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ESSAIS SUR LA PROTECTION D'EMPLOI ET SES IMPACTS SUR LE BIEN-ÊTRE DES TRAVAILLEURS

THÈSE

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Table des matières

Table des figures

Liste des tableaux

Grand résumé

Les lois de protection d'emploi ont été instaurées dans le but d'améliorer la situation des employés permanents. La question centrale de cette thèse est la suivante : Ces lois sont-elles toujours bénéfiques, ont-elles des impacts non anticipés sur les travailleurs et comment se comparent-elles à d'autres institutions du marché du travail telles l'assurance chômage et les programmes de partage du temps de travail ? Dans les trois volets suivants, les effets non pécuniaires des lois de protection d'emploi sur le bien-être des travailleurs et de leur famille sont étudiés à partir de trois angles distincts en utilisant une approche principalement empirique.

Dans le premier volet, l'impact des licenciements et de la réduction des heures de travail sur la consommation des ménages est estimé par score de propension. Une approche structurelle est ensuite proposée où le revenu est modélisé comme un processus de Markov, afin d'apprécier l'impact de ces chocs sur le bien-être des travailleurs et d'entrevoir l'efficacité de diverses réformes de l'assurance-chômage et des programmes de partage du temps de travail. Le second volet étudie la possibilité que les coûts d'ajustement de la main-d'œuvre, et spécialement les lois de protection d'emploi, incitent les entreprises à modifier les heures de travail ou l'intensité du travail au lieu de recourir aux embauches et aux licenciements. Enfin, le troisième volet [1] explore les effets de la protection d'emploi sur le stress et le bien-être des employés. Si la protection d'emploi augmente la sécurité des travailleurs en équilibre partiel en réduisant leur risque de licenciement, elle pourrait aussi avoir des impacts négatifs indirects. Par exemple, lorsque la procédure de congédiement d'un travailleur est coûteuse ou incertaine, une entreprise peut chercher à la contourner en augmentant la pression sur le travailleur, en le surveillant plus étroitement ou, dans les cas extrêmes, en l'intimidant pour qu'il quitte de lui-même.

Près de 80% des personnes en emploi sont salariées dans les pays industrialisés. Pour les entreprises qui les emploient, les embauches et les licenciements constituent une marge d'ajustement essentielle aux conditions du marché. Mais un licenciement provoque souvent une perte de revenu à court et à long terme chez le travailleur, en plus d'entrainer des conséquences psychologiques et émotionnelles. Ainsi, les contrats de travail ne sont pas signés fréquemment, mais ils ont d'importantes conséquences matérielles et humaines sur les travailleurs durant l'emploi et après une séparation. Des recherches récentes suggèrent même que les aspects non pécuniaires du travail ont une importance comparable et même supérieure à celle du revenu sur le bien-être des travailleurs. Par exemple, Helliwell et Huang (2010) montrent que le climat de travail, particulièrement la confiance accordée aux cadres, est très fortement associé à leur satisfaction générale, autant qu'une importante hausse du revenu. De même, un licenciement a un impact négatif sur leur bonheur beaucoup plus grand que ne peut

1. Ce volet est écrit avec Étienne Wasmer.

l'expliquer la simple perte de revenu d'emploi (Helliwell et Huang, 2004).

L'impact sur la consommation des pertes d'emploi, des licenciements et des pertes d'heures de travail

Un des thèmes importants abordés dans cette thèse est le compromis pour les travailleurs entre sécurité d'emploi et régularité des heures de travail. Ainsi, le premier volet explore les conséquences de ce compromis du point de vue de la consommation et du bien-être des ménages. À ce jour, aucune étude n'a comparé l'impact sur la consommation des ménage de divers types de licenciement et des pertes d'heures de travail liées à la conjoncture économique.[2] Les données utilisées pour ce volet proviennent du Current Population Survey (CPS) des États-Unis. Ce sondage, avec son supplément sur la sécurité alimentaire, est le seul qui détaille avec suffisamment de précision la situation des répondants sur le marché du travail, y compris les changements d'heures de travail. Chaque ménage est sondé mensuellement au cours de deux années consécutives pendant la même période de quatre mois, ce qui procure deux observations sur les dépenses alimentaires et au maximum huit observations sur le marché du travail. Bien que le CPS ne soit pas conçu comme une enquête longitudinale, des identifiants permettent de lier les individus et les ménages entre chaque vague. On peut ainsi utiliser les données en première différence, contrôlant ainsi pour les caractéristiques individuelles invariables inobservées.

Les données

Le supplément sur la sécurité alimentaire est inséré dans le CPS chaque décembre depuis 2001. La définition exacte des dépenses est : dépenses alimentaires totales au supermarché, boucher, kiosques de nourriture, pâtissier, restaurants, restauration rapide, cafétérias, machines distributrices, etc. Les dépenses alimentaires ne sont pas les dépenses totales, mais plusieurs études soulignent que l'élasticité des dépenses alimentaires peut être une très bonne approximation de l'élasticité des dépenses totales (Gervais et Klein (2010) (Tableau 4)). En outre, plusieurs autres articles importants de la littérature sur la consommation utilisent aussi cette variable.

Les situations sur le marché du travail considérées seront les suivantes :

- employé : employé à temps plein ;
- licenciement$_{6m}$: mise à pied avec retour au travail possible dans les six mois ;

2. Plusieurs études ont estimé l'impact de divers types de pertes d'emploi sur la consommation et elles trouvent un impact entre -6.4% et -27%. La démarche qui se rapproche le plus de celle utilisée ici est celle de Browning et Crossley (2001a). Grâce à une base de données canadienne sur des travailleurs licenciés, les auteurs estiment par score de propension que l'impact d'un licenciement permanent, par rapport à un licenciement avec une date de retour connue, est de -6.4%.

– licenciement$_{\text{rappel}}$: mise à pied avec date de retour connue ;
– pertes d'heures : l'employé travaille normalement à temps plein, mais a travaillé moins de 35 heures la semaine dernière en raison de manque de travail / du contexte économique.

Un modèle plus général considérera également un plus large éventail de circonstances, telles qu'un licenciement sans espoir de rappel, un découragement suivi d'une sortie du marché du travail, le travail en temps supplémentaire, une perte d'emploi après fermeture ou déménagement d'entreprise, une perte d'emploi avec ou sans assurance chômage et une perte d'assurance santé à la suite d'une perte d'emploi. Enfin, l'élasticité de la consommation relativement au revenu annuel, au revenu hebdomadaire et au salaire sera aussi calculée.

Le modèle empirique

Le modèle linéaire de base estimé est le suivant :

$$\Delta ln\,(\text{dépenses}_i) = \beta_0 + \beta_1 \text{Lic.}_{6\text{m}i} + \beta_2 \text{Lic.}_{\text{rappel}i} + \beta_3 \text{Pertes d'heures}_i + \gamma \text{contrôles}_i + \varepsilon_i$$

où $\Delta ln\,(\text{dépenses}_i)$ est le logarythme du changement annuel des dépenses hebdomadaires de nourriture du travailleur i. L'échantillon est constitué des travailleurs employés à temps plein il y a un an et présentement employés dans des circonstances similaires ou dans une des situations telles que Licenciement$_{6\text{m}i}$, Licenciement$_{\text{rappel}i}$ ou Pertes d'heures$_i$.

Les résultats montrent que les travailleurs subissant un licenciement prolongé (Lic.$_{6\text{m}i}$) réduisent leur consommation de 13.9%, en comparaison avec ceux qui demeurent employés. La différence est négligeable dans le cas des licenciements avec date de retour connue ou pour les pertes d'heures de travail dues aux conditions économiques.

Pour aller au-delà de cette formulation linéaire du modèle, une approche basée sur l'appariement par score de propension (propensity score matching) (Rosenbaum et Rubin (1982)) est employée. Cette méthode a l'avantage d'assurer que les travailleurs comparés sont similaires quant à leurs caractéristiques observables. Comme Licenciement$_{6m}$, Licenciement$_{\text{rappel}}$ et Pertes d'heures représentent de multiples 'traitements' mutuellement exclusifs, la procédure suivie s'inspire de Lechner (2002). La propension de subir chaque 'traitement' est estimée par régression logistique multinomiale. L'appariement est effectué par distance Mahalanobis et d'autres métriques sont employées pour tester la robustesse des résultats.

Les résultats, présentés dans le tableau 0.1, sont très similaires au modèle linéaire. L'impact sur les dépenses hebdomadaires d'un licenciement avec retour dans les six mois est de -13.7% (ligne 1). La différence entre un Licenciement$_{6m}$ et des pertes d'heures est aussi significative (ligne 4).

TABLE 0.1: Appariement, spécification de base

	Var dep : **Δlog dépenses**[a]		Résultats[b]					Observations exclues[c]		
	Traités	Contrôles	Groupe	Traités	Contrôles	Différence	E. T.	Assignation	Hors sup.	Sur le sup.
1	Licenciement$_{6m}$	Employé	Non appariés	-0.142	0.013	-0.155***	(0.043)	Traités	0	84 556
			TMT	-0.132	0.005	**-0.137*****	(0.044)	Non traités	10	246
2	Licenciement$_{rappel}$	Employé	Non appariés	-0.035	0.013	-0.048	(0.046)	Traités	0	84 556
			TMT	-0.036	0.003	**-0.039**	(0.055)	Non traités	12	213
3	Perte d'heures	Employé	Non appariés	0.011	0.013	-0.003	(0.027)	Traités	0	84 556
			ATT	0.013	0.012	**0.002**	(0.03)	Non traités	27	639
4	Licenciement$_{6m}$	Perte d'heures	Non appariés	-0.142	0.010	-0.152***	(0.053)	Traités	0	680
			TMT	-0.133	0.000	**-0.133****	(0.063)	Non traités	30	226
5	Licenciement$_{rappel}$	Perte d'heures	Non appariés	-0.035	0.010	-0.044	(0.058)	Traités	0	680
			TMT	-0.024	0.043	**-0.068**	(0.071)	Non traités	32	193
6	Licenciement$_{6m}$	Licenciement$_{rappel}$	Non appariés	-0.142	-0.039	-0.103	(0.066)	Traités	0	228
			TMT	-0.129	0.002	**-0.131**	(0.083)	Non traités	45	211

Écarts-types entre parenthèses, e.t. = *** p<0.01, ** p<0.05, * p<0.1.

[a]Changement annuel du log des dépenses hebdomadaires de nourriture du ménage au supermarché, boucher, kiosques de nourriture, pâtissier, restaurants, restauration rapide, cafétérias, machines distributrices, etc.

[b]Appariement sur la distance Mahalanobis basée sur le score de propension d'être traité, le score de propension d'être dans le groupe de contrôle, le sexe et une variable dichotomique pour l'année 2006.

[c]Note, 3 495 observations de travailleurs employés, 19 observations de travailleurs en perte d'heures, 6 de travailleurs en licenciement$_{\text{rappel}}$ et 2 observations de travailleurs en licenciement$_{6\text{m}}$ ont été exclues pour garantir un support commun pour tous les scores de propension.

L'échantillon total inclut les travailleurs qui, l'an dernier, étaient employés à temps plein pour le secteur privé ou public et qui, la semaine dernière, étaient employés dans des conditions similaires, ont travaillé moins de 35 heures par manque de travail ou autre raison économique, ou étaient au chômage après un licenciement.

L'analyse est également élargie à un plus grand nombre de circonstances, à des sous-groupes de travailleurs et à des sous-ensembles de dépenses alimentaires. Les résultats principaux sont présentés dans le tableau 0.2. Les travailleurs qui réduisent le plus leur consommation sont ceux qui sont découragés (−35.4%). La réaction des travailleurs au chômage après un licenciement permanent est similaire à celle des travailleurs en licenciement avec retour dans les six mois. Les travailleurs en temps supplémentaire augmentent leurs dépenses de nourriture de 4.1% de plus que les autres travailleurs. L'effet d'avoir quitté le marché du travail par découragement et l'effet d'un licenciement_{6m} sont plus grands pour les ménages à un seul gagne-pain. Sans surprise, tous les effets sont plus forts pour les hommes que pour les femmes, étant donné que les hommes sont toujours les principaux pourvoyeurs. Enfin, les dépenses sont beaucoup moins élastiques dans le cas de la nourriture consommée à la maison que pour celle consommée à l'extérieur.

Grâce au supplément du CPS de janvier sur la mobilité professionnelle et l'ancienneté, des informations supplémentaires sur les circonstances des licenciements sont disponibles pour un sous-échantillon d'observations. Ainsi, quand une perte d'emploi est due à une fermeture ou un déménagement de l'employeur, l'impact est de −20.4%. Un autre résultat intéressant est que l'impact de la fin des prestations d'assurance chômage sur les dépenses alimentaires est de −39.7%, une magnitude difficilement explicable sans la présence de fortes contraintes à l'emprunt pour de nombreux chômeurs.

Enfin, l'élasticité des dépenses de consommation est estimée à 4% dans le cas d'un changement du revenu hebdomadaire, à 7.9% pour un changement de salaire et à 6.5% pour un changement du revenu familial annuel. Ces chiffres sont en accord avec la littérature.

Un modèle structurel

Depuis les travaux de Friedman, un des objectifs de la littérature empirique a été de vérifier si les ménages réussissent effectivement à lisser leur consommation au cours de fluctuations temporaires de revenu, et s'ils s'ajustent complètement aux chocs permanents. Un résultat récurrent est que la consommation s'ajuste souvent trop aux chocs transitoires et ne s'ajuste pas suffisamment aux chocs permanents (voir Jappelli et Pistaferi (2010) pour un résumé de cette littérature). Plusieurs hypothèses ont été proposées pour expliquer ces résultats, suggérant des altérations possibles aux fonctions objectifs des travailleurs. L'approche structurelle utilisée ici consiste plutôt à modéliser un sous-ensemble de chocs bien définis liés au marché du travail. [3]

3. Cette approche s'inspire de Dynarski et Gruber (1997) qui considèrent séparément les chocs dus aux changements d'heures, vus comme temporaires, et les chocs dus aux changements de salaires, considérés comme permanents.

TABLE 0.2: L'impact de divers chocs liés au marché du travail sur des sous-échantillons de la population et des sous-échantillons de dépenses alimentaires

	Moindres carrés ordinaires								
Var. dépendante : Δlog Dépenses nour.[a]	**total**							**excl. nour. à l'extérieur**	**excl. nour. à la maison**
Échantillon :	Total	Total + Δrevenu	Un seul emploi	Un seul gagne-pain	Secteur privé	Homme	Femme	Total	Total
	1	2	3	4	5	6	7	8	9
Découragé[b]	-0.354***	-0.360**	-0.370***	-0.444**	-0.346***	-0.470***	-0.193	-0.336***	-0.402
	(0.103)	(0.135)	(0.106)	(0.178)	(0.109)	(0.100)	(0.136)	(0.104)	(0.315)
$\text{Licenciement}_{perm}$[c]	-0.148***	-0.131***	-0.154***	-0.148***	-0.141***	-0.169***	-0.070	-0.105***	-0.305***
	(0.034)	(0.034)	(0.037)	(0.046)	(0.033)	(0.035)	(0.052)	(0.036)	(0.065)
Licenciement_{6m}[d]	-0.133***	-0.140***	-0.145***	-0.213**	-0.140***	-0.132***	-0.129	-0.062	-0.089
	(0.042)	(0.042)	(0.044)	(0.080)	(0.040)	(0.045)	(0.115)	(0.051)	(0.065)
$\text{Licenciement}_{rappel}$[e]	-0.042	-0.047	-0.073	-0.075	-0.048	-0.028	-0.069	-0.036	-0.168
	(0.059)	(0.058)	(0.056)	(0.072)	(0.061)	(0.066)	(0.084)	(0.057)	(0.112)
Perte d'heures[f]	0.027	0.047*	0.017	-0.004	0.050*	0.014	-0.004	0.037	-0.094
	(0.025)	(0.026)	(0.024)	(0.043)	(0.027)	(0.028)	(0.048)	(0.027)	(0.067)
Temp supplémentaire	0.041***	0.037***	0.038***	0.040***	0.039***	0.046***	0.024**	0.023***	0.033***
	(0.007)	(0.007)	(0.007)	(0.014)	(0.007)	(0.006)	(0.011)	(0.008)	(0.011)
ΔRevenu annuel		0.015***							
(# de catégories)		(0.002)							
Contrôles[h]	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	68 972	64 486	65 075	29 563	54 653	49 174	36 458	64 449	47 026
R^2	0.017	0.018	0.016	0.026	0.017	0.016	0.016	0.016	0.007

Écarts-types entre parenthèses, e.t. = *** p<0.01, ** p<0.05, * p<0.1.

[a]Changement annuel du log des dépenses hebdomadaires de nourriture du ménage au supermarché, boucher, kiosques de nourriture, pâtissier, restaurants, restauration rapide, cafétérias, machines distributrices, etc.

[b]Sorti de la vie active, découragé.

[c]Au chômage après une perte d'emploi, recherche un nouvel emploi.

[d]En licenciement, l'employeur a indiqué que l'employé serait rappelé dans les six mois.

[e]En licenciement, l'employé a une date de retour au travail.

[f]A travaillé moins de 35 heures la semaine passée pour manque de travail / causes économiques

[h]Inclut sexe, âge, âge^2, race blanche, race noire, 14 effets fixes secteurs. 11 effets fixes occupation, taille du ménage, changement annuel de la taille du ménage, nombre d'enfants, changement annuel du nombre d'enfants, éducation supérieure, effets fixes années, effets fixes régions, propriétaire de maison, chômage au niveau de l'État.

L'échantillon total inclut les travailleurs qui, l'an dernier, étaient employés à temps plein pour le secteur privé ou public et qui, la semaine dernière, étaient employés dans des conditions similaires, ont travaillé moins de 35 heures par manque de travail ou autre raison économique, étaient au chômage après un licenciement, après une perte d'emploi ou hors de la vie active et découragé.

Conformément à la section , le revenu des travailleurs est modélisé comme un processus de Markov alternant entre cinq états : employé, en pertes d'heures de travail, en licenciement avec date de retour connue, en licenciement avec retour espéré dans les six mois et licencié de façon permanente. Les flux entre états sont calculés à l'aide des données du CPS. Les travailleurs gagnent leur plein salaire quand ils sont au travail, en obtiennent une partie quand ils sont en pertes d'heures et touchent de l'assurance chômage s'ils sont sans emploi. Les pertes d'heures et licenciements entraînent aussi une probabilité qu'un travailleur change d'employeur et subisse une perte de salaire permanente.

Un travailleur entre dans la population active à 20, prend sa retraite à 60 ans et meurt avec certitude à 75 ans sans intention de laisser d'héritage. Son utilité à chaque période est de type CRRA : $u(c_t) = \frac{c_t^{1-\nu}}{1-\nu}$ où $\nu = 2$, ce qui est standard dans la littérature. Il fait face à une contrainte de crédit et ne peut dépenser plus de 5% de son revenu en intérêt sur ses dettes.

Le salaire moyen des travailleurs augmente annuellement en fonction de l'âge. Le taux d'intérêt annuel est de 5%, indépendamment du niveau d'actifs. Le taux d'inflation est de 2.55% et le taux d'escompte annuel est de $\beta = .95$. Le modèle est résolu numériquement et l'unité de temps est un mois.

La résolution du modèle permet de simuler les réponses d'un groupe représentatif de travailleurs, composé à 37.41% de ménages à un seul revenu et de 62.59% de ménages à revenus multiples.

Le modèle reproduit bien la réaction des ménages calculée à partir des données réelles, tel que présenté dans le tableau 0.3. Dans les données simulées des colonnes 1 et 3, les ménages réagissent à des pertes d'emploi en réduisant leurs dépenses de 19%. Cette réaction est supérieure à celle obtenue dans l'échantillon total (col. 4 et 6), mais très près de celle liée à une perte d'emploi due à une fermeture ou à un déménagement d'entreprise (col. 7). L'effet d'un licenciement$_{\text{6m}}$ pour l'échantillon simulé est légèrement plus faible que pour l'échantillon complet. En revanche, l'effet d'un licenciement$_{\text{rappel}}$ est un peu plus grand pour l'échantillon simulé. L'effet simulé des pertes d'heures est négatif, mais très faible.

