. Fujita and Ramey (2009), using CPS data for the 1976-2005 period, build a two-state model and compute transition rates' contribution to unemployment variability using an exact decomposition of the unemployment rate variance and use two different filters, the Hodrick-Prescott filter and the first-order difference filter. They find that the job separation rate is countercyclical and that the separation and job finding rates account for almost the same proportion in unemployment fluctuations and that the contribution of the separation rate raises to 60 to 67% (according to the filtering method used) using a dynamic decomposition.

The role of the separation rate in unemployment fluctuations has been the subject of dis-

[3]See section 2.3.1 for more details about this bias.

cussions in several countries. Petrongolo and Pissarides (2008) compute the contribution of the transition rates to unemployment dynamics for sevral European countries using two and three-sate models. For the United Kingdom, Petrongolo and Pissarides (2008) use claimant count data (1967-2007) and the Labor Force Survey (1993-2003) to evaluate the contribution of the transition rates in unemployment fluctuations in a two-state model (claimant count) and in a three-state model (LFS). With claimant count data (two-state model), they find that between 25 to 33% of unemployment variability can be explained by the separation rate depending on the period considered. With the LFS (three-state model), they report a 50:50 split and notice that "transitions between activity and inactivity contribute less than transitions between employment and unemployment, but they still contribute to a significant amount". For Spain, they build a two-state model using the Spanish Labor Force Survey for the 1987-2006 period and find that the separation and the job finding rates account in the same proportion in unemployment dynamics (50:50 split). Adding inactivity as the third state, they show that, on the whole period, the contribution of the unemployment to employment transition rate slightly exceeds (34.8%) the one of employment to unemployment (29.9%). Finally, they find that on the whole sample, flows involving inactivity contribute to 13.3% (inactivity to unemployment) to 22% (unemployment to inactivity) to unemployment dynamics. For France, using claimant data (1991-2007), they find that "employment to unemployment transitions contribute less to cyclical volatility" because of the stringent employment protection legislation existing in this country (the contribution of the separation rate is around 20% and the one of the job finding rate is almost 80%). Over the 1997-2001 period, the 50:50 split holds.

More recent papers contribute to enrich the literature on this topic. Smith (2011) uses the British Household Panel Survey to compute the transition rates for the 1990-2008 period. She does not correct the time aggregation bias and decomposes inflow and outflow rates into job separation rate via inactivity and job finding rate via inactivity. Her main finding is that inflows to unemployment are the principal determinant of unemployment fluctuations (around 60%) and that the fluctuations in the separation rate (employment to unemployment flows) has a greater impact on unemployment rate variability (41%) than the job finding rate (31%). She finds that flows involving inactivity are also important: the separation rate via inactivity accounts for 16% in unemployment variability and the job finding rate via inactivity accounts for 9%. Moreover, Gomes (2012) uses the United Kingdom LFS for the 1993-2010 period and claimant count data for the 1989-2010 period to study transition probabilities in a continuous environment[4]. To quantify the contribution of each transition in a two-state and in a three-

[4]The time aggregation bias is corrected following Shimer (2012).

state model, he uses the counterfactual method (Shimer) and the total variance decomposition method (Fujita and Ramey). In a two-state world, the job separation rate explains a larger part of unemployment fluctuations that the separation rate does (40-60 split with LFS data and 50:50 split with claimant count data) so the 50:50 split of Petrongolo and Pissarides (2008) holds using claimant data. Considering three states, the job finding rate explains a larger part of unemployment fluctuations (around 60%) than the separation rate does (around 40%). Moreover, the contribution of inactivity in unemployment dynamics is around 20%.

More recently, Elsby, Hobijn and Şahin (2013), with a non-steady state decomposition, find that in Anglo-Saxon economies, the outflow rate is more important in accounting for unemployment fluctuations ("15:85 inflow-outflows" split). For European countries such as France, they find a "45:55 inflow-outflows split". With a steady-state decomposition, they find for France that the contribution of the job finding rate is about 75% and that of the job separation rate is about 62%.

Moreover, Silva and Vázquez-Grenno (2013) examine transition rates in Spain with the Spanish LFS for the 1993-2010 period. The Spanish labor market has some similarities with the French one since the coexistence of fixed-term and open-ended contracts on this market makes it subject to dualism. They build a typical three-state model and a four-state model including temporary employed, permanently employed, unemployed and inactive workers. They operate a discrete correction of the time aggregation bias. They use alternatively the method of Shimer and a method which adapts the one of Fujita and Ramey to a four-state model to compute the contribution of the transition rates to unemployment fluctuations. In the three-state case, they find that the 50:50 split of Petrongolo and Pissarides (2008) holds (the contribution of the separation rate is around 33% and the one of the job finding rate is around 35%). In the four-state case, they show that almost the entire unemployment to employment transition comes from temporary contracts. They conclude that transitions between unemployment and permanently employed "do not play any role in the observed variation in the unemployment rate" (-0.6%). In addition, they find that "the transition rate from temporary jobs to unemployment is responsible for more than 60% of the fluctuations in the aggregate employment-unemployment rate". As a consequence, unemployment dynamics are mainly explained by fluctuations involving temporary jobs than by fluctuations involving permanent jobs. Finally, they find that movements between permanent and temporary jobs are compensating (18% for the permanent to temporary transitions and 17.7% for the temporary to permanent transitions) so they conclude that their impact on unemployment dynamics is non-existent.

The most recent papers concern the French labor market. Indeed, Hairault et al. (2015) use the retrospective calendar of the LFS and administrative data (*Fichier historique*, FH here-

after) for the 1990-2010 period to study unemployment dynamics. They compute transition rates and apply a continuous correction of the time aggregation bias in a two-state model (employment and unemployment) and in a three-state model (permanent jobs, temporary jobs and unemployment; then implying to use the French LFS only instead of the retrospective calendar to split employment between permanent and temporary). They compute the contribution of the transition rates to unemployment fluctuations using the counterfactual Shimer's (2012) method and compare two filters to detrend the series, the Hodrick-Prescott filter and the first order difference filter. According to them, with administrative data for the period 1994-2010, unemployment dynamics are mainly driven by the job finding rate (about 60%). The results are comparable when they use the French LFS data (and the FH data) for the 2004-2010 period (over the 1990-2002 period, they report a 50:50 split). Moreover, introducing a distinction between temporary and permanent jobs, they find that flows involving permanent jobs are more important than those involving temporary jobs both for the job finding and the job separation rates. As a consequence, they find that, depending on the detrending method used, 49 to 57% of unemployment fluctuations are explained by fluctuations in the job separation rate involving permanent jobs. Those results are at the opposite of those of Silva and Vázquez-Grenno (2013) but Hairault et al. explain that these differences could be explained by the different use of temporary jobs between France and Spain leading to a larger proportion of temporary contracts in employment stocks in Spain than in France. Finally, Hairault et al. (2015) found that transitions involving temporary jobs are more important in the job finding than in the job separation rate and that the transitions between these two types of contracts offset. This latest fact is in line with Silva and Vázquez-Grenno (2013). Finally, using the French LFS for the 2003-2012 period to build a three-sate model, Fontaine (2016) suggests that, the job finding rate is more important to explain unemployment fluctuations than the separation does. Moreover, he shows that flows involving inactivity are not negligible since they contribute to one quarter of unemployment dynamics.

Table 2.1: Summary of methodologies and results of previous studies

Article	**Data**	**Model**	**Time correction**	**Computation method**	**Who wins ?**
Shimer (2012)	1948-2010, CPS	Two-state and three-state	Continuous correction	Counterfactual method	Unemployment dynamics mostly explained by fluctuations of the JFR. Possible acyclicality of the JSR.
Petrongolo and Pissarides (2008)	UK: CC (1967-2007) and LFS (1993-2003)	Two-state and three-state	Continuous correction	The same type as Fujita et Ramey	50:50 split holds with LFS (3-state model) and flows involving inactivity are not negligible.
Petrongolo and Pissarides (2008)	Spain: LFS (1987-2006)	Two-state and three-state	Continuous correction	The same typa as Fujita et Ramey	50:50 split holds and flows involving inactivity are not negligible.
Petrongolo and Pissarides (2008)	France: CC (1991-2007)	Two-state	Continuous correction	The same type Fujita et Ramey	"employment to unemployment transitions contribute less to cyclical volatility" because of the stringent employment protection legislation existing in this country. The JFR equals 80% on the whole sample (1991-2007).
Fujita et Ramey (F&R) (2009)	1976-2005, CPS	Two-state	Continuous correction	SS and non SS decomposition	SS: 50:50 split holds. Non SS: The contribution of the JSR exceeds 60% using a dynamic decomposition.
Smith (2011)	1990-2008, BHPS	Three-state	No correction	Takes into acount flows via inactivity	Fluctuations in the JSR has a greater impact on unemployment rate variability than the JFR. Flows via inactivity are not negligible.

Note: CC stands for Claimant Count data, SS for steady state, JFR for Job Finfing Rate, JSR for Job Separation Rate.

Article	Data	Model	Time correction	Computation method	Who wins ?
Gomes (2012)	1993-2010, UK LFS and CC data (1989-2010)	Two-state and three-state	Continuous correction	Counterfactual method and F&R method	Two-state : 40-60 split with LFS, 50:50 split with CC.
Elsby et al. (2013)	OECD data	Two-state and three-state	Continuous correction	F&R method	Non SS decomposition, Anglo-Saxon economies, "15:85 inflow-outflows" split. For European countries, "45:55 inflow-outflows split".
Silva and Vázquez-Grenno (2013)	1993-2010, Spanish LFS	Three and four-state	Discrete correction	Counterfactual method and F&R method	Three-state: 50:50 split. Four-state: UE and EU transitions mainly come from temp. contracts. Unemployment fluctuations mainly come from fluctuations of flows involving temp. jobs.
Hairault et al. (2015)	1990-2010, French LFS (inc. RC) and administrative data	Two-state and three-state (spliting employment)	Continuous correction	Counterfactual method and dynamic analysis	Two-state: Unemployment dynamics mainly driven by the JFR. Three-state: The contribution of perm. jobs to unemployment fluctuations is higher than that of temp. jobs. 49 to 57% of unemployment fluctuations are explained by fluctuations in the JSR involving perm. jobs.
Fontaine (2016)	2003-2012, French LFS	Three-state	Continuous correction	Steady-state and dynamic analysis	The JFR is more important to explain unemployment fluctuations. Flows involving inactivity contribute to one quarter of unemployment dynamics.

Note: CC stands for Claimant Count data, SS for steady state, RC for the Retrospective Calendar of the French LFS, UE for Unemployment to Employment transitions, EU for Employment to Unemployment transitions, JFR for Job Finfing Rate and JSR for Job Separation Rate.

2.3 Methodology

2.3.1 The French Labor Force Survey

I use the French Labor Force Survey restrained to the private sector over the 2003-2012 period[5]. The French LFS was created in 1950 and its major objective was the measurement of employment, unemployment and inactivity according to the definitions of the International Labour Office. Since January 2003, the French LFS is a quarterly survey and it is conducted every week of each quarter. Each households is interviewed six times (six successive quarters). The first and the last interviews are face-to-face, the others are conducted by telephone. The French LFS contains informations on around 108,000 individuals (15 years old and more) from 57,000 distinct households.

The computation of transition probabilities faces several problems. First, the measured probabilities suffers from what Shimer (2012) called the time aggregation bias. Indeed, the French LFS being a quarterly survey, we do not observe the possible transitions that occur during the quarter. For instance, an individual can be unemployed at the begin and at the end of a quarter but he can find a job (temporary or permanent) during the first month and loose it during the second or third month. Unfortunately, the quarterly dimension of the dataset does not take into account this kind of scenario. To correct this bias, I apply Shimer's (2012) method to model a continuous-time environment. Secondly, results can suffer from non-response bias and response-error bias. The non-response bias concerns individuals who does not answer the interview for several reasons including changes in geographic location or lack of availability. The response-error bias is more problematic because it could result in an overestimation of worker flows[6]. Exploiting the results, we have to remember that flows could be possibly overestimated.

2.3.2 Computation of labor market flows

Existing three-state models are useful to describe labor markets but are incomplete if we consider some European markets such as France where two types of labor contract coexist. Indeed, the prevalence of temporary contracts in flows has to be taken into account if one wants to fully understand the functioning of European dual labor markets. In this section, I then investigate the transition that occur on the French labor market involving four states: permanently em-

[5]Results convey the same idea when I do not remove the agricultural and public industries.

[6]Gomes (2012) also explains that the flows could be biased upward especially those concerning movements between unemployment and inactivity but that the cyclical properties of the flows are not affected by this bias. Moreover, Hairault et al. (2015) use the retrospective calendar of the French LFS and implement a method to correct recall errors.

ployed (P), temporary employed (T), unemployed (U) and inactive (I). The following equations describe the dynamics of a model which includes these four states:

$$\Delta U_t = -(n_t^{UP} + n_t^{UT} + n_t^{UI})U_{t-1} + n_t^{PU}P_{t-1} + n_t^{TU}T_{t-1} + n_t^{IU}I_{t-1} \tag{2.1}$$

$$\Delta P_t = -(n_t^{PU} + n_t^{PT} + n_t^{PI})P_{t-1} + n_t^{UP}U_{t-1} + n_t^{TP}T_{t-1} + n_t^{IP}I_{t-1} \tag{2.2}$$

$$\Delta T_t = -(n_t^{TU} + n_t^{TP} + n_t^{TI})T_{t-1} + n_t^{UT}U_{t-1} + n_t^{PT}P_{t-1} + n_t^{IT}I_{t-1} \tag{2.3}$$

$$\Delta I_t = -(n_t^{IU} + n_t^{IP} + n_t^{IT})I_{t-1} + n_t^{UI}U_{t-1} + n_t^{PI}P_{t-1} + n_t^{TI}T_{t-1} \tag{2.4}$$

where n_t^{XY} are the transition probabilities and Δ is the difference operator ($\Delta U_t = U_t - U_{t-1}$). The transition probability from state X in $t-1$ to state Y in t is defined according to the following expression:

$$n_t^{XY} = \frac{N_t^{XY}}{X_{t-1}} \tag{2.5}$$

where N_t^{XY} is the number of individuals transitioning from state X to state Y between $t-1$ and t, X_{t-1} is the number of individuals in the state X in $t-1$ and $X, Y = P, T, U, I$[7].

Finally, these transition rates are corrected for the multiple transitions bias using Shimer's (2012) continuous method[8]. The resulting transition rates are defined by λ_t^{XY} with $X, Y = P, T, U, I$ and $X \neq Y$.

[7]The probability to be in the state T (*temporary employed*) at time t whereas the previous state in $t-1$ was U (*unemployed*) is therefore $n_t^{UT} = \frac{N_t^{UT}}{U_{t-1}}$ (where N_t^{UT} is the number of individuals transitioning from state U to state T between $t-1$ and t).

[8]See Appendix 2.A.1 for more details. I thank Pedro Gomes for providing me his MATLAB codes for the correction of the time aggregation bias in a three-state model.

2.4 Transition probabilities analysis

2.4.1 Transition rates in four-state models vs. three-state models

The level of transition rates highly depends on the country considered. It is then interesting to compare European economies and Anglosaxon ones in order to better understand the particularities of each labor market. In this section, I compute transition rates for France and compare those results to the existed figures for three other countries: Spain, the United Kingdom and the United States. The objective is then to shed light on the existed differences that exist in terms of transition probabilities between the two major Anglosaxon countries and the two European countries the most subject to dualism.

Table 2.2: Transition probabilities, French LFS (2003-2012), Spanish LFS (1993-2010), UK (1993-2010) and US (1993-2010).

	France (quarterly)	France (monthly)	Spain	UK	US
EU	1.80	**0.60**	0.73	0.63	3.16
EI	1.32	0.44	0.67	0.61	3.31
UE	13.75	4.58	4.83	9.98	49.83
UI	22.80	7.60	3.01	6.92	46.38
IE	0.61	0.20	0.7	1.73	4.96
IU	2.76	0.92	0.58	1.95	6.29
PT	0.19	0.06	0.49		
PU	1.06	0.35	0.15		
PI	1.20	0.40	0.37		
TP	15.25	5.08	2.16		
TU	20.61	6.87	2.66		
TI	4.31	1.44	0.69		
UP	5.73	1.91	0.41		
UT	8.92	2.97	4.91		
IP	0.41	0.14	0.2		
IT	0.21	0.07	0.24		

Note: For France (author's computation using the French LFS), transition probabilities are averages between 2003 and 2012. These rates are computed using Eq. (2.5), corrected using Shimer's time-aggregation correction (see Shimer (2012) for more details) and have been converted to a monthly basis for comparisons (thanks to Gomes (2012) method and codes). The first column for France reports the quarterly rates. For Spain, UK and US, I use the transition probabilities computed by Silva and Vázquez-Grenno (2013) for the 1993-2010 period. Results are monthly averages expressed in percentages (except for the first column of the French case which contains quarterly averages). On average, over the 2003-2012 period, the probability to exit from employment is **0.60%**.

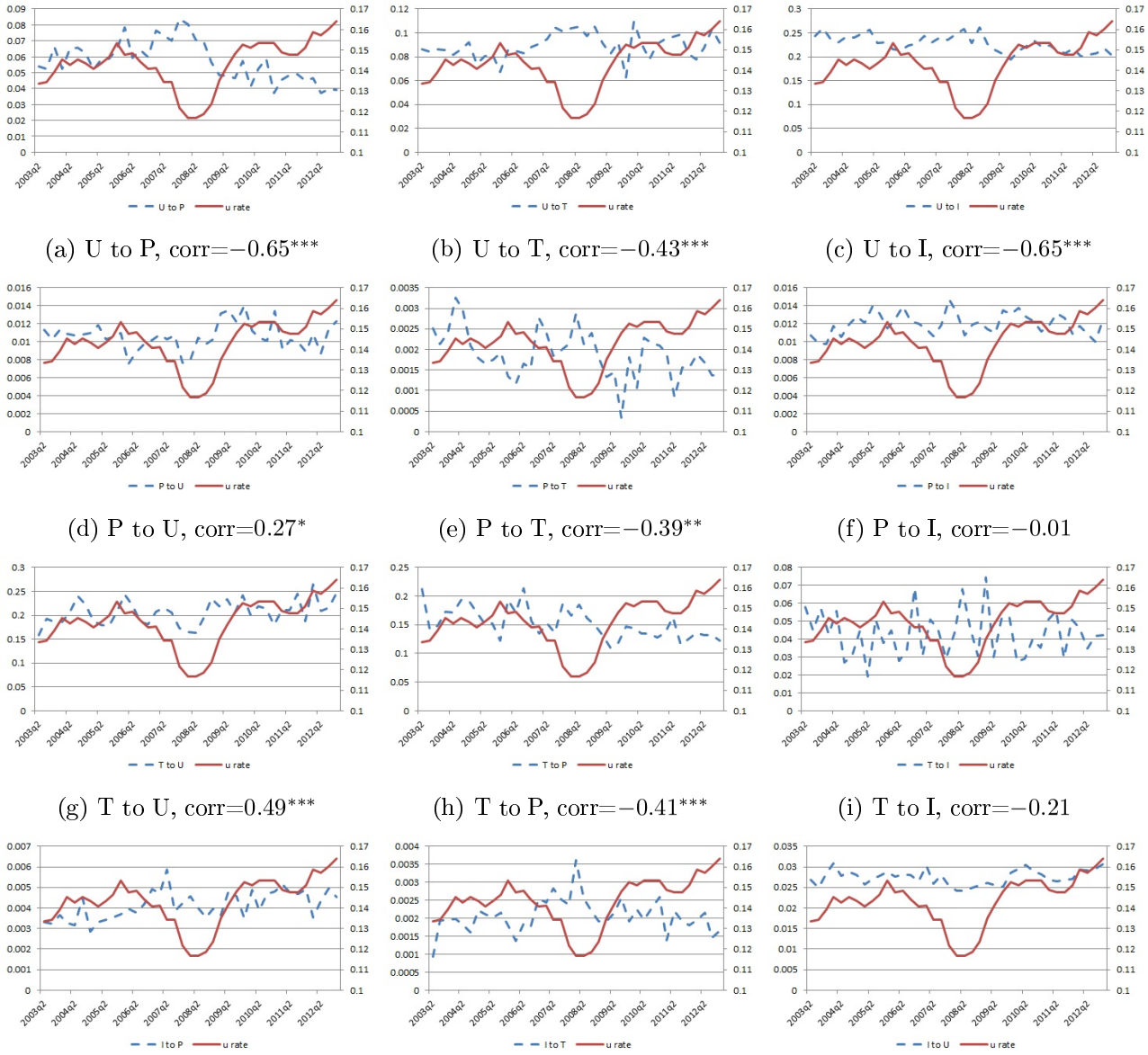
Transition rates deeply differ depending on the country considered and seem to increase with the level of flexibility of labor markets. Table 2.2 compares the transition rates computed with the French LFS to the transition rates computed for Spain, the United Kingdom and the United Sates by Silva and Vázquez-Grenno (2013). Transitions have been computed in a three-state (France, Spain, UK and US) and in a four-state (France and Spain) model. P, T, U and I are the four states described in the previous section while E, U, and I corresponds to the typical three states considered, Employed, Unemployed and Inactive, when employment is not divided between permanent and temporary.
As pointed out by Silva and Vázquez-Grenno (2013), transition probabilities are generally lower in France and in Spain than in the UK and the US because of the weaker level of flexibility in the two former countries. The probability to find a job (U to E transition) is then much lower in France and in Spain (4.58% and 4.83%) than in the UK and the US (9.98% and 49.83%) because the duration of unemployment is longer in France and in Spain.

If we now turn to dual labour markets (columns 1 and 2), we see that flows involving temporary jobs are higher than flows involving permanent jobs in the two countries.
In the French case, Table 2.2 exhibits two major facts. First, the probability to exit unemployment for a temporary job is two times higher than for a permanent job (2.97% vs. 1.91%). Moreover, transitions from temporary employment to unemployment are almost 20 times higher than transitions from permanent employment to unemployment (6.87% vs. 0.35%). As a consequence, inflows and outflows to/from unemployment involve mainly temporary jobs. Secondly, when a worker exits a temporary position, his probability to obtain a permanent job is lower than his probability to become unemployed (5.08% vs. 6.87%).
If we now compare those figures to the Spanish ones, the transition probability from permanent employment to temporary employment transition is 8 times lower in France than in Spain (0.06% vs 0.49%). Moreover, the probability to become unemployed is higher in France (0.35% vs 0.15% for permanently employed, 6.87 vs 2.66 for temporary employed) and the probability for an unemployed worker to find a temporary job is higher in Spain than in France (4.91 vs. 2.97). Finally, the transition rate from unemployment to permanent employment is 5 times higher in France.

Figure 2.1 depicts the relation between the transitions rates and the unemployment rate for France. The correlations of the unemployment rate with the job finding rate involving permanent jobs (-0.65) and involving temporary jobs (-0.43) are high. The job separation rate involving temporary employment also seems to be highly correlated with the unemployment rate compared to the one involving permanent employment (0.49 vs 0.27). Those elements show, as in Hairault et al. (2015) that separation rates are countercyclical and that job finding

rates are procyclical for both types of contract (permanent and temporary). Flows between unemployment and inactivity show also a high and significant correlation with the actual unemployment rate. Transitions from unemployment to inactivity are procyclical (-0.65) whereas movements from inactivity to unemployment are countercyclical (0.75).

To conclude, we can say that figures exhibit the main stylized fact of dual labor markets: workers exit from unemployment mainly to temporary contracts and unemployment inflows are especially made of transitions involving temporary jobs. As a consequence, exits (entries) from (in) unemployment especially involve temporary jobs. Moreover, temporary jobs do not seem to be a stepping stone to permanent employment since the probability to become unemployed when a worker were previously temporary employed is higher than that to be permanently employed.



(a) U to P, corr=-0.65^{***} (b) U to T, corr=-0.43^{***} (c) U to I, corr=-0.65^{***}

(d) P to U, corr=0.27^{*} (e) P to T, corr=-0.39^{**} (f) P to I, corr=-0.01

(g) T to U, corr=0.49^{***} (h) T to P, corr=-0.41^{***} (i) T to I, corr=-0.21

(j) I to P, corr=0.16 (k) I to T, corr=-0.41^{***} (l) I to U, corr=0.75^{***}

Note: Transition rates: dashed line, left scale. Unemployment rate: bold line, right scale.
*** indicates that the correlation is statistically significant at 1% level, ** at 5% level and * at 10% level.

Figure 2.1: Quarterly transition rates and actual unemployment rate, French LFS 2003-2012.

2.4.2 Conditional probabilities

The transitions undergone by an individual may depend on his past state. As in Gomes (2012), I measure the transition probabilities conditional on the status of the individual two quarters ago in order to take into account history dependency and the possible heterogeneity of transition probabilities

$$n^{XY}_{t\backslash K_{t-2}} = \frac{N^{XY}_t \backslash K_{t-2}}{N^{KX}_{t-1}}, X, Y, K \in P, T, U, I. \tag{2.6}$$

where K_{t-2} is the individual's status at time $t-2$ and N^{KX}_{t-1} is the number of individuals transitioning from state K to state X between $t-2$ and $t-1$. Therefore, the transition probability from state T (*temporary employed*) to state P (*permanently employed*) conditional on the fact that the individual was previously unemployed (time $t-2$) is simply $n^{TP}_{t\backslash U_{t-2}} = \frac{N^{TP}_t \backslash U_{t-2}}{N^{UT}_{t-1}}$.

Table 2.3: Quarterly conditional probabilities, French LFS 2003-2012.

		Transition rates conditional on:			
	Uncond. TR	P_{t-2}	T_{t-2}	U_{t-2}	I_{t-2}
PT	0.18	**0.15**	1.25	1.50	1.28
PU	0.85	0.77	2.47	7.45	3.13
PI	1.26	1.17	0.99	2.73	11.15
TP	13.15	21.96	14.37	9.69	8.49
TU	14.11	13.10	12.42	19.47	14.00
TI	5.40	3.45	4.77	4.56	13.13
UP	5.09	15.41	8.73	4.37	4.45
UT	5.74	8.00	19.01	5.12	5.05
UI	18.89	13.69	12.64	14.66	35.03
IP	0.45	15.08	6.43	3.28	0.28
IT	0.25	1.81	11.51	3.37	0.17
IU	2.04	13.11	29.43	36.51	1.33

Note: Author's computation using the French LFS. Quarterly averages between 2003 and 2012 in percentages. The transition probability from permanent to temporary contract knowing that the worker was permanently employed two quarters ago is **0.15%**.

Table 2.3 is analogous to the one of Gomes (2012) but reports transition rates in a four-state model. The probability for an unemployed worker to find a temporary job is about 8% if the individual was previously permanently employed, 19% if he was previously temporary employed, 5.12% if he was previously unemployed and 5.05% if he was previously inactive.

The job separation rate for permanent contract is 0.77% if the individual was permanently employed two quarters ago, 2.47% if he was temporary employed, 7.45% if he was unemployed and 3.13% if the individual was inactive. Moreover, the probability to exit from inactivity to a permanent position is much higher if the worker was employed two quarters earlier than if he was unemployed or inactive. The job finding rate involving permanent job is two times higher for an individual who was previously permanently employed than if he was previously temporary employed. In addition, the probability to operate unemployment to inactivity transition is nearly the same if the individual was permanently/temporary employed or unemployed two quarters ago.