TABLE 0.3: Simulation du modèle

Var dep. : Δlog dépenses en nourr.	Simulation 1	2	3	Échantillon complet[b] 4	5	6[c]	Mobil. 7
$\text{Licenciement}_{\text{perm.}}$ ou Perte d'emploi[a]	-0.190	-0.148	-0.190	-0.158***	-0.136**	-0.161***	-0.203***
				(0.037)	(0.051)	(0.037)	(0.052)
				[.390]	[.829]	[.434]	[.818]
$\text{Licenciement}_{6\text{m}}$	-0.137	-0.119	-0.137	-0.151***	-0.141***	-0.148***	-0.128
				(0.044)	(0.044)	(0.045)	(0.078)
				[.759]	[.618]	[.802]	[.913]
$\text{Licenciement}_{\text{rappel}}$	-0.098	-0.082	-0.098	-0.077	-0.071	-0.079	-0.093
				(0.057)	(0.055)	(0.056)	(0.084)
				[.722]	[.846]	[.743]	[.953]
Pertes d'heures	-0.019	-0.019	-0.019	0.013	0.013	0.013	-0.013
				(0.024)	(0.024)	(0.025)	(0.031)
				[.191]	[.191]	[.210]	[.846]
Mois depuis la perte d'emploi		-0.012			-0.005		
					(0.008)		
					[.411]		
ret. $\text{Licenciement}_{\text{perm.}}$			0.130			0.094**	
						(0.037)	
						[.336]	
ret. $\text{Licenciement}_{6\text{m}}$			0.107			0.043	
						(0.057)	
						[.271]	
ret.$\text{Licenciement}_{\text{rappel}}$			0.083			0.011	
						(0.056)	
						[.199]	
ret. Perte d'heures			0.012			0.008	
						(0.027)	
						[.888]	
Contrôles				Y	Y	Y	Y
Observations				65 040	65 040	69 795	24 388
R^2				0.016	0.016	0.016	0.016
Pr > F ($\vec{\beta} = \vec{\beta}_{\text{sim}}$)				[.514]	[.514]	[.581]	[.996]

Écarts-types entre parenthèses, e.t. = *** p<0.01, ** p<0.05, * p<0.1.

[a]Dans l'échantillon total, cette variable est $\text{Layoff}_{\text{perm}}$: au chômage après une perte d'emploi, à la recherche d'un nouvel emploi. Dans l'échantillon du Supplément sur la mobilité professionnelle et l'ancienneté, cette variable est : perte d'emploi après une fermeture ou un déménagement de l'employeur.

[b]L'échantillon inclut les travailleurs qui, l'an dernier, étaient employés à temps plein pour le secteur privé ou public dans un seul emploi et qui, la semaine dernière, étaient employés dans des conditions similaires, ont travaillé moins de 35 heures par manque de travail ou autre raison économique, étaient au chômage après un licenciement, après une perte d'emploi ou hors de la vie active et découragé.

[c]Inclut également les travailleurs du secteur privé ou public employés à temps plein dans un seul emploi la semaine passée et qui étaient, l'an dernier, employés dans des conditions similaires, travaillaient moins de 35 heures par manque de travail lié au contexte économique, étaient en licenciement ou avaient perdu leur emploi de façon permanente.

Le modèle permet également d'approximer l'impact de réformes de l'assurance-emploi sur la consommation. Les résultats indiquent que ces réformes auraient un impact léger sur la consommation des ménages, mais un effet très faible sur leur bien-être.

En somme, les résultats des différentes sections sont cohérents et suggèrent fortement que les licenciements à long terme ont des répercussions importantes alors que les pertes temporaires d'heures de travail sont sans conséquences. Les programmes de partage du temps de travail, encore peu utilisés, surtout en Amérique du Nord, seraient donc envisageables pour aider les firmes à s'ajuster aux fluctuations temporaires du cycle économique tout en minimisant l'incertitude ressentie par leurs employés.

La protection d'emploi et la variabilité des heures de travail

Dans le second volet, on s'interroge sur l'existence, pour les firmes et leurs travailleurs, d'un compromis entre stabilité des heures de travail et stabilité d'emploi. En effet, les embauches et les licenciements ne sont pas la seule marge d'ajustement du travail pour les firmes. Les cadres peuvent aussi ajuster la production en modifiant les horaires de travail ou l'intensité du travail. La protection d'emploi pourrait donc favoriser le recours à des horaires plus instables et à plus de travail supplémentaire, entrainant ainsi des conséquences physiques et mentales sur la santé, tel que rapporté dans une méta-analyse récente sur l'impact du temps supplémentaire sur la santé.[4]

Un modèle théorique

Au moyen d'un modèle dans lequel une firme choisit entre les travailleurs et les heures de travail, on peut montrer que, peu importe le processus d'ajustement des prix ou la forme des coûts d'ajustement de l'emploi, dès qu'une firme ne peut ajuster parfaitement sa main d'œuvre, elle compensera en ajustant les heures de travail. Les profits de l'entreprise sont

$$\Pi = py(nh) - nw(h)$$

où p est le prix de vente, y ($y' > 0$, $y'' < 0$) est la production, n est le nombre de travailleurs, h est le nombre d'heures par travailleur et $w(h)$ ($w(0) > 0$, $w' > 0$, $w'' > 0$) est le salaire par travailleur. Le salaire est convexe et dérivable deux fois en tout point, ce qui est justifié en annexe.

Après un changement de prix, la firme devrait ajuster sa main d'oeuvre. Mais si on suppose qu'elle n'opère qu'une fraction $(1-\alpha) < 1$ de son ajustement optimal du

4. Les impacts incluent une moins bonne santé, plus de blessures, plus de maladies et une plus grande mortalité.(Caruso et al., 2004)

nombre de travailleurs, on peut démontrer qu'elle compensera en ajustant les heures de travail :

$$\frac{dh}{dp} = \frac{\alpha y'(nh)}{w''(h) - py''(nh)n} > 0$$

Pour illustrer ce mécanisme dynamiquement, et contrairement à la littérature antérieure [5], le modèle postule un prix de vente qui varie entre deux valeurs, tel que proposé par Bertola (1990). Ainsi, le prix varie entre un prix haut : $\overline{p}$ et un prix bas $\underline{p}$, suivant un processus de Markov. Il y a une probabilité $\overline{q}$ que le prix change de $\overline{p}$ à $\underline{p}$ et une probabilité $\underline{q}$ qu'il change de $\underline{p}$ à $\overline{p}$. Le taux d'intérêt est r. Suivant un changement de prix, la façon dont la firme ajustera sa main d'oeuvre dépend de la forme des coûts d'ajustement. Le cas où l'ajustement est instantanné est exploré en détail en appendice.

La figure 2.1 illustre le cas d'un coût de licencement linéaire c_f par travailleur et aucun coût d'embauche. Comme l'ajustement est instantanné, la figure 2.1 présente les deux choix optimaux de main d'oeuvre $\overline{n}$ et $\underline{n}$, d'heures par travailleur $\overline{h}$ et $\underline{h}$, et de production $y\left(\overline{nh}\right)$ et $y\left(\underline{nh}\right)$ en fonction du coût d'ajustement c_f. Le cas d'une firme qui ne peut ajuster les heures par travailleur est présenté en pointillés et le cas d'une firme qui peut ajuster à la fois le nombre de travailleurs et les heures est présenté en lignes pleines.

Les résultats généraux peuvent être résumés ainsi. Les coûts de licenciement augmentent la variation des heures de travail et diminuent la variation du nombre d'employés et de la production de l'entreprise. La probabilité des chocs et le taux d'intérêt réduisent les embauches et les licenciements et augmentent la variation des heures. De plus, ils amplifient l'impact des coûts d'ajustement.

Une extension du modèle illustre également la situation où un minimum d'heures par travailleur est imposé à la firme. Quand cette limite est contraignante pour la firme, elle a pour effet d'augmenter les heures moyennes et de réduire le nombre de travailleurs employés.

Deux prédictions sont dérivées du modèle : 1. le coût d'ajustement du travail augmente la variabilité des heures, surtout dans les secteurs avec un haut taux de licenciement ; 2. une hausse temporaire de la demande de travail accroît les heures de travail, surtout dans un contexte où l'ajustement du travail est coûteux. Ces prédictions servent de stratégie d'identification dans la section empirique.

Section empirique

La section empirique exploite des microdonnées sur le temps supplémentaire payé tirées de l'Enquête sur la population active du Canada. Comme dans le premier volet, la variable de protection d'emploi varie entre les provinces. Ces préavis ont deux

5. Nickell (1978) et Chen et Funke (2004)

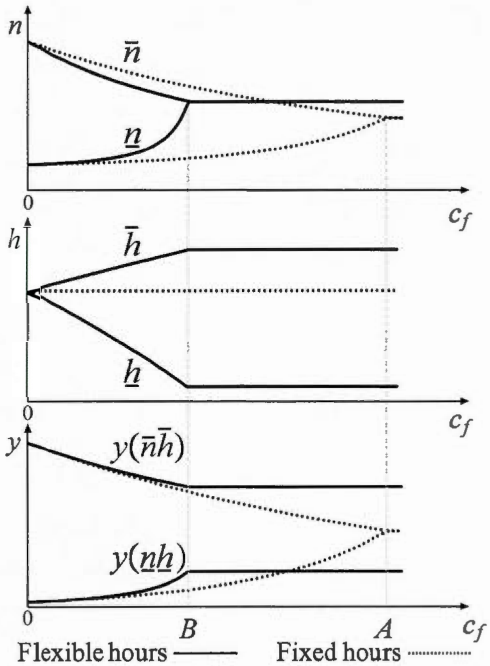


FIGURE 0.1: Travailleurs, heures par travailleur et production en fonction des coûts de licenciement c_f, avec des heures fixes ou flexibles.

sous-composantes : les préavis de licenciement individuels qui augmentent en fonction de l'ancienneté d'un travailleur et les préavis supplémentaires en cas de licenciement collectif, proportionnels à la taille du licenciement.

Pour contrer le risque d'endogénéité entre la législation d'une province et la propension des travailleurs de cette province à travailler en temps supplémentaire, des effets provinces sont inclus comme contrôles. Puisque les législations ne varient pas au cours du temps, l'identification est basée sur l'impact hétérogène qu'elles ont sur des sous-groupes d'observations. La première stratégie d'identification consiste à interagir les préavis de licenciement avec le taux de licenciement spécifique à chaque secteur d'activité. Comme les firmes ayant un besoin naturel plus grand de licencier des travailleurs seront plus affectées par les licenciements, elles devraient avoir davantage recours aux heures supplémentaires pour éviter un maximum de licenciements. Dans l'esprit d'une différence en différences, le groupe traité est constitué des travailleurs des secteurs à hauts taux de licenciement et le groupe contrôle, des travailleurs des secteurs à bas taux de licenciement. Le modèle estimé, en termes de variable latente, est

$$\text{Temps sup.}^*_{i,p,s} = \begin{array}{c} \beta_1 \text{Préavis ind.}_p \times \text{Taux de Lic.}_s + \beta_2 \text{Préavis Coll.}_{pf} \times \text{Taux de Lic.}_s \\ + \beta_3 \text{Préavis Coll.}_{pf} + \gamma_1 \text{Taux d'emploi}_{ps} + \gamma_2 \text{Dev. Emploi}_{pst} \\ + \phi \,\textbf{contrôles ind.}_i + EF_p + EF_t + EF_s + u_{ip} \end{array}$$

où Temps $\text{sup.}^*_{i,p,s}$ est la propension à travailler en temps supplémentaire payé pour l'individu i de la province p employé dans le secteur s. Préavis ind._p est le niveau moyen de préavis individuel de la province p, pondéré par le taux de licenciement par niveau d'ancienneté, Préavis Coll._{pf} est la période de préavis pour les licenciements collectifs de la province p d'un nombre de travailleur f, Taux de lic._s est le taux de licenciement du secteur s, Taux d'emploi_{ps} est le taux d'emploi moyen de la province p et le secteur s, Dev. Emploi._{pst} est la déviation trimestrielle du taux d'emploi au temps t du secteur s de la province p par rapport à sa moyenne au cours de la période, **contrôles ind**$_i$ est un vecteur de contrôles individuels. EF_p, EF_t and EF_s sont des effets fixes province, temps (11 effets années et 12 effets mois) et secteur. Le terme d'erreur est $u_{ip} = \nu_p + \varepsilon_i$, où ν_p est un terme d'erreur qui peut être corrélé au sein de la province et ε_i est un terme d'erreur individuel de l'individu i.

Dans la seconde stratégie d'identification, les préavis de licenciement sont interagis avec la déviation du taux d'emploi. Cette approche prend avantage du fait que la demande de temps supplémentaire ne sera pas uniforme au cours du temps, mais sera proportionnelle à la demande de travail, et ce lien devrait être amplifié par la protection d'emploi.

Enfin, la dernière stratégie exploite le fait que les préavis collectifs sont proportionnels au nombre de travailleurs licenciés. Ainsi, une firme ne sera pas affectée par un préavis qui s'applique au licenciement d'un nombre de travailleurs plus grand que son nombre total d'employés.

L'estimation se fait d'abord directement par probit sur l'ensemble des microdonnées. Mais, pour s'assurer d'obtenir des écarts-types non biaisés et faciliter l'interprétation des coefficients, des estimés en deux étapes par la méthode de distance minimale sont utilisés. La propension de travailler en temps supplémentaire est d'abord estimée par modèle de probabilité linéaire.

Le tableau 2.1 montre les estimés probit initiaux. Les résultats confirment en général le lien entre la protection d'emploi individuelle et la variabilité des heures de travail. La colonne 2 présente la première stratégie d'identification où les préavis de licenciements sont interagis avec les taux de licenciement sectoriels. Le coefficient pour les préavis $\text{individuels}_p \times$taux de licenciement_s est très significatif, mais le coefficient de préavis $\text{collectif}_{pf} \times$taux de licenciement_s ne l'est pas. Ainsi, les préavis individuels de licenciement ont un impact positif et statistiquement significatif sur le temps supplémentaire à travers leur interaction avec les taux de licenciement.

Les estimés par méthode de distance minimale confirment ces résultats probit. Ils permettent également de calculer que l'impact de premier ordre des préavis sur les travailleurs de secteurs à haut taux de licenciement est positif et significatif. Il est non significatif pour les secteurs à bas taux de licenciement, Ces résultats sont conformes à l'esprit d'une stratégie différence en différences. Spécifiquement, une semaine supplémentaire de préavis individuel augmente de 34% le nombre de travailleurs en temps supplémentaire.

TABLE 0.4: Temp supplémentaire payé, probit

Variable dépendante :	Probit				
Travaille en temps sup.[a]	**Tout**	**Strat. 1**	**Strat. 2**	**Coll.**	**Coupe transversale**
	1	2	3	4	5
Préavis ind.$_p$[b]×Taux de lic.$_s$[c]	32.21***	32.35***			
	(8.34)	(8.34)			
Préavis coll.$_{pf}$[d]×Taux de lic.$_s$	0.42	0.42			
	(0.35)	(0.35)			
Préavis ind.$_p$×Empl. dev.$_{pst}$[e]	1.03***		1.07***		
	(0.36)		(0.37)		
Préavis coll.$_{pf}$×Empl. dev.$_{pst}$	0.00		0.00		
	(0.03)		(0.03)		
Préavis coll.$_{pf}$	0.02	0.02	0.01**	0.01**	-0.004
	(0.01)	(0.01)	(0.00)	(0.00)	(0.003)
Taux d'empl.$_{ps}$[f]	-0.11	-0.12	0.60	0.59	0.55
	(0.47)	(0.48)	(0.42)	(0.43)	(0.50)
Dev. Emploi$_{pst}$	-1.37*	0.69***	-1.47*	0.68***	0.68***
	(0.76)	(0.17)	(0.78)	(0.17)	(0.18)
Préavis ind.$_p$					-0.19
					(0.11)
Contrôles ind.[g]	Y	Y	Y	Y	Y
Effets fixes secteurs	Y	Y	Y	Y	Y
Effets fixes taille de l'entreprise	Y	Y	Y	Y	Y
Effets fixes province	Y	Y	Y	Y	
Effets temps[h]	Y	Y	Y	Y	Y
Contrôles province[i]					Y
Nombre d'observations	4 379 885	4 379 885	4 379 885	4 379 885	4 379 885
Nombre de groupes	10	10	10	10	10
R^2 ajusté	0.092	0.092	0.092	0.092	0.091

Écarts-types robustes entre parenthèses ; *** p<0.01, ** p<0.05, * p<0.1

[a] Variable dichotomique pour le travail en temps supplémentaire

[b] Préavis de licenciement individuel moyen de la province p, pondéré par le taux de licenciement de chaque niveau d'ancienneté

[c] Taux de licenciement du secteur

[d] Préavis de licenciement collectif, spécifique pour chaque taille de firme

[e] Déviation trimestrielle du taux d'emploi spécifique à la province et au secteur

[f] Taux d'emploi spécifique à la province×secteur, moyenne sur toute la période

[g] Les contrôles incluent l'ancienneté et des effets fixes pour la taille de l'entreprise, l'âge, l'occupation et le type de contrat.

[h] Inclut des effets fixes année et trimestre

[i] Inclut un effets fixes pour NE, NB and TN, où la prime pour temps supplémentaire est 1.5 fois le salaire minimum. Inclut également le nombre standard d'heures régulières dans chaque province, ainsi que le PIB per capita de chaque province.

Inclut seulement les employés du secteur privé en contrat permanent dans des emplois non saisonniers. Exclut les travailleurs de la construction.

La colonne 3 du tableau 2.1 présente la seconde stratégie d'identification. L'interaction des préavis individuels avec la variation du taux d'emploi est positive et significative, alors que l'interaction des préavis collectifs avec la variation du taux d'emploi ne l'est pas. Les estimés subséquents par méthode de distance minimale montrent que l'impact d'une variation du taux d'emploi est non significatif dans les provinces à préavis individuels courts, alors qu'il est positif et significatif dans les provinces avec de longs préavis individuels. Dans ces provinces, une augmentation d'un point du taux d'emploi augmente le nombre de travailleurs en temps supplémentaire de 1.9%.

Les autres spécifications sont non significatives ou ne résistent pas aux tests de robustesse. Des régressions sur des sous-groupes de travailleurs montrent que ces effets sont plus importants pour les petites et moyennes entreprises que pour les grandes entreprises de plus de 100 employés. De plus, l'effet est aussi important pour les employés qui sont membres d'un syndicat que pour les non-membres.

Ces résultats confirment l'influence des préavis individuels sur la probabilité qu'un employé travaille en temps supplémentaire. Plus généralement, ils illustrent la capacité des firmes de changer de marge d'ajustement si les licenciements sont coûteux. Pour les juridictions à forte protection d'emploi, l'usage accru du travail en temps supplémentaire devrait être un risque additionnel à considérer. Bien sûr, le Canada est une économie nord-américaine avec un niveau de protection d'emploi peu élevé par rapport à la moyenne de l'OCDE. La même analyse devrait être reproduite dans un contexte où la protection est plus stricte, idéalement en utilisant des données provenant directement des firmes.

La protection d'emploi et le stress au travail

Enfin, le dernier volet étudie plus largement les conséquences des lois de protection d'emploi sur le moral des travailleurs. Ces lois devraient en principe bénéficier aux employés permanents en réduisant leur risque de chômage. Par contre, la littérature théorique et empirique démontre clairement que cette législation tend également à réduire l'embauche d'employés permanents. Elle n'augmente donc pas le bien-être des travailleurs au chômage, en période de probation, en contrat temporaire ou à temps partiel. Les lois de protection d'emploi ont également plusieurs impacts secondaires positifs et négatifs. Ceci étant, la protection d'emploi n'apporte-t-elle que des avantages aux détenteurs d'un contrat permanent ? C'est la question abordée par le troisième volet de cette thèse. Comme le coût du divorce prolonge parfois de façon excessive les mariages malheureux, il est aussi possible que la protection d'emploi exacerbe le stress et les tensions au sein des firmes. Par exemple, dans le cas d'un emploi non rentable, une firme peut tenter d'éviter les coûts ou l'incertitude associés au processus de licenciement en faisant pression sur un travailleur pour qu'il quitte de lui-même en altérant les routines de travail, l'organisation ou les techniques de gestion. Dans des cas extrêmes, les collègues ou les supérieurs peuvent harceler un travailleur, phénomène rapporté par une large littérature. L'entreprise peut également le surveiller étroitement afin de trouver une justification pour le licencier pour faute, et éviter ainsi les coûts associés à un licenciement pour motifs économiques. La protection d'emploi peut aussi pousser les firmes à ajuster le travail en modifiant l'intensité ou les heures plutôt que le nombre de travailleurs, tel que montré dans le chapitre 2. Tous ces mécanismes peuvent être source de stress pour le travailleur. En équilibre général, comme la protection ralentit les embauches et allonge le chômage, la crainte de perdre un emploi peut être source de stress, ou pousser un travailleur à demeurer dans un emploi insatisfaisant s'il doute de ses capacités de se retrouver un travail.

Les données

Ces mécanismes sont illustrés dans un modèle théorique où la firme peut affecter la qualité de l'environnement de travail d'un travailleur et le surveiller pour pouvoir le licencier pour faute. Toutefois, la contribution principale de ce volet est empirique. Pour tester ces mécanismes, sept sondages internationaux récents contenant des informations sur le stress au travail ont été identifiés : le European Quality of Life Survey (EQLS) de 2003 ; le International Social Survey Program (ISSP) de 1997 et 2005 ; les sondages Eurobaromètre de 1996 et 2001 et les Enquêtes européennes sur les conditions de travail (European Working Conditions Survey (EWCS)) de 2000-2001 pour les candidats EU et 2005. De plus, des données canadiennes, les premières illustrant la différence de protection d'emploi existant entre les provinces canadiennes et les secondes tirées de l'Enquête nationale sur la santé de la population (ENSP) du Canada, permettent également d'étudier les relations entre la protection d'emploi et le stress.

Le panel principal utilisé est constitué des enquêtes EWCS 2000-01 et 2005, ainsi que de l'enquête Eurobaromètre 1996. La question ayant trait au stress est "Votre travail affecte-t-il votre santé ? Si oui, comment ?", le stress étant une réponse possible. Cette variable est donc binaire. La mesure de protection d'emploi de l'OCDE est une moyenne pondérée de l'estimation des coûts imposés aux firmes par les composantes de la protection d'emploi. Ses trois composantes sont i) protection contre les licenciements individuels, ii) protection contre les licenciements collectifs iii) restrictions de l'usage des contrats temporaires. Cette troisième dimension est très importante, car ces restrictions obligent les firmes à fournir des contrats permanents avec une protection plus grande qu'elles ne l'auraient souhaité.

L'approche empirique

La figure 3.2 montre une forte corrélation positive entre protection d'emploi et stress au travail pour les trois sondages du panel principal. Une corrélation similaire est présente dans tous les autres sondages étudiés. Bien sûr, une simple corrélation ne peut pas déterminer si la protection d'emploi augmente le stress ou si les travailleurs stressés demandent une plus forte protection.

Des facteurs affectant le stress dans un pays ou une région peuvent également influencer la volonté de légiférer en matière de protection d'emploi. Pour faire face à ce risque d'endogénéité, deux stratégies sont proposées. La première utilise les variations de la protection d'emploi au cours du temps. La seconde tire parti du fait que l'impact de la protection d'emploi devrait être plus grand pour les entreprises des secteurs d'activité nécessitant davantage de licenciements. Cette idée, exploitée dans le chapitre 2, a été développée par Rajan et Zingales (1998) en finance et adaptée subséquemment pour d'autres secteurs, incluant la macroéconomie du marché du travail. Dans l'esprit d'une approche de différence en différences, le groupe de contrôle serait un secteur avec une faible protection d'emploi et le secteur traité serait celui avec une forte protection d'emploi. Bien sûr, les deux stratégies pourront être combinées dans la mesure du possible, ce qui équivaut à une triple différence.

Le modèle économétrique le plus général est :

$$Stress_{santé_{i,p,s,t}} = \beta_1 \text{Protection}_{p,t} \times \text{Destr. d'emploi}_s + \beta_2 X_{c,t} + \beta_3 Z_i + \text{EF}_{p,t} + \text{EF}_{s,t} + \text{EF}_{p,s} + \varepsilon_{i,p,s,t} \quad (1)$$

où $Stress_{santé_{i,p,s,t}}$ est le stress rapporté par l'individu i, dans le pays p, dans le secteur s et au temps t. $\text{Protection}_{p,t}$ est la protection d'emploi du pays p au temps t, Destr. d'emploi_s est la mesure du taux de destruction d'emploi du secteur s dans lequel l'individu travaille. Z_i est un vecteur de contrôles pour l'individu i, incluant le sexe et des effets fixes pour l'âge, le nombre d'enfant dans le ménage, le nombre total de membres du ménage, la taille de l'entreprise, le titre de l'emploi et les heures hebdomadaires. Le modèle inclut aussi le taux de chômage spécifique au sexe et au groupe d'âge. $\text{EF}_{p,t}$,$\text{EF}_{s,t}$ and $\text{EF}_{p,s}$ sont des vecteurs d'effets fixes au niveau pays$\times$temps, secteur$\times$temps et temps$\times$secteur, respectivement. Dans les spécifications qui n'incluent pas $\text{EF}_{p,t}$, (table 0.5, colonne 4 à 6), ces effets fixes sont remplacés par un vecteur $X_{p,t}$ de contrôles pays$\times$pays, incluant la couverture des négociations salariales, le taux de syndicalisation, la centralisation salariale, la coordination salariale, l'assurance chômage et le PIB per capita. Dans les spécifications sans $\text{EF}_{p,t}$, la protection d'emploi du pays et de l'année est bien sûr ajoutée. Finalement, les résidus ont deux parties : $\varepsilon_{i,p,s,t} = \mu_p + v_i$, où μ_p est un effet inobservé du pays et v_i est un terme d'erreur idiosyncratique.

Le stress au travail peut être lié à d'autres institutions du marché du travail. Si ces institutions sont corrélées avec la protection d'emploi ou avec le moment des réformes de la protection d'emploi, elles pourraient être un facteur confondant. Sans véritable expérience naturelle, la meilleure stratégie est de contrôler pour le plus grand nombre d'autres institutions avec le vecteur $\text{X}_{p,t}$.

Comme pour le volet 2, l'estimation de l'impact des variables institutionnelles directement sur les microdonnées risque de fortement biaiser les écarts-types vers le bas. Pour contrer ce risque, un estimé par distance minimum est employé. Le stress moyen

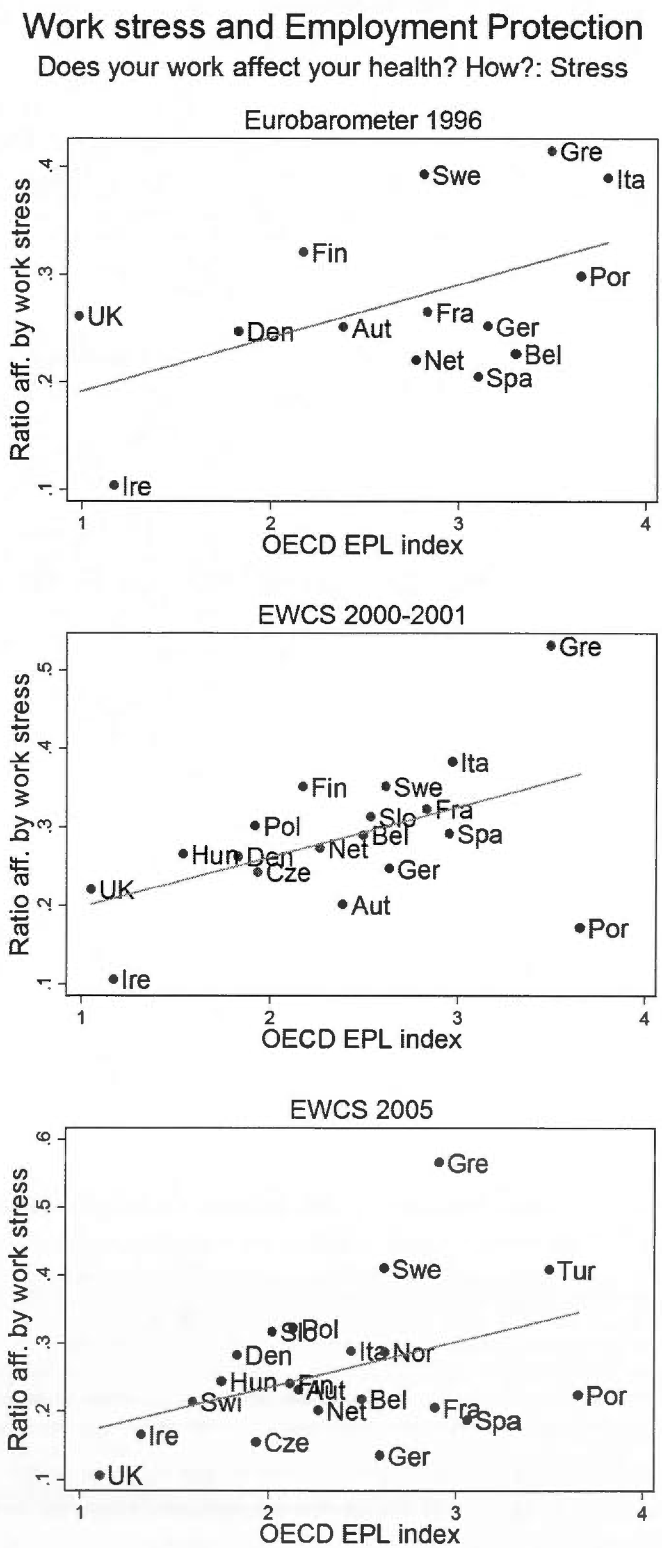


FIGURE 0.2: Indice de la protection d'emploi de l'OCDE et problèmes de santé liés au stress au travail

du pays×temps×secteur est d'abord estimé par un modèle de probabilité linéaire :

$$p\left(Stress_{santé_{i,p,s,t}} \mid p, s, t, Z_i\right) = D_{p,s,t} + \beta_3 Z_i$$

où $D_{c,s,t}$ est un vecteur d'effets fixes pays×secteur×temps de l'individu i. Ce modèle linéaire facilite l'interprétation des effets marginaux, sachant que le coefficient qui nous intéresse est un terme d'interaction. Ensuite, on estime

$$\hat{D}_{p,s,t} = \beta_1 \text{EPL}_{p,t} \times \text{Destr. d'emploi}_s + \beta_2 X_{p,t} + \text{EF}_{p,t} + \text{EF}_{s,t} + \text{EF}_{p,s} + u_{p,s,t} \qquad (2)$$

où chaque cellule est pondérée par le nombre d'observations de chaque pays×secteur×temps. Les résidus ont deux parties : $u_{p,s,t} = \mu_p + v_{p,s,t}$, où μ_p est un terme d'erreur du pays p. L'effet groupe est au niveau du pays pour éviter le risque d'autocorrélation.

Les résultats principaux

Les résultats principaux sont présentés dans le tableau 0.5. Ils peuvent être résumés ainsi. Les réformes de la protection d'emploi sont positivement et significativement associées à une augmentation du stress dans les secteurs à haut taux de destruction d'emploi en comparaison aux secteurs à bas taux de destruction d'emploi (à 10% pour la colonne 1, à 1% pour la colonne 2). Le colonnes 1 et 2 présentent les principales stratégies d'identification : l'interaction de la destruction d'emploi d'un secteur avec la protection d'emploi en contrôlant pour des effets pays×temps, pays×secteur et aussi pour secteur×temps pour la colonne 1. En retirant les effets pays×secteur, la colonne 3 mesure l'effet absolu de la protection sur le stress. L'effet est non significatif. La colonne 4 confirme l'intuition de la figure 3.2 et montre que les travailleurs les plus stressés se trouvent principalement dans les pays où la protection d'emploi est élevée. La colonne 6 décompose l'effet total de la protection d'emploi en effet moyen et en effet interagi. Cette spécification permet de calculer l'effet absolu de la protection d'emploi. Elle montre que l'effet absolu de la protection d'emploi est d'augmenter le stress dans les secteurs à haute protection d'emploi, et de diminuer le stress dans les secteurs à basse protection d'emploi.

Ces résultats résistent à l'inclusion de l'assurance chômage et d'indicateurs d'autres institutions comme contrôles. Dans le cas des composantes spécifiques du stress disponibles au Canada, les conclusions sont moins précises et dépendent du type de protection d'emploi. Plus que le stress, c'est la qualité des relations de travail qui peut être affectée négativement par une forte régulation du travail, surtout dans certains pays européens avec forte protection d'emploi. Une protection plus flexible pourrait donc améliorer à la fois la fluidité du marché du travail et la qualité des relations industrielles dans ces pays.

TABLE 0.5: L'effet de la protection d'emploi sur le stress au travail : identification entre pays et interaction avec les secteurs (EWCS 2000, 2001, 2005 et Eurobaromètre 1996)

Variable principale	Modèle de probabilité linéaire (estimation par distance minimum)					
Votre travail affecte votre santé : stress[a]	Spéc. princ : DDD		DD	*Within*	Coupe transversale	Décomposition
	1	2	3	4	5	6
$Protection_{p,t}$[b] $\times$ Destr. d'$emploi_s$[c]	4.508*	4.765***	0.713			
	(2.248)	(1.219)	(0.418)			
$Protection_{p,t}$				-0.0399	0.0476***	
				(0.0359)	(0.0142)	
$\Delta Protection_{p,t}$[d] $\times$ Destr. d'$emploi_s$						5.250***
						(1.115)
Protection $moy._p$[e] $\times$ Destr. d'$emploi_s$						0.256
						(0.380)
$\Delta Protection_{p,t}$						-0.233***
						(0.0535)
Protection $moy._p$						0.0468**
						(0.0222)
Contrôles indiv.[f]	Y	Y	Y	Y	Y	Y
Contrôles $pays_{p,t}$[g]				Y	Y	Y
Effets temps				Y	Y	Y
Effets secteur			Y	Y	Y	Y
Effets pays				Y		
Effets pays × temps	Y	Y	Y			
Effets secteur × temps	Y					
Effets pays × secteur	Y	Y				
Nombre d'obs.	584	584	584	543	543	543
Nombre de groupes	21	21	21	19	19	19
R^2	0.782	0.747	0.512	0.375	0.290	0.317

note : *** p<0.01, ** p<0.05, * p<0.1. Écarts-types robustes entre parenthèses.

[a] Est-ce que votre travail affecte votre santé ? Comment ? - Stress ?

[b] Indice de protection d'emploi (OCDE 2004) du pays p au temps t

[c] Taux de destruction d'emploi du secteur s

[d] Déviation de la protection d'emploi du pays p au temps t de sa moyenne au cours de la période : $\Delta Protection_{p,t} = Protection_{p,t} - Protection\ moyenne_p$

[e] Protection moyenne du pays p au cours de la période

[f] Inclut le sexe et des effet fixes pour l'âge, le nombre d'enfants du ménage, le nombre de membres du ménage, la taille de l'entreprise, le titre de l'emploi et les heures de travail hebdomadaires. Inclut également le taux de chômage spécifique au groupe d'âge et au sexe.

[g] Inclut la couverture des négociations salariales, le taux de syndicalisation, la centralisation salariale, la coordination salariale, l'assurance chômage et le PIB per capita du pays p au temps t.

note : Inclut seulement les travailleurs de 25 et 65 ans à temps plein du secteur privé dans un contrat permanent.

Conclusion

Cette thèse a porté sur les impacts non pécuniaires des lois de protection d'emploi sur le bien-être des travailleurs et des ménages. Plus spécialement, comme la protection d'emploi influence la façon dont les firmes ajustent leur main d'œuvre via les licenciements et la variation des heures de travail, le premier volet s'est penché sur les conséquences de ces décisions sur la consommation des travailleurs. Autant l'approche par appariement par score de propension que l'approche structurelle suggèrent fortement que les licenciements prolongés affectent fortement la consommation des ménages, alors que les pertes involontaires d'heures de travail n'ont pas d'impacts majeurs. Le second volet s'intéressait à l'impact des lois de protection d'emploi sur la variabilité des heures de travail. Cet impact est confirmé au moyen d'un modèle théorique et par une analyse empirique qui montre un effet significatif des préavis de licenciements individuels au Canada. Enfin, le dernier volet a étudié l'effet de la protection d'emploi sur le stress des travailleurs. Au sein des pays de l'OCDE, la protection d'emploi augmente le stress des travailleurs dans les secteurs à fort taux de destruction d'emploi par rapport aux secteurs à faible taux de destruction d'emploi.

Cette thèse a de multiples implications au regard des politiques publiques. Les résultats suggèrent que la protection d'emploi devrait être utilisée avec modération pour éviter les conséquences indirectes générant du stress en emploi, ce qui s'ajoute au ralentissement d'embauches de nouveaux employés. Une des conséquences étudiées est l'usage accru des heures supplémentaires, tel que souligné dans le second volet. Dans les secteurs en perte de vitesse, où la protection d'emploi risque spécialement de créer des frictions et du stress, l'objectif devrait être de garantir la sécurité du revenu pour les salariés plutôt que de protéger des emplois en particulier. Une approche intéressante serait la flexisécurité qui combine une faible protection d'emploi et un soutien aux chômeurs au cours de leur recherche d'emploi ou de leur réorientation professionnelle. Comme l'économie profite globalement du progrès technologique, il semble naturel d'épauler ceux qui en subissent fortement les contrecoups.

La protection d'emploi peut amplifier la variation des heures de travail. Mais devrait-on favoriser la sécurité d'emploi ou la stabilité des heures de travail ? Du point de vue de la consommation des ménages, le volet 1 permet d'affirmer que la variation des heures a beaucoup moins d'impact qu'une perte d'emploi. Ces résultats indiquent que les programmes de partage du temps de travail pourraient atténuer les conséquences des cycles économiques sur les travailleurs.

Mots clefs : Protection d'emploi, consommation, heures de travail, temps supplémentaire, stress au travail

Résumé

Cette thèse en trois volets explore l'impact de la protection d'emploi et d'autres institutions du marché du travail sur la consommation, les heures de travail et le stress au travail au moyen d'une approche principalement empirique.

Le premier volet examine l'impact des licenciements et des coupures involontaires d'heures de travail sur la consommation des ménages à partir des données du Current Population Survey (CPS) des États-Unis et de son supplément de décembre sur la sécurité alimentaire. Des estimés par appariement par score de propension et régressions linéaires sont utilisés pour comparer la réaction des travailleurs aux licenciements et aux pertes involontaires d'heures de travail. Les résultats montrent que l'impact d'un licenciement avec promesse de rappel au travail dans les six mois est de -13.7%. Il est en revanche non significatif pour les licenciements avec date de retour connue ou pour les pertes d'heures. Ces chocs sur le marché du travail sont modélisés par un processus de Markov. Les données du CPS sont utilisées pour calculer les flux entre états et les pertes de court et de long terme associées à chaque choc. Grâce au modèle, on peut simuler les réponses de la consommation des ménages aux chocs, comparer ces réponses aux données réelles, calculer les pertes de bien-être qu'ils entraînent et évaluer l'impact qu'auraient des réformes à l'assurance chômage. À nouveau, les pertes d'heures ont un impact négligeable comparé aux licenciements prolongés. Les réformes de l'assurance emploi offrent de modestes bénéfices en termes de stabilisation du revenu.

Le deuxième volet s'intéresse à l'impact de la protection d'emploi sur la variabilité des heures de travail et le temps supplémentaire. Dans un modèle théorique, une firme choisit le nombre de ses travailleurs et les heures de travail en réponse à des variations de la demande et en présence de coûts d'ajustement de la main d'œuvre. Ces coûts augmentent la variabilité des heures de travail. De plus, si la firme se voit imposer un minimum d'heures de travail par travailleur, il en résulte une diminution de l'emploi moyen et une augmentation des heures moyennes de travail. Pour tester ces mécanismes empiriquement, deux prédictions sont dérivées du modèle : (i) les coûts d'ajustement augmentent la variabilité des heures de travail, spécialement dans les secteurs à haut taux de licenciement ; (ii) une augmentation temporaire de la demande de travail accroîtra la demande d'heures de travail, surtout en présence de coûts d'ajustement de la main d'œuvre. Ces prédictions sont testées grâce aux différences de préavis de licenciement individuels et collectifs existant entre les provinces canadiennes. Chaque prédiction est vérifiée pour les préavis individuels. L'impact des préavis individuels sur le temps supplémentaire dans les secteurs à hauts taux de licenciement est positif et significatif, mais il est n'est pas statistiquement différent de zéro pour le temps supplémentaire dans les secteurs à bas taux de licenciement. L'effet du taux d'emploi sur l'utilisation du temps supplémentaire est positif et significatif pour les provinces avec long préavis individuels, mais négligeable quand les préavis sont courts. Les préavis collectifs n'ont pas d'impact mesurable.

Finalement, le troisième volet étudie les effets de la protection d'emploi sur le stress au travail et le bien-être des travailleurs. Ces législations devraient bénéficier aux travailleurs en réduisant le risque de licenciement. Mais il est aussi possible qu'elles aient des effets pervers. Si licencier un travailleur est onéreux, l'entreprise peut chercher à faire pression sur le travailleur ou le surveiller dans le but de le licencier pour faute. Une analyse exhaustive est entreprise afin de vérifier si la protection augmente ou diminue le stress au moyen de sept sondages de pays de l'OCDE et de l'Enquête nationale sur la santé de la population du Canada. Les effets obtenus sont hétérogènes entre secteurs et entre chaque composante de la protection d'emploi. La protection d'emploi augmente significativement le stress des travailleurs dans les secteurs à haute destruction d'emploi par rapport au stress dans les autres secteurs avec interprétation causale. Quand on décompose l'effet total, la protection d'emploi accroît significativement le stress dans les secteurs à haute destruction d'emploi et le diminue dans les secteurs à basse destruction d'emploi. Lorsqu'on s'intéresse aux sous-composantes de la protection d'emploi, son effet positif sur le stress provient principalement des limitations imposées aux licenciements collectifs, des restrictions à l'usage des contrats temporaires et, finalement, de l'interaction entre ces restrictions, la protection individuelle et la protection collective.