Table 2.4: Conditional unemployment exit probabilities, French LFS 2003-2012.

	U_{t-1}	U_{t-2}	U_{t-3}	U_{t-4}	U_{t-5}
UP	5.29	4.37	3.67	3.15	**3.00**
UT	6.09	5.12	4.30	3.33	2.69
UI	18.86	14.66	13.10	12.60	12.66

Note: Author's computation using the French LFS. Averages between 2003 and 2012 in percentages. The probability to exit unemployment to obtain a permanent job is **3%** if the individual was unemployed since five quarters.

Table 2.4 shows that the probability to exit unemployment is lower as the unemployment spell increases. Unemployed workers are more likely to become inactive even if they have a greater probability to find a temporary job than a permanent one.

2.4.3 Transition rates vary according to the individual's characteristics

Transition probabilities could be affected by multiple factors such as the age of workers, their gender or their skill level. In order to study deeper this fact, I study three different age categories: less than 25 years old, between 25 and 55 years old and older than 55 years old. I also build three skill categories depending on the school level of individuals. The high-skilled category contains workers who have completed two or more years after the Baccalauréat, the medium-skilled group contains those who have the Baccalauréat or an equivalent and those who have a CAP/BEP and the unskilled category contains individuals who have completed the Brevet or who are not graduated. Finally, I study the level of the transition rates according to

the gender of individuals.

Table 2.5 reports the composition of the French Labor Force Survey over the 2003-2012 period according to the categories described before in order to keep in mind the distribution of each characteristics when interpreting results. I also compute the proportion of short-term and long-term contracts for each age, skill levels and gender. Table 2.6 reports the proportion of temporary and permanent workers in each age, skill and gender categories. The most striking fact is that younger workers are more often temporary employed than all the others categories (22.86% vs. 3.54% and 1.46%). Moreover, compared to male, women are more likely to have a temporary job. Then, Table 2.6 clearly confirms the intuition that younger (compared to older individuals) and female (compared to male) workers are those who are more subject to temporary jobs. In this section, I will show that these workers are also more subject to transitions involving temporary jobs. By comparison, the proportions of temporary and permanent worker seems less dependent on the skill level. Nevertheless, I will show that unskilled workers mainly exit from unemployment to temporary job.

Table 2.5: Composition of the dataset, French LFS 2003-2012.

	Frequency	Percent
Male	1,357,374	49.5
Female	1,384,702	50.5
	2,742,076	100.00
$<$ 25 years old	486,681	17.75
25-55 years old	1,161,698	42.37
$>$ 55 years old	1,093,697	39.89
	2,742,076	100.00
High-skilled	455,052	16.6
Medium-skilled	1,001,885	36.54
Unskilled	1,276,766	46.56
	2,333,703	99.7

Note: Proportion of each categories in the dataset. For the skill level, the three categories considered do not sum to 100% because of missing values.

Table 2.6: Proportion (in stocks) of temporary and permanent workers in each age and skill and gender categories, French LFS 2003-2012.

	STC	LTC
$<$ 25 years old	**22.86**	**77.14**
25-55 years old	3.54	96.46
$>$55 years old	1.46	98.54
High-skilled	5.12	94.88
Medium skilled	5.01	94.99
Unskilled	4.82	95.98
Male	4.16	95.84
Women	6.19	93.81
Unskilled and young workers	23.72	76.28
Young and female workers	26.86	73.14
Unskilled and female workers	5.17	94.83
Unskilled, young and female workers	26.35	73.65

Note: Author's computations using the French LFS, 2003-2012. Among individual who are less than 25 years old, **22.86%** work as temporary workers and **77.14** as permanent ones. "Unskilled and young workers" corresponds to the unskilled workers who are less than 25 years old.

2.4.3.1 Transition rates by age

Table 2.7 reports the value of the transition rates for individuals who are less than 25 years old, between 25 and 55 years old and older than 55 years old. Overall, the probability to exit unemployment to find a short-term contract is almost twice as much larger than the probability to find a long-term contract except for workers older than 55 years old. If we concentrate on young workers (less than 25 years old), we see that they are more likely to operate temporary job to unemployment transitions and unemployment to inactivity transitions.

Moreover, the probability to find a job is lower as the individual get older: the probability to find a permanent job is almost 3 times lower for individuals older than 55 years old compared to the other age categories and their probability to find a temporary job is four to six times lower. On the other hand, movements from unemployment toward inactivity are much frequent for older individuals (41.61% vs 27.59% and 21.09%). The job separation and the job finding rates are always higher for younger workers (except for the separation involving temporary jobs for the 25-55 years old category) regardless the type of contract involved (the unemployment to temporary job transition (and inversely) is particularly high for the younger workers (13.69% and 20.26%)).

Table 2.7: Transition rates by age categories, French LFS 2003-2012.

	Transition rates			
	All	$<$ 25 years old	25-55 years old	$>$ 55 years old
PT	0.19	**0.99**	0.15	0.03
PU	1.06	3.11	0.92	0.68
PI	1.20	2.12	0.76	5.90
TP	15.25	14.52	15.96	5.41
TU	20.61	20.26	21.06	14.15
TI	4.31	5.46	3.57	10.68
UP	5.73	6.73	5.56	2.43
UT	8.92	13.69	8.00	2.28
UI	22.71	27.59	21.09	41.61
IP	0.41	0.55	1.93	0.06
IT	0.21	0.55	0.54	0.01
IU	2.75	4.66	11.87	0.30

Note: Author's computation using the French LFS, 2003-2012. Series have been seasonally adjusted and corrected for the time-aggregation bias using Shimer (2012) method. The transition rate from permanent to temporary contract is **0.99%** for workers who are less than 25 years old.

2.4.3.2 The job finding and separation rates differ across skills

Results are reported in Table 2.8. First, the probability to exit unemployment is much lower as the skill level is weak (3.75% for unskilled vs 6.32% and 8.82% for medium and high-skilled for permanent jobs and 6.28% for unskilled vs 10% and 12.5% for medium and high-skilled for temporary jobs). In addition, the probability to exit from unemployment to a temporary job is almost two times higher than that to access to a permanent position for unskilled workers. However, the transition rate from unemployment to inactivity is independent of the skill level. Finally, the job finding rate is always higher for the high-skilled whereas the separation rate is always higher for the unskilled category. The probability to move from temporary to permanent contract (and inversely) is higher for the medium skilled.

Table 2.8: Transition rates by skills, French LFS 2003-2012.

	Transition rates			
	All	High-skilled	Medium-skilled	Unskilled
PT	0.19	**0.12**	0.21	0.20
PU	1.06	0.90	1.05	1.24
PI	1.20	0.79	1.16	1.72
TP	15.25	15.08	15.52	14.47
TU	20.61	16.91	20.74	24.56
TI	4.31	4.27	4.49	4.13
UP	5.73	8.82	6.32	3.75
UT	8.92	12.50	10.00	6.28
UI	22.71	20.34	22.82	23.61
IP	0.41	0.85	0.58	0.18
IT	0.21	0.48	0.33	0.08
IU	2.75	4.96	3.83	1.74

Note: Author's computation using the French LFS, 2003-2012. Series have been seasonally adjusted and corrected of the time-aggregation bias using Shimer (2012) method. The transition rate from permanent to temporary contract is **0.12%** for high-skilled workers.

2.4.3.3 The role of the gender in transitions

Transition rates by gender are reported in Table 2.9. Exit from unemployment to permanent jobs are less frequent for women than for male (5.48% vs 6.01%) whereas exit from unemployment to temporary jobs are more frequent for women (9.27% vs 8.62). Moreover, women more often become inactive especially when they were unemployed (26.24% vs 19.20%). They also more often exit from employment to unemployment particularly when they were temporary employed (20.97% vs 20.31% when they are temporary employed and 1.15% vs 1% when they were permanently employed). Finally, it is important to notice than women are less likely to obtain a permanent position when they are temporary employed than men do (13.97% vs 16.76%).

In this subsection, I then show that young workers are more often employed as temporary workers. Moreover, unskilled workers, compared to more qualified workers, more often become unemployed after being temporary employed. Finally, women are slightly more concerned by temporary work than men and men more often exit temporary job to permanent job than women.

Table 2.9: Transition rates by gender, French LFS 2003-2012.

	Transition rates		
	All	Male	Female
PT	0.19	**0.18**	0.21
PU	1.06	1.00	1.15
PI	1.20	0.93	1.61
TP	15.25	16.76	13.97
TU	20.61	20.31	20.97
TI	4.31	3.52	4.99
UP	5.73	6.01	5.48
UT	8.92	8.62	9.27
UI	22.71	19.20	26.24
IP	0.41	0.42	0.41
IT	0.21	0.25	0.18
IU	2.75	2.75	2.77

Note: Author's computation using the French LFS, 2003-2012. Series have been seasonally adjusted and corrected for the time-aggregation bias using Shimer (2012) method. The transition rate from permanent to temporary contract is **0.18%** for male workers.

2.5 What drives unemployment dynamic in a two-tier system ?

2.5.1 A general overview

The central question of this paper is to quantify the role of the separation and job finding rates in unemployment fluctuations in a country where the labor market is dual. In this section, I build the first four-state model for France and show that unemployment fluctuations are mainly driven by transition rates involving permanent jobs.

In order to stay close to the existing literature, I decide to evolve in a basic three-state world (employment, unemployment and inactivity) and in a four-state world (permamently employed, temporary employed, unemployed and inactive) following the methodology of Silva and Vázquez-Grenno (2013) to make some comparisons between my results and those they obtained for Spain. Finally, I compare the results I obtain in a three-state world *à la* Hairault et al. (permanently employed, temporary employed and unemployed).

I compute the steady-state unemployment rate in the case of a four-state model following Silva and Vázquez-Grenno (2013). The steady state values of P_t, T_t, U_t and I_t are found solving

the following system[9]

$$\lambda_t^{PU} P_t^{SS} + \lambda_t^{TU} T_t^{SS} + \lambda_t^{IU} I_t^{SS} = (\lambda_t^{UP} + \lambda_t^{UT} + \lambda_t^{UI}) U_t^{SS} \tag{2.7}$$

$$\lambda_t^{UP} U_t^{SS} + \lambda_t^{TP} T_t^{SS} + \lambda_t^{IP} I_t^{SS} = (\lambda_t^{PU} + \lambda_t^{PT} + \lambda_t^{PI}) P_t^{SS} \tag{2.8}$$

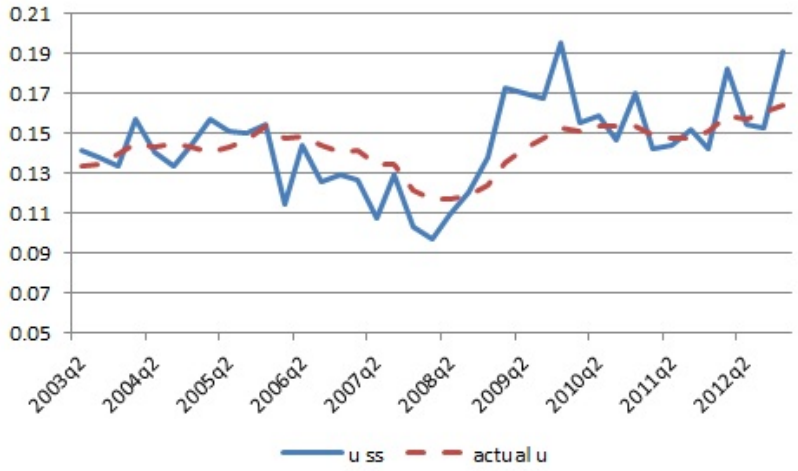
$$\lambda_t^{UT} U_t^{SS} + \lambda_t^{PT} P_t^{SS} + \lambda_t^{IT} I_t^{SS} = (\lambda_t^{TU} + \lambda_t^{TP} + \lambda_t^{TI}) T_t^{SS} \tag{2.9}$$

$$\lambda_t^{UI} U_t^{SS} + \lambda_t^{PI} P_t^{SS} + \lambda_t^{TI} T_t^{SS} = (\lambda_t^{IU} + \lambda_t^{IP} + \lambda_t^{IT}) I_t^{SS} \tag{2.10}$$

where λ^{XY} correspond to the transition rates corrected for the time-aggregation bias. The last equation required to solve this system is the one defining Ω which ensures that $\Omega = U + P + T + I$, at each point of time t[10].

Using the value of the stocks at the steady-state, one can easily compute the steady-state unemployment using the formula:

$$u_t^{SS} = \frac{U_t^{SS}}{U_t^{SS} + P_t^{SS} + T_t^{SS}} \tag{2.11}$$



(a) corr=0.70***

Note: *** indicates that the correlation is statistically significant at 1% level.

Figure 2.2: Actual and steady state unemployment rates, French LFS 2003-2012.

Figure 2.2 shows a strong correlation between the actual unemployment rate and the steady-

[9]Where ss stands for "steady state".
[10]See Shimer (2012) for more details.

state unemployment rate (0.70) justifying a steady-state decomposition of the unemployment rate[11].

In order to investigate which transition rate (especially the type of contract involved in these transitions) drives unemployment on the French labor market, I compute the contribution of the transition rates to unemployment fluctuations first using the method of Shimer (2012) and secondly using the one of Silva and Vázquez-Grenno (2013) that extends the one of Fujita and Ramey (2009)[12].

To implement Shimer's method, I use the system of equations described earlier to compute the counterfactual values for the stocks P_t^{ss}, T_t^{ss}, U_t^{ss} and I_t^{ss} holding all the transition rates constant except one at their sample average values ($\bar{\lambda}^{XY}$) . By doing so, we obtain counterfactual values of the steady-state unemployment. Then, to compute the contributions of each transition rate to unemployment fluctuations, I regress these detrended counterfactual unemployment rates on the detrended steady-state unemployment rate. The coefficients from these regressions are obtained computing the following ratio

$$\beta_s^{XY} = \frac{cov(u_t^{ss}, u_t^{ss,XY})}{var(u_t^{ss})} \tag{2.12}$$

where the subscript s refers to Shimer's coefficient.

The second method I use to compute these coefficients is the one proposed by Silva and Vázquez-Grenno (2013) that extends the one implemented by Fujita and Ramey (2009) to a four-state model. I then compute counterfactual unemployment rates holding all the transition rates constant except one at their HP trend value. Thanks to the decomposition of the unemployment rate, one can compute the contribution of each transition rates through the following regression coefficient:

$$\beta_{svq}^{XY} = \frac{cov(\Delta u_t^{ss}, \Delta u_t^{ss}(\lambda_t^{XY})}{var(\Delta u_t^{ss})} \tag{2.13}$$

where the subscript svq refers to Silva and Vázquez-Grenno method to obtain coefficients in a four-state model.

The coefficients from the regression are reported in Table 2.10. The two methods considered convey the same ideas so I focus on results issued from Shimer's method.

The three-state analysis points out that separation and job finding rates account for a large

[11]Some papers build non-steady state decomposition. This is beyond the scope of this paper whose main objective is to show the importance to study four-state models (and then separate employment between permanent and temporary) when focusing on dual European labor markets.

[12]See appendix 2.A.2 for mathematical details of these methods.

Table 2.10: Contribution of the transition rates to unemployment fluctuations. France (2003-2012)

Shimer				Fujita and Ramey extended			
3 states		4 states		3 states		4 states	
EU	0.314	PU	0.313	EU	0.328	PU	0.338
UE	0.428	TU	0.056	UE	0.433	TU	0.094
EI	0.035	UP	**0.240**	EI	0.038	UP	0.254
IE	0.124	UT	0.130	IE	0.125	UT	0.158
IU	0.042	PI	0.043	IU	0.039	PI	0.082
UI	0.051	TI	**-0.002**	UI	0.045	TI	0.034
		IP	0.091			IP	0.125
		IT	0.011			IT	0.044
		IU	0.041			IU	0.075
		UI	0.043			UI	0.078
		PT	-0.022			PT	0.016
		TP	0.068			TP	0.099

Note: Author's computation using the French LFS. Coefficients come from Eq. (2.12) and (2.13). Series have been previously detrended using a Hodrick-Prescott filter with a smoothing parameter of 1600. The job finding rate involving permanent employment explains **24%** of unemployment fluctuations. Transitions from temporary jobs to inactivity tends to decrease unemployment fluctuations about **0.2%**

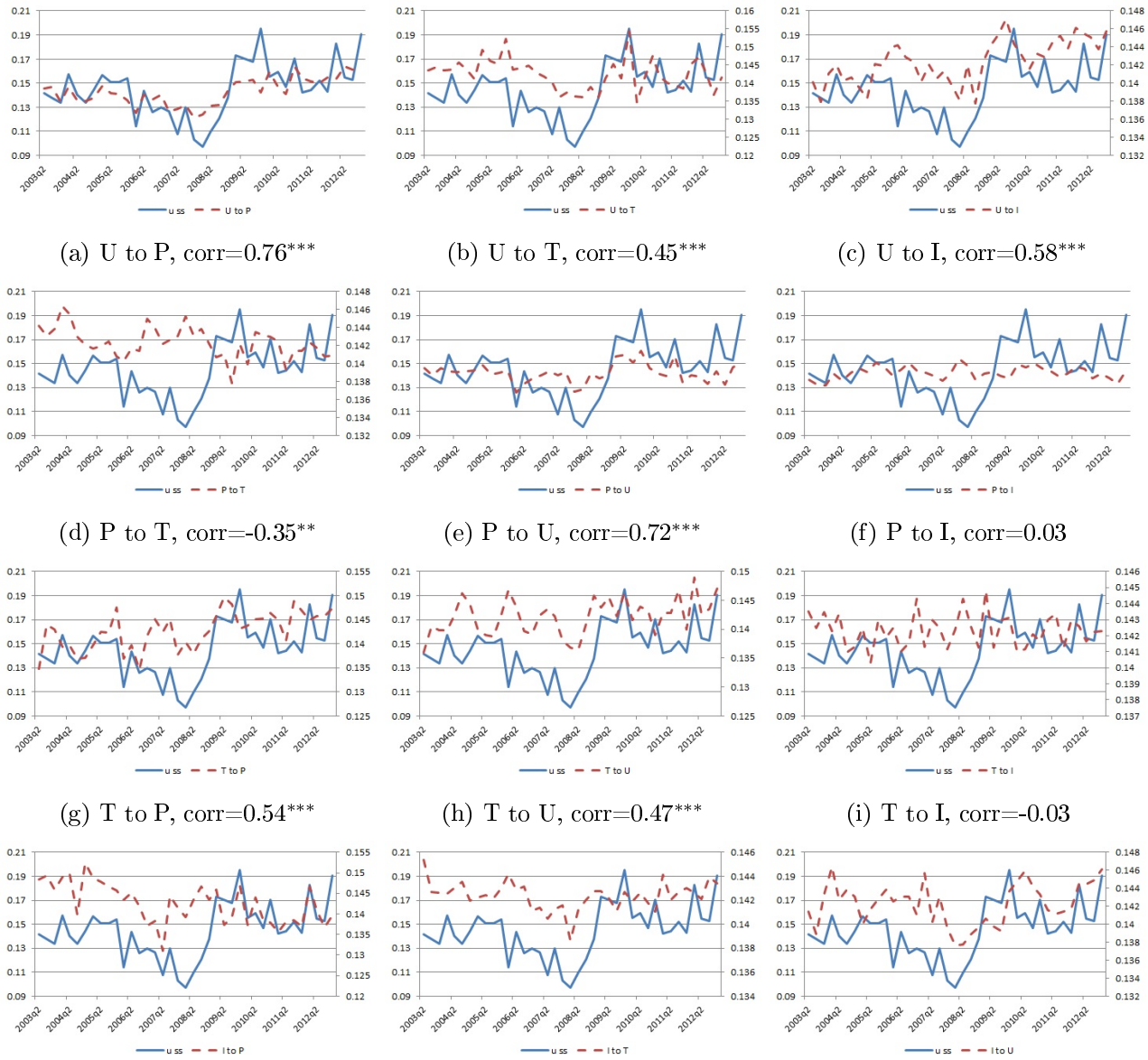
part of unemployment fluctuations (31.4% and 42.8% respectively) but, contrary to Silva and Vázquez-Grenno (2013) (who report a 50:50 split), it shows that the job finding rate plays a more important role than the job separation rate does. This is in line with Hairault et al. (2015) who report, in a two-state model for the 2004-2010 period, a contribution of the job finding rate equal to 57.6% to 72% (depending on the filtering method and the type of data used). In addition, the impact of fluctuations in the transition rate from inactivity to employment is not negligible (12.4%).

With the four-state model, I find that unemployment rate fluctuations mostly come from transition rates involving permanent jobs than from transition rates involving temporary jobs: 31.3% for the separation rates and 24% for the job finding rate. This result is at the opposite of the one of Silva and Vázquez-Grenno (2013). Then, the separation rate involving temporary jobs seems to not affect unemployment dynamics (fluctuations in the transition rate from temporary employment to unemployment accounts only for 5.6% in unemployment fluctuations). Overall, changes in the job separation and job finding rates involving permanent employment account for around 55% of the unemployment fluctuations. This result, in contradiction with Silva and Vázquez-Grenno (2013), is in line with Hairault et al. (2015). As a result, the variability of the French unemployment rate mostly comes from movements involving permanent jobs.

In order to better compare my results to those obtained by Hairault et al., I compute the contribution of fluctuations of permanent and temporary jobs to unemployment dynamics in the case of their three-state model (permanently employed, temporary employed, unemployed). Results are reported in appendix 2.A.3 (Table 2.14). Like them, I find that the job separation rate involving permanent jobs accounts for around 50% of unemployment fluctuations and that the job finding rate involving permanent jobs account for at least 20%. The only difference is that I find that temporary to unemployment transitions account only for 6.3 to 9.4% in unemployment fluctuations while they report a contribution of 12%.

In addition, Table 2.10 shows that temporary jobs account more in the job finding rate than in the separation rate: transitions from unemployment to temporary employment account for 13% in unemployment fluctuations whereas transitions from temporary employment to unemployment account for only 5.6%. This final result is in line with Silva and Vázquez-Grenno. It is also in line with Hairault et al. (2015) since I find that transitions from unemployment to temporary employment account for at least 12% in unemployment fluctuations whereas transitions from temporary employment to unemployment account for around 6.3% to 9.4% (Table 2.14, appendix 2.A.3).

Finally, contrary to Silva and Vázquez-Grenno (2013), transitions between the two types of contract do not offset. Indeed, I find that transitions between temporary and permanent jobs account for almost 5% in unemployment fluctuations.



(a) U to P, corr=0.76*** (b) U to T, corr=0.45*** (c) U to I, corr=0.58***

(d) P to T, corr=-0.35** (e) P to U, corr=0.72*** (f) P to I, corr=0.03

(g) T to P, corr=0.54*** (h) T to U, corr=0.47*** (i) T to I, corr=-0.03

(j) I to P, corr=0.15 (k) I to T, corr=0.31* (l) I to U, corr=0.46***

Note: Counterfactuals: dashed line, right scale. Unemployment rate: bold line, left scale.
*** indicates that the correlation is statistically significant at 1% level, ** at 5% level and * at 10% level.

Figure 2.3: Steady-state and counterfactual unemployment rates (Shimer's method), French LFS 2003-2012.

Figure 2.3 depicts the correlations between the steady-state and the counterfactual unemployment rates obtained using Shimer's method. Counterfactual unemployment rates obtained allowing only transition rate involving permanent jobs to change over time shows high positive and significant correlations with the steady state unemployment rate (0.76 for the job finding rate and 0.72 for the job separation rate). The magnitude of the correlations obtained focusing on temporary employment transitions are less important (0.45 and 0.47) but highly significant.

To sum up, in the French case, if we consider the basic three-state model, fluctuations in the job finding rate explain a larger part of unemployment variability than the job separation rate does. Moreover, the role of transitions from inactivity to employment is not negligible in explaining unemployment dynamics. Considering the dualism existing on this market (i.e. splitting employment into permanent and temporary), transition rates involving permanent jobs account more than those involving temporary jobs in explaining unemployment fluctuations. Nevertheless, the contribution of the job finding rate involving temporary employment is not negligible.

2.5.2 Focusing on young, unskilled and female workers

In this section, I want to know if the impact of transition rates on unemployment rate fluctuations depends on some workers' characteristics as their age, their level of qualification or their gender. I show that, if we concentrate on young, unskilled and female workers, the results obtained in the previous section are altered. This is mainly explained by the fact that these workers are more subject to temporary jobs, especially young workers, as shown in Table 2.6.

Table 2.11 shows the contribution of each transitions rates to unemployment fluctuations for workers who are less than 25 years old. The most striking fact is that, for this subsample, the job separation rate explains a larger part of unemployment fluctuations (50.4%) than the job finding rate does (28.6%). This is at the opposite of the general case in the previous section where the job separation rate explains at least 30% of unemployment fluctuations and the job finding rate explains 42.8%. Using the four-state model, unemployment fluctuations are mostly explained by the job separation rate involving permanent employment (45.2%) as in the general case (31.3%). However, the contribution of the job separation rate involving temporary jobs is higher for younger workers than in the general case (9.6% vs. 5.6%). Moreover, the contribution of unemployment to permanent job transitions is much lower (1.2% vs. 24%) and the contribution of unemployment to temporary job transitions is lower than in the general case (11.4% vs.13%). As a result, the job separation rate involving temporary jobs plays now a more important role to explain unemployment dynamic since the contributions to unemployment

fluctuations of the temporary job to unemployment transition rate is more important than in the general case. Finally, the contribution of transitions from permanent employment to inactivity is much larger for young workers than in the general case (13.6% vs. 4.3%).

Table 2.12 reports the results for unskilled workers. In the three-state case, the job finding rate explains a larger part of unemployment dynamics (42.3%) than the job separation rate does (29.3%) as in the general case. In the four-sate model, the job separation rate involving permanent jobs is the first component of unemployment fluctuations (26.2%) but the job finding rate involving permanent employment is lower (18.1% vs 24%) than in the general case. Moreover, the transition rate from unemployment to temporary employment explains a larger part of unemployment fluctuations (19.1%) than in the general case whereas the contribution of transitions from temporary jobs to unemployment is weaker than in the general case. Finally, as in the general case, temporary jobs play a more important role via the job finding than via the job separation rate (19.1% vs. 3.7%) which is also the case for young workers.

In addition, focusing on women, we observe that the job finding rate is very high (almost 60%) and that the contribution of the transition from inactivity to employment to unemployment dynamic is higher than in the general case which is mostly due to transitions from inactivity to permanent jobs. Moreover, exits from unemployment explain a larger part of unemployment volatility when it is directed to permanent job (39.1%). The fact that transitions involving temporary jobs account more in findings than in separations is more striking than in the general case (13.7% and 1.7% vs 13% and 5.6%). Finally, transition from permanent job to inactivity are more than three times higher for women than in the general case (as we saw in Table 2.9, women are more subject to this kind of transition comparing to the whole population) explaining unemployment dynamic which confirms the importance of the role of inactivity in unemployment volatility.

As a consequence, the impact of transition rates on unemployment fluctuations differs from what is observed for the whole population. Heterogeneity matters in the sense that the existence of dualism matters for specific individuals, especially young and female workers. This fact does not contradict the vision of Shimer (2012) since this paper explores unemployment dynamics in the case of a labor market subject to dualism, a situation that does not exist in the United States.