Mots clefs : Protection d'emploi, consommation, heures de travail, temps supplémentaire, stress au travail

Abstract

This thesis explores in three chapters the impact of employment protection and related labor market institutions on workers stress, work hours and consumption, using a mainly empirical approach. With data from the US Current Population Survey (CPS), chapter one examines how labor market displacements affect household consumption. Propensity score matching and linear regression are used to compare how previously employed workers react to layoffs and cutbacks in work hours. On average, workers being laid off and expecting to be recalled to work within six months cut their food spending by 13.7%. On the other hand, layoffs with known recall dates and hour loss have no effect on consumption. These displacements are then modeled as a Markov using the CPS data to compute flows and reproduce their associated short term and expected long-term income losses. This model is used to simulate consumption reactions of representative workers, compare their reactions with real data, compute welfare losses associated with each outcome and conduct policy experiments regarding unemployment insurance. Again, losing work hours has a negligible impact on consumption compared to a long term layoff. Unemployment insurance reforms offer modest income stabilization benefits.

The second chapter investigates the specific impact of employment protection on work hour variability and overtime. In a theoretical model, a firm chooses between workers and hours per worker as productive inputs. If there are hiring and firing costs, variations in output demand generate variability in work time. Moreover, if the firm has to provide a minimum number of hours per worker, it can result in a reduction of average employment and an increase in average work hours. To test these mechanisms empirically, two predictions are derived from the model : (i) labor adjustment costs increase the variability of work hours, especially in sectors with high layoff rates ; (ii) a temporary rise in the need for labor increases demand for work hours, especially when workforce adjustment is costly. These predictions are tested on Canadian data, making use of the differences in individual and collective advance notice requirements between Canadian provinces. Both predictions are verified for individual notice requirements. Additional notice requirements for mass layoffs have no significant impact. In particular, the impact of individual notice on overtime work is positive and significant for sectors with high layoff rates, but not statistically different from zero for those with low layoff rates. The impact of the employment rate on overtime use is positive and significant for provinces with lengthy individual notice, but negligible when notice requirements are short.

Finally, chapter three looks at the effects of employment protection laws (EPL) on workers' stress and well-being. Such laws should be beneficial to permanently employed workers by lowering the risk of job loss, but may also have adverse effects. In particular, costly separations may induce firms to exert pressure on workers or raise the intensity of monitoring. An exhaustive empirical analysis is undertaken to verify whether employment protection increases or decreases stress using seven surveys from OECD countries and the Canadian National Population Health Survey. The effects obtained are heterogeneous across sectors and between subcomponents of the EPL indices. Employment protection has a positive and significant effect on work stress in high turnover sectors relative to low turnover sectors, which can be interpreted as causal. When decomposing the total effect, employment protection increases stress significantly in high turnover sectors, but decreases it in low turnover sectors. The positive effect of EPL on stress comes from collective layoff regulations, from restrictions on the use of temporary contracts and finally from the interactions between both individual and collective employment protection with restrictions on the use of temporary contracts.

Key words : Employment protection, consumption, work hours, overtime, stress at work

Introduction

Les lois de protection d'emploi ont été instaurées dans le but d'améliorer la situation des employés permanents. La question centrale de cette thèse est la suivante : Ces lois sont-elles toujours bénéfiques, ont-elles des impacts non anticipés sur les travailleurs et comment se comparent-elles à d'autres institutions du marché du travail telles l'assurance chômage et les programmes de partage du temps de travail ? Dans les trois volets suivants, les effets non pécuniaires des lois de protection d'emploi sur le bien-être des travailleurs et de leur famille sont étudiés à partir de trois angles distincts en utilisant une approche principalement empirique.

Dans le premier volet, on estime par appariement par score de propension l'impact des licenciements et de la réduction des heures de travail sur la consommation des ménages. Une approche structurelle est ensuite proposée où le revenu est modélisé comme un processus de Markov, afin d'apprécier l'impact de ces chocs sur le bien-être des travailleurs et d'entrevoir l'efficacité de diverses réformes de l'assurance-chômage et des programmes de partage du temps de travail. Le second volet étudie la possibilité que les coûts d'ajustement de la main-d'œuvre, et spécialement les lois de protection d'emploi, incitent les entreprises à modifier les heures de travail ou l'intensité du travail au lieu de recourir aux embauches et aux licenciements. Enfin, le troisième volet explore les effets de la protection d'emploi sur le stress et le bien-être des employés. Si la protection d'emploi augmente la sécurité des travailleurs en équilibre partiel en réduisant leur risque de licenciement, elle pourrait aussi avoir des impacts négatifs indirects. Par exemple, lorsque la procédure de congédiement d'un travailleur est coûteuse ou incertaine, une entreprise peut chercher à la contourner en augmentant la pression sur le travailleur, en le surveillant plus étroitement ou, dans les cas extrêmes, en l'intimidant pour qu'il quitte de lui-même.

Près de 80% des personnes en emploi sont salariées dans les pays industrialisés.

Pour les entreprises qui les emploient, les embauches et les licenciements constituent une marge d'ajustement essentielle aux conditions du marché. Mais un licenciement provoque souvent une perte de revenu à court et à long terme chez le travailleur, en plus d'entrainer des conséquences psychologiques et émotionnelles. Ainsi, les contrats de travail ne sont pas signés fréquemment, mais ils ont d'importantes conséquences matérielles et humaines sur les travailleurs durant l'emploi et après une séparation. Des recherches récentes suggèrent même que les aspects non pécuniaires du travail ont une importance comparable et même supérieure à celle du revenu sur le bien-être des travailleurs. Par exemple, Helliwell et Huang (2010) montrent que le climat de travail, particulièrement la confiance accordée aux cadres, est très fortement associé à leur satisfaction générale, autant qu'une importante hausse du revenu. De même, un licenciement a un impact négatif sur leur bonheur beaucoup plus grand que ne peut l'expliquer la simple perte de revenu d'emploi (Helliwell et Huang, 2004).

Dans cette optique, un des thèmes importants abordés dans cette thèse est le compromis pour les travailleur entre sécurité d'emploi et régularité des heures de travail. Le premier volet explore les conséquences de ce compromis du point de vue de la consommation et du bien-être des ménages. À ce jour, aucune étude n'a comparé l'impact sur la consommation des ménage de divers types de licenciements et de pertes d'heures de travail liées à la conjoncture économique.[6] Les données utilisées pour ce volet proviennent du Current Population Survey (CPS) des États-Unis. Ce sondage, avec son supplément sur la sécurité alimentaire, est le seul qui détaille avec suffisamment de précision la situation des répondants sur le marché du travail, y compris les changements d'heures de travail. Chaque ménage est sondé deux années consécutives pendant la même période de quatre mois, ce qui procure deux observations sur les dépenses alimentaires et au maximum huit observations sur le marché du travail. Les principaux résultats obtenus par appariement par score de propension sont les suivants. Pour les travailleurs employés à temps plein l'an passé, l'impact d'être présentement en licenciement avec retour possible dans les six mois est de -13.7% en moyenne. Les licenciements avec date de retour connue ou les pertes d'heures de travail pour causes

6. Plusieurs études ont estimé l'impact de plusieurs types de pertes d'emploi sur la consommation et elles trouvent un impact entre -6.4% et -27%. La démarche qui se rapproche le plus de celle utilisée ici est celle de Browning et Crossley (2001a). Grâce à une base de données canadienne de travailleurs licenciés, les auteurs estiment par appariement par score de propension que l'impact d'un licenciement permanent, par rapport à un licenciement avec une date de retour connue, est de -6.4%.

économiques n'ont pas d'impact significatif. L'impact d'un licenciement permanent sur la consommation est de -14.8%, mais si ce licenciement est dû à une fermeture, l'impact du choc est de -20.4%. Enfin, les travailleurs qui avaient l'an dernier un travail à temps plein et sont maintenant découragés sont ceux qui réduisent le plus leur consommation de nourriture, de -35.4%.

Depuis les travaux de Friedman, un des objectifs de la littérature empirique a été de vérifier si les ménages réussissent effectivement à lisser leur consommation au cours de fluctuations temporaires de revenu, et s'ils s'ajustent complètement aux chocs permanents. Un résultat récurrent est que la consommation s'ajuste souvent trop aux chocs transitoires et ne s'ajuste pas suffisamment aux chocs permanents (voir Jappelli et Pistaferi (2010) pour un résumé de cette littérature). Plusieurs hypothèses ont été proposées pour expliquer ces résultats, suggérant des altérations possibles aux fonctions objectifs des travailleurs. L'approche structurelle utilisée ici consiste plutôt à modéliser un sous-ensemble de chocs bien définis du marché du travail.[7] Le revenu des travailleurs est modélisé comme un processus de Markov alternant entre cinq états : employé, en pertes d'heures de travail, en licenciement avec date de retour connue, en licenciement avec retour espéré dans les six mois et licencié de façon permanente. Les flux entre états sont calculés à l'aide des données du CPS. Les travailleurs gagnent leur plein salaire quand ils sont au travail, en obtiennent une partie quand ils sont en pertes d'heures et touchent de l'assurance chômage s'ils sont sans emploi. Le modèle reproduit bien la réaction des ménages calculée à partir des données réelles. Il permet également de simuler l'impact de réformes de l'assurance-emploi sur la consommation. Les résultats indiquent que ces réformes auraient un léger impact sur la consommation des ménages, mais un très faible effet sur leur bien-être.

Le second volet s'interroge sur l'existence, pour les firmes et leurs travailleurs, d'un compromis entre stabilité des heures de travail et stabilité d'emploi. En effet, les embauches et les licenciements ne sont pas la seule marge d'ajustement du travail pour les firmes. Les cadres peuvent aussi ajuster la production en modifiant les horaires de travail ou l'intensité du travail. La protection d'emploi pourrait donc favoriser le recours à des horaires plus instables et à plus de travail supplémentaire, entrainant

7. Cette approche est dans l'esprit de Dynarski et Gruber (1997) qui considèrent séparément les chocs dus aux changements d'heures, vus comme temporaires, et les chocs dus aux changements de salaires, considérés comme permanents.

ainsi des conséquences physiques et mentales sur la santé, tel que rapporté dans une méta-analyse récente sur l'impact du temps supplémentaire sur la santé. [8] Au moyen d'un modèle dans lequel une firme choisit entre les travailleurs et les heures de travail, on peut montrer que, peu importe le processus d'ajustement des prix ou la forme des coûts d'ajustement de l'emploi, dès qu'une firme ne peut ajuster parfaitement sa main d'œuvre, elle compensera en ajustant les heures de travail. Pour illustrer ce mécanisme, et contrairement à la littérature antérieure [9], le modèle postule un prix de vente qui varie entre deux valeurs, tel que proposé par Bertola (1990). Ce processus stochastique permet de confirmer l'intuition générale au moyen de solutions de formes fermées à partir de formes fonctionnelles générales. Deux prédictions sont dérivées du modèle : 1. le coût d'ajustement du travail augmente la variabilité des heures, surtout dans les secteurs avec un haut taux de licenciement ; 2. une hausse temporaire de la demande de travail augmente les heures de travail, surtout quand l'ajustement du travail est coûteux. Ces prédictions servent de stratégie d'identification dans la section empirique. Celle-ci exploite des micro-données sur le temps supplémentaire payé tirées de l'Enquête sur la population active du Canada. Comme dans le premier volet, la variable de protection d'emploi varie entre les provinces. Ces préavis ont deux sous-composantes : les préavis de licenciement individuels qui augmentent en fonction de l'ancienneté d'un travailleur et les préavis supplémentaires en cas de licenciement collectif, proportionnels à la taille du licenciement. Les résultats confirment en général le lien entre la protection d'emploi individuelle et la variabilité des heures de travail. Les préavis individuels de licenciement ont un impact positif et statistiquement significatif sur le temps supplémentaire à travers leur interaction avec les taux de licenciement et la variation du taux d'emploi. En particulier, l'impact des préavis individuels sur le temps supplémentaire des secteurs à hauts taux de licenciement est positif et significatif, mais il est n'est pas statistiquement différent de zéro pour le temps supplémentaire des secteurs à bas taux de licenciement. L'effet du taux d'emploi sur l'usage du temps supplémentaire est positif et significatif pour les provinces avec long préavis individuels, mais négligeable quand les préavis sont courts. Les préavis collectifs n'ont pas d'impact significatif sur le temps supplémentaire.

8. Les impacts incluent une moins bonne santé, plus de blessures, plus de maladies et une plus grande mortalité.(Caruso et al., 2004)

9. Nickell (1978) et Chen et Funke (2004)

Enfin, le dernier volet étudie plus largement les conséquences des lois de protection d'emploi sur le moral des travailleurs. Ces lois devraient en principe bénéficier aux employés permanents en réduisant leur risque de chômage. Par contre, la littérature théorique et empirique démontre clairement que cette législation tend également à réduire l'embauche d'employés permanents. Elle n'augmente donc pas le bien-être des travailleurs au chômage, en période de probation, en contrat temporaire ou à temps partiel. Les lois de protection d'emploi ont également plusieurs impacts secondaires positifs et négatifs. Ceci étant, la protection d'emploi n'apporte-t-elle que des avantages aux détenteurs d'un contrat permanent ? C'est la question abordée par le troisième volet de cette thèse. Comme le coût du divorce prolonge parfois de façon excessive les mariages malheureux, il est aussi possible que la protection d'emploi exacerbe le stress et les tensions au sein des firmes. Par exemple, dans le cas d'un emploi non rentable, une firme peut tenter d'éviter les coûts ou l'incertitude associés au processus de licenciement en faisant pression sur un travailleur pour qu'il quitte de lui-même en altérant les routines de travail, l'organisation ou les techniques de gestion. Elle peut également le surveiller étroitement afin de trouver une justification pour le licencier pour faute. La protection d'emploi peut aussi pousser les firmes à ajuster le travail en modifiant l'intensité ou les heures plutôt que le nombre de travailleurs. Tous ces mécanismes peuvent être source de stress pour le travailleur. En équilibre général, comme la protection ralentit les embauches et allonge le chômage, la crainte de perdre un emploi peut être source de stress, ou pousser un travailleur à demeurer dans un emploi insatisfaisant s'il doute de ses capacités de se retrouver un travail.

Pour tester empiriquement ces mécanismes, sept sondages internationaux récents contenant des informations sur le stress au travail ont été identifiés : le European Quality of Life Survey (EQLS) de 2003 ; le International Social Survey Program (ISSP) de 1997 et 2005 ; les sondages Eurobaromètre de 1996 et 2001 et les Enquêtes européennes sur les conditions de travail (European Working Conditions Survey (EWCS)) de 2000-2001 pour les candidats EU et 2005. De plus, des données canadiennes, les premières illustrant la différence de protection d'emploi existant entre les provinces canadiennes et les secondes tirées de l'Enquête nationale sur la santé de la population (ENSP) du Canada, permettent également d'étudier les relations entre la protection d'emploi et le stress. Bien sûr, des facteurs affectant le stress dans un pays ou une région peuvent également influencer la volonté de légiférer en matière de protection d'emploi. Pour faire face à ce risque d'endogénéité, deux stratégies sont exploitées. La première utilise les variations de la protection d'emploi au cours du temps. La seconde exploite le fait que l'impact de la protection d'emploi devrait être plus grand pour les entreprises des secteurs d'activité nécessitant davantage de licenciements. Cette idée a été développée par Rajan et Zingales (1998) en finance et adaptée subséquemment pour d'autres secteurs, incluant la macroéconomie du marché du travail. Dans l'esprit d'une approche de différence en différences, le groupe de contrôle serait un secteur avec faible protection d'emploi et le secteur traité serait celui avec une forte protection d'emploi. Bien sûr, les deux stratégies pourront être combinées dans la mesure du possible, ce qui équivaut à une triple différence.

Les résultats montrent que la protection d'emploi est positivement et significativement corrélée avec les divers indicateurs de stress, ou non corrélée. En d'autres mots, en comparant simplement le stress moyen par pays, il n'y a jamais d'impact négatif et significatif entre le stress moyen au travail et la protection d'emploi. Dans les spécifications en triples différences, la protection d'emploi augmente le stress des travailleurs des secteurs à haut taux de licenciement par rapport au stress des travailleurs des secteurs à bas taux de licenciement. Ces résultats résistent à l'inclusion de l'assurance chômage et d'indicateurs d'autres institutions comme contrôles. Dans le cas des composantes spécifiques du stress disponibles au Canada, les conclusions sont moins précises et dépendent du type de protection d'emploi. Plus que le stress, c'est la qualité des relations de travail qui peut être affectée négativement par une forte régulation du travail, surtout dans certains pays européens avec forte protection d'emploi. Une protection plus flexible pourrait donc améliorer à la fois la fluidité du marché du travail et les relations industrielles de ces pays.

Cette thèse a de multiples implications au regard des politiques publiques. La protection d'emploi devrait être utilisée avec modération pour éviter les conséquences indirectes générant du stress en emploi, en plus de compromettre l'embauche de nouveaux employés. Une de ces conséquences est l'usage accru des heures supplémentaires, tel que souligné dans le second volet. Dans les secteurs en perte de vitesse, où la protection d'emploi risque spécialement de créer des frictions et du stress, l'objectif devrait être de garantir la sécurité du revenu pour les salariés plutôt que de protéger des emplois en particulier. Une approche intéressante serait la flexisécurité qui combine une faible protection d'emploi et un soutien aux chômeurs au cours de leur recherche d'emploi ou de leur réorientation professionnelle. Comme l'économie profite globalement du progrès technologique, il semble naturel d'épauler ceux qui en subissent fortement les contrecoups.

La protection d'emploi peut amplifier la variation des heures de travail. Mais devrait-on favoriser la sécurité d'emploi ou la stabilité des heures de travail ? Du point de vue de l'impact sur la consommation des ménages, le premier volet suggère fortement que les licenciements à long terme ont des répercussions importantes alors que les pertes temporaires d'heures de travail sont sans conséquences. Les programmes de partage du temps de travail, encore peu utilisés, surtout en Amérique du Nord, seraient donc envisageables pour aider les firmes à s'ajuster aux fluctuations temporaires du cycle économique en minimisant l'incertitude ressentie par leurs employés.

Chapitre 1

The Consumption Response to Job Displacements, Layoffs and Hour Losses

Abstract

This paper examines how labor market displacements affect household consumption. It uses the US Current Population Survey (CPS). Propensity score matching and linear regression are used to compare how consumption changes when previously employed workers experience various labor market displacements such as layoffs with expected recall to work within six months, layoffs with known recall dates or loss of work hours due to business conditions. The average impact on food spending of being currently laid off and expecting a recall within six months is -13.7%, while it is negligible for either reduiced work hours or layoffs with known recall dates. In a structural approach, these displacements are modeled as a Markov process reproducing their associated short-term and expected long-term income losses. This model is used to simulate consumption reactions and compare them with real data, compute welfare losses associated with each displacement and conduct policy experiments regarding unemployment insurance. The general message is that, compared to layoffs with uncertain recall dates, reductions in work hours have negligible impacts on consumption. Furthermore unemployment insurance offers modest income stabilization benefits.

1.1 Introduction

According to Friedman's permanent income hypothesis, agents with concave utility functions try to consume according to expected lifetime wealth, not current income. They would succeed do so if they knew their expected lifetime earnings and had unconstrained access to credit, or had access to perfect insurance markets. Unfortunately, future earnings are difficult to predict, access to credit is limited and insurance markets are imperfect due to the presence of moral hazards and information asymmetries. This is especially problematic in thelabor market. Given that large firms are less risk averse than workers, these risks could be internalized in labor contracts. However, as shown by Shapiro and Stiglitz (1984a), unemployment risk may be necessary if worker effort is hard to monitor. Also, with seniority rules, the risk of job loss is unevenly distributed, with low-tenured workers bearing most of the burden of labor adjustment. While seniority rules are pervasive in most US firms it is doubtful whether they reflect or promote worker efficiency (Carmichael, 1983).

As a result, labor market displacements may be hard to smooth for households, leaving room for income stabilization programs such as unemployment insurance, employment protection legislation or work-sharing. Each of these programs has specific impacts on labor market flows, wages and efficiency that have received their fair share of attention in the literature. However, their relative impact from the worker's perspective is less clear. How does a stable income from unemployment insurance compare to a lower risk of job loss from employment protection ? Should policymakers favor more jobs or stable work hours ? This paper will focus on one criterion : the impact of job displacements on consumption and consumption utility.