Table 2.11: Contribution of the transition rates to unemployment fluctuations. France (2003-2012), young workers

Shimer				Fujita and Ramey extended			
	3 states		4 states		3 states		4 states
EU	0.504	PU	0.452	EU	0.50	PU	0.474
UE	0.286	TU	0.096	UE	0.291	TU	0.119
EI	0.002	UP	0.012	EI	0.003	UP	0.022
IE	0.132	UT	**0.114**	IE	0.12	UT	0.145
IU	0.03	PI	0.136	IU	0.022	PI	0.167
UI	0.043	TI	-0.012	UI	0.034	TI	0.023
		IP	0.077			IP	0.113
		IT	0.023			IT	0.051
		IU	0.022			IU	0.053
		UI	0.035			UI	0.066
		PT	0.018			PT	0.05
		TP	0.015			TP	0.043

Note: Coefficients come from Eq. (2.12) and (2.13). Series have been previously detrended using a Hodrick-Prescott filter with a smoothing parameter of 1600. The job finding rate involving temporary employment explains **11.4%** of unemployment fluctuations. Author's computation using the French LFS.

Table 2.12: Contribution of the transition rates to unemployment fluctuations. France (2003-2012), unskilled workers

Shimer				Fujita and Ramey extended			
3 states		4 states		3 states		4 states	
EU	0.293	PU	0.262	EU	0.306	PU	0.286
UE	0.423	TU	0.037	UE	0.424	TU	0.069
EI	0.091	UP	0.181	EI	0.095	UP	0.19
IE	0.139	UT	**0.191**	IE	0.145	UT	0.213
I U	0.012	PI	0.091	IU	0.011	PI	0.121
UI	0.02	TI	0.011	UI	0.018	TI	0.04
		IP	0.113			IP	0.143
		IT	0.012			IT	0.041
		IU	0.007			IU	0.038
		UI	0.028			UI	0.054
		PT	-0.025			PT	0.008
		TP	0.094			TP	0.121

Note: Coefficients come from Eq. (2.12) and (2.13). Series have been previously detrended using a Hodrick-Prescott filter with a smoothing parameter of 1600. The job finding rate involving temporary employment explains **19.1%** of unemployment fluctuations. Author's computation using the French LFS.

Table 2.13: Contribution of the transition rates to unemployment fluctuations. France (2003-2012), women workers

Shimer				Fujita and Ramey extended			
3 states		4 states		3 states		4 states	
EU	0.147	PU	0.093	EU	0.161	PU	0.126
UE	0.587	TU	0.017	UE	0.60	TU	0.051
EI	0.047	UP	0.391	EI	0.053	UP	0.406
IE	0.144	UT	**0.137**	IE	0.158	UT	0.162
IU	0.038	PI	0.148	IU	0.039	PI	0.187
UI	0.053	TI	-0.028	UI	0.053	TI	0.008
		IP	0.122			IP	0.149
		IT	-0.002			IT	0.034
		IU	0.042			IU	0.078
		UI	0.044			UI	0.075
		PT	0.01			PT	0.047
		TP	0.085			TP	0.113

Note: Coefficients come from Eq. (2.12) and (2.13). Series have been previously detrended using a Hodrick-Prescott filter with a smoothing parameter of 1600. The job finding rate involving temporary employment explains **13.7%** of unemployment fluctuations. Author's computation using the French LFS.

2.6 Conclusion

In this paper, I use the French Labor Force Survey to compute transition probabilities in three and four-state models. It allows to complement the existing literature, which typically focuses on two and tree-state models, taking into account the dual European labor markets specificity. Indeed, the co-existence of two types of contracts (permanent and temporary) must be taken into account if one wants to fully understand the dynamic of unemployment on those specific markets. I find that transition rates differ according to the country considered because of the more or less stringent employment protection legislation. In more flexible countries (i.e. UK and US), the probability to exit from unemployment is higher than in countries where employment protection legislation is more binding. Moreover, the past state of individuals plays a role in his transition probabilities and his characteristics (age, skill level, gender) are factors which are not negligible in the probability to change status on the labor market.

Concerning unemployment dynamic, using a three-state model, I show that the French unemployment rate is mainly driven by the job finding rate (almost 43% of unemployment dynamics are explained by fluctuations of the unemployment to employment transition rate). I then introduce a fourth state splitting employment between permanent and temporary in order to better describe European labor markets. Especially, I find that, in France, transitions that involve permanent jobs account more in explaining unemployment fluctuations than those involving temporary jobs (changes in the job separation and job finding rates involving permanent employment account for around 55% of the unemployment fluctuations). Nevertheless, the contribution of temporary job to unemployment fluctuations is much stronger through the job finding rate than through the job separation rate (13% vs. 5.6%). Finally, I show that unemployment dynamics are affected by workers' characteristics such as their age, their skill level or their gender.

2.A Appendix

2.A.1 Time-aggregation bias

The goal of this method is to compute continuous transition rates from the discrete ones provided by datasets. Here, I resume the Shimer's continuous method in a four-state model[13] (Permanently employed (P), Temporary employed (T), Unemployed (U) and Inactive (I)). We will see that, using discrete data for the computation of transition rates, it is possible to obtain continuous rates. Notations are very close to the one of Shimer (2012) and Gomes (2015): consider a discrete time Markov transition matrix 4×4, n_q, obtained using quarterly data. The time variable is then represented by t and transitions are computed observing the individual status between two consecutive dates (i.e. quarters). The associated continuous time Markov transition matrix is also 4×4 and call it λ. By definition, λ has nonnegative off-diagonal entries and each columns sums to zero. In addition, λ contains all the transitions from state X to state Y with $X, Y = P, T, U, I$ and $Y \neq X$.
Defining μ_q the diagonal matrix of eigenvalues and p_q the matrix containing the eigenvectors, one can compute the continuous time Markov transition matrix $\hat{\lambda}_q$:

$$\hat{\lambda}_q = \lim_{\Delta \to 0} \frac{p_q \mu_q^{\Delta} p_q^{-1} - I}{\Delta} \tag{2.14}$$

2.A.2 Various methods for unemployment decomposition

2.A.2.1 Shimer (2012)

Consider a simple two-state model and let λ_t^{EU} and λ_t^{UE} be respectively the separation and the job finding rates. Then the evolution of the unemployment rate can be written in the following terms

$$\dot{u} = (1 - u)\lambda_t^{EU} - u\lambda_t^{UE} \tag{2.15}$$

Recalling that at the steady state $\dot{u} = 0$ and since it is commonly argued that the unemployment rate can be approximated by its steady-state value ($u_t \equiv u_t^{ss}$), the unemployment rate could be defined as follows:

$$u_t = \frac{\lambda_t^{EU}}{\lambda_t^{EU} + \lambda_t^{UE}} \tag{2.16}$$

[13] See Gomes (2015) for the three-state case.

Shimer (2012) compute the contribution of the separation and job finding rates building counterfactual unemployment rates assuming that only one of the transition rates can vary over time and that the remaining rate is fixed at its sample average:

$$c_t^{EU} = \frac{\lambda_t^{EU}}{\lambda_t^{EU} + \bar{\lambda}_t^{UE}} \tag{2.17}$$

$$c_t^{UE} = \frac{\bar{\lambda}_t^{EU}}{\bar{\lambda}_t^{EU} + \lambda_t^{UE}} \tag{2.18}$$

2.A.2.2 Petrongolo and Pissarides (2008)

This method is widely used in the litterature (see Fujita and Ramey 2009 and so on). Petrongolo and Pissarides (2008) approximate monthly unemployment by :

$$u_t = \frac{s_t}{s_t + f_t} \tag{2.19}$$

Then, unemployment rate dynamics can be decomposed into two additive terms' fluctuations, s_t (the separation rate) and f_t (the job finding rate)[14]. Starting by computing the change $\Delta u_t = u_t - u_{t-1}$, one obtains

$$\Delta u_t = \frac{s_t}{s_t + f_t} - \frac{s_t}{s_{t-1} + f_{t-1}} \tag{2.20}$$

Then we have:

$$\frac{s_t f_{t-1} - s_{t-1} f_t}{(s_t + f_t)(s_{t-1} + f_{t-1})}$$

Rearranging we get,

$$\frac{f_t \Delta s_t - s_t \Delta f_t}{(s_t + f_t)(s_{t-1} + f_{t-1})}$$

We then obtain the key equation of Petrongolo and Pissarides:

$$\Delta u_t = (1 - u_t) u_{t-1} \frac{\Delta s_t}{s_{t-1}} - u_t (1 - u_{t-1}) \frac{\Delta f_t}{f_{t-1}} \tag{2.21}$$

Finally, the contribution of inflows and outflows in unemployment dynamics is computed in the same way as in the other methods, that is, computing the β coefficients

$$\beta_s = \frac{cov(\Delta u, \Delta u_s)}{var(\Delta u)},\ \beta_f = \frac{cov(\Delta u, \Delta u_f)}{var(\Delta u)} \tag{2.22}$$

[14] See Smith (2011) for the full demonstration.

The same linear method is applied in Fujita and Ramey (2009) and Elsby et al. (2013).

2.A.2.3 Silva and Vázquez-Grenno (2013)

Silva and Vázquez-Grenno (2013) adapt the Fujita and Ramey (2009) method to a four-state model. They use a first-order Taylor expansion around the HP trend values of the transition rates ($\bar{\lambda}_t^{XY}$) to decompose the equilibrium unemployment rate. They obtain the following expression :

$$\Delta u_t^{ss} = \frac{u_t^{ss} - u_t^{\bar{ss}}}{\bar{u}_t^{ss}} = \sum_{XY} \frac{\bar{u}_t^{ss}(\lambda_t^{XY}) - \bar{u}_t^{ss}}{\lambda_t^{XY} - \bar{\lambda}_t^{XY}} \frac{\bar{\lambda}_t^{XY}}{\bar{u}_t^{ss}} \left(\frac{\lambda_t^{XY} - \bar{\lambda}_t^{XY}}{\bar{\lambda}_t^{XY}} \right) + \epsilon_t \tag{2.23}$$

where $\frac{\bar{u}_t^{ss}(\lambda_t^{XY}) - \bar{u}_t^{ss}}{\lambda_t^{XY} - \bar{\lambda}_t^{XY}} = \frac{\partial \bar{u}_t^{ss}}{\partial \bar{\lambda}_t^{XY}}$ and $\frac{\partial \bar{u}_t^{ss}}{\partial \bar{\lambda}_t^{XY}} \frac{\bar{\lambda}_t^{XY}}{\bar{u}_t^{ss}}$ corresponds to the elasticity of the HP trend equilibrium unemployment rate with respect to the HP trend value of the transition rates.

2.A.3 Comparison with Hairault at al. (2015)

Hairault et al. (2015) decompose unemployment fluctuations using the French Labor Force survey (2004-2011) following Shimer (2012). They continuously correct the time-aggregation bias and build counterfactual unemployment rates holding all transition rates except one fixed at their sample average (they use two types of filters, an Hodrick-Prescott filter with a smoothing parameter of 10^5 and a first-order difference filter). I compute the contribution of each transition rate in their three-state model using Shimer's counterfactual method and Silva and Vázquez-Grenno method with the French LFS (2003-2012).

Table 2.14: Contribution of the transition rates to unemployment fluctuations, France

			Hairault et al.	
	Shimer	Fujita and Ramey extended	HP	FOD
PU	0.523	**0.541**	0.4900	0.5700
TU	0.063	0.094	0.1200	0.1200
UP	0.236	0.25	0.2500	0.2000
UT	0.129	0.152	0.1600	0.1000

Note: First two columns: author's computation (French LFS, 2003-2012). Series have been previously detrended using a Hodrick-Prescott filter with a smoothing parameter of 1600. The job separation rate involving permanent employment explains **54.1%** of unemployment fluctuations. The coefficients in the last two columns of the table come from Hairault et al. (2015) and cover the period 2004-2011. HP refers to Hodrick-Prescott filter and FOD to first-order difference filter.

Chapter 3

Taxation of Temporary Jobs: Good Intentions With Bad Outcomes ?

Abstract[1]

This paper analyzes the consequences of the taxation of temporary jobs recently introduced in several European countries to induce firms to create more open-ended contracts and to increase the duration of jobs. The estimation of a job search and matching model on French data shows that the taxation of temporary jobs does not reach its objectives: it reduces the mean duration of jobs and decreases job creation, employment and welfare of unemployed workers. We find that a reform introducing an open-ended contract without layoff costs for separations occurring at short tenure would have opposite effects.

Key words: Temporary jobs, Employment protection legislation, Taxation.

JEL classification: J63, J64, J68.

[1]This article has been written with Pierre Cahuc, Olivier Charlot, Franck Malherbet and Hélène Benghalem. We thank the *Chaire Sécurisation des Parcours Professionnels* and the *Investissements d'Avenir (ANR-11-IDEX-0003/Labex Ecodec/ANR-11-LABX-0047)* for their support and *Unédic* for providing data. We thank Andrea Bassanini, Paul Beaudry, Pawel Doligalski, Gérard Filoche, Grégory Jolivet, Etienne Lalé, Guy Laroque, Olivier l'Haridon, Michael Reiter, Alireza Sepahsalari, Thepthida Sopraseuth and Hélène Turon for their comments. We also thank Normann Rion for excellent research assistance.

3.1 Introduction

The spread of temporary jobs of short duration is an important concern in countries with stringent employment protection legislation, especially in France, Italy, Portugal and Spain. In these countries, the open-ended contract is the normal form of employment contract. It has no fixed term. But the breach of open-ended contracts is costly for employers, who must fulfill complex procedures and provide severance payments. When the expected duration of jobs is short, employers are allowed to use temporary contracts that stipulate their termination date. In practice, legal rules require that employers remunerate workers until the termination date, but there is no red-tape separation cost at the termination date. The regulation of temporary contracts aims at stabilizing employment and at reducing the uncertainty for workers hired on jobs of short expected duration. However, the success of this regulation is questionable: temporary jobs account for most job flows because employers avoid open-ended contracts.[2] Given this situation, is has been argued that allowing employeurs to use open-ended contracts without (or with very small) layoff costs for separations occurring at short tenure instead of temporary contracts would reduce job turnover and foster employment.[3] But this type of structural reform is difficult to implement and several European countries have decided to tax temporary contracts to induce employers to lengthen job durations. Our paper evaluates this strategy.

Temporary contracts of short duration are especially targeted in France, Portugal and Spain, while all temporary contracts are taxed in Italy. France introduced in 2013 a tax equal to 3 percent of gross wages for temporary contracts shorter than one month, and equal to 1.5 percent for those from 1 to 3 months. If the temporary contract is transformed into an open-ended contract, the tax is refunded.[4] In 2014, Portugal introduced an adjustment of the rate of social contribution according to the type of labor contract, increasing the employer contribution by 4 percentage points (from 22.75 percent to 26.75 percent) for temporary contracts of durations shorter than 15 days. In Spain, unemployment insurance contributions are higher for temporary contracts than for permanent contracts since 1997.[5] Since 2009, temporary contracts of short duration are particularly targeted. There is a supplementary employer social contribution, equal to 36 percent of gross wages, for temporary contracts of duration shorter than one week.

[2]See Bassanini and Garnero (2013), Boeri (2011), Bentolila, Cahuc, Dolado and Le Barbanchon (2012), Sala, Silva and Toledo (2012).

[3]Blanchard and Tirole (2008), Dolado et al. (2016), Garcia-Perez and Osuna (2014).

[4]See: http://www.unedic.org/sites/default/files/ci201317_1.pdf

[5]6.7 percent instead of 5.5 percent for employers and 1.6 percent instead of 1.55 percent for employees. http://www.seg-social.es/Internet_1/Trabajadores/CotizacionRecaudaci10777/Basesytiposdecotiza36537/index.htm

The Italian reform enacted in 2012 introduced a tax on all temporary contracts equal to 1.4 percent of gross wages which is used to finance unemployment benefits. The tax is refunded if temporary contracts are transformed into open-ended contracts. The amount of the refund is limited to the last six monthly payments of the tax.

As far as we are aware, almost nothing is known about the consequences of such policies, which nonetheless have non-trivial effects. To shed light on this issue, we provide and estimate a job search and matching model where firms hire workers to operate production opportunities of different expected durations. Some production opportunities are expected to end (i.e. to become unproductive) quickly, others are expected to last longer. This model shows that temporary contracts are used for production opportunities of short expected duration and open-ended contracts are used for production opportunities of long expected duration. It becomes apparent that the obligation to commit to a termination date for temporary contracts, with limited possibilities to renew the contracts, induces employers to reduce employment spells because they want to avoid paying workers on jobs that become unproductive. To put it differently, the regulation of temporary contracts allows workers to have secure jobs until the termination date of contracts but it induces an excess of job turnover. In this context, it can be tempting to tax temporary contracts of short duration to induce employers to lengthen the contracts or to use open-ended contracts. However, our model shows that the taxation of temporary contracts does not always reduce job turnover. Obviously, the taxation of contracts of short duration may induce employers to substitute contracts of longer duration for contracts of shorter duration and to transform temporary contracts into open-ended contracts if this allows them to avoid the tax. This effect is amplified if the tax is refunded when temporary contracts are transformed into open-ended contracts. The reduction of job instability can also be amplified if higher taxes on temporary contracts of short duration are offset by lower taxes on temporary contracts of long duration and on open-ended contracts. But higher taxes have opposing effects on the duration of temporary contracts. For instance, it is unlikely that 7-day contracts are transformed into one month contracts in response to a tax increase on contracts shorter than one month, but it can be optimal to reduce the duration of contracts from 7 days to 6 days, because employers have incentives to reduce the length of temporary contracts when they are less profitable. Hence, higher taxes on temporary contracts do not necessarily reduce job instability. Their impact on job stability, employment and welfare depends on the design of the tax scheme and on the empirical context.

The structural estimation of the model on French data allows us to run simulations to evaluate the impact of different tax systems on the distribution of employment spells, on unemployment, and on the welfare of unemployed workers. We find that the taxation of tempo-

rary contracts implemented in European countries has a negative impact on the labor market. First, it reduces the mean duration of jobs. Hence, the taxation of temporary contracts does not achieve its main objective, which is to reduce labor turnover. Second, the tax decreases job creation, increases unemployment and reduces the welfare of unemployed workers. All in all, it is unlikely that this tool is suited to improve labor market performance with a reasonable level of confidence.

From this perspective, we analyze the consequence of another approach, more likely to reduce excess labor turnover. We find that the introduction of an open-ended contract with no termination cost for separations occurring at short tenure is more appropriate than the taxation of temporary jobs: it increases the duration of jobs of short duration, raises employment and improves the welfare of unemployed workers. This suggests that an intricate system combining taxes and regulations that imposes temporary contracts for jobs of short duration is less efficient and less favorable to unemployed workers than a simple regulation comprising an open-ended contract without layoff costs for separations occurring at short tenure.

Our paper is related to at least two strands of the literature. First, we use a model inspired from Cahuc, Charlot and Malherbet (2016), which explains the distribution of durations of temporary contracts and the choice between open-ended and temporary contracts. It shows that the use of temporary contracts induces an excess of job turnover leading to production losses. Our paper complements this analysis by estimating the structural parameters of the model, by introducing taxation of temporary contracts, and by running simulation exercises to evaluate the impact of different tax systems. Our model explains the large share of temporary contracts of very short duration, which is displayed on figure 3.1. This figure shows that about 50% of temporary contracts are shorter than one month in France. Usual models, relying on the standard version of the model of Mortensen and Pissarides (1994), are not able to account for this feature of job creation. Likewise, the contributions relying on the view that temporary contracts are used to screen workers before they are promoted into permanent jobs cannot account for this feature:[6] in all countries, permanent contracts comprise probationary periods, with no firing cost and very short notice, which can be used to screen workers into permanent jobs.[7] To the extent that temporary jobs cannot be terminated before their expiration date, it can only be profitable to screen workers using temporary contracts if the duration of the probationary period is short, at least shorter than that of temporary contracts. In France, the probationary periods last at least two months and can go to eight months.[8] Accordingly, the

[6]See for instance Faccini (2014), Kahn (2010), Portugal and Varejão (2009).

[7]The maximum mandatory duration of probationary periods is around several months, depending on countries, industries and skills. See: http://www.ilo.org/dyn/eplex/termmain.home?p_lang=uk.

[8]More precisely, the legal maximum duration of the probationary period for permanent contract goes from

view that temporary contracts are used to screen workers cannot explain the huge amount of creation of temporary contracts of very short spell, much shorter than that of probationary periods.[9]

Another contribution, with respect to the literature devoted to the analysis of employment protection legislation, is to provide a much more complete picture of the consequences of regulations that change the relative cost of temporary and permanent jobs. Our approach allows us to evaluate the impact of such regulations on the distribution of employment spells and on the choice between permanent and temporary jobs. This is an improvement with respect to the current literature, which does not explain in a unified framework the choice between temporary and permanent contracts, or the duration of temporary contracts and their transformation into permanent contracts.[10] Our approach is especially suited to evaluating different tax systems, targeted either at temporary contracts of short duration, like in the French system, or generalized to all temporary contracts, like in the Italian system. It is also relevant to the analysis of the consequences of more structural reforms, like the introduction of open-ended contracts with low termination costs for jobs of short duration.

The paper is organized as follows. The model is presented in section 2. Section 3 presents the data and the estimation of the benchmark model in which the job arrival rate is exogenous. Section 4 is devoted to the empirical evaluation of the impact of different systems of taxation of temporary contracts. Section 5 extends the benchmark model to account for the reaction of the job arrival rate to the taxation of temporary contracts. Section 6 analyzes the consequences of an open-ended contract without layoff costs for separations occurring at short tenure. Section 7 concludes.

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2 months for blue collar workers to 4 months for white collar workers in France. The probationary period can be renewed once if this is stipulated in the labor contract.

[9]To the extent that workers can be dismissed at zero cost during probationary periods, at first sight it is more profitable to exploit job opportunities expected not to last long with permanent contracts that are terminated at no cost during the probationary periods, rather than with temporary contracts that cannot be terminated before their date of termination even if the job becomes non profitable. However this type of behavior is illegal. An employer who systematically hires workers under permanent contracts and dismisses them during the probationary period instead of using temporary contracts runs the risk of being prosecuted. Our approach does not account for probationary periods for the sake of simplicity. We merely assume that permanent workers are protected by firing costs from the start of their contract.

[10]See, among others: Bentolila et al. (2012), Berson and Ferrari (2015), Berton and Garibaldi (2012), Blanchard and Landier (2002), Boeri and Garibaldi (2007), Cahuc and Postel-Vinay (2002), Costain, Jimeno and Thomas (2010), Macho-Stadler et al. (2014), Portugal and Varejào (2009), Sala, Silva and Toledo (2012), Smith (2007).

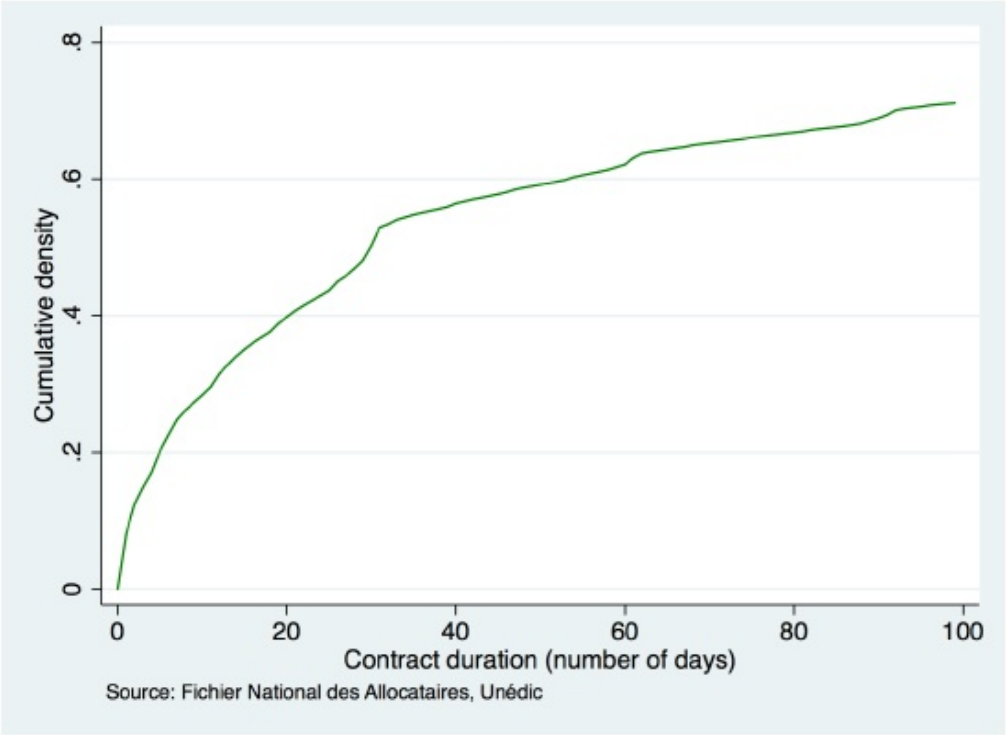

Figure 3.1: Cumulative density of temporary contracts durations in temporary jobs inflows in France over the period 2010-2012.

3.2 The model

This section outlines the economic environment in which we analyze the effects of the introduction of a tax on temporary contracts. In this framework, the choice (temporary or open-ended) and the duration of labor contracts are endogenous. Jobs can be either taxed or subsidized according to their type and duration. We first describe the framework before explaining how firms choose the type of contract and the duration of temporary jobs. Then, we define the labor market equilibrium.

3.2.1 The framework

3.2.1.1 Assumptions

Time is continuous and there is a measure one of infinitely-lived agents who discount the future at a common rate $r > 0$. There are two goods: labor, which is the sole input, and a numéraire good which is produced and consumed. Our analysis is focused on low wage workers, who are

the most likely to hold temporary jobs. In continental European countries, low wages are far from being competitive. They are set by wage floors at the national level and at the industry level. Accordingly, we assume that all workers are paid the minimum wage w.[11] Firms are competitive and create jobs to produce a numéraire output, using labor as sole input. All jobs produce the same quantity of output per unit of time, denoted by $y > 0$, but jobs differ by the rate at which they become unproductive, denoted by $\lambda > 0$. When a job is created, its type λ is randomly selected from $[\lambda_{\min}, +\infty)$, $\lambda_{\min} > 0$, according to a sampling distribution with cumulative distribution function G and density g. The distribution of λ has positive density over all its support and no mass point. Jobs and workers are brought together pairwise through a sequential, random and time consuming search process.

There are two types of contract: temporary and permanent. Permanent contracts stipulate the fixed minimum wage w and are open-ended: they do not stipulate any pre-determined duration. Permanent jobs can be terminated at any time at cost F. There is a (small) cost to write a contract,[12] either temporary or permanent, which is denoted by $c > 0$. Temporary contracts stipulate the wage w and a fixed duration. Temporary contracts are neither renegotiable nor renewable.[13] The employer must pay the worker the wage stipulated in the contract until the date of termination, even if the job becomes unproductive before this date.[14] At their date of termination, temporary jobs can be either destroyed at zero cost or transformed into permanent jobs.

Firms choose the type of contract that maximizes the value of the starting job. A temporary contract is chosen if it yields a higher value to the firm than a permanent contract. If a temporary contract is selected, the duration of the contract is chosen once for all in the starting

[11] The case of endogenous wages is analyzed in Cahuc et al. (2016). Here, we assume that the wage is exogenous given our focus on low paid workers. In France, 95% of workers are covered by collective agreements. All wage floors set by collective agreements react to the national minimum wage (Gautier, Fougère and Roux, 2016) and increases in the minimum wage have significant effects on wages up to the seventh decile of the wage distribution (Aeberhardt, Givord and Marbot, 2012).

[12] A strictly positive cost is necessary to account for the fact that jobs can start with open-ended contracts. Put differently, if the cost to write contracts is equal to zero, it is always preferable to hire workers on temporary jobs, possibly for very short periods of time, and then to transform temporary jobs into permanent jobs instead of directly hiring workers on permanent jobs.

[13] For the sake of simplicity, we rule out the possibility to renew contract. Renewal of temporary contracts is analyzed in the working paper version of Cahuc et al. (2016), available as IZA discussion paper n°6365.

[14] This assumption covers the French type of regulation, implemented in Belgium, France, Greece, Italy and Germany, where temporary contracts cannot be terminated before their expiration date, and the Spanish type of regulation, implemented in Spain and Portugal, where the rule for dismissals before the expiration date of temporary contracts is the same as for permanent contracts. Hence, for a given employment spell, it is generally at least as costly to terminate a temporary contract before its expiration date as to terminate a regular contract. See ILO Employment protection legislation database (http://www.ilo.org/dyn/terminate/) and the OECD indicator of job protection (www.oecd.org/employment/protection).

contract because it is not permitted to renegotiate the contract.

Temporary contracts have to pay a tax. This tax, denoted by $\tau(\Delta) \geq 0$, can depend on the duration Δ of the temporary contract. Temporary contracts turned into open-ended contracts can get a refund, denoted by $\rho(\Delta) \geq 0$, which can also depend on the duration of the temporary contract. The total amount of collected taxes is paid back to firms with a lump-sum subsidy to all jobs.

3.2.1.2 The value of permanent and temporary jobs

The value to a firm of starting permanent jobs with shock arrival rate λ, denoted by $J_p(\lambda)$, can be written as:

$$J_p(\lambda) = \int_0^{\infty} (y - w - \lambda F) e^{-(r+\lambda)\varkappa} \mathrm{d}\varkappa - c. \tag{3.1}$$

The first term $y - w$, stands for the flow of profits, multiplied by the term $e^{-(r+\lambda)\varkappa}$, which corresponds to the discount factor times the survival probability of the job, equal to $e^{-\lambda\varkappa}$. Profits are expected until some random date $\varkappa$, at which the job becomes unproductive and is destroyed at cost F. The term $\lambda e^{-\lambda\varkappa}$ corresponds to the density of the Poisson process governing productivity shocks. The last term, c, denotes the cost to write the contract. The value $J_p(\lambda)$ can be written as:

$$J_p(\lambda) = \frac{y - w - \lambda F}{r + \lambda} - c. \tag{3.2}$$

By the same token, the value to a firm of starting temporary jobs with shock arrival rate λ and duration Δ, $J_t(\lambda, \Delta, \tau, \rho)$, can be written as:

$$J_t(\lambda, \Delta, \tau(\Delta), \rho(\Delta)) = \int_0^{\Delta} \left[y e^{-\lambda\varkappa} - w - \tau(\Delta) \right] e^{-r\varkappa} \mathrm{d}\varkappa + \max\left[J_p(\lambda) + \rho(\Delta), 0 \right] e^{-(r+\lambda)\Delta} - c. \tag{3.3}$$

The first term, $\int_0^{\Delta} \left[y e^{-\lambda\varkappa} - w - \tau(\Delta) \right] e^{-r\varkappa} \mathrm{d}\varkappa$, stands for the discounted sum of expected profits over the duration of the job. In this expression, the level of production y is multiplied by the survival function $e^{-\lambda\varkappa}$ because the production drops to zero at rate λ. The wage w and the tax $\tau(\Delta)$ are not multiplied by the survival function because the employer has to keep and pay the employee until the date of termination of the contract. The second term, $\max\left[J_p(\lambda) + \rho(\Delta), 0 \right] e^{-(r+\lambda)\Delta}$, is the present value of the option for the firm linked to the possibility of transforming the temporary job into a permanent job at the date of termination of the temporary contract, where $\rho(\Delta)$ stands for the refund of the tax paid on the temporary contracts. A temporary job may be converted into a permanent job provided it yields a positive profit and has not been hit by a productivity shock, an event that occurs at rate

$e^{-\lambda\Delta}$. The present value of this option decreases with the duration of the contract because time is discounted at rate r and because the probability that the job is productive at the date of termination of the contract decreases with the spell of the contract. The last term is the cost to write the contract.

Let us now describe the optimal choice of the type of contract and of the duration of temporary contracts in the simplest case where there is no tax and no refund ($\tau(\Delta) = \rho(\Delta) = 0$). Then, we will analyze the consequences of the Italian and French tax systems.

3.2.2 The benchmark case without tax

In order to determine the choice between temporary and permanent contracts, we first need to define the value of temporary jobs at their optimal duration.

3.2.2.1 The optimal duration of temporary contracts

When $\tau(\Delta) = \rho(\Delta) = 0$, the optimal duration of temporary contracts is given by:

$$\Delta(\lambda) = \arg\max_{\Delta} J_t(\lambda, \Delta, 0, 0)$$

Using equation (3.3), it turns out that the optimal duration of a temporary contract on a job with shock arrival rate λ is defined by the following condition:[15]

$$\underbrace{ye^{-\lambda\Delta}}_{\text{marginal benefit}} = \underbrace{w + (r+\lambda)\max\left[J_p(\lambda), 0\right]e^{-\lambda\Delta}}_{\text{marginal cost}}. \tag{3.4}$$

In this expression, the left-hand side term, $ye^{-\lambda\Delta}$ stands for the marginal gain of an increase in the duration of the contract. This gain decreases with the duration of the contract because the survival probability of production opportunities decreases with the contract spell. It goes to zero when the duration goes to infinite. The right hand side corresponds to the marginal cost, which is equal to the sum of two terms. The first term, w, denotes the labor costs that must be paid until the termination date of the contract. The second term, $(r+\lambda)\max\left[J_p(\lambda), 0\right]e^{-\lambda\Delta}$, is the option value linked to the possibility of transforming the temporary job into a permanent

[15] The SOC is always fulfilled. Namely, it reads

$$-\lambda y e^{-\lambda\Delta} + \lambda e^{-\lambda\Delta}(r+\lambda)\max\left[J_p(\lambda), 0\right]$$

It is obviously negative when $\lambda > \lambda_p$, or equivalently, when $\max\left[J_p(\lambda), 0\right] = 0$, as it writes simply $-\lambda y e^{-\lambda\Delta} < 0$ in this case. When $J_p(\lambda) > 0$, the derivative of the first order condition with respect to Δ is $-\lambda y e^{-\lambda\Delta} + \lambda e^{-\lambda\Delta}(r+\lambda)J_p(\lambda)$ which is equal to (using (3.4)): $-\lambda w < 0$.

job. The marginal cost decreases with the duration of the job and has a strictly positive lower bound, equal to w.

The first order condition yields, together with equation (3.2), the optimal duration, as a function of λ, denoted by:

$$\Delta(\lambda) = \begin{cases} \frac{1}{\lambda}\log\left(\frac{w+\lambda F+(r+\lambda)c}{w}\right) & \text{if } \lambda \leq \lambda_p \\ \frac{1}{\lambda}\log\left(\frac{y}{w}\right) & \text{otherwise} \end{cases} \tag{3.5}$$

where

$$\lambda_p = \{\lambda | J_p(\lambda) = 0\} \tag{3.6}$$

denotes the threshold value above which permanent jobs are no longer profitable. Equation (3.5) shows that function Δ decreases with λ,[16] with a kink at λ_p as shown on figure 3.2. When the shock arrival rate is smaller than λ_p, temporary jobs that have not been hit by a shock at duration $\Delta(\lambda_p)$ are transformed into permanent jobs. When the shock arrival rate is larger than λ_p, temporary jobs are destroyed when they reach their termination date. In other words, only temporary jobs with duration longer than $\Delta(\lambda_p)$ can be transformed into permanent jobs when they reach their termination date.

It is worth noting that the duration $\Delta(\lambda)$ of temporary contracts that are never transformed into permanent contracts at their termination date is shorter than the average duration of type-λ production opportunities, equal to $1/\lambda$, which would also correspond to the average duration of jobs if these production opportunities were exploited with permanent contracts. To put it differently, the obligation to pay workers until the termination date of contracts induces employers to shorten job durations.[17]

[16] It is easy to check that $\lim_{\lambda\to 0}\Delta(\lambda) = +\infty$ and $\lim_{\lambda\to\infty}\Delta(\lambda) = 0$.

[17] More accurately, the bottom part of equation (3.5) shows that the contract duration of type-λ production opportunities is lower than $1/\lambda$ if $\log(y/w) < 1$, which is generally the case to the extent that the ratio between marginal productivity y and the wage w is usually well below $\exp(1) = 2.72$. It can be shown that this conclusion holds true if temporary contracts can be renewed a limited number of times.

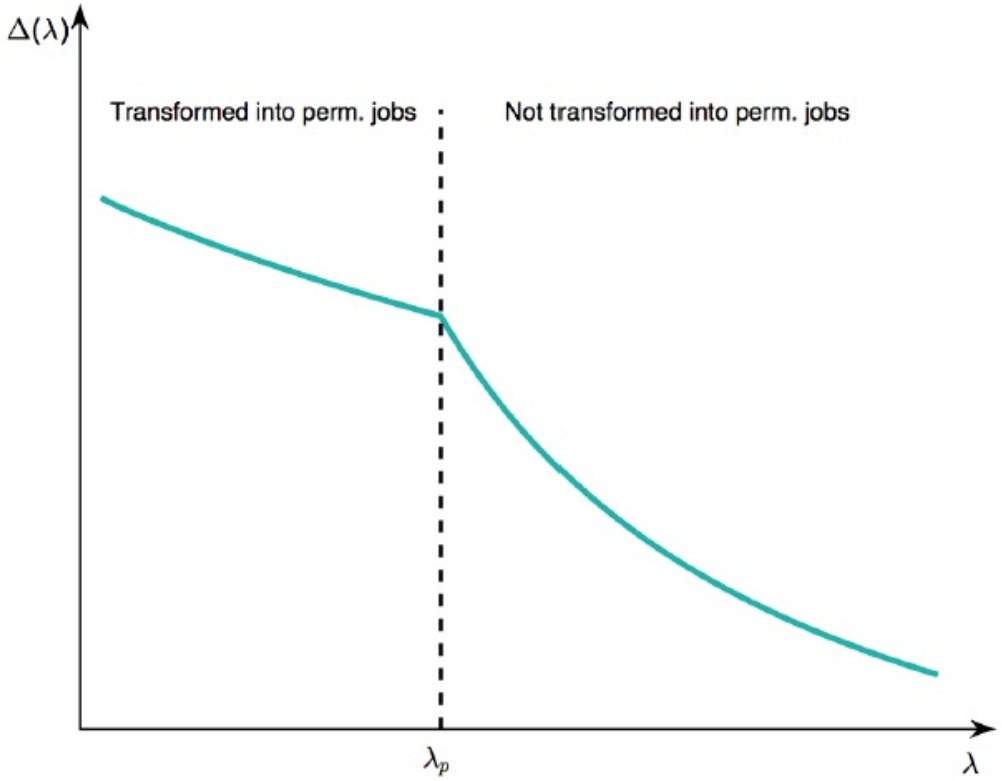

Figure 3.2: The relation between the shock arrival rate λ and the optimal duration of temporary contracts $\Delta(\lambda)$. Temporary jobs can be transformed into permanent jobs if $\lambda < \lambda_p$. Otherwise, they are destroyed at the end of the temporary contract.

3.2.2.2 The choice between temporary and permanent contract

Firms prefer permanent jobs to temporary jobs if and only if the value of starting permanent jobs is greater than the value of starting temporary jobs, or more formally

$$J_p(\lambda) \geq J_t(\lambda) = \max_{\Delta} J_t(\lambda, \Delta, 0, 0).$$

Figure 3.3 displays the shape of the values of permanent and temporary jobs.[18] It shows that permanent jobs are more profitable than temporary jobs if the shock arrival rate is smaller than the threshold value

$$\lambda_s = \{\lambda | J_p(\lambda) = J_t(\lambda)\}. \tag{3.7}$$

Accordingly, in that case, firms create permanent jobs. Otherwise, they create temporary jobs

[18]Formal proofs for the precise shape of these functions are given in appendix 3.A.1.

if the shock arrival rate is lower than

$$\lambda_t = \{\lambda | J_t(\lambda) = 0\}. \tag{3.8}$$

If a temporary job is created, its duration is equal to $\Delta(\lambda)$ and it can be transformed into a permanent job only if its duration is longer than $\Delta(\lambda_p)$.

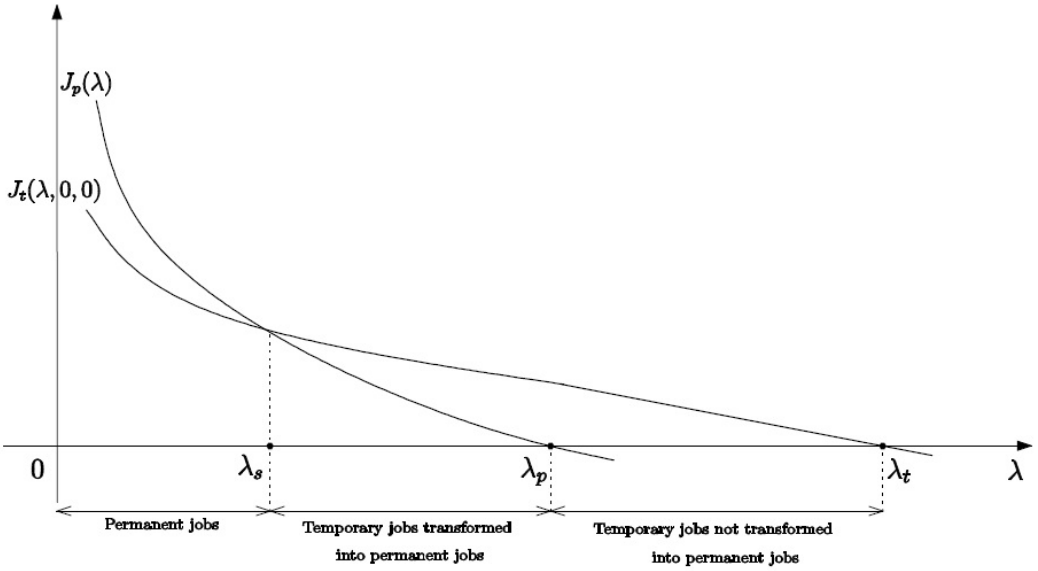

Figure 3.3: The relation between the shock arrival rate and the type of job creation.

3.2.3 The Italian system

In the Italian system, all temporary jobs pay the tax $\tau(\Delta) = \bar{\tau}$ independent of the duration of the contract and employers get a refund limited to the last 6 monthly payments of the tax. For the sake of simplicity, we assume that only temporary jobs of duration longer than 6 months are transformed into permanent jobs, meaning that the refund does not depend on the duration of the temporary jobs transformed into permanent jobs, i.e. $\rho(\Delta) = \bar{\rho} < \bar{\tau}\Delta$. The tax receipt is paid back to firms with a lump-sum subsidy to all jobs denoted by $\bar{s}$. It is easily checked that the optimal duration of temporary jobs is

$$\Delta^{\text{It}}(\lambda) = \begin{cases} \frac{1}{\lambda} \log\left(\frac{w-\bar{s}+\lambda F+(r+\lambda)(c-\bar{\rho})}{w-\bar{s}+\bar{\tau}}\right) & \text{if } \lambda \leq \lambda_p^{\text{It}} \\ \frac{1}{\lambda} \log\left(\frac{y}{w-\bar{s}+\bar{\tau}}\right) & \text{otherwise} \end{cases} \tag{3.9}$$

where $\lambda_p^{\text{It}} = \{\lambda | J_p(\lambda) + \bar{\rho} = 0\}$ is the threshold value of the shock arrival rate below which temporary jobs can be transformed into permanent jobs. From the definition of λ_p^{It}, it appears that higher refunds $\bar{\rho}$ increase the share of temporary jobs transformed into permanent jobs.[19] The refund also reduces the optimal duration of temporary contracts that can be transformed into permanent contracts. This effect helps to increase the share of temporary jobs transformed into permanent jobs, since the probability to be hit by a shock increases with contract duration. The tax $\bar{\tau}$ reduces the duration of all temporary contracts. The tax also has a negative impact on the creation of temporary jobs since it reduces the threshold value of the shock arrival rate below which it is profitable to create temporary jobs, $\lambda_t^{\text{It}} = \{\lambda | J_t(\lambda, \bar{\tau}, \bar{\rho}) = 0\}$.

The tax and the refund modify the choice between temporary and permanent contracts. The condition under which permanent jobs are preferred to temporary jobs is

$$J_p(\lambda) \geq J_t(\lambda, \bar{\tau}, \bar{\rho}) = \max_{\Delta} J_t(\lambda, \Delta, \bar{\tau}, \bar{\rho}).$$

The tax reduces the present value of starting temporary jobs since the refund $\bar{\rho}$ does not fully offset the total expected amount of tax paid on temporary jobs. By reducing the relative profitability of temporary jobs, the Italian reform raises the number of creations of permanent jobs ($\lambda_s^{\text{It}} = \{\lambda | J_p(\lambda) = J_t(\lambda, \bar{\tau}, \bar{\rho})\} > \lambda_s$) and the number of temporary jobs that are transformed into permanent jobs ($\lambda_p^{\text{It}} > \lambda_p$), as shown on figure 3.4 which displays the shape of functions $J_p(\lambda)$ and $J_t(\lambda, \bar{\tau}, \bar{\rho})$. These two effects help to decrease unemployment. However, the Italian reform decreases the total number of job creations since it lowers the threshold value of the shock arrival rate below which jobs are created ($\lambda_t^{\text{It}} < \lambda_t$). This is a direct consequence of the increase in labor costs induced by the tax, the refund being smaller than the total expected amount of taxes paid by firms. Another consequence of the increase in labor cost is the shorter duration of temporary jobs. These two effects help to increase unemployment.

All in all, the Italian reform has ambiguous effects on job stability, job market segmentation and unemployment. On one hand, it increases the number of permanent jobs, but on the other hand it reduces the duration of temporary jobs and prevents the creation of temporary jobs used to exploit production opportunities of very short duration (i.e. $\lambda > \lambda_t^{\text{It}}$).

[19] Since $J_p(\lambda)$ decreases with λ, the condition which defines λ_p^{It}, $J_p\left(\lambda_p^{\text{It}}\right) + \bar{\rho} = 0$ implies that $\mathrm{d}\lambda_p^{\text{It}}/\mathrm{d}\bar{\rho} > 0$. See appendix 3.A.3 for more details on the comparative statics of the Italian case.

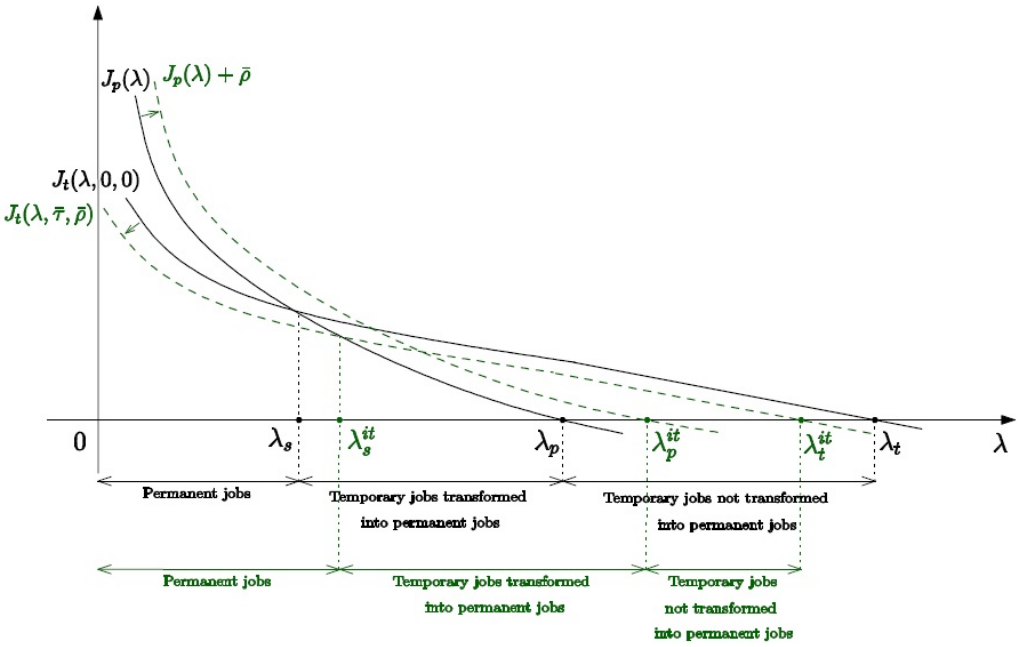

Figure 3.4: The relation between the shock arrival rate and the type of job creation in the Italian system.

3.2.4 The French system

The French system (including Portugal and Spain) targets the tax on temporary jobs of short durations. The tax $\bar{\tau}$ is paid for temporary contracts of duration shorter than $\bar{\Delta}$.[20] The tax receipt is paid back to firms with a lump-sum subsidy to all jobs denoted by $\bar{s}$. There is a refund equal to the total amount of tax paid on temporary contracts transformed into open-ended contracts. For the sake of simplicity, we assume that $\bar{\Delta}$ is small enough to ensure that contracts of duration $\Delta \leq \bar{\Delta}$ subject to the tax are not transformed into permanent contracts. This assumption is relevant to describing the French system in which only contracts of durations shorter than 3 months are taxed.[21]

This assumption implies that the duration of temporary contracts that can be transformed into permanent contracts is too long to be subject to the tax (i.e. longer than $\bar{\Delta}$), or, in other words, that firms do not pay taxes and do not get refund when they decide to transform temporary contracts into permanent contracts. In this context, the value to a firm of starting

[20] Actually, the French system comprises two thresholds. The tax amounts to 3 percent of the gross wage for contracts of duration shorter than one month and to 1.5 percent for contracts of duration from 1 to 3 months. We consider only one threshold for the sake of simplicity.

[21] This threshold is equal to 2 weeks in Portugal and 1 week in Spain.

temporary jobs with shock arrival rate λ and duration Δ, is equal to

$$J_t(\lambda,\Delta,\bar{\tau},0)=\begin{cases}\int_0^{\Delta}\left(ye^{-\lambda\varkappa}-w+\bar{s}\right)e^{-r\varkappa}\mathrm{d}\varkappa+\max\left[J_p\left(\lambda\right),0\right]e^{-(r+\lambda)\Delta}-c & \text{if } \bar{\Delta}\leq\Delta\\ \int_0^{\Delta}\left(ye^{-\lambda\varkappa}-w-\bar{\tau}+\bar{s}\right)e^{-r\varkappa}\mathrm{d}\varkappa-c & \text{if } \bar{\Delta}>\Delta.\end{cases} \tag{3.10}$$

The relation between the optimal duration of temporary contracts and the shock arrival rate is displayed on figure 3.5.[22] To understand the shape of the optimal duration, it is convenient to start from a low shock arrival rate and see how the duration changes as the arrival rate increases. When the shock arrival rate is sufficiently small, the optimal contract duration is longer than $\bar{\Delta}$, which implies that there is no tax to pay. In that case, the optimal duration of temporary contracts is identical to that defined absent taxation, as defined by equation (3.5), except that the labor cost is equal to $w-\bar{s}$ instead of w. Therefore, the optimal contract duration is defined by:

$$\Delta^{\mathrm{Fr}}\left(\lambda\right)=\begin{cases}\frac{1}{\lambda}\log\left(\frac{w-\bar{s}+\lambda F+(r+\lambda)c}{w-\bar{s}}\right) & \text{if } \lambda\leq\lambda_p^{\mathrm{Fr}}\\ \frac{1}{\lambda}\log\left(\frac{y}{w-\bar{s}}\right) & \text{if } \lambda_p^{\mathrm{Fr}}<\lambda\leq\bar{\lambda}\end{cases} \tag{3.11}$$

where $\lambda_p^{\mathrm{Fr}}=\left\{\lambda|J_p\left(\lambda\right)=0\right\}$ is the threshold value of the shock arrival rate below which temporary jobs can be transformed into permanent jobs.[23] This threshold value is larger than it would be absent taxation ($\lambda_p^{\mathrm{Fr}}>\lambda_p$) because the subsidy $\bar{s}$, which lowers the labor cost, increases the incentive to keep going jobs at the termination date of temporary contracts. The drop in labor cost also increases the duration of temporary jobs. However, these effects are very small to the extent that the subsidy $\bar{s}$, which redistributes the tax receipt to all jobs, is very small in a context where only contracts of short durations are taxed.

Below the threshold $\bar{\lambda}=\left\{\lambda|\Delta^{\mathrm{Fr}}\left(\lambda\right)=\bar{\Delta}\right\}$, the optimal contract duration is not directly influenced by the tax on temporary contracts: it is only affected by the lump-sum subsidy that slightly raises the duration of contracts. Now, if the shock arrival rate is higher than the threshold value $\bar{\lambda}$, the firm has to pay the tax τ if it chooses a duration lower than $\bar{\Delta}$. But it is not always profitable to do so. It can be more profitable to choose a duration equal to $\bar{\Delta}$, in order to avoid paying the tax. It is profitable to do so if the shock arrival rate is not too large, i.e. if $\lambda\leq\lambda_\tau=\left\{\lambda|\max_\Delta J_t\left(\lambda,\Delta,\bar{\tau},0\right)=J_t\left(\lambda,\bar{\Delta},0,0\right)\right\}$. This implies that there is bunching at duration $\bar{\Delta}$, for all values of the shock arrival rate belonging to the interval $\left[\bar{\lambda},\lambda_\tau\right]$, because

[22] See appendix 3.A.2 for a formal derivation of the optimal duration of temporary contracts in the French system.

[23] Here, $J_p\left(\lambda\right)=\frac{y-w+\bar{s}-\lambda F}{r+\lambda}-c$. We keep the same notation as in the case without taxation for the sake of simplicity.

it is worth lengthening contract duration to avoid the tax over this interval. If the shock arrival rate exceeds λ_τ, it becomes profitable to reduce the contract duration below $\bar{\Delta}$ and to pay the tax. In this situation, the tax reduces the optimal duration of temporary jobs as it increases the marginal cost of extending their duration.

Besides, the value of temporary jobs decreases with the tax. This implies that the tax reduces the threshold value λ_t of the shock arrival rate below which jobs are created. The tax is thus detrimental to job creation, as it makes unprofitable the contracts of very short duration, below $\Delta(\lambda_t)$.