This choice is motivated by multiple reasons. A more direct and easily measurable impact of job displacements would be a loss of wage income. But it can be obviously compensated for by several mechanisms such as unemployment insurance and spousal labor supply. A change in total income would paint a more accurate picture of current household consumption prospects, but it does not take into account access to credit. Also, it is only an imperfect account of the changes in household's long term income prospects which are obviously taken into account in today's consumption choices. Hence, as argued by Hall (1978), current consumption is probably the best indicator of current and future marginal consumption utility since it incorporates all of the household's relevant information on expected lifetime available income. Of course, the precise functional relationship between consumption change and utility change is unknown and will have to be modeled in section 1.4. Also, since consumption traditionally has to be proxied by consumption spending on food due to data availability, we must keep in mind that changing work habits and the availability of free time can also influence spending without reflecting a decline in household utility. [1]

A handful of studies have looked at the impact of various kinds of job losses on consumption and find an average impact between 6.4% and 27%. [2] But no research has compared the impact of various types of layoffs or hour losses on households' consumption, which is the first contribution of this paper. Unlike the previous literature in this field, I use the Current Population Survey (CPS) to obtain detailed information on workers' labor market situations and work hours. Consumption data comes from the Food Security supplement conducted each December since 2001, which provides two observations per household.

The main results are as follows. For workers employed full-time in the previous year, the average impact of experiencing a layoff with expected recall to work within six months is -13.7%, while there is no measurable impact of a layoff with known recall date or hour losses due to business conditions. A linear framework including more outcomes makes it possible to compute the impact of being unemployed after a permanent job loss, which is -14.8%. If the job loss is due to firm closure, its impact jumps to -20.4%. Finally, discouraged workers who are now out of the labor force experience the largest change, at -35.4%. These effects are larger for single income families, and for male workers. They are also larger for food consumed away compared to food at home.

A second objective of the paper is to understand these reactions using a structural approach. Following Friedman's seminal work, a large empirical literature on consump-

1. For instance, unemployment can reduce expensive eating out without reducing food consumption utility. More free time can also be used to look for discounts (Greg Kaplan, 2013).

2. Using PSID data on food consumption in 1980-83, Cochrane (1991) finds that the consumption of workers facing a job loss is 24 to 27% lower than those keeping their job. Also using PSID data, from 1968 to 1992, Stephens (2001) finds a reduction of 9% of consumption the year following a job loss, which persists even after six years (he even finds some reduction before the job loss). Finally, Browning and Crossley (2008) apply propensity score matching on a dataset of Canadian workers to compare the consumption increase of workers on permanent layoff with that of workers on temporary layoff. They find a 6.4% difference between the two groups.

tion has tested whether households do indeed smooth temporary income shocks and adjust fully to permanent income shocks. A popular approach is to first estimate the income process by itself, identifying a transitory component following an ARMA process and a permanent component following a random walk. Then consumption change is regressed on the identified transitory and permanent unexpected shocks. A recurrent finding is that consumption is typically too reactive to temporary income changes and too unresponsive to permanent changes. [3]

Many hypotheses have been proposed to explain these puzzles, often altering worker's objective function. [4] This paper suggests that part of the difficulty may come from aggregation. Income shocks may differ greatly in terms of the timing of temporary income change and of news on expected future income. In particular, the underlying assumption in regressing consumption on 'transitory' and 'permanent' income fluctuations identified ex-post is that the income model is well-specified, incorporating all information relevant for future income available to households, and that households have a good idea of how long these fluctuations will last. But information relevant to future income may be totally unrelated to current earnings changes. In some cases, current and future expected earnings could even be negatively related. [5] That is why this paper proposes to focus the analysis on a specific series of well-defined labor market shocks and model them in terms of their impact on present earnings and future expected earnings. [6] There are many sources of wealth for households. But for a vast majority of them, labor income is certainly the most important one.

Income will be modeled as a Markov process, alternating between 5 states : Employed, losing work hours, on layoff with known recall date, on layoff with recall within

3. See a review of this literature by Jappelli and Pistaferri (2010)

4. Attanasio (1999) surveys many of them such as habit formations, non-separability, home production, goods durability, etc.

5. For example, imagine the case of a worker who decides to enter the labor market, looks for work and finds a new job. In all likelihood, this is best captured as a permanent positive income shock. But how will the worker react to it? Since he was looking for work, his consumption was probably taking this possible new income into account. His future expected income increased significantly the day he decided to enter the labor market, not so much the day he found work. In fact, the way his new job will influence his consumption will probably depend on the difference between his new wage and the average wage he was hoping to get. If his new wage is close to the minimum wage he was willing to accept, the worker will in fact consider his new job as a permanent loss of future earnings, since he would have hoped to find better (assuming no on-the-job search once he starts working).

6. This is in the spirit of Dynarski and Gruber (1997) who separate income changes due to hour changes, deemed temporary, and to wage changes, that should be more permanent.

6 months and permanently displaced. Flows between states are computed from the CPS data. Workers earn their full wage if employed, part of it if they face hours cutbacks, and unemployment benefits if unemployed.

It has been well-recognized since the seminal work of Jacobson et al. (1993) that permanently displaced workers also suffer long-term income losses. To a lesser degree, there is a probability that workers facing temporary layoff, or even episodes of involuntary hour cutbacks, may experience long term income losses too. These probabilities are also proxied.

After estimating a consumer's optimal reaction to each labor market outcome over a working career of 40 years for a single or dual income family, [7] I simulate the consumption path of a representative sample of workers and run the same regressions on the simulated data and the real data. I also compare the welfare losses from each outcome and conduct policy experiments on unemployment insurance reforms and work-sharing programs. [8] These reforms have some impact on consumption, but modest effects on welfare.

The rest of the paper is as follows. Section 1.2 describes the CPS data, Section 1.3 presents the reduced form approach, section 1.4 presents the structural approach and section 1.5 concludes.

1.2 The data

The only US database providing detailed information on labor market situations and consumption is the Current Population Survey (CPS), the monthly household survey of the Bureau of Census for the Bureau of Labor Statistics. Each household is interviewed for four consecutive months, then leaves the sample for eight months, then is back in the survey for four months again. In other words, each household is interviewed for the same four months for two consecutive years. Although the CPS is not meant to be a

7. I assume a CRRA utility function with standard risk aversion of $\nu = 2$, monthly future discounting of $\beta = 0.99573$, debt limit allowing 8% of current income to serve debt interests (the difference between the back end and front end ratio in the US). Retirement is at 60 years old and death at 75 years old with non-negative wealth and no bequest.

8. Another advantage of the structural approach is that whereas changes in consumption are good proxies for lifetime marginal utility change in the traditional life-cycle problem, this link breaks down in the presence of credit constraints (see Jappelli and Pistaferri (2010) for a discussion of the topic).

panel survey, identifiers allow to match each individual across time with a good success rate. All the variable used are described in tables A.1 and A.2 of the Appendix.

1.2.1 Consumption

Since 2001, the CPS has conducted its food security supplement survey every December. Hence, the CPS provides two consumption data points for each household, hereby allowing to account for unobserved invariant family characteristics. The main variable used will be total household expenditure on food and food-related purchases in the preceding week, which gives confidence to the accuracy of recall. The exact definition is : last week's household spending at supermarkets, grocery stores, meat markets, produce stands, bakeries, restaurants, fast food places, cafeterias and vending machines, etc. Like much of the empirical literature on consumption, total spending is not available. However, many studies highlighted how the elasticity of food expenditure may be a very good proxy for the elasticity total expenditure. For example, Gervais and Klein (2010) (Table 4) find an income elasticity of food consumption roughly twice as large as housing, but less than half the elasticity of household durables. They also find total consumption is more elastic than food at home, but less so than food away from home. Hence, food is both a necessity and a luxury good. Also, it will be possible to look at two alternative aggregates, consumption at home and spending on food away from home, which should provide fair lower and upper bounds for total consumption elasticity.

The total sample covers 2001 to 2010, losing the first year to first differencing. Also, lagged consumption is only available for the households who are leaving the survey. After data cleaning, the number of observations in the benchmark regressions are 74 347. Of course, a longer panel for each individual would be better, but it is not essential since the main goal of the paper is to compare the relative importance of layoffs and hours losses.

1.2.2 The labor market situation

The basic CPS monthly file provides a total of eight observations per individual. The total sample is restricted to the waves for which consumption data is available. Since the food security supplement is conducted in December, the rotation groups answering to the supplement are those joining in September, October, November or December. Since unemployment spells tend to be short lived, quasi monthly information on the labor situation is proving to be very useful, especially when modeling dynamic consumption decisions. [9]

Thanks to the numerous CPS items, it is possible to assess very precisely worker's labor market situations. Respecting the Survey's logic, I distinguishing between permanent job loss and temporary layoffs with known or unknown recall date. Hence, the following variables are used in sections 1.3.1 and 1.3.2, comparing the impact of temporary layoffs to hours cuts :

- Employed : Currently employed full time
- Layoff_{6m} : On temporary layoff last week, employer has given indication that the worker would be recalled within six months
- Layoff_{recall} : On temporary layoff last week, employer has given a return date
- Hours loss : Usually works full time, but last week worked less than 35 hours because of slack work/business conditions

In models encompassing more labor outcomes in section 1.3.3, additional states are considered

- Layoff_{perm} : Unemployed after losing job with no recall expectation
- Discouraged : Out of the labor force, discouraged
- Overtime : Last week, worked overtime or extra hours at the main job not worked usually

The first differencing controls for all invariant household characteristics. But to account for possible specific trends in the data, I also include a vector of controls on personal and labor market situations, namely sex, age, age^2, white dummy, black dummy, 14 sector dummies, 11 occupation dummies, household size level and yearly change, household children number and yearly change, college education, year×region dummies, house owner dummy, year×state level unemployment rate, lagged family income dummy.

In one specification, yearly family income change (the number of income categories change from one year to the next) will also be included to see if consumption's

9. Also, with monthly observations following a consumption observation, it is possible to whether a particular labor market outcome was anticipated by a worker. However, in the regressions, future job loss or hours loss did not significantly influence consumption decisions.

choice are mostly driven by yearly income alone or if labor market outcomes are still significant, implying that they also carry information about future income prospects (of course, labor market outcomes could well remain significant due to the imprecision of this categorical income variable).

1.2.3 Mobility supplement

It is very convenient to see that the CPS has conducted its Displaced Worker, Employee Tenure, and Occupational Mobility Supplement surveys in January of 2002, 2004, 2006, 2008, 2010 and 2012. Since it is conducted only one month after the Food Security Supplement, additional information can be deduced on a subset respondents [10]. The questions are used to construct the following additional variables, used in section 1.3.4 :

- Lost job : During the last years, the respondent lost a job or left because the plant or company closed down or moved.
- No UI / Expired UI : Was not eligible for unemployment insurance after losing the job, / had unemployment insurance, but is no longer eligible.
- Lost health insurance : Had health insurance at old job, but now does not have any.

1.2.4 Outgoing rotation groups

In the CPS, households in their fourth interview or at their final interview (outgoing rotation groups) are asked a number of additional questions on weekly earnings and wages. Also, all waves answer a categorical question on last year's income. This question is used to build a 'pseudo' continuous variable for last year's household income using the middle of each income category. These variables are used to compute consumption elasticities to current income variation. These estimates will confirm that households' behavior is in line with the evidence from previous literature in section 1.3.5.

10. Half of respondents are lost when the supplement was not conducted the following january (December of 2002, 2004, 2006, 2008 and 2010). Also, the respondents who exited the survey after December did not answer the January survey.

1.3 A reduced-form approach

This section investigates the consumption behaviors making as few parametric assumptions as possible. The sample always comprises workers who 12 months ago were at work in a private for profit or government job, employed full time. They are now either employed in similar conditions or are facing one of the labor market shocks considered. In about 25% of households, two or more individuals met the criteria. In that case, men are kept in priority since they remain for the most part the primary earners. When there are no men, women headed households are kept to maintain a large enough sample. In the few instances of several workers of the same sex in one household, one of them is chosen at random.

1.3.1 Impact of hours loss

The first question of interest is the precise impact of work hours cutbacks compared to other means of temporary labor reduction such as temporary layoffs. The sample comprises private sector or government workers employed full time last year that are now either 1. still employed in similar conditions; 2. worked less than 35 hours last week for business-related reasons or 3. are on temporary layoff with known recall date or 4. on layoff with expectation of recall within 6 months. The benchmark is simply a least square first difference model [11] computing the difference in mean consumption growth between each category of outcome :

$$\Delta ln\,(\text{spending}_i) = \beta_0 + \beta_1 \text{Layoff}_{6\text{m}_i} + \beta_2 \text{Layoff}_{\text{recall}_i} + \beta_3 \text{Hours loss}_i + \gamma \text{controls}_i + \varepsilon_i.$$

As described earlier, $\Delta ln\,(\text{spending}_i)$ is the year to year change in log total weekly food expenditure of worker i's household, $\text{Layoff}_{6\text{m}_i}$ is a dummy indicating whether a worker i employed full-time last year is currently on layoff, but has received indication that he would be recalled within 6 months, $\text{Layoff}_{\text{recall}_i}$ indicates if worker i is currently on layoff, but has a known return date, Hours loss_i is a dummy indicating that he is currently working fewer than 35 hours because of slack work/business conditions. Other specifications include the number of hours lost in linear or squared terms, or as

11. Random effects are inappropriate because lower income workers have simultaneously lower consumption and a higher chance of losing their jobs.

a set of dummies and controls_i are described in section 1.2.2. Finally, the error term is assumed independent across individual, but allows for heteroskedasticity by reporting cluster-robust standard errors, clustered at the region×year level. The error term is interpreted as incorporating idiosyncratic changes in the marginal value of consumption unaccounted for by the controls, including other income shocks. For now, it is assumed to be uncorrelated to all unobserved's workers characteristics. Of course, it is entirely possible that this linear model may not perfectly account for job characteristics influencing both the likelihood of layoffs or hours loss and income growth, which would be captured by the error term. To control for non-linear effects of job characteristics and exclude workers that are not comparable, next section will approach the problem using propensity score matching.

The results, displayed in table 1.3, show that workers on layoff_{6m} reduce their consumption by -13.9% compared to those who remain employed, as seen in column 1. The difference is negligible for workers on layoff_{6m} or hours loss. Columns 2, 3 and 4 all suggest that workers losing more work hours reduce their consumption more, although only column 3's quadratic specification is significant. A F test does not reject the null hypothesis of Hours loss and Num. of hours lost and Num. of hours $\text{lost}^2/1000$ being jointly zero. Still, we can easily compute that the consumption reduction peaks at $-\frac{-0.016}{2*\frac{0.394}{1000}} = 20.3$ hours. On first sight, the overwhelming magnitude of the impact of Layoff_{6m} compared to $\text{Layoff}_{\text{recall}}$ and Hours loss suggests that a key consideration in workers' consumption decision is the presence of uncertainty over whether he will be called back or not.

1.3.2 A matching analysis

Although job losses and hours losses due to business conditions are for the most part unwanted and not entirely foreseeable, workers keeping their jobs may not be an appropriate comparison group for laid off workers, and either group may not be comparable to workers experiencing hours loss. Workers in an unsecure job may cautiously reduce their consumption, even if they do not lose it. Or, they may simply be less optimistic about the future prospects of wages increase. Browning and Crossley (2008) provide a formal treatment of these potential biases.

Least squares models allow to model how these observed differences affect treatment and control groups. However, a growing body of literature in statistics and biostatistics suggest that propensity score matching, as first proposed by Rosenbaum and Rubin (1982), can have several advantages when estimating treatment effects. By modelling the propensity of receiving treatment, it is possible to make sure that, based on observables, there is a significant overlap between treatment control groups, and show over which range of value the two groups can be compared, as highlighted by Itzhak Yanovitzkya (2005). A poor overlap would suggest a risk of colinearity between treatment and other controls. Imposing common support allows to exclude outliers, another advantage of matching over least squares (Hill et al., 2004). Finally, Rubin's work (1973, 1979) has shown that for well-matched sample, estimates can be relatively robust to various modelling, and some studies have found that propensity score matching can produce estimates closer to real experimental data (Hill et al., 2004). The context is very favourable to the approach since 'treatment' and 'control' groups are within the same labor market, part of the same survey and there is a wealth of regressors to model the propensity score, important conditions for the matching estimation, as highlighted by Heckman et al. (1997). In conformity with the previous section, I consider three possible 'treatments' : $layoff_{6m}$ (layoff with recall within six months), $layoff_{recall}$ (layoff with known recall date) and hours loss. [12]

Since there are a total of four possible states a worker can be in, I use the propensity score matching protocol proposed by Lechner (2002) for multiple mutually independent treatments. The procedure is as follows :

1. Estimate by multinomial logit the probability of being in each situation : employed, $layoff_{6m}$, $layoff_{recall}$ and hours loss, controlling for sex, three age dummies, white dummy, black dummy, (lag) blue collar, ln(Household size), higher education, house owner, state-level unemployment rate, year dummies and 4 region dummies. Note that it is now possible to use all months in the database. Propensity scores using only December observations will serve as a robustness check.

2. For each propensity score, ensure common support by dropping observations with propensity score lower than the highest minimum or higher than the lowest

12. Again, since the idea is to compare the options of a firm that needs to temporarily reduce its workforce, the situation of permanently laid off workers is not relevant since they probably lost their job for reasons unrelated to the firm's economic situation.

maximum in both states.

3. Perform matching estimation on the six following pairs of treatment/control : Layoff_{6m}/employed, Layoff_{recall}/employed, hours loss/employed, Layoff_{6m}/hours loss, Layoff_{recall}/hours loss and Layoff_{6m}/Layoff_{recall}. For each, the benchmark matching algorithm will be Mahalanobis distance kernel matching on pr('treatment'), pr('control'), a dummy for being under 30 years old and a dummy for higher education. [13] [14] Sensitivity tests will also involve matching only on the propensity scores, and nearest neighbor matching.
4. For each matching estimation, I perform ex post balancing test using standardized differences, as proposed by Rosenbaum and Rubin (1985).

The multinomial logit estimation is presented in table A.3 with columns 1 2 and 3 for the whole sample result. An eye-catching result is that most regressors have very similar impact on the probability of hours loss, layoff_{recall} and layoff_{perm}. The three outcomes are more likely for men, for younger workers, for blacks, for blue colar workers and when the local unemployment rate is high. They are less likely for service workers, for college and university educated workers and for house owners. In other words, the same people are likely to face similar labor market events. This is good news since workers having similar probability of facing layoff_{6m} layoff_{recall} or hours loss mean that they are in fact comparable with each others. To confirm this, table A.4 of the Appendix shows that the correlation between the propensity of layoff_{6m} and layoff_{recall} is93.66% , between layoff_{6m} and hours loss is 73.95%, and between layoff_{recall} and hours loss is 83.16%. Hence, when the control group is the employed population, the comparison sample selected by the matching algorithm should be substantially different from the unmatched population, while it should remain similar when both treatment and control groups are layoff_{6m}, layoff_{recall}or hours loss. This intuition is confirmed by figure A of the Appendix.

Table 1.4 shows the results for the main specification. [15] As discussed earlier, we

13. These two dummies are added because they are important matching criterias, but systematically performed poorly on the Smith and Todd balancing test.

14. The matching estimation was performed using PSMATCH2 in STATA, written graciously made available by Leuven and Sianesi (2003).

15. Standard deviations are computed using the variance approximation suggested by Lechner (2001) :
$$Var(\hat{\tau}_{ATT}) = \frac{1}{N_1} Var(Y(1) \mid D=1) + \frac{\sum_{j\in\{D=0\}}(w_j)^2}{(N_1)^2} \cdot Var(Y(0) \mid D=0).$$

should expect employed workers matched to those facing a layoff or hours losses have smaller than average income growth. Indeed, when matching Employed workers to Layoff$_{6m}$, Layoff$_{recall}$ or Hours loss, their mean consumption growth decreases from 1.3% to 0.5%. But the difference is extremely close to the regression approach of the previous section. By and large, the conclusions are essentially unchanged : Workers on Layoff$_{6m}$ significantly reduce their consumption, by -13.7% on average, compared to employed workers (row 1). The difference is also significant when comparing with Hours loss (row 4) and layoff$_{recall}$(row 6), and there is no measurable impact of Hours loss compared to employed workers (row 3). Row 6 shows the comparison between layoff with known recall date and recall within six months, the closest to Browning and Crossley (2008)'s work. The measured difference is Table A.5 shows that these findings are robust to matching only on propensity scores, nearest neighbor matching and estimating the propensity score using only December observations.

1.3.3 Additional labor market outcomes, food aggregates and subgroups

Until now, the focus has been on studying the fate of workers who's firm needs to reduce labor input temporarily, by reducing hours or using temporary layoffs. But other outcomes like permanent layoffs, discouraged workers, and workers working overtime can be considered as well. I also look at subsamples of workers, such as only workers with a single job (last year), single earners, only private sector workers (last year) and male or female. Finally, I consider alternative food aggregates : all food expenditure except food away and only food away from home. These are credible lower and upper bounds for estimating the impact of labor market outcomes on total food expenditure. Food at home is also a convenient way to try to root out automatic consumption adjustment directly linked to working full time, such as eating at restaurants. The econometric model is the same as in section 1.3.1, with the addition of the new regressors.