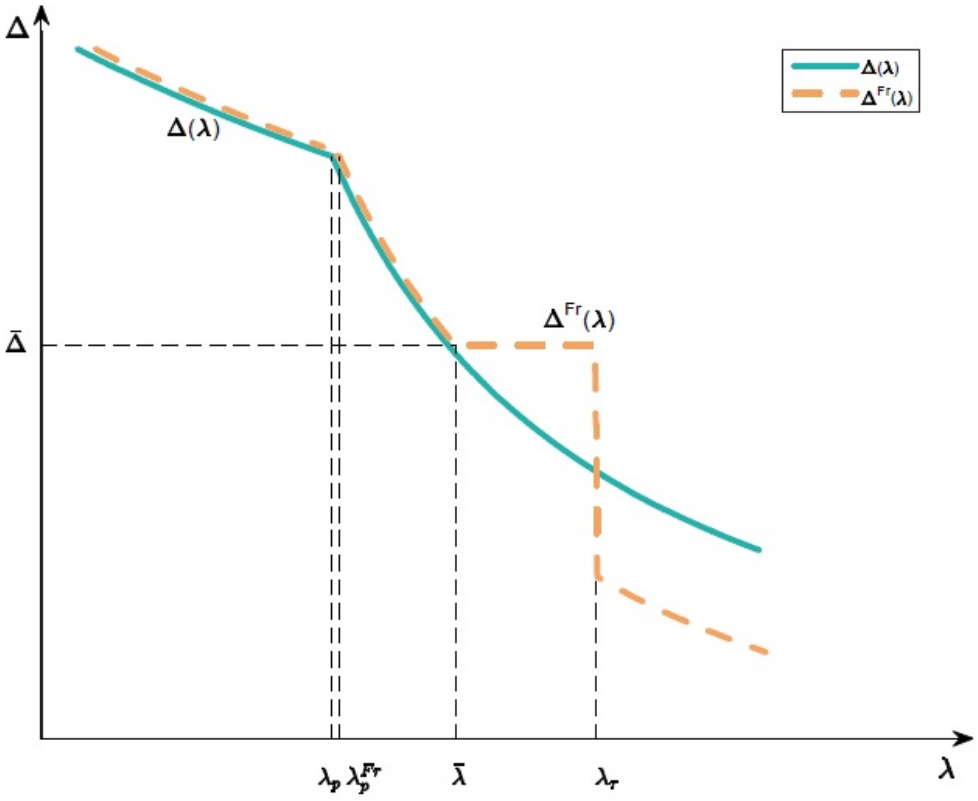

Figure 3.5: The relation between the shock arrival rate λ and the optimal duration of temporary jobs in the French system (dotted line) and in the system without tax (continuous line).

In the French system, since only temporary contracts of very short duration are taxed, the choice between temporary and open-ended contracts is not directly impacted by the tax on temporary contracts.[24] All in all, the French system changes the duration of temporary

[24]It is however influenced by the subsidy, which has a small effect, that is not discussed here. Appendix 3.A.4 provides a more detailed analysis of the comparative statics in the French case.

contracts of short duration, with opposing effects. It decreases the very short durations and it increases the durations close to and shorter than the threshold duration below which temporary contracts are taxed.

3.2.5 Unemployment and welfare

Each unemployed worker gets job opportunities at rate α. Since only jobs with a productivity shock arrival rate below the threshold value λ_t are created, the job finding rate is $\alpha G(\lambda_t)$. The job finding rate, together with the equilibrium values of λ_p, λ_s and λ_t defined by equations (3.6), (3.7), (3.8) determines the equilibrium distribution of job durations and the equilibrium unemployment rate computed from the equality of unemployment inflows and outflows. Absent taxation of temporary contracts, the equilibrium unemployment rate is defined by:[25]

$$u = \frac{1}{1 + \alpha \left[\int_{\lambda_{\min}}^{\lambda_s} \frac{1}{\lambda} g(\lambda) \mathrm{d}\lambda + \int_{\lambda_s}^{\lambda_p} g(\lambda) \left[\frac{e^{-\lambda \Delta(\lambda)}}{\lambda} + \Delta(\lambda) \right] \mathrm{d}\lambda + \int_{\lambda_p}^{\lambda_t} g(\lambda) \Delta(\lambda) \, \mathrm{d}\lambda \right]}. \tag{3.12}$$

It is also possible to compute the discounted expected utilities of unemployed workers and of workers on temporary jobs and on permanent jobs. Let us assume that workers have no access to financial markets and that production is non-storable so that the flow of consumption is equal to the flow of income. Let us denote by $v(\cdot)$, $v'(\cdot) > 0, v''(\cdot) \leq 0$ the instantaneous utility function, which depends on instantaneous income. If b denotes unemployment benefits, the discounted expected utilities of unemployed workers W_u, of employees on type-λ temporary jobs, $W_t(\lambda)$, and on type-λ permanent jobs, $W_p(\lambda)$, satisfy

$$\begin{aligned}
rW_u &= v(b) + \alpha \left[\int_{\lambda_{\min}}^{\lambda_s} [W_p(\lambda) - W_u] \, \mathrm{d}G(\lambda) + \int_{\lambda_s}^{\lambda_t} [W_t(\lambda) - W_u] \, \mathrm{d}G(\lambda) \right] \\
rW_p(\lambda) &= v(w) + \lambda [W_u - W_p(\lambda)] \\
W_t(\lambda) &= \begin{cases} \int_0^{\Delta(\lambda)} v(w) e^{-rt} \mathrm{d}t + e^{-r\Delta(\lambda)} W_u & \text{if } \lambda_t \geq \lambda > \lambda_p \\ \int_0^{\Delta(\lambda)} v(w) e^{-rt} \mathrm{d}t + e^{-(r+\lambda)\Delta(\lambda)} W_p(\lambda) + \left[1 - e^{-\lambda \Delta(\lambda)}\right] e^{-r\Delta(\lambda)} W_u & \text{if } \lambda_p \geq \lambda > \lambda_s \end{cases}
\end{aligned}$$

3.3 Data and Estimation

We now turn to the estimation of the model. The model is estimated using French data on the segment of low paid workers, whose wages are set by legal and conventional wage floors and who often occupy temporary jobs of short durations. We start by presenting the data, then the

[25] See appendix 3.A.5.

estimation strategy and the empirical results.

3.3.1 Data

Information about employment spells comes from administrative records of the public employment agency (Pôle Emploi and Unédic). These records comprise information on the employment spell, on the type of contract, the wage, the number of hours worked and on several characteristics of firms and workers. These records cover all the contracts of the past work experience of individuals registered with the public employment agency. They do not cover the whole universe of labor contracts since individuals who never registered with the public employment agency are not covered. Comparison of these data with other sources that register all hiring intentions shows that the number of temporary jobs registered by the public employment agency covers about 70 percent of hiring intentions and evolves in the same way as the overall number of hiring intentions (Benghalem, 2016).[26]

A natural strategy for analyzing the impact of the taxation of temporary contracts is to look at the changes in the distribution of contract durations around the 1 month and the 3 month thresholds before and after the implementation of the taxation of temporary jobs, on 1 July 2013. Given the mechanisms described in the previous section the density of durations of temporary contracts should bunch at these thresholds (see figure 3.5). Unfortunately, the actual tax implemented in France was so ineffective that it does not allow us to proceed with this strategy. Many industries, professions and types of contract were exempted from the tax. For instance, temporary contracts used to replace absent workers and seasonal jobs were exempted. These exemptions created many loopholes to avoid taxation. All in all, the amount of taxes collected has been very low.[27] As a consequence, available data do not allow us to detect changes in the distribution of contract durations around the 1 month and 3 month thresholds before and after 1 July 2013, as shown by figure 3.6 which displays the distributions of contract durations from 1 July 2012 to 30 June 2013 and from 1 July 2013 to 30 June 2014 for the first quartile of the wage distribution of the professions, types of contracts and industries subject to the tax. Nevertheless, our model does allow us to evaluate the potential impact of the tax. The model

[26] In France, prior to hiring, firms must report the type of vacancy they are about to open to the social security (ie. their hiring intentions). The DPAE (Déclarations Préalables A l'Embauche) records the universe of hiring intentions of French firms. Data are unfortunately not available to researchers at the required level of disaggregation.

[27] The annual receipt of the taxation of temporary jobs is about 70 million euros. The total receipt for the contributions to unemployment insurance is about 30 billion euros. The amount of collected taxes represents only 1.5 percent of the wage for contracts of duration shorter than one month in eligible professions and industries (instead of 3 percent in principle) and 0.7 percent for contracts of duration from 1 to 3 months (instead of 1.5 percent). Accordingly, the changes in tax at the 1 month and 3 months thresholds are very small.

is estimated over the period from January 2010 to June 2013, before the implementation of the taxation of temporary jobs for the first quartile of the wage distribution of the professions, types of contracts and industries subject to the tax.[28] There are 1,033,913 observations. The average and median contract durations are 45.8 days and 4 days respectively.

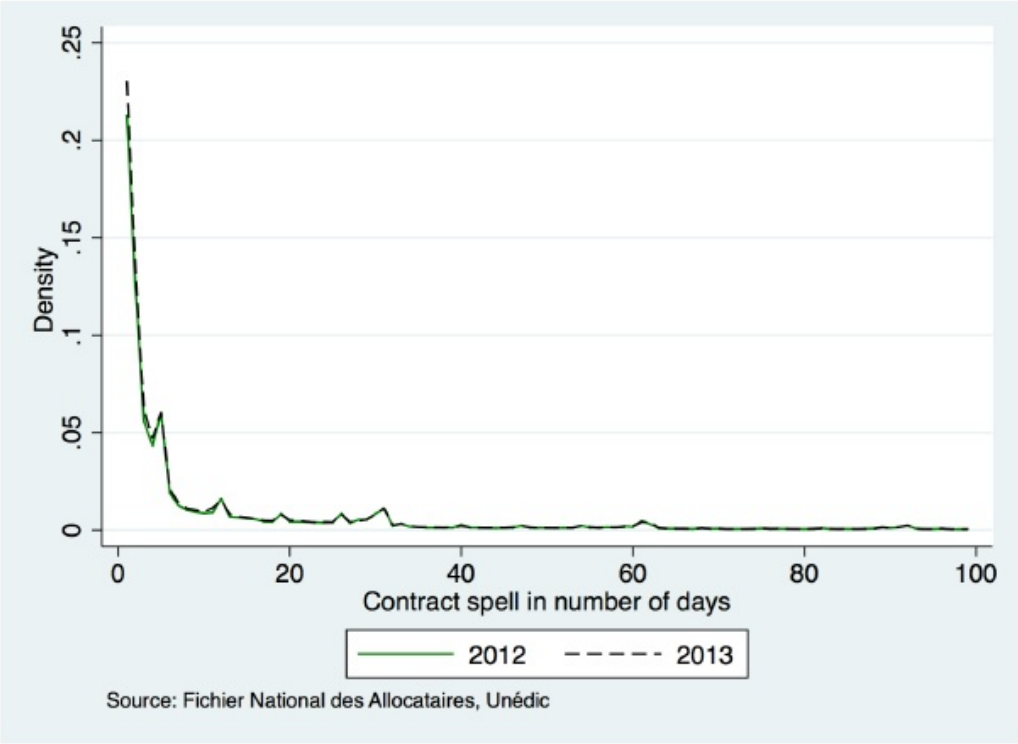

Figure 3.6: Density of durations of temporary contracts among all temporary contracts for the first quartile of the wage distribution of professions, industries and types of contracts subject to the tax implemented on 1 July 2013. 2012: contracts starting from 1 July 2012 to 30 June 2013; 2013: contracts starting from 1 July 2013 to 30 June 2014.

3.3.2 Estimation

The block recursivity of the model allows us to proceed to the estimation of its parameters step by step. The first block of the model determines the distribution of contract spells, which is defined by equations (3.5), (3.6), (3.7), (3.8) and by the distribution G of the arrival rates

[28] We consider contracts of duration shorter than 18 months, which is the maximal legal duration for the type of temporary contracts subject to the tax. Temporary contracts used to replace absent workers, which are not covered by the tax, can last 24 months.

of productivity shocks, which is assumed to be a Weibull distribution.[29] This implies that the distribution of contract spells is entirely defined by seven parameters: the discount rate r, the productivity y, the wage w, the scale μ, and the shape σ, of the Weibull distribution, the firing costs F and the costs of writing contracts c. We define the time period to be one day and consequently set the discount rate r to 0.000135, which corresponds to a 5 percent annual discount rate. The wage, which is exogenous in the model, is normalized to one. The five remaining parameters are estimated with the Generalized Method of Moments. The S moments are the shares of contracts of spell equal to $(1, 2, .., S)$ days. Let us denote by $p(s|\theta)$ the proportion of contracts of spell equal to s days predicted by the model conditional on the vector of parameters $\theta = (\mu, \sigma, F, c, y)$ and denote by $p(s)$ the empirical proportion of contracts of spell equal to s days. The GMM estimator $\hat{\theta}$ is defined by the following quadratic form

$$\hat{\theta} = \arg\min_{\theta} \left[\mathbf{p} - \mathbf{p}(\theta)\right] \hat{\Omega}^{-1} \left[\mathbf{p} - \mathbf{p}(\theta)\right]'$$

where $\mathbf{p} = (p(1), .., p(S))$, $\mathbf{p}(\theta) = (p(1|\theta), ..., p(S|\theta))$ and $\hat{\Omega}^{-1}$ is a symmetric and positive definite efficient weighting matrix.[30] In the benchmark estimates, the vector $(1, .., S)$ is equal to job spells from 1 to 45 days. The results, presented in Table 3.1, are consistent with empirical observation: we find that the wage amounts to 71% of productivity. The firing costs are equal to about two monthly wages (64 days) and the cost to write a contract represents about 0.08% of the daily wage. The fit between the empirical density of the contract durations and that predicted by the model, represented on Figure 3.7, is good. This visual impression is confirmed by the Hansen over-identification test as shown in Table 3.1.

[29] Estimates with a generalized Gamma distribution converge to a Weibull distribution.
[30] The estimation procedure is detailed in Appendix 3.A.6.

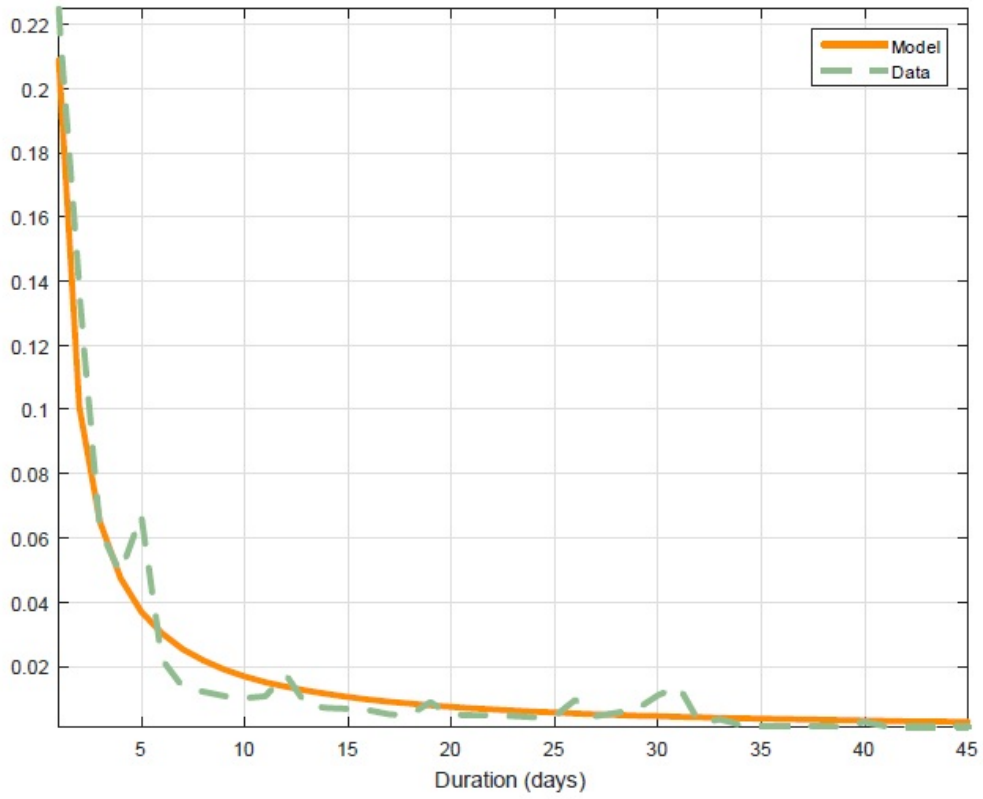

Figure 3.7: Empirical and estimated distributions of temporary contract durations in the flow of entries.

Once the values of the parameters μ, σ, y, F, c are estimated, the value of the arrival rate of job opportunities α is chosen to match the unemployment rate of unskilled workers, equal to 13.5%.

Table 3.1: GMM estimation.

Estimated parameters		
Parameter	Notation	Value
Weibull scale	μ	1.0881
		(0.0155)
Weibull shape	σ	0.1841
		(0.0033)
Firing costs	F	64.0750
		(0.0011)
Cost to write a contract	c	0.0008
		(0.0001)
Productivity	y	1.3951
		(0.0364)
Baseline parameters		
Discount rate	r	0.000135
Wage	w	1
Job arrival rate	α	0.0228
Hansen statistic		0.1029
		$\chi^2(45-5)$

Note: Standard errors in parentheses.

3.4 Empirical evaluation

This section is devoted to the analysis of the impact of the taxation of temporary contracts in the French system and in the Italian system.

3.4.1 The French system

In France, Portugal and Spain, taxation of temporary contracts targets contracts of short duration. In what follows, the duration below which temporary contracts are taxed, $\bar{\Delta}$, is set equal to 30 days. Figure 3.8 displays the consequences of a tax of 1.5% of the labor cost on temporary contracts of duration shorter than one month on the distribution of contract spells in the flow of entries into employment. The figure shows that there are no contracts between 23 and 30 days after the introduction of the tax because it is more profitable to use contracts of duration longer than one month to avoid taxation. There is bunching just above one month. The bunching increases the duration of contracts because contracts of durations between 23 days and one month are lengthened. However, the contracts below 23 days are shortened as shown in table 3.2 which reports the impact of the tax on unemployment, welfare and the

Table 3.2: Impact of the tax in the French system.

	unemp. rate (%)	Welfare (%)	Mean duration of Temp. jobs			
τ(%)			< 10 days	< 20 days	< 30 days	all
0	13.5000	0.0000	1.2762	2.1936	2.9926	11.9284
2.5	13.5008	−0.0041	1.1816	2.0310	2.9528	11.8970
5.0	13.5017	−0.0086	1.0892	1.9085	2.9097	11.8621
7.5	13.5027	−0.0133	0.9990	1.8613	2.8642	11.8249
10	13.5037	−0.0184	0.9109	1.8118	2.8164	11.7856

This table presents the impact of the tax on temporary jobs on the unemployment rate, on the welfare of unemployed workers and on the mean duration of temporary jobs. The preferences of workers are represented by a CRRA utility function. The coefficient of relative risk aversion is equal to 1 in this table. The measure of welfare change is the percentage change in the unemployment benefits replacement ratio equivalent to the change in welfare of unemployed workers induced by the tax. For instance, the tax equal to 10 percent of the labor cost induces a decrease in welfare equivalent to that induced by a drop of 0.0184 percent of the unemployment benefits replacement ratio.

duration of temporary contracts. The last column of table 3.2 shows that the tax decreases the mean duration of temporary contracts. This result is striking in as much as the aim of the taxation of temporary jobs is to decrease job turnover. Our evaluation suggests that the policy has the opposite effect. The tax also induces a fall in λ_t, the threshold value of the shock arrival rate λ below which jobs are created. This reduces the exit rate from unemployment, equal to $\alpha G(\lambda_t)$.

All in all, the drop of the exit rate from unemployment and the decrease in the mean duration of temporary jobs imply that unemployment increases. However, the effect is small when the tax is targeted at contracts of short duration, as in France (maximum 3 months), Portugal (2 weeks) and Spain (1 week). A tax on contracts of duration shorter than one month equal to 10% of the labor cost raises unemployment by 0.004 percentage points.

Since the tax decreases the job finding rate and increases job turnover, its impact on the discounted expected utility of unemployed workers is negative. Here too, the effect is small. A tax on contracts of duration shorter than one month equal to 10% of the labor cost induces a drop in the welfare of unemployed workers equivalent to a decrease in the unemployment benefit replacement ratio of 0.02%.

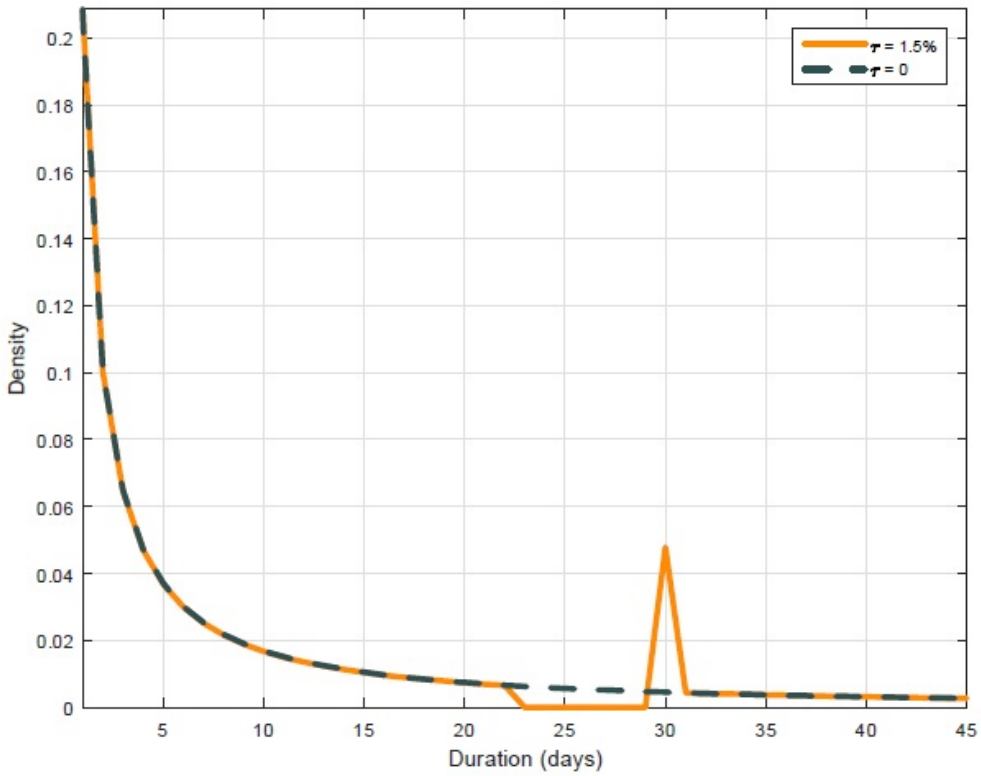

Figure 3.8: Impact of taxation of temporary contracts of duration shorter than one month on the distribution of the duration of contracts.

3.4.2 The Italian system

In the Italian system, all temporary contracts are taxed. The tax is refunded if temporary contracts are transformed into open-ended contracts, but the amount of the refund is limited to the last six monthly payments of the tax. Since all temporary contracts are taxed, the tax has a stronger impact than in the French system, where only contracts of short duration are taxed. Table 3.3 shows that the duration of temporary contracts of short duration decreases as in the French system. The duration of temporary contracts of greater length (above one month in our framework), which is slightly increased thanks to the lump-sum subsidy $\bar{s}$ in the French system, decreases in the Italian system. This helps to amplify the negative effects of the tax on job stability. But the refund of the tax for temporary contracts transformed into permanent contracts induces more transformation of temporary contracts into permanent contracts. This counteracts the shortening of temporary contracts. Nevertheless, table 3.3 shows that the tax increases unemployment more in the Italian system than in the French system, merely because

Table 3.3: Impact of the tax in the Italian system.

	unemp. rate (%)	Welfare (%)	Mean duration of Temp. jobs			
τ (%)			< 10 days	< 20 days	< 30 days	all
0	13.5000	0.0000	1.2762	2.1936	2.9926	11.9284
2.5	13.5095	−0.0454	1.1819	2.0316	2.7716	8.4284
5.0	13.5177	−0.0852	1.0896	1.8731	2.5555	6.8548
7.5	13.5254	−0.1223	0.9992	1.7180	2.3440	5.7420
10	13.5327	−0.1578	0.9102	1.5657	2.1366	4.8696

This table presents the impact of the tax on temporary jobs on the unemployment rate, on the welfare of unemployed workers and on the mean duration of temporary jobs. The preferences of workers are represented by a CRRA utility function. The coefficient of relative risk aversion is equal to 1 in this table. The measure of welfare change is the percentage change in the unemployment benefits replacement ratio equivalent to the change in the welfare of unemployed workers induced by the tax. For instance, the tax equal to 10 percent of the labor cost induces a decrease in welfare equivalent to that induced by a drop of 0.1578 percent of the unemployment benefits replacement ratio.

more temporary contracts are taxed in the Italian system. Unemployment increases by 0.03 percentage points when the tax equals 10%, an amount 9 times larger than in the French system. The drop in the welfare of unemployed workers is also about 9 times larger in the Italian than in the French system.

3.5 Endogenous arrival rate of job offers

Until now, it has been assumed that the arrival rate of job offers was exogenous, equal to α. In this section, the arrival rate of job offers is made endogenous to account for the potential impact of the tax on temporary contracts on job creation.

3.5.1 Labor market equilibrium

In order to account for job creation, it is assumed that there is free entry into the labor market. Firms must invest $\kappa > 0$ to find a production opportunity. κ is a sunk cost. Unemployed workers and job vacancies are brought together through a constant returns to scale matching technology which implies that vacant jobs are filled at rate $q(\theta)$, $q'(\theta) < 0$, where θ denotes the labor market tightness, equal to the ratio of the number of job vacancies over unemployment. Once matches are created, firms draw production opportunities from the sampling distribution $G(\lambda)$ of arrival rates of productivity shocks. The distribution of λ has positive density over all its support and no mass point. As shown in section 3.2.2, jobs are created only if the shock arrival rate is lower than the threshold λ_t. In this case, a temporary job is created if the shock

arrival rate is greater than λ_s and a permanent job is created otherwise. Thus, the value of a vacant job satisfies, in the benchmark model without taxes on temporary jobs,

$$rV = q(\theta)\left[\int_{\lambda_{\min}}^{\lambda_s} J_p(\lambda)\mathrm{d}G(\lambda) + \int_{\lambda_s}^{\lambda_t} \max_{\Delta} J_t(\lambda, \Delta, 0, 0)\mathrm{d}G(\lambda) - V\right], \tag{3.13}$$

where the value of $J_p(\lambda)$ is defined by equation (3.2), that of $\max_{\Delta} J_t(\lambda, \Delta, 0, 0)$ by equations (3.3) and (3.5). The free entry condition $V = \kappa$, can be written

$$\kappa = \frac{q(\theta)}{r + q(\theta)}\left[\int_{\lambda_{\min}}^{\lambda_s} J_p(\lambda)\mathrm{d}G(\lambda) + \int_{\lambda_s}^{\lambda_t} \max_{\Delta} J_t(\lambda, \Delta, 0, 0)\mathrm{d}G(\lambda)\right]. \tag{3.14}$$

The equilibrium distribution of job spells and the unemployment rate are defined as in the benchmark model, except that the variable $\theta q(\theta)$ is substituted for α, and the equilibrium value of the labor market tightness θ is defined by equation (3.14). At this stage, thanks to the block recursivity of the model, we already know the empirical values of the parameters of the Weilbull distribution (μ, σ), of the productivity y (the wage w is normalized to 1), of the firing cost F and of the cost of writing contracts c. We need to determine the empirical values of the parameters of the matching function and of the cost of posting job vacancies κ to define the equilibrium value of the labor market tightness.

3.5.2 Estimation and calibration

We assume that the matching function is Cobb-Douglas and homogeneous of degree one, which implies that the number of hires, H, is defined by the expression $H = mU^{1-\eta}V^{\eta}$, $\eta \in (0, 1)$, $m > 0$, where U stands for the number of unemployed workers and V for the number of vacant jobs. Therefore, the exit rate from unemployment, H/U, can be written $m\theta^{\eta}$, with $\theta = V/U$. To evaluate the parameter η of the matching function we estimate the logarithm of the job finding rate:

$$\log(H/U) = \eta \log \theta + \nu$$

where $\nu = \log m$.

The OLS estimates of this equation are exposed to an endogeneity bias arising from the search behavior of agents on either side of the market. For instance, improvements in the matching technology parameter m can raise the labor market tightness θ and the hiring rate (see Borowczik et al. 2013). This implies a potential correlation between the residuals of the OLS estimation and the labor market tightness which can bias downwards the OLS estimate of the

coefficient of the labor market tightness. To identify the coefficient of the labor market tightness, we need exogenous variations in labor demand. To address this issue, we use variations across commuting zones over time to achieve this identification and we rely on IV estimation following the approach of Bartik (1993). The shift in labor demand in commuting zone j is instrumented by the weighted average of the national rates of growth of the number of entries into employment across industries using commuting zone j industry entries shares as weights.

Data on unemployment and job vacancies for low skilled workers come from the French employment agency (*Pôle emploi*). Firms can post job vacancies at *Pôle emploi*. This is a free service and *Pôle emploi* estimates that they deal with almost 50% of the total of French vacancies. These data allow us to compute the labor market tightness, as the ratio of the number of job vacancies posted at the employment agency over the number of unemployed workers registered at the employment agency, at the commuting zone level for blue collars and low skilled white collars for each year from 2009 to 2011. There are 348 commuting zones. Data on hires of blue collars and low skilled white collars at the commuting zone level over the same period come from two data sets provided by the French Ministry of labor. The DMMO register (Déclaration Mensuelle de Mouvements de Main d'Oeuvre), which describes establishments job flows (entries, exits, jobs created and lost, etc.) by type of contract, gender, age, occupational category. This is an administrative register which is mandatorily filled by all establishments with more than 50 employees. Information for establishments with fewer than 50 employees relies on the EMMO survey (Enquête sur les Mouvements de Main d'Oeuvre), which is a quarterly survey providing the same information as the DMMO register.

We measure the tightness (θ_{jt}) and unemployment (U_{jt}) at the commuting zone level j at date t from the employment agency data and the hires (H_{jt}) from the establishment data. Let us denote by f_{jt} the annual job finding rate (H_{jt}/U_{jt}). We estimate the following equation

$$\log f_{jt} = a_1 \log \theta_{jt} + \sum_t b_t 1\left[date = t\right] + c_j + \nu_{jt} \tag{3.15}$$

where j is one of the 348 commuting zones and the date t varies from 2009 to 2011. The estimation controls for date dummies and commuting zones fixed effects (c_j). Equation (3.15) is estimated by standard (within) OLS regression, taking first difference to eliminate the commuting zone fixed effect. The shift in labor demand in commuting zone j at date t is instrumented by the variable $z_{jt} = \sum_i \bar{s}_{ij} E_{ijt}$ where $\bar{s}_{ij}$ denotes the average share of entries in industry i in commuting zone j in 2005-2006 and E_{ijt} denotes the growth rate of the number of entries in industry i in year t, in all commuting zones different from commuting zone j. Lagged values of z_{jt} are also used as instruments. These instruments are strongly correlated with the labor

Table 3.4: Estimates of the parameters of the matching function.

	(1)	(2)
	OLS	IV
Dep. var.		Labor market tightness (log)
		First stage
Entries		$.63^{***}$
		(.05)
Entries (-1)		-1.31^{***}
		(.17)
Entries (-2)		-0.65^{***}
		(.12)
Dep. var		Job finding rate (log)
		Second stage
Labor market tightness (log)	$.38^{***}$	$.43^{***}$
	(.07)	(.15)
Date FE	Yes	Yes
R^2	0,33	
Nb. Observations	879	879

Source : Pôle emploi and EMMO-DMMO. Note: Estimation of the parameter of the job matching function equation (A15) on 348 employment pools from 2005 to 2010. Labor market tightness (log) stands for the first difference in the log of the labor market tightness. Job finding rate (log) stands for the first difference in the log of the job finding rate.
(1) Standard OLS ; (2) IV regression. As instruments we include commuting zone fixed effects and we use the Bartik type instrument described in the text. 'Entries' stands for the weighted average of national growth rates of the number of entries into employment across industries using by the commuting zone industry shares averaged on 2005-2006 as weights. For each commuting zone j, the national growth rate of the number of entries in industry i in year t is equal to the growth rate of entries in industry i in year t in all commuting zones different from commuting zone j. 'Entries (-1)' and 'Entries (-2)' are the one year and two year lagged values of 'Entries' respectively. Robust standard errors in parentheses. * significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent.

market tightness, as shown by table 3.4. This table reports the estimates of the coefficient a_1 using OLS in column 1 and IV in column 2. Both estimates are highly significant. However, the OLS estimate is lower than the IV estimate as expected. Taking the IV estimation as our preferred estimate, η, the elasticity of the matching function with respect to the number of vacancies, amounts to 0.43. This estimate is in the range of those found in previous studies (see eg. Petrongolo and Pissarides, 2001, Coles and Petrongolo, 2008 or Borowczik et al. 2013).

The estimation of the matching function provides the estimate of the value of the elasticity of the matching function with respect to the number of vacancies. One needs to define the value of two more parameters, κ the investment cost the firm has to pay to find a production opportunity, and m, the parameter of the matching function, to be able to define the equilibrium value of the labor market tightness, defined by the free entry condition (3.14). The values of these two

parameters are chosen to match the unemployment rate, equal to 13.5%, and the elasticity of employment with respect to the wage, assumed equal to 1, which is the relevant target for low skilled workers (Hamermesh, 2014). As a result, it turns out that in our calibration m and κ are equal to 0.0035 and 23.79 respectively.

3.5.3 Results

The reaction of labor market tightness amplifies the negative impact of the taxation of temporary contracts on the labor market as shown by table 3.5 for the French system, where only temporary contracts of short duration are taxed, and by table 3.6 for the Italian system, where all temporary contracts are taxed. The impact of the tax on the duration of contracts is not reported in these tables because it is almost identical to the case where the arrival rate of job offers is exogenous, displayed in tables 3.2 and 3.3.

In the benchmark case for the French system, reported in columns 3 and 4 of table 3.5, where the elasticity of the matching function η is equal to 0.43, the impact on unemployment of the tax equal to 10% of the labor cost is about 16 times larger (0.063 percentage points instead of 0.004) than when the job arrival rate is exogenous. In order to gauge the robustness of this result, columns 1 and 2 of table 3.5 present the results when the elasticity of the matching function equals 0.3 instead of 0.43, which implies that the wage elasticity of employment is equal to 0.23 instead of 1. Although the wage elasticity of employment is much lower – actually a lower bound for the wage elasticity of employment of low skilled workers –, the reaction of labor market tightness still considerably amplifies the impact of the tax on unemployment, which is 6 times larger (0.024 percentage points instead of 0.004) than when the job arrival rate is constant. Columns 5 and 6 of table 3.5 show that the unemployment rate increases by 0.13 percentage points when the elasticity of the matching function is equal to 0.5, corresponding to wage elasticity of employment equal to 2.20.

Comparison of the welfare of unemployed workers in tables 3.2 and 3.5 shows that the negative impact of the tax of 10% of the labor cost on welfare is about 7 times larger than when the job arrival rate is exogenous in the benchmark case where the wage elasticity of employment equals 1. This ratio falls to 2.5 when the wage elasticity of employment equals 0.23 and climbs to 13 when the wage elasticity of employment equals 2.2.

The analysis of the Italian system relying on the comparison of tables 3.3 and 3.6 leads to the same conclusion: the reaction of labor market tightness considerably amplifies the negative impact of the taxation of temporary contracts on employment and welfare.

Table 3.5: Impact of the tax in the French system when the labor market tightness is endogenous.

	unemp. rate (%)	Welfare (%)	unemp. rate (%)	Welfare (%)	unemp. rate (%)	Welfare (%)
	$\eta = 0.3$, $\varepsilon_w^l = 0.23$		$\eta = 0.43$, $\varepsilon_w^l = 1$		$\eta = 0.5, \varepsilon_w^l = 2.20$	
τ (%)						
0	13.5000	–	13.5000	–	13.5000	–
2.5	13.5108	−0.0112	13.5186	−0.0345	13.5395	−0.0675
5.0	13.5154	−0.0218	13.5347	−0.0652	13.5724	−0.1267
7.5	13.5196	−0.0321	13.5494	−0.0935	13.6022	−0.1807
10	13.5237	−0.0423	13.5630	−0.1201	13.6296	−0.2309

This table presents the impact of the tax on temporary jobs on the unemployment rate and on the welfare of unemployed workers when the labor market tightness is endogenous for different values of the elasticity of the matching function. The preferences of workers are represented by a CRRA utility function. The coefficient of relative risk aversion is equal to 1 in this table. The measure of welfare change is the percentage change in the unemployment benefits replacement ratio equivalent to the change in the welfare of unemployed workers induced by the tax. For instance, when $\eta = 0.43$, the tax of 10 percent induces a drop in welfare equivalent to that induced by a drop of 0.1201 percent of the unemployment benefits replacement ratio.

Table 3.6: Impact of the tax in the Italian system when the labor market tightness is endogenous.

	unemp. rate (%)	Welfare (%)	unemp. rate (%)	Welfare (%)	unemp. rate (%)	Welfare (%)
	$\eta = 0.3$, $\varepsilon_w^l = 0.23$		$\eta = 0.43$, $\varepsilon_w^l = 1$		$\eta = 0.5$, $\varepsilon_w^l = 2.20$	
τ (%)						
0	13.5000	–	13.5000	–	13.5000	–
2.5	13.5333	−0.0824	13.5785	−0.1700	13.6537	−0.2960
5.0	13.5584	−0.1565	13.6521	−0.3274	13.7981	−0.5747
7.5	13.5822	−0.2260	13.7231	−0.4779	13.9388	−0.8447
10	13.6049	−0.2921	13.7920	−0.6233	14.0768	−1.1083

This table presents the impact of the tax on temporary jobs on the unemployment rate and on the welfare of unemployed workers when the labor market tightness is endogenous for different values of the elasticity of the matching function.
The preferences of workers are represented by a CRRA utility function. The coefficient of relative risk aversion is equal to 1 in this table. The measure of welfare change is the percentage change in the unemployment benefits replacement ratio equivalent to the change in the welfare of unemployed workers induced by the tax. For instance, when $\eta = 0.43$, the tax of 10 percent induces a drop in welfare equivalent to that induced by a drop of 0.6233 percent of the unemployment benefits replacement ratio.

3.6 Open-ended contract without layoff cost for separations occuring at short tenure

Having found that the taxation of temporary jobs is not relevant to improving labor market performance, we now look at other reforms that change the regulation of jobs of short duration. We consider a reform that allows jobs filled with temporary contracts in the benchmark case without taxes to be filled with open-ended contracts without firing costs up to tenure T. We assume that this tenure equals the maximum duration of temporary contracts of the benchmark model. The reform considered here is somehow reminiscent of the Italian Job act which has introduced in 2014 a new open contract with separation costs increasing with tenure. Beyond tenure T, job destruction costs F to the employer. F is equal to the estimated value in the benchmark model, defined in table 3.1.

In this context, all jobs start with the "new" open-ended contract because it is always more profitable than the temporary contract. Type-λ jobs are destroyed at rate λ and they reach tenure T with probability $e^{-\lambda T}$. At tenure T, either they go on if the value of the job $J_p(\lambda) + c$ (where $J_p(\lambda)$ is defined by equation (3.1)) is positive, or else they are destroyed. Jobs with shock arrival rate larger than $\lambda_p = \{\lambda | J_p(\lambda) + c = 0\}$ are destroyed at tenure T. Therefore, the value of starting jobs with shock arrival rate λ is

$$J(\lambda) = \int_0^T (y - w)\, e^{-(r+\lambda)t} \mathrm{d}t + e^{-(r+\lambda)T} \max\left[J_p(\lambda) + c, 0\right] - c.$$

Table 3.7 compares the equilibrium with the new open-ended contracts to the benchmark equilibrium with temporary and open-ended contracts. The first row shows that the new open-ended contract reduces unemployment. The effect is stronger when the arrival rate of job offers is endogenous: the unemployment rate drops by 1.4 percentage points. This significant drop is related to the lengthening of job spells as displayed by the last row of table 3.7: production opportunities exploited with temporary contracts shorter than 30 days, whose average duration is 2.99 days in the benchmark economy, are exploited with jobs that last 4.91 days on average in the economy with the new open-ended contract. This comparison shows that the new open-ended contract reduces job turnover because the regulation of temporary contracts induces employers to shorten the employment spells in order to avoid paying unproductive workers until the termination date of their contract. However, the jobs separation date becomes uncertain with the new open-ended contract. This uncertainty may be detrimental to welfare when workers are risk averse. Rows 2, 3 and 4 of table 3.7 display the change in welfare of unemployed workers

Table 3.7: The consequence of open-ended contracts without layoff costs at short tenure.

		Benchmark		New open-ended contract	
		Exogenous	Endogenous	Exogenous	Endogenous
Unemployment (%)		13.50	13.50	13.41	12.13
Welfare (%)	$\sigma = 0$ (risk neutrality)	–	–	0.4847	2.9798
	$\sigma = 1$ (weak risk aversion)	–	–	0.4195	2.6159
	$\sigma = 3$ (strong risk aversion)	–	–	0.3202	2.0363
Mean duration (days)	$d \leq 30$ days	2.9926	2.9926	4.9107	4.9107

This table compares the benchmark economy with temporary jobs to the economy with open ended-contracts without layoff cost for separations occuring at short tenure. 'Exogenous' and 'Endogenous' stand for the exogenous and endogenous arrival rates of job offers respectively. The last row compares the average duration of temporary contracts of duration shorter than 30 days (equal to 2.9926) to the average duration of these jobs if open-ended contracts are used instead of temporary contracts. The preferences of workers are represented by a CRRA utility function. The measure of welfare change is the percentage change in the unemployment benefits replacement ratio equivalent to the change in the welfare of unemployed workers induced by the introduction of the open-ended contract. For instance, under the assumption of risk neutrality, the open-ended contract induces an increase in welfare equivalent to a hike of 0.48 percent of the unemployment benefits replacement ratio when the arrival rate of job offers is exogenous.

induced by the introduction of the new open-ended contract for different degrees of relative risk aversion. It is apparent that welfare is always improved, meaning that the lengthening of job spell induced by the new open-ended contract dominates the increase in uncertainty about the job separation date. When the arrival rate of job offers is endogenous, welfare improvement is significant even if risk aversion is strong since the new open-ended contract raises the welfare of unemployed workers by an amount equivalent to 2.1% of the unemployment benefit ratio if the coefficient of relative risk aversion amounts to 3.

3.7 Conclusion

Our analysis suggests that the taxation of temporary contracts is not an appropriate policy to induce firms to create more stable jobs on a typical Continental European labor market that features stringent protection of permanent jobs. The taxation of temporary contracts shortens average job duration, raises unemployment and reduces the welfare of unemployed workers. This conclusion holds even if the taxation is targeted at temporary contracts of short duration and is offset by lower taxation of open-ended contracts and of temporary jobs of long duration. All in all, the taxation of temporary contracts deteriorates labor market efficiency and is detrimental to unemployed workers.

We argue that other policies should be implemented to counteract the strong segmentation of European labor markets between stable and unstable jobs. Our analysis suggests that regulations allowing employers to use either open-ended contracts with high dismissal costs or fixed term contracts which require employers to remunerate workers until the termination date of contracts are an important source of job instability, detrimental to employment and to the welfare of unemployed workers. In this context, it is more appropriate to reduce the dismissal costs of open-ended contracts occurring at short tenure than to tax temporary contracts to reduce job instability, in order to raise employment and the welfare of unemployed workers.

3.A Appendix

3.A.1 Properties of the values of permanent and temporary jobs

3.A.1.1 Properties of $J_p(\lambda)$

The function:

$$J_p(\lambda) = \frac{y - w - \lambda F}{r + \lambda} - c \tag{3.A1}$$

is continuous. It is decreasing in λ, as $J_p'(\lambda) = -\frac{y-w+rF}{(r+\lambda)^2} \leq 0$. It decreases from $\lim_{\lambda \to 0} J_p(\lambda) = \frac{y-w}{r} - c \geq 0$ to $\lim_{\lambda \to +\infty} J_p(\lambda) = -c - F \leq 0$. Thus, there exists a unique threshold

$$\lambda_p = \frac{y - w - rc}{c + F} \tag{3.A2}$$

such that $J_p(\lambda_p) = 0$ and $J_p(\lambda) \gtreqless 0$ iff $\lambda \lesseqgtr \lambda_p$, as indicated in the text.

3.A.1.2 Properties of $J_t(\lambda) = \max_{\Delta} J_t(\lambda, \Delta, 0, 0)$

The value of a temporary job is:

$$J_t(\lambda) = y\left(\frac{1 - e^{-(r+\lambda)\Delta(\lambda)}}{r + \lambda}\right) - \frac{w}{r}\left(1 - e^{-r\Delta(\lambda)}\right) + \max\left[J_p(\lambda), 0\right] e^{-(r+\lambda)\Delta(\lambda)} - c. \tag{3.A3}$$

Function $J_t(\lambda)$ is continuous over $[0, +\infty[$ and has a kink at $\lambda = \lambda_p$. Let us prove that $J_t(\lambda)$ is decreasing in λ.

- When $\lambda \geq \lambda_p$ we have

$$J_t(\lambda) = y\left(\frac{1 - e^{-(r+\lambda)\Delta(\lambda)}}{r + \lambda}\right) - \frac{w}{r}\left(1 - e^{-r\Delta(\lambda)}\right) - c \tag{3.A4}$$

  Keeping in mind that the envelope theorem implies that $\partial J_t / \partial \Delta = 0$, we have

$$J_t'(\lambda) = y\frac{\Delta(\lambda)(r + \lambda) e^{-(r+\lambda)\Delta(\lambda)} - 1 + e^{-(r+\lambda)\Delta(\lambda)}}{(r + \lambda)^2} \tag{3.A5}$$

  which is negative as $xe^{-x} - 1 + e^{-x}$ is negative for any value of $x > 0$.

- When $\lambda < \lambda_p$, we have, using the condition (3.4) which can be rewritten as follows:

$$\frac{e^{-r\Delta(\lambda)}\left[ye^{-\lambda\Delta} - w\right]}{r+\lambda} = \max\left[J_p(\lambda), 0\right] e^{-(r+\lambda)\Delta} \tag{3.A6}$$

Reinserting in (3.A3) yields

$$J_t(\lambda) = \frac{y}{r+\lambda} - w\left(\frac{1-e^{-r\Delta(\lambda)}}{r} + \frac{e^{-r\Delta(\lambda)}}{r+\lambda}\right) - c \tag{3.A7}$$

Differentiating yields

$$J_t'(\lambda) = -\frac{y - we^{-r\Delta(\lambda)}}{(r+\lambda)^2} < 0 \tag{3.A8}$$

Thus $J_t(\lambda)$ is decreasing in λ everywhere. Function $J_t(\lambda)$ monotonically decreases from $\lim_{\lambda\to 0} J_t(\lambda) = \frac{y-w}{r} - c \geq 0$ to $\lim_{\lambda\to\infty} J_t(\lambda) = -c \leq 0$, and therefore, there exists a unique threshold λ_t such that $J_t(\lambda_t) = 0$.

3.A.2 Optimal temporary contract duration in the French system

The optimal duration of temporary contracts maximizes the value of starting temporary jobs defined by equation (3.10). This leads us to distinguish two cases depending on whether the contract duration below which contracts are taxed, $\bar{\Delta}$, is either shorter or longer than the optimal contract duration absent taxes defined by

$$\Delta(\lambda, \bar{s}) = \frac{1}{\lambda}\log\left(\frac{w - \bar{s} + \lambda F + (r+\lambda)c}{w - \bar{s}}\right) \tag{3.A9}$$

Case 1: $\bar{\Delta} \leq \Delta(\lambda, \bar{s})$, the optimal contract duration in the presence of tax maximizes the value of starting temporary jobs defined by the first row of equation (3.10). This implies that the optimal duration of temporary contracts is given by $\Delta(\lambda, \bar{s})$ as defined by (3.A9). In this context, the tax has no direct effect on the optimal contract duration for values of the shock arrival rate λ such that the optimal contract duration is longer than the duration $\bar{\Delta}$ below which temporary contracts are taxed. Since $\Delta(\lambda, \bar{s})$ decreases with λ, these values of the shock arrival rate are smaller than the threshold $\bar{\lambda} = \left\{\lambda | \Delta(\lambda, \bar{s}) = \bar{\Delta}\right\}$. Moreover, when $\bar{\Delta} \leq \Delta(\lambda, \bar{s})$, the optimal choice of the transformation of temporary contracts into permanent contracts is the same as that defined absent taxes and refunds except that the labor cost is equal to $w - \bar{s}$ instead of w : temporary jobs are transformed into permanent jobs only if $\lambda < \lambda_p^{\text{Fr}} = \{\lambda | J_p(\lambda) = 0\}$. It can easily be checked that $\lambda_p^{\text{Fr}} > \lambda_p$ from the

definition (3.2) of $J_p(\lambda)$.

Case 2: $\bar{\Delta} > \Delta(\lambda)$, two subcases arise. It can be optimal for the firm either to pay the tax and choose the duration, denoted by $\Delta_\tau(\lambda)$, that maximizes $J_t(\lambda, \Delta, \bar{\tau}) = \int_0^{\Delta} \left(ye^{-\lambda\varkappa} - w - \bar{\tau} + \bar{s}\right) e^{-r\varkappa} \mathrm{d}\varkappa$ or to increase the duration of the contract up to $\bar{\Delta}$ to avoid taxation and get the profit $J_t(\lambda, \bar{\Delta}, 0) = \int_0^{\bar{\Delta}} \left(ye^{-\lambda\varkappa} - w + \bar{s}\right) e^{-r\varkappa} \mathrm{d}\varkappa$.

Case 2a: If the shock arrival rate is larger than

$$\lambda_\tau = \left\{ \lambda | \max_{\Delta} \int_0^{\Delta} \left(ye^{-\lambda\varkappa} - w - \bar{\tau} + \bar{s}\right) e^{-r\varkappa} \mathrm{d}\varkappa = \int_0^{\bar{\Delta}} \left(ye^{-\lambda\varkappa} - w + \bar{s}\right) e^{-r\varkappa} \mathrm{d}\varkappa \right\}, \tag{3.A10}$$

the firm gets higher profits by paying the tax and choosing a duration that maximizes

$$\int_0^{\Delta} \left(ye^{-\lambda\varkappa} - w - \bar{\tau} + \bar{s}\right) e^{-r\varkappa} d\varkappa.$$

This case is displayed on the left side panel of figure 3.9.

Case 2b: If the shock arrival rate is smaller than λ_τ, it is more profitable not to pay the tax and choose the contract duration $\bar{\Delta}$. This case is displayed on the right side panel of figure 3.9.

Finally, the optimal duration of temporary contracts is defined by:

$$\Delta^{\mathrm{Fr}}(\lambda) = \begin{cases} \frac{1}{\lambda} \log\left(\frac{w - \bar{s} + \lambda F + (r+\lambda)c}{w - \bar{s}}\right) & \text{if } \lambda < \lambda_p^{\mathrm{Fr}} \\ \frac{1}{\lambda} \log\left(\frac{y}{w - \bar{s}}\right) & \text{if } \lambda_p^{\mathrm{Fr}} < \lambda \leq \bar{\lambda} \\ \bar{\Delta} & \text{if } \bar{\lambda} < \lambda \leq \lambda_\tau \\ \frac{1}{\lambda} \log\left(\frac{y}{w - \bar{s} + \bar{\tau}}\right) & \text{if } \lambda_\tau < \lambda \end{cases} \tag{3.A11}$$

where $\bar{\lambda} = \left\{\lambda | \Delta(\lambda) = \bar{\Delta}\right\}$ and λ_τ is defined by equation (3.A10). $\Delta^{\mathrm{Fr}}(\lambda)$ is displayed on figure 3.5.

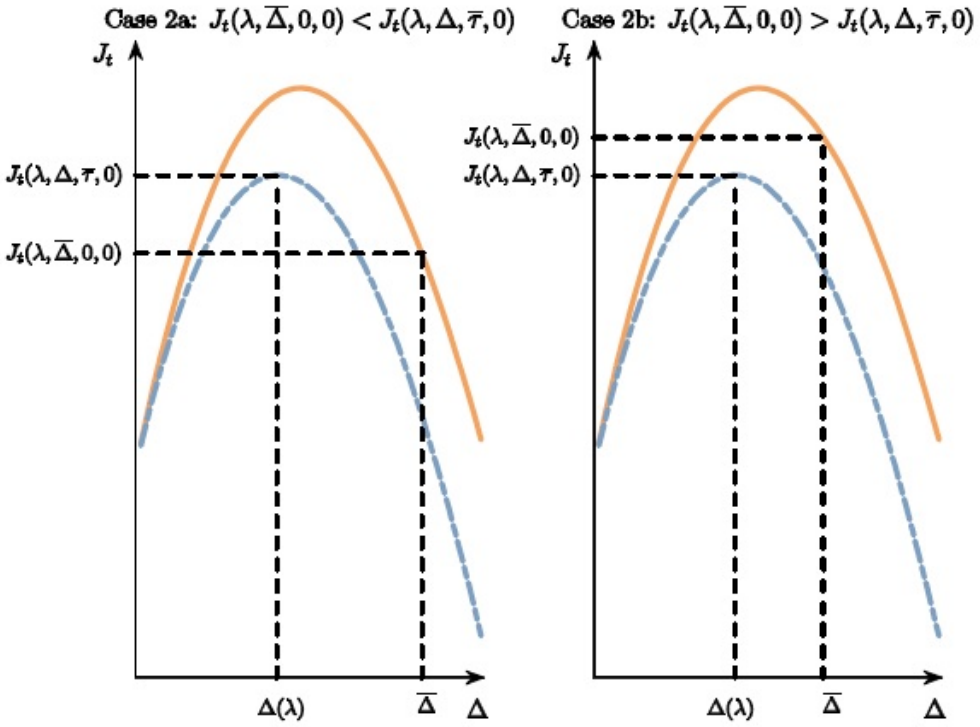

Figure 3.9: The relation between the value of temporary jobs and the duration of temporary contracts in the French system.

3.A.3 Comparative statics in the Italian case

In this appendix, we analyse the impact of the tax $\bar{\tau}$, of the refund $\bar{\rho}$ and of the subsidy $\bar{s}$ on the optimal duration of temporary contracts $\Delta^{\mathrm{It}}(\lambda)$, and on the thresholds λ_p^{It}, λ_t^{It}, and λ_s^{It} as discussed in subsection 3.2.3.