Table 1.5 reports the results. Column 1 shows the benchmark regression with the whole sample and all regressors. Not surprisingly, discouraged workers (who were at work 12 months ago) experience the largest consumption reductions, with a point estimate of -35.4% (statistically different from any type of layoff).

The reaction of workers experiencing layoff$_{perm}$ is slightly stronger than those on

layoff_{6m}, although the difference is not statistically significant. All else being equal, we could have expected a stronger response from the permanently laid-off, but these two situations are not easily comparable. Temporary layoffs are often the result of less foreseeable circumstances and can bear upon senior workers while permanent layoffs tend to be caused by personal circumstances and affect younger workers. To verify this, we can compare the average tenure of workers who are going to face a $\text{layoff}_{\text{perm}}$ and a $\text{layoff}_{\text{6m}}$ next month. The average tenure of workers who are going to be temporarily laid off next month is 6.4 years, whereas the average for permanent layoffs is 3.7 years [16]. As before, there is no measurable impact of $\text{layoff}_{\text{recall}}$ or hours loss.

There is a very significant increase of 4.1% of food expenditure for overtime workers, an impact that seems strong for a slight and temporary increase in earnings. Overtime workers could be expecting larger permanent wage gains in the future, although no evidence for such hypothesis could be mustered from the data.

In column 2, adding yearly income change to the list of controls do not alter the result meaningfully. It probable that labor market outcomes also carry information on expected future income that may differ from their impact on last year's income. We must also keep in mind that this categorical variable is imprecise quite imprecise.

The sample restrictions in columns 3 to 7 yield mostly intuitive results, or no difference with the benchmark regression. Column 3 leaves out workers with many jobs, with no appreciable consequence. Single earners, in column 4, react more to all shocks, except permanent layoffs which may be attributed to the specificity of permanent job losers. The largest contrast is the impact of $\text{layoffs}_{\text{6m}}$, which is now at −21.3%. Leaving out public sector workers has no systematic or strong impact. Consumption reacts much more to shocks on male workers than by female workers. Columns 6 and 7 show that men experiencing layoffs react more than female, which probably reflects the fact that men are still household's main breadwinners.

Columns 8 and 9 confirm that households reduce their consumption of food away from home much more than food at home, to all shocks. Two factors may explain this. Food away is complementary to work activities. It can also be a luxury good that families can reduce easily in case of temporary income reduction. To conclude, as previously mentioned, the impact of these shocks on total consumption probably lies between the

16. Unfortunately, the overlap between consumption data and tenure data was not sufficient to use tenure directly in consumption models.

estimates of column 7 and 8.

1.3.4 Job loss and insurance

The BLS conducted its mobility supplement in January of 2002, 2004, 2006, 2008, 2010 and 2012, asking detailed questions about the circumstances of permanent job loss. It allows to replace the variable layoff_{perm} with the variable Job loss : a displacement within the last 12 months in circumstances such as plant or company closed or moved. Hopefully, firm closure reflects impersonal and unpredictable circumstances that can affect senior workers as well as new entrants. Information on unemployment insurance and health insurance can also be added.

The mobility supplement was conducted in January, but the answers are used to impute corresponding values to the same worker one month earlier. The downside of using the January supplement is a smaller dataset since the supplement information is unavailable every other year, or for waves of households leaving the Survey in December. Workers with many jobs are also excluded to be sure that the lost job was the main job.

Table 1.6 reports the results. Column 1 shows that for workers who were employed last year and lost their job during the last 12 months, the impact on consumption was -13.1% on average.

Of the workers who lost their job last year, 48% have already found a new job and 52% have not. Looking at them separately in column 2, those reemployed (full time or part time) seem to have recovered from the loss. For those still without job, the reduction is -20.4%.

Column 3 finds a negative but insignificant impact for having no unemployment insurance, or having lost health insurance due to a job loss. But column 4 finds that the impact on food spending of having had unemployment insurance but being now ineligible is -39.7%. It is strikingly strong, given UI expiration should in principle be perfectly foreseeable. Even when controlling for the number of months unemployed in column 5, the effect does not go away. Such reaction is hard to reconcile with the fact noted by Hall (1978) that anticipated changes in the income processes should not help predict consumption growth if agents can borrow freely.[17] [18] It is however compatible with the presence of borrowing limits, which are included in the structural model of section 1.4.

1.3.5 Earning elasticities

The outgoing rotation groups (a quarter of the sample) have to answer extra questions on earnings and wages, which allows to build two variables : weekly earnings and total hourly pay, including overtime pay and extras. This adds up to the monthly question about total income over the last 12 months. Although this last variable is coded categorically, I build a continuous variable based on the midpoint of each category, which is far from perfect, but nonetheless a decent comparison with the two previous measures. Upward and downward movements in earnings are also considered separately.

Table 1.7 shows that the earnings elasticity of consumption of 4% (col. 1) a wage elasticity of 7.9% (col. 3) and an income elasticity of 6.5% (col. 5). These magnitudes are in line with previous findings using the Consumer expenditure survey (CEX), notably Gervais and Klein (2010) who find OLS estimates of income elasticity of 5.4% for food consumption and 6.7% for total consumption, or Krueger and Perri (2005) who find an income elasticity of total consumption of 4%.

The three elasticities measures are very strong upward and weaker downward, a sign that downward movements are either perceived to be more temporary, or that households are more reluctant to cutback spendings than to increase it.

17. Note that selection effect could help to reconcile this result with the Permanent Income Hypothesis. Ceteris paribus, workers that are eligible for UI for a longer period are more likely to be observed as still receiving benefits. Also, the expected length of benefits has a positive impact on expected lifetime earnings. Thus, this could create a systematic difference between workers who used to receive benefit and those who still receive them. However, it is doubtful that it could be enough to explain such a large difference, especially given that there was no difference between eligible and non-eligible workers in the first place.

18. This observation echoes many other findings on reaction to anticipated tax refunds, reviewed in Browning and Crossley (2001a).

1.3.6 The impact of labor market displacement on yearly change in family income

To assess the magnitude of these estimates, it is useful to verify the extent to which household income is affected by work hours losses and layoffs and compare the results to existing literature. As just mentioned in section 1.3.5, last year's family income is available as a 16 category variable, but a continuous variable is created by imputing the middle point of each income category. To estimate the impact of labor market displacements on yearly income, the linear model to be estimated will be

$$\Delta ln\,(\text{income}_i) = \beta_0 + \beta_1 \text{Layoff}_{\text{perm}i} + \text{Layoff}_{6\text{m}i} + \beta_2 \text{Layoff}_{\text{recall}i} + \beta_3 \text{Hours loss}_i + \gamma \text{controls}_i + \varepsilon_i$$

where $\Delta ln\,(\text{income}_i)$ is the year to year change in log household income, and $\text{Layoff}_{\text{perm}i}$ $\text{Layoff}_{6\text{m}i}$, $\text{Layoff}_{\text{recall}i}$ and Hours loss_i are dummies indicating whether worker i experienced a layoff or an episode of work hours losses one month after reporting last year's income (discouraged workers were not included because of too few observations), and controls_i is the same vector as that of section 1.2.2, including last year's income dummies, but excluding income changes, of course. As before, only one observation per household is kept (not necessarily December), and male earners are kept in priority.

Table 1.5 shows the results. The biggest impact on annual household income growth comes from a permanent layoff, with a point estimate of −25.9%, while the lowest is from hours loss, with −9.3%. To get a rough idea of the magnitude of consumption reaction to each outcome compared to its actual impact on income a year later, we can simply divide table 1.5's column 1 consumption reactions with 1.5's income impact. Doing so would yield an income elasticity of consumption of 0.57 for permanent layoffs and 0.85 for layoffs with recall within six months. These are not only much higher than the estimates of income elasticity of table 1.7, but indicate that workers seem rather pessimistic in their prospect of ever catching up to their pre-displacement earning path, perceiving that the negative impact of permanent and long term layoffs on next year's income is a good forewarning of the long term income loss.

1.4 A structural model

So far, all estimates point to the same conclusion : that losing the link with an employer ($\text{layoff}_{\text{perm}}$ and $\text{layoff}_{\text{6m}}$) is felt strongly by workers, while temporary reductions in workload ($\text{layoff}_{\text{recall}}$ and hours loss) do not seem to matter to them. But without a structural approach, it is hard to interpret exactly what these estimates mean in a dynamic decision process. Is a worker more influenced by the changes in present income, the expected length of an unemployment period, the change in the perceived risk of other shocks, credit limitations and the risk of bancrupcy or the change to expected long-term gains ?

To explore these questions, I model the income process as a Markov chain between five different states : employed, hours loss, $\text{layoff}_{\text{recall}}$, $\text{layoff}_{\text{6m}}$ and $\text{layoff}_{\text{perm}}$. Each entails short term earnings losses compared to staying employed. Also, each shock is associated with a probability of long-term wage loss when he returns to full time employment. The model is estimated numerically. In accordance with the CPS, the unit of time will be one month.

With the consumption reaction estimated, I use the model to replicate the results found in section 1.3.

Before writing down the worker's intertemporal problem, I explain its various components.

1.4.1 Instantaneous utility

The worker's goal is to maximize his expected lifetime consumption utility, subject to variable income and credit constraints. The instantaneous utility is CRRA : $u(c_t) = \frac{c_t^{1-\nu}}{1-\nu}$. The marginal utility of consumption is assumed to be separable from other components of utility such as leisure. The benchmark parameter for ν will be $\nu = 2$ as is standard in the literature, but note that the results are quite insensitive to a wide range of values of ν. Consumption and saving is the only decision available to the worker.

1.4.2 Credit constraints

There are two constraints to credit. First, workers need to die without debt. Second, there is a limit to the debt level. In the United States, the typical limits for conforming loans are a front-end-ratio of 28% and a back-end-ratio of 36%. The front-end-ratio is the fraction of income used on housing related expenses, including mortgage. The back-end-ratio includes the front-end-ratio plus interest on recurring debt including credit cards, car loans, student loans, alimony, etc. Since in the model there are no durable goods and only one type of asset, the appropriate measure should be the net worth, thus excluding mortgage. The maximal ratio of earnings devoted to paying the debt will be $\zeta \equiv 36\% - 28\% = 8\%$. The annual nominal interest rate r will be 5%, regardless of the debt level. This implies a debt limit of $\frac{8\%}{5\%} = 160\%$ of total annual income. Sensitivity analysis will be performed for ζ.

1.4.3 Current income

The income depends on the worker's labor market status. [19] The individual can have in 5 different labor market status s, labeled $s \in \{0,1,2,3,4\}$, which correspond to the states used in section 1.3 : **0.** Employed full time, **1.** Hours loss, **2.** On temporary layoff with known recall date ($\text{layoff}_{\text{recall}}$), **3.** On temporary layoff with indication of recall within 6 months ($\text{layoff}_{\text{6m}}$) and **4.** Permanent layoff ($\text{layoff}_{\text{perm}}$). Search and matching is not modeled explicitly. It is assumed that the worker has separatly solved the problem of optimal search intensity and quit decisions. He is taking his labor market situation as a given for his choice of consumption and saving. I use the CPS data to compute the Markov matrix of transition between states from one month to the next [20] :

19. Of course, most workers have other income sources and it would have been nice to include them as well. The problem with that is that it is not straight forward, become the other income source fluctuates as well, and the worker will want to keep precautionnary savings in case of shocks happening to this other income source. The ideal way would be to have a two income household. But, as it will become clear, this would square the number of states of squared ((5*5)*(5*5)=625) very computationally burdensome.

Note however that we can probably imagin how this would influence the simulation. An additional stable income reduces the share of the labor market earnings in the total budget, reducing the importance of shocks. If this addidional income is unstable, it would encourage the household to amass even more precautionary savings, reducing again the importance of labor market shocks.

20. Note that to be coherent with the previous section, I only consider employed workers who wwork full time last year. I don't consider individuals out of the labor force or unemployed after a quit or entry in the labor force, or part-timers. The reason is that it is unclear what is their available income what their motivations are. Of course it would be better to include all possible states, but this is a reasonable

TABLE 1.1: Transition probabilities next month

s	**0.**	**1.**	**2.**	**3.**	**4.**	Total	Stocks	
							Theoretical[a]	Real
0. Employed	99.07	0.56	0.11	0.11	0.14	100	97.99	97.90
1. Hours loss	77.06	18.07	2.14	1.87	0.85	100	0.70	0.81
2. Layoff$_{recall}$	52.9	5.32	25.32	13.71	2.74	100	0.23	0.27
3. Layoff$_{6m}$	34.69	3.4	13.78	35.37	12.76	100	0.27	0.29
4. Layoff$_{perm}$	19.39	0.56	1.12	2.98	75.94	100	0.81	0.73

[a]If M is the is the Markov matrix of transition probabilities, then the theoretical equilibrium stocks are

$$\begin{pmatrix} 1 & 1 & 1 & 1 & 1 \\ m_{1,1}-1 & m_{2,1} & m_{3,1} & m_{4,1} & m_{5,1} \\ m_{1,2} & m_{2,2}-1 & m_{3,2} & m_{4,2} & m_{5,2} \\ m_{1,3} & m_{2,3} & m_{3,3}-1 & m_{4,3} & m_{5,3} \\ m_{1,4} & m_{2,4} & m_{3,4} & m_{4,4}-1 & m_{5,4} \end{pmatrix}^{-1} * \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

A striking feature is how short-lived labor market shocks are. It underscores how important it is to month as time unit as oppose to a trimester or a year. A worker on hours loss has a 77% chance of being back at work full time next month, while the chance is 53% for Layoff$_{recall}$ and 35% Layoff$_{6m}$. Only Layoff$_{perm}$ has a significantly longer duration. Interestingly, for employed workers, the chance of moving to Layoff$_{recall}$ or Layoff$_{6m}$ next month is only 0.11%. But for workers already on hours loss, it is 2.14% and and 1.87% respectively, roughly 20 times higher. It echoes the message of table A.4 showing that workers who have a high propensity to face hours cutbacks also face high propensities of layoff. Hence, if Hours loss has an impact on workers, it might come not from the temporary decline in earnings but from the higher risk of being laid off.

CPS data can be used to compute the impact of weekly earnings of hours loss, but doing so requires controlling for dummies of last year's earnings.[21]On average, the

compromise for modelling and computational purposes. Also, to verify that it does not distort too much workers flows, I compute the theoretical equilibrium stocks of workers in each states using these flows, and compare them with real stocks and see that they match very well.

21. Computing the impact of hours loss on weekly earnings is subtle, because hours loss affect lower income workers. But using income growth is not enough because of mean reversion. Low earners last year tend to earn more this year, while high earners last year tend to earn less this year. As a result, when computing the impact of Hours loss using income levels, the impact is a staggering −47%, while using income growth yields −9%. Controlling for dummies of weekly earnings categories last year brings

loss is 20.81%.[22] There are no data on weekly earnings for unemployed workers in the CPS. But the OECD produces estimates of average replacement rates of net wages over average unemployment periods.[23] The estimate was of 30% for most of the 2000's decade. The benefits period was extended in July 2010, but this reform barely impacts our sample.

We can define$\phi(S)$ as the fraction of full time wage that a worker gets when in state S :

$$\phi(0) = 1;\ \phi(1) = 0.7919;\ \phi(2) = \phi(3) = \phi(4) = 0.30. \tag{1.1}$$

1.4.4 Wage growth and job displacement

All workers start their carreer at age 20, retire at age 60 and die with certainty at 75. The starting wage is$w = 1$, but it rises over through career. The rate of wage growth ρ is a function of age : $\rho(a)$ is estimated with the CPS data by local linear regression with a triangle kernel of three years.

Of course, wage growth is affected by the labor market situation since involuntarily changing job often entails a loss of seniority and job specific skills. Estimating long-term wage losses is challenging and requires long-term panel data not available in the CPS. A recent estimation of long-term income losses from job displacement is the work of Davis and Wachter (2011). They estimate the post displacement long-run average earning losses at 10%[24] (the same number that was found by Stevens (1997)). As a baseline, I will assume that following a layoff$_{\text{perm}}$, when a worker finds a new job, the new wage is 10% lower than the pre-displacement wage and never recovers.

What about the other shocks ? Workers on temporary layoffs may be lucky and be recalled to their initial position with identical long-term wage gains. But they may also

these two numbers much closer : to -25.31% in levels and -20.81% in differences (this last estimate will be prefered).

22. Note that with a 77.06% chance of being employed again next month, it is most likely that periods of hours loss do not last a whole month. It means that 20.81% probably overestimates the true cost of hours losses, but without more data or further assumptions, it is difficult to estimate the true cost.

23. The exact definition of the initial replacement rate is : "is an average of cases of a single person and one-earner married couple, an average of cases with no children and with two children, and an average of cases with previous earnings in work 67% of average production worker (APW) level, 100% of APW level and 150% of APW level."

24. These are earning losses during expansions, but their estimates for average sample is very close and most of the present sample encompasses expansionary years.

have to accept a new job with lower qualification, lower seniority and lower wage. Without statistics on rates of recall, it is impossible to compute the probability of recall directly. But it is possible to proxy it.

The trick will be to compute the probability of changing sector after a shock. Jacobson et al. (1993) find that eight year after displacement, the income loss of workers having changed sector was roughly twice that of those who had remained in the same sector. Hence, changing sector is a good proxy for skill loss that translates into futur wage loss. Knowing that, we can ask : What is the average risk that a worker will change sector during a certain period of time ? How higher is this risk if he just came out of each shock ? Then, by comparing the impact of a temporary layoff to the impact of a permanent job loss, we can estimate what fraction of those workers experienced an involuntary job displacement leading to a permanent wage loss of 10%, and how many return to their initial position with no wage loss.

More formally, assume that all permanent layoffs involve involuntary job changes, and that a constant fraction of these changes, say ξ, involve changing sector. We can estimate how each shock contributes to the risk of sector change by estimating the following model :

$$E\left(ch_{i,t} \mid S_{i,t-1}\right) = \gamma_0 + \sum_{s\in\{1,2,3,4\}} \gamma_s D_{s,i,t-1}.$$

The sample is made of workers employed full-time at period t and employed full-time at period $t-j$, where j may be 12 months. $ch_{i,t}$ is a dummy variable indicating if the worker i changed sector between period t and $t-j$. $S_{i,t-1}$ is the state of the worker last month (0 : Employed to 4 : Layoff$_{perm}$) and $D_{s,i,t-1}$are dummie variables of the state values of $S_{i,t-1}$. The parameter$\hat{\gamma}_0$ will capture the normal rate of change of sectors after j periods for a worker who was employed last month,[25] and the $\hat{\gamma}_s$ will capture the extra changes resulting from the fact that the worker came out of being in state S (either Hours loss, Layoff$_{recall}$, Layoff$_{6m}$ or Layoff$_{perm}$) last month to state 0 (employed full time) this month. Then, define $\psi(s)$ as the ratio of involuntary job changers when exiting state S, $\psi(S) = \frac{\xi\hat{\gamma}_s}{1} = \frac{\xi\hat{\gamma}_s}{\xi\hat{\gamma}_4} = \frac{\hat{\gamma}_s}{\hat{\gamma}_4}$ (where by construction, $\psi(4) = \frac{\hat{\gamma}_4}{\hat{\gamma}_4} = 1$). As a robustness check, involuntary job change was also defined as a change of both sector and occupation. Here are results for various choices of j to make sure that they are

25. Note that the worker may have experienced other shocks before last months that we cannot observe, but they are captured by $\hat{\gamma}_0$.

TABLE 1.2: Probability of involuntary job displacement following a shock

Based on :	pr(sector change$_{i,t}$ | $S_{i,t-1}$)				pr(sect. & occ. change$_{i,t}$ | $S_{i,t-1}$)
Lag (months) :	$j=11$	$j=12$	$j=13$	$j=\{11,12,13\}$	$j=\{11,12,13\}$
Hours loss ($\psi(1)$)	0.070	0.060	0.040	**0.069**	**0.206**
Layoff$_{recall}$ ($\psi(2)$)	0.083	0.047	0.054	**0.075**	**0.282**
Layoff$_{6m}$ ($\psi(3)$)	0.431	0.480	0.473	**0.452**	**0.625**
Layoff$_{perm}$ ($\psi(4)$)	1.000	1.000	1.000	**1.000**	**1.000**

relatively stable, and one specification with all j pooled that we will use for the model (actual regressions in online appendix). As robustness check, I also use a change in both sector and occupation :

Hence, in the benchmark solution, the $\psi(S)$ function is

$$\psi(0)=0;\ \psi(1)=0.069;\ \psi(2)=0.075;\ \psi(3)=0.452;\ \psi(4)=1 \tag{1.2}$$

1.4.5 Households with multiple incomes

A final complexity arises from the fact that shocks impact one workers, but that consumption is at the household level. While earlier literature could convincingly assume single earner families, as column 3 of table 1.5 shows that more than half of the families of the sample have more than one income. Since spousal income is a foremost way of smoothing earning shocks, we should expect single earners to react much more than multiple-earner families (as is clearly seen in table 1.5, column 4).