3.A.3.1 Duration of temporary contracts

In the Italian case, the optimal duration of temporary contracts is defined by:

$$\Delta^{\mathrm{It}}(\lambda) = \begin{cases} \frac{1}{\lambda}\log\left(\frac{w-\bar{s}+\lambda F+(r+\lambda)(c-\bar{\rho})}{w-\bar{s}+\bar{\tau}}\right) & \text{if } \lambda \leq \lambda_p^{\mathrm{It}} \\ \frac{1}{\lambda}\log\left(\frac{y}{w-\bar{s}+\bar{\tau}}\right) & \text{otherwise} \end{cases} \tag{3.A12}$$

Differentiating the two parts of equation (3.A12) is it obvious that $\frac{\mathrm{d}\Delta^{\mathrm{It}}(\lambda)}{\mathrm{d}\bar{\tau}} < 0$ and:

$$\frac{\mathrm{d}\Delta^{\mathrm{It}}(\lambda)}{\mathrm{d}\bar{\rho}} = \begin{cases} -\frac{1}{\lambda}\frac{r+\lambda}{w-\bar{s}+\lambda F+(r+\lambda)(c-\bar{\rho})} < 0 & \text{if } \lambda \leq \lambda_p^{\mathrm{It}} \\ 0 & \text{otherwise} \end{cases} \tag{3.A13}$$

$$\frac{\mathrm{d}\Delta^{\mathrm{It}}(\lambda)}{\mathrm{d}\bar{s}} = \begin{cases} \frac{1}{\lambda}\frac{-\bar{\tau}+\lambda F+(r+\lambda)(c-\bar{\rho})}{(w-\bar{s}+\bar{\tau})(w-\bar{s}+\lambda F+(r+\lambda)(c-\bar{\rho}))} & \text{if } \lambda \leq \lambda_p^{\mathrm{It}} \\ \frac{1}{\lambda}\frac{1}{(w-\bar{s}+\bar{\tau})} > 0 & \text{otherwise} \end{cases} \tag{3.A14}$$

Therefore, the tax $\bar{\tau}$ reduces the duration of all temporary contracts, while the refund $\bar{\rho}$ reduces the optimal duration of temporary contracts that can be transformed into permanent jobs, as argued in the text. Finally, the subsidy $\bar{s}$ increases the optimal duration of temporary contracts if the parametric condition $\lambda F + (r+\lambda)(c-\bar{\rho}) > \bar{\tau}$ holds in the first row of (3.A14).

3.A.3.2 Thresholds

3.A.3.2.1 Threshold λ_t^{It} Let us first study the impact $\bar{\tau}$, $\bar{\rho}$ and $\bar{s}$ on the threshold λ_t^{It} above which it is not profitable to create temporary jobs. Temporary contracts are never converted into permanent contracts when $\lambda = \lambda_t^{\mathrm{It}}$. Therefore, the refund $\bar{\rho}$ has no impact on the threshold λ_t^{It}. The value of a temporary job with characteristic $\lambda = \lambda_t^{\mathrm{It}}$ and optimal duration $\Delta(\lambda_t^{\mathrm{It}})$, $J_t(\lambda_t^{\mathrm{It}}, \bar{\tau}, \bar{\rho}) = \max_{\Delta} J_t(\lambda_t^{\mathrm{It}}, \Delta, \bar{\tau}, \bar{\rho})$ then writes:

$$\begin{aligned} J_t(\lambda_t^{\mathrm{It}}, \bar{\tau}, \bar{\rho}) &= \int_0^{\Delta(\lambda_t^{\mathrm{It}})} \left(y e^{-\lambda_t^{\mathrm{It}} \varkappa} - w - \bar{\tau} + \bar{s} \right) e^{-r\varkappa} \mathrm{d}\varkappa - c \\ &= y \frac{1 - e^{-\left(r+\lambda_t^{\mathrm{It}}\right)\Delta(\lambda_t^{\mathrm{It}})}}{r + \lambda_t^{\mathrm{It}}} - (w + \bar{\tau} - \bar{s}) \frac{1 - e^{-r\Delta(\lambda_t^{\mathrm{It}})}}{r} - c. \end{aligned} \tag{3.A15}$$

Using the envelope theorem, which implies that $\partial J_t / \partial \Delta = 0$, it is straightforward to show that:

$$\frac{\partial J_t}{\partial \lambda_t^{\mathrm{It}}} = y \frac{\left(r + \lambda_t^{\mathrm{It}}\right) \Delta(\lambda_t^{\mathrm{It}}) e^{-\left(r+\lambda_t^{\mathrm{It}}\right)\Delta(\lambda_t^{\mathrm{It}})} - 1 + e^{-\left(r+\lambda_t^{\mathrm{It}}\right)\Delta(\lambda_t^{\mathrm{It}})}}{\left(r + \lambda_t^{\mathrm{It}}\right)^2} < 0 \tag{3.A16}$$

as $xe^{-x} - 1 + e^{-x}$ is negative for any value of $x > 0$. As $\frac{\partial J_t}{\partial \bar{\tau}} = -\frac{1 - e^{-r\Delta\left(\lambda_t^{\mathrm{It}}\right)}}{r} < 0$, the implicit function theorem allows us to conclude that

$$\frac{\mathrm{d}\lambda_t^{\mathrm{It}}}{\mathrm{d}\bar{\tau}} = -\frac{\frac{\partial J_t}{\partial \bar{\tau}}}{\frac{\partial J_t}{\partial \lambda_t^{\mathrm{It}}}} < 0, \tag{3.A17}$$

as argued in subsection 3.2.3. Similarly,

$$\frac{\mathrm{d}\lambda_t^{\mathrm{It}}}{\mathrm{d}\bar{s}} = -\frac{\frac{\partial J_t}{\partial \bar{s}}}{\frac{\partial J_t}{\partial \lambda_t^{\mathrm{It}}}} = -\frac{\left(\frac{1-e^{-r\Delta(\lambda_t^{\mathrm{It}})}}{r}\right)}{y\frac{e^{-\left(r+\lambda_t^{\mathrm{It}}\right)\Delta\left(\lambda_t^{\mathrm{It}}\right)}\left[1+\left(r+\lambda_t^{\mathrm{It}}\right)\left(\lambda_t^{\mathrm{It}}\right)\right]-1}{\left(r+\lambda_t^{\mathrm{It}}\right)^2}} > 0. \tag{3.A18}$$

Therefore, the Italian system reduces the creation of temporary jobs: it decreases the threshold λ_t^{It} in spite of the subsidy, as the tax is paid by temporary contracts only and its proceeds are redistributed to all jobs. Therefore the negative effect of the tax dominates the positive effect induced by the subsidy on λ_t^{It}. This also implies that λ_t^{It} is smaller than the same threshold absent taxation, i.e. $\lambda_t^{\mathrm{It}} < \lambda_t$ as illustrated by figure 3.4.

3.A.3.2.2 Threshold λ_p^{It} Let us now study the impact of the tax $\bar{\tau}$, of the refund $\bar{\rho}$ and of the subsidy $\bar{s}$ on the threshold λ_p^{It} below which temporary contracts can be transformed into permanent jobs. In the Italian case, λ_p^{It} is such that $J_p(\lambda_p^{\mathrm{It}}) + \bar{\rho} = 0$, which leads to:

$$\lambda_p^{\mathrm{It}} = \frac{y - (w - \bar{s}) + r\left(\bar{\rho} - c\right)}{F + c - \bar{\rho}}. \tag{3.A19}$$

Differentiating (3.A19), we get:

$$\frac{\mathrm{d}\lambda_p^{\mathrm{It}}}{\mathrm{d}\bar{\rho}} = \frac{y - (w - \bar{s}) + rF}{\left(F + c - \bar{\rho}\right)^2} > 0. \tag{3.A20}$$

Notice that the threshold λ_p^{It} does not depend on the tax $\bar{\tau}$, and as a result, $\frac{\mathrm{d}\lambda_p^{\mathrm{It}}}{\mathrm{d}\bar{\tau}} = 0$. Finally, it is straightforward to get:

$$\frac{\mathrm{d}\lambda_p^{\mathrm{It}}}{\mathrm{d}\bar{s}} = \frac{1}{F + c - \bar{\rho}} > 0. \tag{3.A21}$$

Therefore, the Italian system leads to a higher threshold λ_p^{It} than the case absent taxation, i.e. $\lambda_p^{\mathrm{It}} > \lambda_p$, as argued in the text and illustrated by figure 3.4.

3.A.3.2.3 Threshold λ_s^{It} Let us now study the impact of the policy parameters $\bar{\tau}$, $\bar{\rho}$ and $\bar{s}$ on the threshold λ_s^{It} which makes firms indifferent between using temporary rather than permanent contracts. Notice that when $\lambda = \lambda_s^{\mathrm{It}}$, temporary jobs are taxed and can be transformed into permanent jobs. The threshold λ_s^{It} is defined by

$$J_p(\lambda_s^{\mathrm{It}}) = \max_{\Delta} \; J_t(\lambda_s^{\mathrm{It}}, \Delta, \bar{\tau}, \bar{\rho}), \tag{3.A22}$$

To study the properties of the threshold λ_s^{It}, let us define

$$\varphi^{\text{It}}(\lambda) \equiv J_p(\lambda) - J_t(\lambda, \bar{\tau}, \bar{\rho}), \tag{3.A23}$$

with λ_s^{It} solving $\varphi^{\text{It}}(\lambda_s^{\text{It}}) = 0$ and with

$$J_p(\lambda) = \frac{y - (w - \bar{s}) - \lambda F}{r + \lambda} - c, \tag{3.A24}$$

and

$$\begin{aligned} J_t(\lambda, \bar{\tau}, \bar{\rho}) &= \max_{\Delta} J_t(\lambda, \Delta, \bar{\tau}, \bar{\rho}) \qquad (3.A25) \\ &= y\left(\frac{1 - e^{-(r+\lambda)\Delta(\lambda)}}{r + \lambda}\right) - (w - \bar{s} + \bar{\tau})\left(\frac{1 - e^{-r\Delta(\lambda)}}{r}\right) + \max\left[J_p(\lambda) + \bar{\rho}, 0\right] e^{-(r+\lambda)\Delta(\lambda)} - c. \end{aligned}$$

To investigate the impact of the policy parameters on the threshold λ_s^{It}, let us apply the implicit function theorem to function φ^{It} defined above in (3.A23) using equations (3.A24) and (3.A25). The theorem implies $\frac{\mathrm{d}\lambda_s^{\text{It}}}{\mathrm{d}\bar{\tau}} = -\frac{\frac{\partial \varphi^{\text{It}}}{\partial \bar{\tau}}}{\frac{\partial \varphi^{\text{It}}}{\partial \lambda_s^{\text{It}}}}$, $\frac{\mathrm{d}\lambda_s^{\text{It}}}{\mathrm{d}\bar{\rho}} = -\frac{\frac{\partial \varphi^{\text{It}}}{\partial \bar{\rho}}}{\frac{\partial \varphi^{\text{It}}}{\partial \lambda_s^{\text{It}}}}$ and $\frac{\mathrm{d}\lambda_s^{\text{It}}}{\mathrm{d}\bar{s}} = -\frac{\frac{\partial \varphi^{\text{It}}}{\partial \bar{s}}}{\frac{\partial \varphi^{\text{It}}}{\partial \lambda_s^{\text{It}}}}$. To study the sign of $\frac{\partial \varphi^{\text{It}}}{\partial \lambda_s^{\text{It}}}$ it is convenient to make use of the first-order condition determining the optimal duration $\Delta^{\text{It}}(\lambda)$, which can be written:

$$\frac{y - (w - \bar{s} + \bar{\tau})\, e^{\lambda\Delta(\lambda)}}{r + \lambda} = \max\left[J_p(\lambda) + \bar{\rho}, 0\right], \tag{3.A26}$$

and to substitute it into (3.A23), making use of (3.A24) and (3.A25). Function $\varphi^{\text{It}}(\lambda)$ then writes:

$$\varphi^{\text{It}}(\lambda) = \frac{w - \bar{s}}{r}\frac{\lambda\left(1 - e^{-r\Delta^{\text{It}}(\lambda)}\right)}{r + \lambda} - \frac{\lambda F}{r + \lambda} + \frac{\bar{\tau}}{r}\left[1 - \frac{\lambda e^{-r\Delta^{\text{It}}(\lambda)}}{r + \lambda}\right], \tag{3.A27}$$

and its derivative with respect to λ is:

$$\frac{\partial \varphi^{\text{It}}(\lambda)}{\partial \lambda} = \underbrace{\frac{(w - \bar{s}) - rF}{(r + \lambda)^2}}_{(+/-)} + \underbrace{(w - \bar{s} + \bar{\tau})\left[\frac{-e^{-r\Delta^{\text{It}}(\lambda)}}{(r + \lambda)^2} + \frac{\lambda\Delta'^{\text{It}}(\lambda) e^{-r\Delta^{\text{It}}(\lambda)}}{r + \lambda}\right]}_{(-)}. \tag{3.A28}$$

Two cases need to be distinguished. *(i)* When $\frac{w - \bar{s}}{r} \leq F$, as $\Delta'^{\text{It}}(\lambda) < 0$, it is straightforward to see that $\frac{\partial \varphi^{\text{It}}(\lambda)}{\partial \lambda} < 0$ for any $\lambda > \lambda_{\min}$. Therefore, $\frac{\partial \varphi^{\text{It}}(\lambda_s^{\text{It}})}{\partial \lambda_s^{\text{It}}} < 0$; *(ii)* When $\frac{w - \bar{s}}{r} > F$, one can

remark that:

$$\varphi^{\mathrm{It}}\left(\lambda_s^{\mathrm{It}}\right)=0 \Leftrightarrow \lambda_s^{\mathrm{It}}\frac{-\left(w-\bar{s}\right)\left(1-e^{-r\Delta^{\mathrm{It}}\left(\lambda_s^{\mathrm{It}}\right)}\right)+rF}{r+\lambda_s^{\mathrm{It}}\left(1-e^{-r\Delta^{\mathrm{It}}\left(\lambda_s^{\mathrm{It}}\right)}\right)}=\bar{\tau}, \tag{3.A29}$$

which implies:

$$w-\bar{s}+\bar{\tau}=\left(w-\bar{s}\right)\frac{r}{r+\lambda_s^{\mathrm{It}}\left(1-e^{-r\Delta^{\mathrm{It}}\left(\lambda_s^{\mathrm{It}}\right)}\right)}+\lambda_s^{\mathrm{It}}\frac{rF}{r+\lambda_s^{\mathrm{It}}\left(1-e^{-r\Delta^{\mathrm{It}}\left(\lambda_s^{\mathrm{It}}\right)}\right)}. \tag{3.A30}$$

Reinserting this expression into (3.A28) yields:

$$\frac{\partial\varphi^{\mathrm{It}}}{\partial\lambda_s^{\mathrm{It}}}=\frac{\left(w-\bar{s}\right)\left(1-e^{-r\Delta^{\mathrm{It}}\left(\lambda_s^{\mathrm{It}}\right)}\right)-rF}{\left(r+\lambda_s^{\mathrm{It}}\right)\left[r+\lambda_s^{\mathrm{It}}\left(1-e^{-r\Delta^{\mathrm{It}}\left(\lambda_s^{\mathrm{It}}\right)}\right)\right]}+\frac{r\left(w-\bar{s}\right)+rF\lambda_s^{\mathrm{It}}}{r+\lambda_s^{\mathrm{It}}\left(1-e^{-r\Delta^{\mathrm{It}}\left(\lambda_s^{\mathrm{It}}\right)}\right)}\frac{\lambda_s^{\mathrm{It}}\Delta'^{\mathrm{It}}\left(\lambda_s^{\mathrm{It}}\right)e^{-r\Delta^{\mathrm{It}}\left(\lambda_s^{\mathrm{It}}\right)}}{r+\lambda_s^{\mathrm{It}}} \tag{3.A31}$$

As $\Delta'^{\mathrm{It}}(\lambda_s^{\mathrm{It}})<0$, this derivative is negative provided that $\left(w-\bar{s}\right)\left(1-e^{-r\Delta^{\mathrm{It}}\left(\lambda_s^{\mathrm{It}}\right)}\right)\leq rF$, which holds when $\bar{\tau}$ is sufficiently small. Namely, when $\bar{\tau}\to 0$, we have $\varphi^{\mathrm{It}}(\lambda_s^{\mathrm{It}})=0 \Leftrightarrow rF=\left(w-\bar{s}\right)\left(1-e^{-r\Delta^{\mathrm{It}}\left(\lambda_s^{\mathrm{It}}\right)}\right)$ and the derivative with respect to λ_s^{It} rewrites as:

$$\frac{\partial\varphi^{\mathrm{It}}}{\partial\lambda_s^{\mathrm{It}}}=\frac{r\left(w-\bar{s}\right)+rF\lambda_s^{\mathrm{It}}}{r+\lambda_s^{\mathrm{It}}\left(1-e^{-r\Delta^{\mathrm{It}}\left(\lambda_s^{\mathrm{It}}\right)}\right)}\frac{\lambda_s^{\mathrm{It}}\Delta'^{\mathrm{It}}\left(\lambda_s^{\mathrm{It}}\right)e^{-r\Delta^{\mathrm{It}}\left(\lambda_s^{\mathrm{It}}\right)}}{r+\lambda_s^{\mathrm{It}}}<0. \tag{3.A32}$$

Therefore, we can conclude that $\frac{\partial\varphi^{\mathrm{It}}}{\partial\lambda_s^{\mathrm{It}}}<0$ in our context where the tax rate on temporary contracts is relatively small.

Let us now evaluate $\frac{\partial\varphi^{\mathrm{It}}}{\partial\bar{s}}$, $\frac{\partial\varphi^{\mathrm{It}}}{\partial\bar{\tau}}$ and $\frac{\partial\varphi^{\mathrm{It}}}{\partial\bar{\rho}}$. Differentiating (3.A27), we get:

$$\frac{\partial\varphi^{\mathrm{It}}}{\partial\bar{\tau}}=\frac{r+\lambda\left(1-e^{-r\Delta^{\mathrm{It}}(\lambda)}\right)}{r\left(r+\lambda\right)}>0, \tag{3.A33}$$

and it follows that

$$\frac{\mathrm{d}\lambda_s^{\mathrm{It}}}{\mathrm{d}\bar{\tau}}=-\frac{\frac{\partial\varphi^{\mathrm{It}}}{\partial\bar{\tau}}}{\frac{\partial\varphi^{\mathrm{It}}}{\partial\lambda_s^{\mathrm{It}}}}>0. \tag{3.A34}$$

Similarly,

$$\frac{\partial\varphi^{\mathrm{It}}}{\partial\bar{s}}=-\frac{\lambda\left(1-e^{-r\Delta^{\mathrm{It}}(\lambda)}\right)}{r\left(r+\lambda\right)}<0, \tag{3.A35}$$

and then:

$$\frac{\mathrm{d}\lambda_s^{\mathrm{It}}}{\mathrm{d}\bar{s}}=-\frac{\frac{\partial\varphi^{\mathrm{It}}}{\partial\bar{s}}}{\frac{\partial\varphi^{\mathrm{It}}}{\partial\lambda_s^{\mathrm{It}}}}<0. \tag{3.A36}$$

Finally, by differentiating (3.A23) and using (3.A24) and (3.A25), it is straightforward to show that $\frac{\partial \varphi^{\mathrm{It}}}{\partial \bar{\rho}} < 0$, so that:

$$\frac{\mathrm{d}\lambda_s^{\mathrm{It}}}{\mathrm{d}\bar{\rho}} = -\frac{\frac{\partial \varphi^{\mathrm{It}}}{\partial \bar{\rho}}}{\frac{\partial \varphi^{\mathrm{It}}}{\partial \lambda_s^{\mathrm{It}}}} < 0 \tag{3.A37}$$

Therefore, the tax increases the threshold λ_s^{It} while the subsidy and the refund reduce it. Overall, this implies that the Italian system raises the creation of permanent jobs: this occurs as the positive effect of the tax dominates the joint (negative) effect of the refund and of the subsidy. As a result, the threshold λ_s^{It} is higher than the case absent taxation, i.e $\lambda_s^{\mathrm{It}} > \lambda_s$, as depicted on figure 3.4.

3.A.4 Comparative statics in the French case

Let us now study the impact of the tax $\bar{\tau}$, of the refund $\bar{\rho}$, and of the subsidy $\bar{s}$ on the optimal duration of temporary contracts $\Delta^{\mathrm{Fr}}(\lambda)$, and on the thresholds λ_p^{Fr}, λ_t^{Fr}, and λ_s^{Fr} as discussed in subsection 3.2.4.

3.A.4.1 Duration

In the French case, the optimal duration of temporary contracts is defined by (3.A11) in appendix 3.A.2. The optimal duration $\Delta^{\mathrm{Fr}}(\lambda)$ depends on $\bar{s}$ and $\bar{\tau}$ but is not affected by the refund $\overline{\rho}$ because temporary jobs of short duration, which are taxed, are never converted into permanent jobs and thus do not get the refund. Temporary contracts of longer duration are not subject to the tax, and therefore do no get the refund either. Differentiating (3.A11), we get:

$$\frac{\mathrm{d}\Delta^{\mathrm{Fr}}(\lambda)}{\mathrm{d}\bar{\tau}} = \begin{cases} -\frac{1}{\lambda}\frac{1}{w-\bar{s}+\bar{\tau}} < 0 & \text{if } \lambda_\tau < \lambda \\ 0 & \text{otherwise} \end{cases}. \tag{3.A38}$$

$$\frac{\mathrm{d}\Delta^{\mathrm{Fr}}(\lambda)}{\mathrm{d}\bar{s}} = \begin{cases} \frac{1}{\lambda}\frac{\lambda F+(r+\lambda)c}{(w-\bar{s})(w-\bar{s}+\lambda F+(r+\lambda)c)} > 0 & \text{if } \lambda < \lambda_p^{\mathrm{Fr}} \\ \frac{1}{\lambda}\frac{1}{w-\bar{s}} > 0 & \text{if } \lambda_p^{\mathrm{Fr}} < \lambda \leq \bar{\lambda} \\ 0 & \text{if } \bar{\lambda} < \lambda \leq \lambda_\tau \\ \frac{1}{\lambda}\frac{1}{w-\bar{s}+\bar{\tau}} > 0 & \text{if } \lambda_\tau < \lambda \end{cases} \tag{3.A39}$$

Such properties are illustrated in figure 3.5. If applicable, the tax reduces the duration of temporary jobs, while the subsidy has a positive effect on contract duration, except for $\lambda \in \left(\bar{\lambda}, \lambda_\tau\right)$. It turns out that $\Delta^{\mathrm{Fr}}(\lambda) > \Delta(\lambda)$ for all $\lambda < \lambda_\tau$, while for $\lambda \geq \lambda_\tau$, $\Delta^{\mathrm{Fr}}(\lambda) < \Delta(\lambda)$, as the subsidy is not sufficiently large to offset the negative impact of the tax, as illustrated by

figure 3.5.

3.A.4.2 Thresholds

3.A.4.2.1 Threshold λ_t^{Fr} Let us now study the impact of $\bar{\tau}$, $\bar{\rho}$, and $\bar{s}$ on the threshold λ_t^{Fr} above which it is not profitable to create temporary jobs. Let us define $J_t\left(\lambda_t^{\text{Fr}}, \bar{\tau}, \bar{\rho}\right) \equiv \max_{\Delta} J_t\left(\lambda_t^{\text{Fr}}, \Delta, \bar{\tau}, \bar{\rho}\right)$. Temporary contracts are never converted into permanent contracts when $\lambda = \lambda_t^{\text{Fr}}$. Therefore, they do not get the refund $\bar{\rho}$ and as a result, $\frac{\mathrm{d}\lambda_t^{\text{Fr}}}{\mathrm{d}\bar{\rho}} = 0$. Besides, λ_t^{Fr} solves $J_t\left(\lambda_t^{\text{Fr}}, \bar{\tau}, 0\right) = 0$, or equivalently:

$$y\left(\frac{1-e^{-\left(r+\lambda_t^{\text{Fr}}\right)\Delta^{\text{Fr}}\left(\lambda_t^{\text{Fr}}\right)}}{r+\lambda_t^{\text{Fr}}}\right) - (w+\bar{\tau}-\bar{s})\left(\frac{1-e^{-r\Delta^{\text{Fr}}\left(\lambda_t^{\text{Fr}}\right)}}{r}\right) - c = 0. \tag{3.A40}$$

Using the implicit function theorem applied to (3.A40) above, we get:

$$\frac{\mathrm{d}\lambda_t^{\text{Fr}}}{\mathrm{d}\bar{s}} = -\frac{\frac{\partial J_t}{\partial \bar{s}}}{\frac{\partial J_t}{\partial \lambda_t^{\text{Fr}}}} = -\frac{\left(\frac{1-e^{-r\Delta^{\text{Fr}}\left(\lambda_t^{\text{Fr}}\right)}}{r}\right)}{y\frac{e^{-\left(r+\lambda_t^{\text{Fr}}\right)\Delta^{\text{Fr}}\left(\lambda_t^{\text{Fr}}\right)}\left[1+\left(r+\lambda_t^{\text{Fr}}\right)\Delta^{\text{Fr}}\left(\lambda_t^{\text{Fr}}\right)\right]-1}{\left(r+\lambda_t^{\text{Fr}}\right)^2}} > 0, \tag{3.A41}$$

$$\frac{\mathrm{d}\lambda_t^{\text{Fr}}}{\mathrm{d}\bar{\tau}} = -\frac{\frac{\partial J_t}{\partial \bar{\tau}}}{\frac{\partial J_t}{\partial \lambda_t^{\text{Fr}}}} = \frac{\left(\frac{1-e^{-r\Delta^{\text{Fr}}\left(\lambda_t^{\text{Fr}}\right)}}{r}\right)}{y\frac{e^{-\left(r+\lambda_t^{\text{Fr}}\right)\Delta^{\text{Fr}}\left(\lambda_t^{\text{Fr}}\right)}\left[1+\left(r+\lambda_t^{\text{Fr}}\right)\Delta^{\text{Fr}}\left(\lambda_t^{\text{Fr}}\right)\right]-1}{\left(r+\lambda_t^{\text{Fr}}\right)^2}} < 0, \tag{3.A42}$$

where the denominator of each expression is negative as $e^{-x} < 1/(1+x)$ for all $x > 0$. Therefore the subsidy has a positive effect on the creation of temporary contracts while the tax has a negative effect. The effect of the tax dominates that of the subsidy, as the tax is paid on contracts with very short durations only, while its proceeds are redistributed to all jobs. Therefore the threshold λ_t^{Fr} is lower than the case absent taxation, i.e. $\lambda_t^{\text{Fr}} < \lambda_t$.

3.A.4.2.2 Threshold λ_p^{Fr} Let us now study the impact of $\bar{\tau}$, $\bar{\rho}$, and $\bar{s}$ on the threshold λ_p^{Fr} above which it is not profitable to convert a temporary contract into a permanent one. In the French case, the refund and the tax do not apply at $\lambda = \lambda_p^{\text{Fr}}$. Thus, the only relevant policy parameter is the subsidy $\bar{s}$. In the French case, λ_p^{Fr} solves $J_p(\lambda_p^{\text{Fr}}) = 0$, which can be rewritten:

$$\lambda_p^{\text{Fr}} = \frac{y-(w-\bar{s})-rc}{F+c},$$

Therefore, the subsidy increases the incentive to transform temporary jobs into permanent contracts, and the threshold λ_p^{Fr} is higher than the threshold absent taxation, $\lambda_p^{\text{Fr}} > \lambda_p$, due to the positive effect of the subsidy, as illustrated on figure 3.5.