The ideal approach to dealing with this issue should be to model multiple-income household explicitly, but it is easy to see how this would be prohibitive computationally.[26] A pragmatic solution will be to assume that the income of the rest of the household is fixed. I will consider two cases : household with single earners and multiple earners. In the multi-earner households, the average income share of a worker is 46%. The income of the rest of the household will increase at the same rate as the worker's

26. ($25*25=625$ states for a dual-earner family)

income, but with certainty. In simulations, both types of households will be weighted by their proportion in the data. [27]

1.4.6 The worker's intertemporal problem

The worker's problem at time t is :

$$\max_{c_t} V(w_t, S_t, A_t) = \sum_{\tau=0}^{T-t} \beta^t E_t \frac{c_{t+\tau}^{1-v}}{1-v}$$

$$\text{s. t.} \quad A_{t+\tau} + w_{t+\tau} * \phi(S_{t+\tau}) - c_{t+\tau} p_{t+\tau} = \tfrac{A_{t+\tau+1}}{1+r} \; \forall \tau \qquad \text{(budget constraint)}$$

$$d_{t+\tau} \geq w_{t+\tau} \phi(S_{t+\tau}) \zeta \; \forall \tau \qquad \text{(debt limit each period)}$$

$$d_T \geq 0 \qquad \text{(non-negative final assets)}$$

Where

- $c_{t+\tau}$ is the worker's consumption at time $t+\tau$
- v is the worker's constant relative risk-aversion
- β is the future discount factor
- $A_{t+\tau}$ is the worker's amount of liquid assets at time $t+\tau$
- $S_{t+\tau}$ is the worker's state at time $t+\tau$, where $S_{t+\tau}$ can be : 0 : employed ; 1 : hours loss ; 2 : layoff$_{\text{recall}}$; 3 : layoff$_{\text{6m}}$; 4 : layoff$_{\text{perm}}$
- $\phi(S_{t+\tau})$ is the fraction of a worker's regular wage received in state $S_{t+\tau}$, described in equation 1.1
- p_t is the price level at time $t+\tau$ (The inflation is 2.55%, corresponding to the annual CPI increase of a representative basket of goods over the 2000's.)
- $\text{pr}(S_{t+\tau+1} = s \mid S_{t+\tau})$ is the probability of transitioning to state s given state $S_{t+\tau}$, a Markov process described in table 1.1
- the wage increases smoothly over time, except when exciting a layoff (or hours loss) which can trigger a long-run wage loss of 10% :
  - $w_{t+\tau+1} = w_t * (1+\rho(a))$ if $S_{t+\tau} = 0$ or $S_{t+\tau+1} > 0$,

27. This solution is pragmatic, but may still overestimate the response to shocks for two reasons. First, if other income sources are also uncertain, families will increase precautionary savings. Second, in the sample, there is a small but very significant inverse correlation between the income of each household members, suggesting that a spouse may enter the labor market or work longer hours to offset a wage loss of the main earner.

  - $w_{t+\tau+1} = w_t * (1+\rho(a))$ with probability $(1-\psi(S_{t+\tau}))$, and $w_{t+\tau+1} = w_t * (1+\rho(a)) * 0.9$ with probability $\psi(S_{t+\tau})$ if $S_{t+\tau} > 0$ and $S_{t+\tau+1} = 0$
  - $\rho(a)$ is the monthly wage increase for an employed worker of age a
  - $\psi(S_t)$ is the probability of experiencing a wage loss (not being recalled to the original job), described in equation 1.2. [28]
- r is the nominal yearly interest rate of 5%, independent of the level of assets.
- The Inada condition $\lim_{c\to 0} u'(c) = \infty$ ensures positive consumption in every period.
- The worker starts working at 20 years old with no assets, retires with certainty at 60 years old and dies with certainty at 75 years old with no desire to leave a bequest.

1.4.7 Results

The model is solved numerically, starting from last period and each month solving the optimal savings/consumption decisions for each asset level.

1.4.7.1 Response paths

Figures 1.5 shows the consumption, savings and expected utility loss [29] trajectories for a single-earner family after a shock. The household head starts working at 20 years old with zero assets, and is consecutively employed until experiencing a shock (and never exciting from the new state), either at 30 years old (left row of graphs) or at 58 years old (right row of graphs). The purple line shows a permanent layoff, the red line shows $\text{layoff}_{\text{perm}}$, the red line shows a $\text{layoff}_{\text{6m}}$, the orange line shows a $\text{layoff}_{\text{recall}}$, the green line shows hours loss and the blue line shows the worker staying employed. Of course, most spells are short lived, except $\text{layoff}_{\text{perm}}$. To reflect that, each line pales after a worker has more than 99% chances of having excited to another another state (employed or not).

As can be seen in the top panels, households cut spending immediately following a shock in response to a loss of expected lifetime utility. Then, as time goes by wi-

28. Note that for computational reasons, we have to limit the maximum number of times a worker experiences wage losses to 4 (few workers will experience 4 job losses)

29. The expected utility loss from going from state 0 (employed) to state S at time t is $V(w_t, S_t, A_t) - V(w_t, 0, A_t)$.

thout going back to full-time employment, consumption slowly declines. Permanent job losses are felt more strongly, followed by layoff$_{6m}$, layoff$_{recall}$ and hours loss. As a result, as seen in middle panels, households on layoff$_{perm}$ go into debt more slowly than households on layoff$_{6m}$ and layoff$_{recall}$.

As seen on the panel on the right, shocks have a much smaller impact for older workers who already have accumulated ample savings for retirement and has little time left to work, a point made by Clarida (1991). As a result, expected utility losses from shocks are also much smaller for workers loosing a job at 58 years old than at 30, as seen from the bottom panels.

Figure 1.5 shows the same shocks for a dual-earner family, for which a shocks only impacts 46% of the family income. All responses from consumption and utility losses have comparable shapes as for single earners, except that their magnitude is less than half. Note that savings levels are slightly lower for dual income families, reflecting the reduced need for precautionary saving.

1.4.7.2 Simulation

I simultate the income trajectory of a large number of workers in single and dual-earner families, entering the labor market being employed at 20 years old, retiring at 60 years old. I weight the proportion of single-earner and dual-earner families and the age composition according to the real data. [30]

Keeping only workers employed full time 12 months ago, I first regress the change in consumption on the four shocks. Then I add as regressors the number of months since the job loss or layoff took place assuming a common slope for all shocks since they are nearly identical in the first few months, as seen in figures 1.5 and 1.5. Finally, a third regression tests how the impact of losing work differs from finding work by including workers employed today, but on layoff or hours loss 12 months ago, and lag shocks as regressors. The same regressions are also performed on the actual data, including all controls.

Table 1.9 shows the results for the simulated sample of the benchmark in columns 1 to 3 without standard errors since no error term was included. Columns 4 to 7 show

30. In the dataset, there are fewer younger or older workers. To get comparable samples, I weight the simulated workers of each age accordingly to its importance in the real data (using a five year weighted average). I also select the same proportion of single earner (37.41%) and multiple earner (62.59%) families (independent of age).

the results for the real sample, with standard errors in parentheses. In bracket is shown the p-value associated with the F test that each coefficient is statistically equal to the simulated one where column 4 and 7 are compared to column 1, column 5 with 2 and 6 with 3.

In the simulated data of columns 1 and 3, households react to permanent job displacements by cutting back consumption by 19%, quite higher than for long-term layoffs. This value is much closer to job losses from jobs closure in column 7, than job loss from any circumstances. The simulated reaction to layoff$_{6m}$ is much closer to the estimated point estimates. The simulated reaction to layoff$_{recall}$ is -9.8% is not much higher than the estimates.

As for Hours loss, the model would have predicted a consumption change of -1.9%. If such is the real reaction to hours loss, it is clear that a much larger dataset would be needed to estimate this number precisely. The estimates for Hours loss mostly suggest a slight positive effect, although not statistically different from zero or -1.4%.

If the imprecision of the estimates call for a larger dataset, they also suggests that in the data, reactions to a layoff with known return date or hours loss are probably quite heterogeneous. Some households may cut consumption like the simulation proposes while others may view these unexpected episodes of free time as an opportunity to spend more.

1.4.7.3 Policy discussion

Table 1.10 shows how various policy experiments affect worker's consumption reactions to shocks and utility. As seen in column 1, compared to Hours loss, the average impact on consumption of layoff$_{recall}$ is 5.16 larger, the impact of Layoff$_{6m}$ is 7.21 times larger and the impact of Layoff$_{perm}$ is 10 times larger. It is hard to say whether firms should be encouraged towards hours cuts or layoffs without a good theory of the firm. But for sure, both sections 1.3 and 1.4 suggest that the impact of hours cuts is quite small compared to layoffs, especially given that the average weekly hours reduction is 13.42 hours and the earnings reduction is 20.8%.

Column 2 and 3 consider a 5 point decrease and increase in unemployment insurance benefits (paid for by employed workers). Assuming that workers do not modify significantly their search behavior,[31] we can see that a 10 points increase, from

31. Of course, the generosity of UI benefits could influence the length of unemployment spells if

.25 to .35 would change average consumption of unemployed workers by $-0.127-(-0.144)=0.026$, or 2.6 points for workers on $\text{layoff}_{\text{perm}}$, 1.7 points for workers on $\text{layoff}_{\text{6m}}$ and 1.5 points for workers on $\text{layoff}_{\text{recall}}$. In terms of elasticity of total expenditures to unemployment insurance benefits, it would imply an elasicity of $\frac{0.026/0.81}{0.1/0.3}=0.096$ for $\text{layoff}_{\text{perm}}$, 0.059 for $\text{layoff}_{\text{6m}}$ and 0.050 for layoff_{recall}. These numbers is comparable to the estimates of the impact of UI.[32] To grasp their impact on welfare, it can be compared to the impact of a 1% wage increase, presented in column 4. For a 30 years old single earner, increasing wages by 1% increases welfare by $228.63-226.77=1.86$, while increasing UI by 10 points increases welfare by $226.89-226.59=0.3$. Thus in terms of the gains from a 1% increase in wages, the gains are roughly 16%, while for $\text{layoff}_{\text{perm}}$ who benefit directly from UI, they are 69%, and for workers with spouse, they are negligible. These benefits are modest, a sign that private borrowing and spousal income are effective income stabilizers for most workers. But they might be larger for workers who are liquidity constrained (Browning and Crossley, 2001b).

Column 4 shows that for a worker with a very low level of benefits (5%), magnifies the reaction to a $\text{layoff}_{\text{perm}}$ by $-0.258-(-0.190)=-0.068$. By comparison, table 1.6 column 3 found a comparable (although imprecise) point estimate of -0.087 for having no unemployment insurance following a job loss.

Column 5 considers the impact of extending UI to income losses from hours losses. The impacts are too small to measure. However, such a policy could be helpful if hours reductions prove less harmful to workers than layoffs and extending UI to hours losses was a way of making them acceptable to workers.

Of course, we must keep in mind that these simulations take the flows between different states for granted. Making these flows would require the much more ambitious task of modeling both labor supply decisions via search intensity, and firm's demand for labor. But note that we can be have a good idea for most of a worker's reaction to a change to unemployment insurance. Theory and many empirical papers show that

workers change their search intensity or the quality of the job offers they will accept (see Card et al. (2007))

32. Using Canadian data, Browning and Crossley (2001b) find an elasticity of expenditure with respect to the benefits of 0.05 for a single income household. By comparison, looking only at single-income households, the simulated elasticities are 0.178 for $\text{layoff}_{\text{perm}}$, 0.068 for $\text{layoff}_{\text{6m}}$ and 0.045 for $\text{layoff}_{\text{recall}}$. On the other hand, Gruber (1997) using PSID data finds larger effects than Browning and Crossley (2001b).

increasing benefits' generosity would reduce a worker's effort to find a new job. Thus, from the point of view of consumption utility, the gains would be reduced, and even potentially negative.

1.5 Conclusion

This paper compared the consumption reaction of households to various shocks on the labor market, bridging reduced-form non-parametric estimates to reactions simulated from a structural model. The OLS and matching results point in the same direction, that workers going through hours cutbacks or a temporary layoff with known recall date do not change their consumptions measurably, but that those facing layoffs with unknown recall date reduce it significantly, in the order of -13.7%. The reaction is much stronger for single earners, for discouraged workers and those displaced after firm closure. The simulated estimates are reasonably close for most estimates.

From a policy perspective, the estimated welfare effects of unemployment insurance reform are modest, due to the fact that personal savings and spousal income are enough to smooth consumption for most workers. The matching estimates of section 1.3 suggests that the key consideration for the worker is not so much the present income or the number of hours worked, but the fact that the link with the bond with the firm still exists. This is good news, given that firms also can benefit from keeping ties with well trained workers. In other words, being available to renew a match after a shock is a positive externality for both parties. Hence, reforms that make it easier to keep such a bond could be welfare improving.

Regarding the consumption literature, this paper suggested that households' reaction can be perfectly compatible with the permanent income hypothesis if shocks are modeled precisely enough in terms of present earnings and their impact on expected future earnings. It also opens many avenues of research. One would be to test the model on more conventional consumption panels such as the Panel Study of Income Dynamics. Also, an improvement to the model would be to make labor supply endogenous since this most certainly influence the impact of unemployment insurance reforms.

Finally, even though the model predicts very modest impacts from unemployment insurance reforms, the sharp drop consumption of households with expired unemployment insurance is a telltale sign that some unemployed workers may be seriously liquidity-constrained. Their situation should mandate more scrutiny as they may be have both a lower income and lower wealth level and be less able to insure themselves against labor market risks.

Tables and figures

TABLE 1.3: Impact of hours cuts and temporary layoffs on consumption

Dependent var.	Least squares			
Δ**log food expend.**[a]	1	2	3	4
Layoff_{6m}[b]	-0.139***	-0.147***	-0.139***	-0.139***
	(0.043)	(0.043)	(0.043)	(0.042)
Layoff_{recall}[c]	-0.047	-0.053	-0.047	-0.047
	(0.059)	(0.058)	(0.059)	(0.059)
Hours loss[d]	0.022	0.053	0.110*	
	(0.025)	(0.059)	(0.057)	
Num. of hours lost[e]		-0.001	-0.016**	
		(0.005)	(0.006)	
Num. of hours $\text{lost}^2/1000$			0.394***	
			(0.140)	
Lost 0-8 hours				0.027
				(0.038)
Lost 9-16 hours				0.056
				(0.068)
Lost > 16 hours				-0.039
				(0.056)
Controls[f]	Y	Y	Y	Y
Observations	68 560	64 114	68 560	68 560
R^2	0.016	0.017	0.016	0.016

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

[a]Yearly change in weekly household spending at supermarkets, grocery stores, meat markets, produce stands, bakeries, restaurants, fast food places, cafeterias and vending machines, etc.

[b]On layoff, employer has given indication that the worker will be recalled within six months.

[c]On layoff, employer has given a return date.

[d]Worked < 35 hours last week because of slack work/business conditions

[e]This variable is the difference between hours usually worked and hours actually worked if Hours loss = 1, and zero otherwise.

[f]Include sex, age, age^2 white, black, 14 sector dummies, 11 occupation dummies, household size level and yearly change, household children number and yearly change, college education, year×region dummies, house owner dummy, year×state level unemployment rate, lagged family income dummie and yearly change in income category.

Full sample includes private for profit or government workers employed full time last year and are now either still employed in similar conditions, worked less than 35 hours last week for business-related reasons or are on on temporary layoff.

TABLE 1.4: Matching, benchmark specification

Dep. Var : **Δlog food expend.**[a]			Estimation results[b]					Excluded observations[c]		
	Treated	Controls	Samples	Treated	Controls	Difference	S. E.	Assignment	Off sup.	On sup.
1	Layoff_{6m}	Employed	Unmatched	-0.142	0.013	-0.155***	(0.043)	Untreated	0	84 556
			ATT	-0.132	0.005	**-0.137*** **	(0.044)	Treated	10	246
2	Layoff_{recall}	Employed	Unmatched	-0.035	0.013	-0.048	(0.046)	Untreated	0	84 556
			ATT	-0.036	0.003	**-0.039**	(0.055)	Treated	12	213
3	Hours loss	Employed	Unmatched	0.011	0.013	-0.003	(0.027)	Untreated	0	84 556
			ATT	0.013	0.012	**0.002**	(0.03)	Treated	27	639
4	Layoff_{6m}	Hours loss	Unmatched	-0.142	0.010	-0.152***	(0.053)	Untreated	0	680
			ATT	-0.133	0.000	**-0.133** **	(0.063)	Treated	30	226
5	Layoff_{recall}	Hours loss	Unmatched	-0.035	0.010	-0.044	(0.058)	Untreated	0	680
			ATT	-0.024	0.043	**-0.068**	(0.071)	Treated	32	193
6	Layoff_{6m}	Layoff_{recall}	Unmatched	-0.142	-0.039	-0.103	(0.066)	Untreated	0	228
			ATT	-0.129	0.002	**-0.131**	(0.083)	Treated	45	211

Standard errors in parentheses, s.e. = *** p<0.01, ** p<0.05, * p<0.1.

[a] Yearly change in weekly household spending at supermarkets, grocery stores, meat markets, produce stands, bakeries, restaurants, fast food places, cafeterias and vending machines, etc.

[b] Mahalanobis distance matching on propensity score of the treated, propensity score of the controls, sex and a dummy for 2006, as described in section 1.3.2. The multinomial logit estimates of the propensity scores is shown in table A.3 of the appendix.

[c] Note, 3 495 Employed observations, 19 Hours loss observations, 6 Layoff_{recall} observations and 2 Layoff_{6m} observations were initially excluded to ensure common support on all propensity scores.

Full sample includes private for profit or government workers employed full time last year and are now either still employed in similar conditions, worked less than 35 hours last week for business-related reasons or are on on temporary layoff.

TABLE 1.5: Impact of various shocks on various subsets of observations and subsets of food purchases

	Least squares								
Dep. var : **Δlog food expend.**[a]	**total**							**excl. food away**	**only food away**
Sample :	All	All + inc. change	One job	Single earner	Private sector	Male	Female	All	All
	1	2	3	4	5	6	7	8	9
Discouraged[b]	-0.354***	-0.360**	-0.370***	-0.444**	-0.346***	-0.470***	-0.193	-0.336***	-0.402
	(0.103)	(0.135)	(0.106)	(0.178)	(0.109)	(0.100)	(0.136)	(0.104)	(0.315)
Layoff_{perm}[c]	-0.148***	-0.131***	-0.154***	-0.148***	-0.141***	-0.169***	-0.070	-0.105***	-0.305***
	(0.034)	(0.034)	(0.037)	(0.046)	(0.033)	(0.035)	(0.052)	(0.036)	(0.065)
Layoff_{6m}[d]	-0.133***	-0.140***	-0.145***	-0.213**	-0.140***	-0.132***	-0.129	-0.062	-0.089
	(0.042)	(0.042)	(0.044)	(0.080)	(0.040)	(0.045)	(0.115)	(0.051)	(0.065)
Layoff_{recall}[e]	-0.042	-0.047	-0.073	-0.075	-0.048	-0.028	-0.069	-0.036	-0.168
	(0.059)	(0.058)	(0.056)	(0.072)	(0.061)	(0.066)	(0.084)	(0.057)	(0.112)
Hours loss[f]	0.027	0.047*	0.017	-0.004	0.050*	0.014	-0.004	0.037	-0.094
	(0.025)	(0.026)	(0.024)	(0.043)	(0.027)	(0.028)	(0.048)	(0.027)	(0.067)
Overtime	0.041***	0.037***	0.038***	0.040***	0.039***	0.046***	0.024**	0.023***	0.033***
	(0.007)	(0.007)	(0.007)	(0.014)	(0.007)	(0.006)	(0.011)	(0.008)	(0.011)
Yearly income change		0.015***							
(# of category changes)		(0.002)							
Controls[h]	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	68 972	64 486	65 075	29 563	54 653	49 174	36 458	64 449	47 026
R^2	0.017	0.018	0.016	0.026	0.017	0.016	0.016	0.016	0.007

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

[a]Yearly change in weekly household spending at supermarkets, grocery stores, meat markets, produce stands, bakeries, restaurants, fast food places, cafeterias and vending machines, etc.

[b]Not in the labor force, discouraged.

[c]Unemployed after losing job, looking for a new job.

[d]On layoff, employer has given indication that the worker will be recalled within six months.

[e]On layoff, employer has given a return date.