3.A.4.2.3 Threshold λ_s^{Fr} Let us now study the impact of $\bar{\tau}$, $\bar{\rho}$, and $\bar{s}$ on the threshold λ_s^{Fr} which makes firms indifferent between using temporary and permanent contracts. Notice that when $\lambda = \lambda_s^{\text{Fr}}$, temporary jobs are not taxed, and thus, the refund does not apply. Let us define:

$$\varphi^{\text{Fr}}(\lambda) \equiv J_p(\lambda) - J_t(\lambda, 0, 0), \tag{3.A43}$$

where λ_s^{Fr} solves $\varphi^{\text{Fr}}(\lambda_s^{\text{Fr}}) = 0$, with

$$J_p(\lambda) = \frac{y - (w - \bar{s}) - \lambda F}{r + \lambda} - c, \tag{3.A44}$$

and

$$J_t(\lambda, 0, 0) = y\left(\frac{1 - e^{-(r+\lambda)\Delta^{\text{Fr}}(\lambda)}}{r + \lambda}\right) - (w - \bar{s})\left(\frac{1 - e^{-r\Delta^{\text{Fr}}(\lambda)}}{r}\right) + \max\left[J_p\left(\lambda\right), 0\right] e^{-(r+\lambda)\Delta^{\text{Fr}}(\lambda)} - c. \tag{3.A45}$$

Using the implicit function theorem, applied to function φ^{Fr} defined above, we have:

$$\frac{\mathrm{d}\lambda_s^{\text{Fr}}}{\mathrm{d}\bar{s}} = -\frac{\frac{\partial \varphi^{\text{Fr}}}{\partial \bar{s}}}{\frac{\partial \varphi^{\text{Fr}}}{\partial \lambda_s^{\text{Fr}}}} \tag{3.A46}$$

To determine the sign of $\frac{\partial \varphi^{\text{Fr}}}{\partial \lambda_s^{\text{Fr}}}$, it is useful to make use of the first-order condition determining the optimal duration of temporary jobs, which writes in the French case $\frac{y - (w-\bar{s})e^{\lambda\Delta^{\text{Fr}}(\lambda)}}{r+\lambda} = \max\left[J_p\left(\lambda\right), 0\right]$. Substituting into (3.A43) above, making use of (3.A44) and (3.A45) yields:

$$\varphi^{\text{Fr}}(\lambda) = (w - \bar{s})\frac{\lambda(1 - e^{-r\Delta^{\text{Fr}}(\lambda)})}{r(r + \lambda)} - \frac{\lambda F}{r + \lambda}. \tag{3.A47}$$

Differentiating function $\varphi^{\text{Fr}}(\lambda)$, and using the fact that $\varphi^{\text{Fr}}(\lambda_s^{\text{Fr}}) = 0 \Leftrightarrow (w - \bar{s})\frac{1 - e^{-r\Delta^{\text{Fr}}\left(\lambda_s^{\text{Fr}}\right)}}{r} = F$ yields directly:

$$\frac{\partial \varphi^{\text{Fr}}}{\partial \lambda_s^{\text{Fr}}} = (w - \bar{s})\frac{\Delta'^{\text{Fr}}(\lambda_s^{\text{Fr}})\lambda_s^{\text{Fr}} e^{-r\Delta^{\text{Fr}}\left(\lambda_s^{\text{Fr}}\right)}}{r + \lambda_s^{\text{Fr}}} < 0. \tag{3.A48}$$

Equations (3.A46) and (3.A48) imply that the derivatives $\frac{\mathrm{d}\lambda_s^{\mathrm{Fr}}}{\mathrm{d}\bar{s}}$ and $\frac{\mathrm{d}\lambda_s^{\mathrm{Fr}}}{\mathrm{d}\bar{\tau}}$have the same sign as $\frac{\partial\varphi^{\mathrm{Fr}}}{\partial\bar{s}}$ and $\frac{\partial\varphi^{\mathrm{Fr}}}{\partial\bar{\tau}}$. Differentiating (3.A47), we have:

$$\frac{\partial\varphi^{\mathrm{Fr}}}{\partial\bar{s}} = \frac{-\lambda(1-e^{-r\Delta^{\mathrm{Fr}}(\lambda)})}{r(r+\lambda)} < 0. \tag{3.A49}$$

It follows that $\frac{\mathrm{d}\lambda_s^{\mathrm{Fr}}}{\mathrm{d}\bar{s}} < 0$. Finally, it is straightforward to show that $\frac{\partial\varphi^{\mathrm{Fr}}}{\partial\bar{\tau}} = 0$ since the choice between the two types of contract is not directly impacted by the tax, and thus $\frac{\mathrm{d}\lambda_s^{\mathrm{Fr}}}{\mathrm{d}\bar{\tau}} = 0$. Similarly, $\frac{\partial\varphi^{\mathrm{Fr}}}{\partial\bar{\rho}} = 0 \Leftrightarrow \frac{\mathrm{d}\lambda_s^{\mathrm{Fr}}}{\mathrm{d}\bar{\rho}} = 0$. Overall, this implies that the threshold λ_s^{Fr} is lower than absent taxation, i.e $\lambda_s^{\mathrm{Fr}} < \lambda_s$, due to the negative effect of the subsidy $\bar{s}$.

3.A.5 Equilibrium unemployment

This appendix presents the computation of the equilibrium unemployment rate absent taxation on temporary contracts. Let us denote by $l(\lambda)$ the mass of permanent jobs with shock arrival rate λ, by $s_t(\lambda)$ the mass of temporary contracts with shock arrival rate λ that can be converted into permanent contracts, and by $s_n(\lambda)$ the mass of temporary contracts with shock arrival rate λ that cannot be converted into permanent contracts.

For all $\lambda \in [\lambda_{\min}, \lambda_s]$, only permanent contracts are created. There are $\alpha u g(\lambda)$ entries into permanent contracts and $\lambda l(\lambda)$ exits. In steady state, we have:

$$\alpha u g(\lambda) = \lambda l(\lambda). \tag{3.A50}$$

For all $\lambda \in (\lambda_s, \lambda_p]$, only temporary contracts are created and they are transformed into permanent contracts if they are still productive at the end of their spell. The steady state flow equilibrium can be written

$$\alpha u g(\lambda) = \frac{s_t(\lambda)}{\Delta(\lambda)}. \tag{3.A51}$$

$$\frac{s_t(\lambda)}{\Delta(\lambda)} e^{-\lambda\Delta(\lambda)} = \lambda l(\lambda) \tag{3.A52}$$

For all $\lambda \in (\lambda_p, \lambda_t]$, only temporary contracts are created and they are never transformed into permanent contracts. The steady state flow equilibrium can be written

$$\alpha u g(\lambda) = \frac{s_n(\lambda)}{\Delta(\lambda)}. \tag{3.A53}$$

By definition, the unemployment rate is defined by the following equation:

$$u = 1 - \int_{\lambda_{\min}}^{\lambda_p} l(\lambda)\mathrm{d}\lambda - \int_{\lambda_s}^{\lambda_p} s_t(\lambda)\mathrm{d}\lambda - \int_{\lambda_p}^{\lambda_t} s_n(\lambda)\mathrm{d}\lambda. \tag{3.A54}$$

Using equations (3.A50) to (3.A54) we get equation (3.12).

3.A.6 GMM estimation

The distribution of contract durations is estimated from the sample $(d_1, ...d_N)$ where d_i stands for the duration of contract $i = 1, ..., N$. It is assumed that the data come from a statistical model defined up to an unknown vector θ of M parameters. Let us denote by $p(s|\theta)$ the share of contracts of spell equal to s days predicted by the model conditional on the vector of parameters θ. Let us define, for each value s, the indicator function $f(d_i, s) = \mathbf{1}(d_i = s)$ which takes value one for every contract i of spell equal to s and to zero for the others. For each spell s the moment condition is

$$\mathbb{E}\left[f(d_i, s) - p(s|\theta)\right] = 0$$

The sample counterpart of $\mathbb{E}\left[f(d_i, s)\right]$ is $\frac{1}{N}\sum_{i=1}^{N}\left[f(d_i, s)\right] \equiv p(s)$. Let us assume that there are $S > M$ moment conditions, corresponding to S values of s. The GMM estimator for these S moment conditions is obtained in 2 steps:

1. Let us first define the estimator

$$\hat{\theta} = \arg\min_{\theta} \sum_{s=1}^{S} \left[p(s) - p(s|\theta)\right]^2.$$

This estimator allows us to compute the variance covariance matrix

$$\hat{\Omega} = \frac{1}{N}\sum_{i=1}^{N} \begin{bmatrix} f(d_i, 1) - p(1|\hat{\theta}) \\ ... \\ f(d_i, S) - p(s|\hat{\theta}) \end{bmatrix} \begin{bmatrix} f(d_i, 1) - p(1|\hat{\theta}) \\ ... \\ f(d_i, S) - p(s|\hat{\theta}) \end{bmatrix}'$$

The terms of the diagonal are

$$\frac{1}{N}\sum_{i=1}^{N}\left[f(d_i, s) - p(s|\hat{\theta})\right]^2 = p(s) - 2p(s)p(s|\hat{\theta}) + \left[p(s|\hat{\theta})\right]^2$$

and the terms outside the diagonal are, for all $s \neq s'$

$$\frac{1}{N}\sum_{i=1}^{N} f(d_i,s)f(d_i,s') - p(s)p(s'|\hat{\theta}) - p(s|\hat{\theta})p(s') + p(s|\hat{\theta})p(s'|\hat{\theta})$$

We have $f(d_i,s') = 0$ if $f(d_i,s) = 1$ for all $s \neq s'$ since $f(d_i,s) = 1$ means that the duration of contract i is equal to s, and the same spell cannot be equal to s and to s'. Therefore, we have

$$\frac{1}{N}\sum_{i=1}^{N} f(d_i,s)f(d_i,s') = 0$$

which implies that the terms outside the diagonal are

$$m(s,s') \equiv p(s|\hat{\theta})p(s'|\hat{\theta}) - p(s)p(s'|\hat{\theta}) - p(s|\hat{\theta})p(s')$$

Since $m(s,s') = m(s',s)$, the variance covariance matrix is

$$\hat{\Omega} = \begin{bmatrix} p(1) - 2p(1)p(1|\hat{\theta}) + \left[p(1|\hat{\theta})\right]^2 & m(1,2) & ... & m(1,S) \\ m(1,2) & ... & ... & ... \\ ... & ... & ... & ... \\ m(1,S) & ... & ... & p(S) - 2p(S)p(S|\hat{\theta}) + \left[p(S|\hat{\theta})\right]^2 \end{bmatrix}$$

2. The GMM estimator is

$$\hat{\theta} = \arg\min_{\theta} \begin{bmatrix} p(1) - p(1|\theta) \\ .. \\ p(S) - p(S|\theta) \end{bmatrix}' \hat{\Omega}^{-1} \begin{bmatrix} p(1) - p(1|\theta) \\ .. \\ p(S) - p(S|\theta) \end{bmatrix}$$

The formula for the variance of the GMM estimator is

$$V(\hat{\theta}) = \frac{1}{N}\left[G'F^{-1}\,G\right]^{-1}$$

where G is the matrix of partial derivatives

$$G = \begin{bmatrix} \frac{\partial p(1|\hat{\theta})}{\partial \theta_1} & \frac{\partial p(1|\hat{\theta})}{\partial \theta_2} & ... & \frac{\partial p(1|\hat{\theta})}{\partial \theta_M} \\ \frac{\partial p(2|\hat{\theta})}{\partial \theta_1} & \frac{\partial p(2|\hat{\theta})}{\partial \theta_2} & ... & ... \\ ... & ... & ... & ... \\ \frac{\partial p(S|\hat{\theta})}{\partial \theta_1} & \frac{\partial p(S|\hat{\theta})}{\partial \theta_2} & ... & \frac{\partial p(S|\hat{\theta})}{\partial \theta_M} \end{bmatrix}$$

and F is the *sample* covariance matrix of the moments

$$F = \frac{1}{N} \begin{bmatrix} \sum_{i=1}^{N} [f(d_i,1) - p(1)]^2 & ... & \sum_{i=1}^{N} [f(d_i,1) - p(1)][f(d_i,S) - p(S)] \\ \sum_{i=1}^{N} [f(d_i,1) - p(1)][f(d_i,2) - p(2)] & ... & ... \\ ... & ... & ... \\ \sum_{i=1}^{N} [f(d_i,1) - p(1)][f(d_i,S) - p(S)] & ... & \sum_{i=1}^{N} [f(d_i,S) - p(S)]^2 \end{bmatrix}$$

We have

$$\sum_{i=1}^{N} [f(d_i,s) - p(s)]^2 = Np(s)[1 - p(s)]$$

and, for all $s \neq s'$:

$$\begin{aligned} & \sum_{i=1}^{N} [f(d_i,s) - p(s)][f(d_i,s') - p(s')] \\ = & \sum_{i=1}^{N} f(d_i,s)[f(d_i,s') - p(s')] - \sum_{i=1}^{N} p(s) \underbrace{[f(d_i,s') - p(s')]}_{=0} \\ = & \sum_{i=1}^{N} \underbrace{f(d_i,s)f(d_i,s')}_{=0} - p(s') \sum_{i=1}^{N} f(d_i,s) \\ = & -Np(s')p(s) \end{aligned}$$

therefore, we have

$$F = \begin{bmatrix} p(1)[1 - p(1)] & -p(1)p(2) & ... & -p(1)p(S) \\ -p(1)p(2) & p(2)[1 - p(2)] & ... & ... \\ ... & ... & ... & ... \\ -p(1)p(S) & & ... & p(S)[1 - p(S)] \end{bmatrix}$$

The model is overidentified as there are 45 moments and 5 parameters. In order to evaluate the overall match between the model and the data, we use a simple over-identifcation test *à la*

Hansen (1982). Let N be the size of the sample. The statistic

$$N\left[\mathbf{p}-\mathbf{p}(\hat{\theta})\right]\hat{\Omega}^{-1}\left[\mathbf{p}-\mathbf{p}(\hat{\theta})\right]'$$

where $\mathbf{p}=(p(1),..,p(S))$, $\mathbf{p}(\theta)=(p(1|\theta),...,p(S|\theta))$, tests the global adequacy of the model and is asymptotically $\chi^2(S-N)$ distributed. The model is not rejected if the statistic is lower than the critical value of $\chi^2(S-N)$ where S denotes the number of moments and N the number of parameters. Results are reported in Table 3.1.

Conclusion Générale

Cette thèse avait pour ambition principale d'évaluer le dualisme contractuel existant sur le marché du travail français, d'en quantifier les impacts et d'évaluer les effets potentiels d'une mesure visant à réduire celui-ci.

En particulier, l'objectif était de répondre à diverses questions telles que : la crise apparue en 2008 a-t-elle aggravé les problèmes liés au dualisme contractuel ? Quel effet l'utilisation des contrats d'usage peut-il avoir sur le dualisme contractuel ? Comment ces contrats ont-ils pu interagir avec la crise de 2008 ? Quel peut être l'impact du dualisme sur les fluctuations du taux de chômage ? Les résultats issus des travaux antérieurs sont-ils toujours vérifiés dans le cas d'un marché dual ? Quel(s) impact(s) peut-on attendre d'une mesure visant à réduire la segmentation du marché du travail telle que l'instauration d'une taxe sur les contrats à durée déterminée ?

Il a été notamment possible de remarquer que la présence de dualisme et d'une forte protection de l'emploi nuisent au bon fonctionnement du marché du travail en induisant, en particulier, une forte rotation des travailleurs et une diminution de la durée des contrats. Le stock de travailleurs, en France, reste donc largement composé d'emplois permanents mais les flux concernent majoritairement des emplois temporaires dont la durée est de plus en plus brève, surtout depuis la crise survenue en 2008. Les assouplissements de la législation régissant les contrats à durée déterminée, tels que la mise en place des contrats dits d'usage permettant aux firmes d'utiliser plus facilement des contrats à durée déterminée, ne semblent avoir eu pour effet que de renforcer l'écart de protection entre travailleurs permanents et travailleurs temporaires et donc le dualisme, en faisant reposer les ajustements de main d'œuvre des entreprises uniquement sur des contrats très courts, précarisant encore davantage la situation des travailleurs en emplois temporaires.

A travers les divers articles composants cette thèse, j'ai pu élargir l'état des connaissances actuelles sur le marché du travail français. En effet, les divers articles la composant ont permis, entre autres choses, de mieux comprendre le comportement d'embauche des firmes françaises en mettant en lumière le rôle de la crise de 2008 sur ce comportement, de mettre en avant de nouvelles évidences empiriques afin de guider les modèles théoriques ainsi que les politiques économiques, de mieux comprendre les fluctuations du taux de chômage dans le cas d'un marché du travail dual et enfin d'évaluer les conséquences de l'instauration d'une mesure de type taxation des contrats à durée déterminée dans l'objectif de réduire le dualisme existant sur le marché du travail français.

En premier lieu, à l'aide des données sur les mouvements de main d'œuvre pour la période 1998-2012, j'ai pu montrer que le niveau de rotation des travailleurs sur les emplois est très

élevé en France et que ceci est principalement dû à l'utilisation de contrats à durée déterminée. En étudiant les fluctuations des embauches en contrat à durée déterminée durant ces dernières années, j'ai pu montrer que l'utilisation de ce type de contrats est procyclique puisque les firmes, lors de la sortie de crise, se sont appuyées sur ces contrats, légalement plus flexibles que les contrats à durée indéterminée. Depuis 2009, les entreprises utilisent davantage de contrats à durée déterminée dont la durée est plus courte qu'avant cette date. Toutefois, cette évolution spectaculaire provient particulièrement du comportement d'embauche des entreprises au sein de secteurs autorisés à utiliser des contrats dits d'usage. Ces intuitions sont confirmées par un modèle économétrique mettant en lumière le lien existant entre le fait d'appartenir à ce type de secteurs et la probabilité d'embaucher en contrat à durée déterminée ainsi que celui existant entre cette probabilité et le fait d'embaucher après l'année 2008.

En second lieu, en utilisant les données de l'enquête emploi en continu sur la période 2003-2012, j'évalue les taux de transition d'état à état pour cette période à la fois pour un marché à trois états (employé, chômeur, inactif) et pour un marché sujet au dualisme où l'emploi est divisé entre emploi temporaire et emploi permanent. Ce fichier de données me permet de calculer ces taux par age, qualification et sexe des individus ainsi que d'étudier l'impact de l'état passé de l'individu sur sa probabilité de transition actuelle. Le point central de cette étude est l'évaluation de l'impact de ces taux de transition sur la volatilité du taux de chômage et, particulièrement, en modélisant, pour la première fois en ce qui concerne la littérature sur le cas français, un marché du travail à quatre états. En effet, je montre que le taux de chômage français est largement impacté par le taux d'embauche puisque 43% des fluctuations du taux de chômage proviennent des fluctuations du taux d'embauche. De plus, les transitions impliquant des contrats à durée indéterminée impactent davantage les fluctuations du taux de chômage que celles impliquant des contrats à durée déterminée. Néanmoins, la contribution des transitions impliquant des contrats à durée déterminée à la dynamique du taux de chômage français est trois fois plus importante via le taux d'embauche que via le taux de séparation. Enfin, l'impact de ces transition n'est pas insensible à la population considérée, particulièrement lorsque sont pris en compte les jeunes travailleurs non qualifiés de sexe féminin.

Cette thèse se conclue par l'estimation d'un modèle théorique sur données françaises provenant de Pôle Emploi ainsi que de l'UNEDIC visant à étudier les conséquences d'un système de taxation tel que celui instauré en France par l'Accord National Interprofessionnel de 2013. Dans cet article en collaboration avec Pierre Cahuc, Olivier Charlot, Franck Malherbet et Hélène Benghalem, nous montrons qu'un système taxant les contrats à durée déterminée de courte durée ne semble pas approprié à un marché du travail sujet à un fort dualisme contractuel et où

la protection de l'emploi est donc fortement présente. En effet, ce type de taxation a pour finalité de diminuer la durée moyenne des emplois, d'augmenter le taux de chômage et de réduire le bien-être des chômeurs. A la lumière de ces résultats, nous montrons qu'un système allégeant les coûts de licenciement sur les contrats à durée indéterminée lorsque ceux-ci prennent fin avant un certain niveau d'ancienneté est plus à même de réduire l'instabilité de l'emploi et, de fait, augmenter l'emploi ainsi le bien-être des chômeurs.

Les problèmes liés au dualisme contractuel ont donc été clairement mis en évidence au cours de ces divers travaux. Cette thèse a permis de montrer l'ampleur de ses incidences pour l'économie et de mettre en évidence, qu'a priori, les politiques actuellement envisagées dans le but de limiter le dualisme et la segmentation du marché du travail français ne semblent pas à même de résoudre ces problèmes et limiter la précarisation d'une partie des travailleurs. Les enjeux de ce problème sont donc multiples puisque les effets néfastes du dualisme contractuel pèsent à la fois sur les travailleurs concernés par ces allers-retours de/vers l'emploi récurrents dont la situation se précarise au fil du temps, mais pèse également sur la société dans son ensemble puisque posent, en particulier, le problème du financement de l'assurance chômage. D'autres politiques sont donc à envisager afin de limiter le dualisme existant. Certaines ont déjà été évoquées à diverses reprises dans la littérature telles que l'instauration du contrat unique, la modulation des coûts de licenciement en fonction de l'ancienneté des travailleurs ou encore l'instauration d'un système « d'experience rating » (comme c'est le cas dans plusieurs Etats aux Etats-Unis). Il semblerait que ces mesures soient davantage à même d'atteindre l'objectif de stabilité de l'emploi, premier objectif de la législation sur la protection de l'emploi, plutôt que des mesures de type taxation des contrats temporaires. L'étude de ces autres types de mesures doivent donc faire l'objet de futures recherches et constituent une suite logique à ces travaux de thèse.

Enfin, d'autres phénomènes en lien avec la législation sur la protection de l'emploi doivent également être explorés. Par exemple, il serait intéressant d'étudier plus en détails les interactions entre le progrès technique et la législation sur la protection de l'emploi ou encore le lien entre cette législation et la formation dont bénéficient les travailleurs. En particulier, dans les pays où le dualisme contractuel est très prononcé, les travailleurs ont-ils tous les mêmes opportunités de formation professionnelle ? Ces éléments constituent une liste non exhaustive des divers thèmes à approfondir et des multiples effets à quantifier afin de mettre en lumière les diverses manières dont les travailleurs sont impactés par la présence d'un niveau de dualisme important sur le marché du travail.

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Résumé

L'objectif de cette thèse est d'étudier le dualisme contractuel existant sur le marché du travail français. Je m'intéresse aux flux ayant lieu sur le marché du travail français en mettant en lumière l'importance des contrats à durée déterminée dans ces flux. La législation française sur la protection de l'emploi semble a priori claire et concise et les entreprises soumises à des règles strictes en ce qui concerne la gestion de leur main d'œuvre. Toutefois, il semblerait qu'en pratique, les contraintes pesant sur les firmes en terme d'utilisation de contrats temporaires ne soient pas si claires et que la vision du contrat à durée indéterminée comme forme « normale » de relation de travail ne soit pas si évidente pour les firmes. En effet, l'on observe que leur utilisation est très fréquente et concerne des emplois dont la durée est de plus en plus courte. Ce travail de thèse a donc pour objectif de mieux comprendre le fonctionnement du marché du travail français et l'impact du dualisme contractuel. A cette fin, cette thèse est composée de trois chapitres. Le premier chapitre évalue l'ampleur des flux d'emplois et de travailleurs sur la période 1998-2012 en mettant en évidence l'impact de la crise de 2008 sur ces flux ainsi que le potentiel renforcement du dualisme contractuel après cette date. Je tiens compte des spécificités sectorielles en isolant les secteurs autorisés à utiliser les contrats dits d'usage afin d'étudier le comportement des firmes en terme d'embauche dans ces secteurs particuliers. Je détaille également l'évolution de ces flux d'emplois et de travailleurs en fonction de la taille des firmes. De plus, j'étudie l'évolution de la durée des contrats à durée déterminée sur cette même période. Enfin, je mets en œuvre un modèle économétrique visant à mettre en lumière les principaux déterminants de l'embauche en contrat à durée déterminée. Dans le second chapitre, je mesure les transitions d'état à état ayant lieu sur le marché du travail français ainsi que leur impact sur la volatilité du taux de chômage. A cette fin, j'utilise un modèle à trois états (en emploi, au chômage, inactif) ainsi qu'un modèle à quatre états (en contrat à durée indéterminée, en contrat à durée déterminée, au chômage, inactif) permettant de prendre en compte le dualisme contractuel caractérisant beaucoup de marchés du travail européens. Ce type de modèle à quatre états constitue une réelle nouveauté dans le sens où celui-ci n'a jamais été mis en œuvre pour la France. Enfin, le troisième article a pour objectif d'analyser les conséquences de l'introduction d'une taxe sur les contrats à durée déterminée dans le but d'inciter les firmes à embaucher davantage en contrat à durée indéterminée et à augmenter la durée des contrats. Cette mesure a récemment été mise en place, sous diverses formes, dans plusieurs pays européens. En ce qui concerne la France, cette taxe a été instaurée par l'Accord National Interprofessionnel signé en 2013. Pour ce faire, un modèle d'appariement est estimé sur des données françaises provenant de l'Unédic et de Pôle Emploi s'appuyant sur le modèle proposé par Cahuc, Charlot et Malherbet (2016).

Mots-clés : Flux d'emploi, Flux de travailleurs, Rotations, Emplois temporaires, Probabilités de transition, Taux de retour à l'emploi, Taux de séparation, Chômage, Législation sur la protection de l'emploi, Taxation.

Classification JEL : E24, E32, J41, J63, J64, J68.

Summary

This thesis studies the dualism existing on the French labor market. Especially, I study job and worker flows and the role played by temporary contracts in those flows. The employment protection legislation is stringent in France, then firms are subject to important rules when they adjust their workforce. However, it seems that the employment legislation governing the use of temporary contracts is not so binding in practice since this type of contract is widely used and that their duration is more and more shorter. In order to have a better knowledge of the French labor market and of the dualism, this thesis is divided into three chapters. The first one quantifies job and worker flows over the 1998-2012 period and explores the possible impact of the 2008 crisis on those flows taking into account industry characteristics. In addition, I study the evolution of contracts' duration and I propose an econometric analysis that highlight the determinants of temporary hiring. The second chapter quantifies transitions existing on the French labor market and their impact on unemployment volatility. I use a three-state model (employed, unemployed, inactive) and a four-state model (permanently employed, temporary employed, unemployed, inactive). This latest model has never been studied for the French case yet. Finally, the last chapter analyzes the consequences of the implementation of a tax on short-term contracts that is supposed to encourage firms to hire with permanent contracts and increase the duration of contracts. This kind of reform has been implemented in several European countries. In France, this tax was implemented by the Interprofessional agreement in july 2013. A search and matching model is estimated on French data from Unédic and Pôle Emploi using the model proposed by Cahuc, Charlot and Malherbet (2016).

Key words : Job flows, Worker flows, Churning, Temporary jobs, Transition probabilities, Job finding rate, Job separation rate, Unemployment, Employment protection legislation, Taxation.

JEL classification : E24, E32, J41, J63, J64, J68.