[f]Worked < 35 hours last week because of slack work/business conditions

[h]Include sex, age, age^2 white, black, 14 sector dummies, 11 occupation dummies, household size level and yearly change, household children number and yearly change, college education, year×region dummies, house owner dummy, year×state level unemployment rate, lagged family income dummie and yearly change in income category.

Full sample includes private for profit or government workers employed full time last year and are now either still employed in similar conditions, worked less than 35 hours last week for business-related reasons, are on temporary or permanent layoff or have left the laborforce because they are discouraged.

TABLE 1.6: Impact of job loss and insurance

Dep. var : Δlog food expend.	1	2	3	4	5
Lost job[b]	-0.131**				
	(0.047)				
Lost job & found new job		-0.074	-0.074	-0.074	-0.074
		(0.062)	(0.062)	(0.062)	(0.062)
Lost job & still not working		-0.204***	-0.219*	-0.119	-0.141
		(0.058)	(0.122)	(0.125)	(0.149)
No UI[c]			0.000	-0.102	-0.091
			(0.202)	(0.208)	(0.223)
Expired UI				-0.397**	-0.402**
				(0.166)	(0.162)
Months since job loss / layoff					0.006
					(0.015)
Lost health insurance[d]			0.034	0.042	0.046
			(0.178)	(0.167)	(0.167)
Layoff_{6m}[e]	-0.156*	-0.156*	-0.156*	-0.156*	-0.168*
	(0.086)	(0.086)	(0.086)	(0.086)	(0.095)
Layoff_{recall}[f]	-0.140	-0.140	-0.140	-0.140	-0.147
	(0.086)	(0.086)	(0.086)	(0.086)	(0.093)
Hours loss	0.019	0.018	0.018	0.018	0.018
	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)
Overtime	0.030**	0.030**	0.030**	0.030**	0.030**
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Controls	Y	Y	Y	Y	Y
Observations	24 388	24 388	24 388	24 388	24 388
R^2	0.015	0.016	0.016	0.016	0.016

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

[b]During the last years, lost or left a job because of : plant or company closed. (Also not presently on temporary layoff.)

[c]Was not eligible for unemployment insurance after losing the job.

[e]Months since job loss or layoff

[f]Had health insurance at old job and not anymore

Includes private for profit or government workers employed full time on a single job last year and are now either still employed in similar conditions, worked less than 35 hours last week for business-related reasons, lost their job permanently during the last 12 months. The sample size is small due to data availaility. It excludes observations from 2000, 2002, 2004, 2006, 2008, 2010, as well as rotation groups exiting the survey after December.

TABLE 1.7: Income elasticities

Dep. var :	Least squares					
Δlog food expend.[a]	1	2	3	4	5	6
Δlog weekly earnings[b]	0.040***					
	(0.009)					
Δlog weekly earnings$_+$		0.057***				
		(0.012)				
Δlog weekly earnings$_-$		0.024*				
		(0.013)				
Δlog wage			0.079***			
			(0.025)			
Δlog wage$_+$				0.090**		
				(0.038)		
Δlog wage$_-$				0.067*		
				(0.038)		
Δlog last year income[c]					0.065***	
					(0.008)	
Δlog last year income$_+$						0.073***
						(0.011)
Δlog last year income$_-$						0.058***
						(0.011)
Controls[d]	Y	Y	Y	Y	Y	Y
Observations	17 264	17 264	8 039	8 039	64 486	64 486
R^2	0.023	0.023	0.032	0.032	0.018	0.018

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

[a]Yearly change in weekly household spending at supermarkets, grocery stores, meat markets, produce stands, bakeries, restaurants, fast food places, cafeterias and vending machines, etc.

[b]Last week's earnings

[c] Household's total income over the last twelve months

[d]Include sex, age, age^2 white, black, 14 sector dummies, 11 occupation dummies, household size level and yearly change, household children number and yearly change, college education, year×region dummies, house owner dummy, year×state level unemployment rate, lagged family income dummie and yearly change in income category. Note that it also includes dummies for hour loss and overtime. Columns 5 and 6 also include dummies for discouraged workers, permanent or temporary layoffs.

Full sample includes private for profit or government workers employed full time on a single job last year and are now either still employed in similar conditions, worked less than 35 hours last week for business-related reasons, are on temporary or permanent layoff or have left the laborforce because they are discouraged.

TABLE 1.8: Impact of hours cuts and temporary layoffs on yearly income

Dependent var.	Least squares
Δlog hh income.[a]	1
$\text{Layoff}_{perm}{}^{b}$	-0.258***
	(0.034)
$\text{Layoff}_{6m}{}^{c}$	-0.157***
	(0.029)
$\text{Layoff}_{recall}{}^{d}$	-0.115***
	(0.020)
Hours loss[e]	-0.102***
	(0.017)
Controls[f]	Y
Observations	102 569
R^2	0.187

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

[a]Yearly change of log household income, based on the center of 16 categories

[b]Unemployed after losing job, looking for a new job.

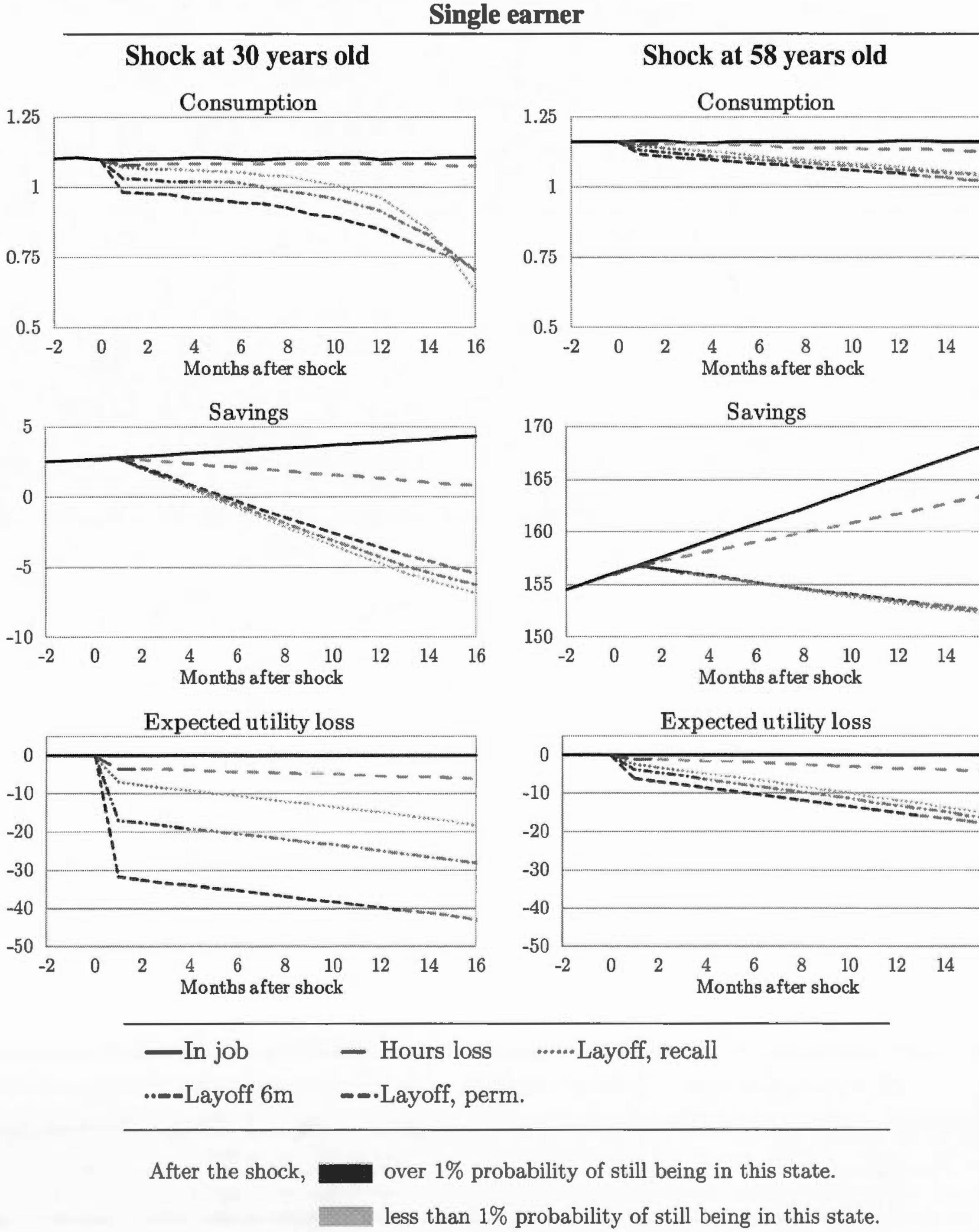
[c]On layoff, employer has given indication that the worker will be recalled within six months.

[d]On layoff, employer has given a return date.

[e]Worked < 35 hours last week because of slack work/business conditions

[f]Include sex, age, age^2 white, black, 14 sector dummies, 11 occupation dummies, household size level and yearly change, household children number and yearly change, college education, year×region dummies, house owner dummy, year×state level unemployment rate, lagged family income dummie and yearly change in income category.

Full sample includes private for profit or government workers employed full time last year and are now either still employed in similar conditions, worked less than 35 hours last week for business-related reasons or are on on temporary layoff.



Note : In all cases, individual has never experienced a wage decrease. Consumption and savings are in real terms.

FIGURE 1.1: Typical path of consumption, savings and expected utility loss after a shock

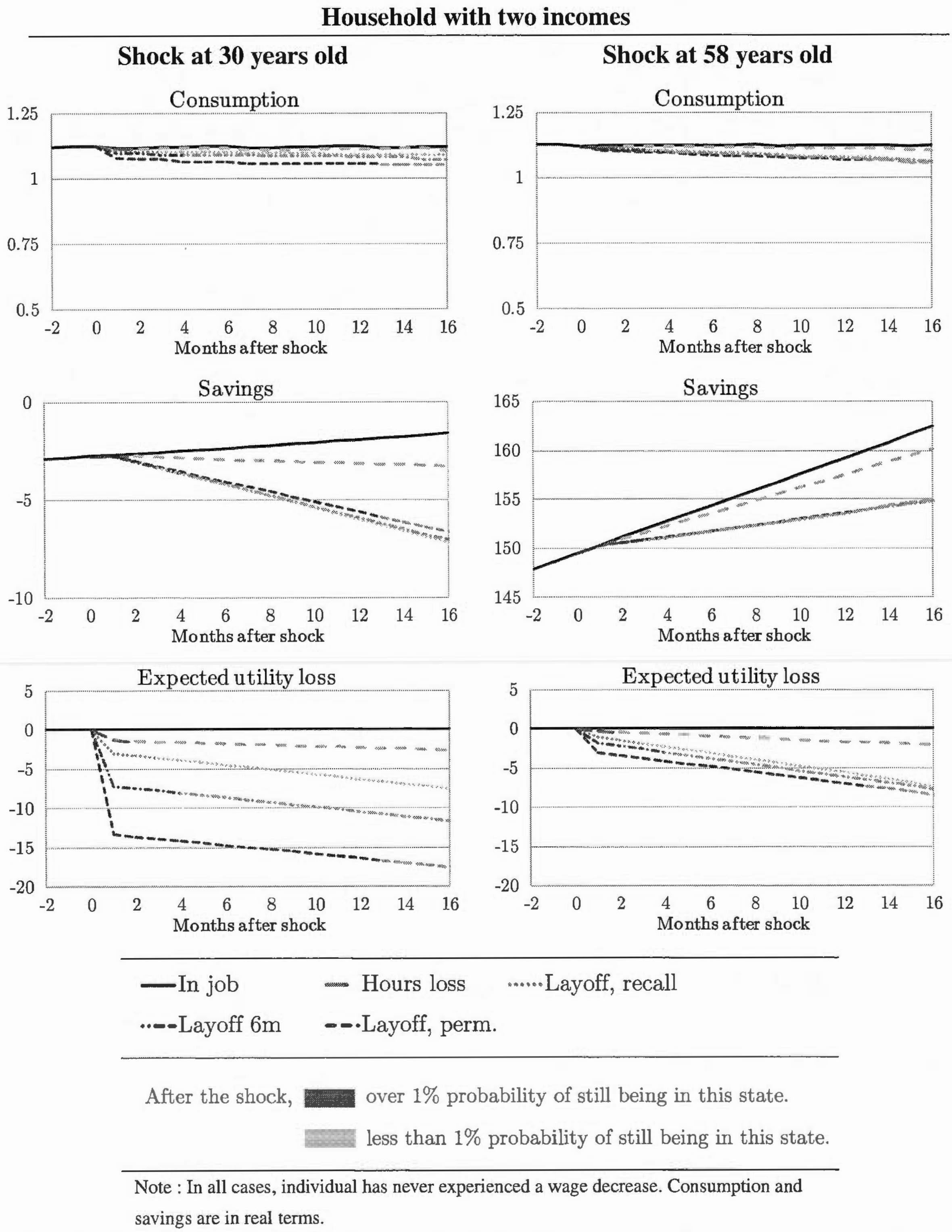


FIGURE 1.2: Typical path of consumption, savings and expected utility loss after a shock

TABLE 1.9: Model simulation

Dep. var : Δlog food expend.	Simulation			Full sample[b]			Mobil.
	1	2	3	4	5	6[c]	7
$\text{Layoff}_{\text{perm.}}$ or Job loss[a]	-0.190	-0.148	-0.190	-0.158*** (0.037) [.390]	-0.136** (0.051) [.829]	-0.161*** (0.037) [.434]	-0.203*** (0.052) [.818]
$\text{Layoff}_{\text{6m}}$	-0.137	-0.119	-0.137	-0.151*** (0.044) [.759]	-0.141*** (0.044) [.618]	-0.148*** (0.045) [.802]	-0.128 (0.078) [.913]
$\text{Layoff}_{\text{recall}}$	-0.098	-0.082	-0.098	-0.077 (0.057) [.722]	-0.071 (0.055) [.846]	-0.079 (0.056) [.743]	-0.093 (0.084) [.953]
Hours loss	-0.019	-0.019	-0.019	0.013 (0.024) [.191]	0.013 (0.024) [.191]	0.013 (0.025) [.210]	-0.013 (0.031) [.846]
Months since job loss or layoff		-0.012			-0.005 (0.008) [.411]		
lag $\text{Layoff}_{\text{perm.}}$			0.130			0.094** (0.037) [.336]	
lag $\text{Layoff}_{\text{6m}}$			0.107			0.043 (0.057) [.271]	
lag $\text{Layoff}_{\text{recall}}$			0.083			0.011 (0.056) [.199]	
lag Hours loss			0.012			0.008 (0.027) [.888]	
Controls				Y	Y	Y	Y
Observations				65 040	65 040	69 795	24 388
R^2				0.016	0.016	0.016	0.016
$\Pr > F\,(\vec{\hat{\beta}} = \vec{\beta}_{\text{sim}})$				[.514]	[.514]	[.581]	[.996]

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. $\Pr > F\,(\hat{\beta} = \beta_{\text{sim}})$ in brackets.

[a]In the full sample, this variable is $\text{Layoff}_{\text{perm}}$: unemployed after losing job, looking for a new job. In the Supplement sample, it is Job loss : lost or left a job because of : plant or company closed or moved.

[b]Includes private for profit or gov. workers employed full time on a single job last year and are now either still employed in similar conditions, worked less than 35 hrs last week for business-related reasons, lost their job permanently in the last 12 months.

[c]Also includes private for profit or government workers employed full time on a single job <u>now</u> and were <u>last year</u> either employed in similar conditions, or worked less than 35 hours last week for business-related reasons, wore on layoff or lost their job permanently during the last 12 months.

TABLE 1.10: Policy experiments

Dep. var : Δlog expend.	Bench.[b] (U.I. = 0.3)	Policy experiments U.I. = 0.25	U.I. = 0.35	U.I. = 0.05	U.I. for Hours loss	Wage × 1.01
	1	2	3	4	5	6
Average impact on cons.						
$\text{Layoff}_{\text{perm.}}$	-0.190	-0.203	-0.177	-0.258	-0.190	-0.190
Layoff_{6m}	-0.137	-0.144	-0.127	-0.174	-0.137	-0.137
$\text{Layoff}_{\text{recall}}$	-0.098	-0.104	-0.089	-0.122	-0.098	-0.097
Hours loss	-0.019	-0.018	-0.019	-0.017	-0.016	-0.019
Values[a]			Single earner			
V(Emp.)	226.77	226.59	226.89	224.57	226.77	228.63
$V(\text{Layoff}_{\text{perm.}}) - V(\text{Emp.})$	-20.69	-21.36	-20.23	-41.76	-20.69	-20.49
$V(\text{Layoff}_{6m}) - V(\text{Emp.})$	-10.96	-11.29	-10.72	-21.54	-10.96	-10.85
$V(\text{Layoff}_{\text{recall}}) - V(\text{Emp.})$	-4.64	-4.83	-4.49	-10.61	-4.63	-4.59
V(Hours loss) − V(Emp.)	-2.04	-2.06	-2.02	-2.72	-1.99	-2.02
			Earners with spouse earner			
V(Employed)	232.78	232.78	232.78	232.77	232.78	234.58
$V(\text{Layoff}_{\text{perm.}}) - V(\text{Emp.})$	-8.14	-8.21	-8.07	-8.49	-8.14	-8.05
$V(\text{Layoff}_{6m}) - V(\text{Emp.})$	-4.31	-4.35	-4.27	-4.53	-4.31	-4.27
$V(\text{Layoff}_{\text{recall}}) - V(\text{Emp.})$	-1.82	-1.85	-1.79	-1.97	-1.82	-1.8
V(Hours loss) − V(Emp.)	-0.82	-0.82	-0.82	-0.83	-0.8	-0.81

[a]Values are for a 30 years old worker who has always been employed before.

[b]Benchmark parameters are monthly $\beta = .99573$, interest rates $r = 0.004$, inflation rate $i = .0021$ and limit to debt service is 8% of current income. Probability of transition between states $p(S_{t+1} = s \mid S_t)$ are described in table 1.1, fractions of current income for each state are $\phi = (1;\ 0.7919;\ 0.3;\ 0.3;\ 0.3)$ and probabilities of changing job when going back to work are $\psi = (0;\ 0.069;\ 0.075;\ 0.452, 1)$.

Chapitre 2

Employment protection and Work Hours Variability

Abstract

I model a firm's input choice between workers and hours following output demand variations. Hiring and firing costs generate variability in work time. I also study the impact of limits to work hours reductions which, in interaction with employment protection, can shed some light on stylized differences between North American and European labor markets.

To test these mechanisms empirically, I use two predictions from the model : (i) Labor adjustment costs increase work hour variability, especially in sectors with high layoff rates ; (ii) A temporary rise in labor requirements increases demand for work hours, especially when workforce adjustment is costly. These predictions are tested on Canadian data, making use of the differences in individual and collective advance notice requirements between Canadian provinces. Unobserved province characteristics are controlled for. Both predictions are verified for individual notice requirements. Additional notice requirements for mass layoffs have no significant impact.

2.1 Introduction

Hiring and firing workers is an essential margin of adjustment for firms facing ever-changing market conditions. But for workers, a layoff often entails short-run and long-run income losses, as well as psychological and emotional consequences. As a response, Western countries have adopted employment protection legislation (EPL) such as severance payments, advance notice requirements and legal oversight of dismissal processes. The theoretical and empirical literature has shown that by limiting the freedom to dismiss employees, EPL reduces labor market fluidity (OECD Employment Outlook 2004), and affect a firm's ability to adjust output to changing economic conditions. For workers, EPL should ceteris paribus benefit employees holding a permanent contract (insiders) by reducing their risk of being fired, but make permanent contracts harder to obtain for workers on temporary contracts or unemployed (outsiders). But hiring and firing is not the only margin of adjustment for firms. Managers can also adjust output through capital or through changes in working hours or work intensity. If so, the stringency of EPL for firms could be overstated. Also, EPL could have adverse indirect consequences for employed workers, such as less stable work schedules and more overtime shifts with psychological and physical health consequences. [1] To show how EPL can increase the variability of work hours, this paper proposes a simple theoretical model and tests empirically two of its predictions.

First, a firm's labor adjustment problem is considered in the presence of hiring and firing costs. Adjustments can occur through the extensive margin, i.e. the number of workers, or the intensive margin, i.e. hours per worker. With minimal assumptions, I show that regardless of the process governing price changes or adjustment costs, as soon as the firm cannot adjust freely its workforce, it will compensate by changing work hours. To illustrate this mechanism dynamically, the product market varies only between a high and a low demand level, as in Bertola (1990) (and contrary to previous literature [2]). This stochastic process allows for closed-form solutions and general functional forms. Within the same setting, I also consider limits to hour reductions, a feature more akin to labor markets in North America and some European countries. Combined

1. A recent meta-analysis on the impact of overtime work on health points to "poorer perceived general health, increased injury rates, more illnesses, or increased mortality", among others. Also, see, Wasmer (2006a) for a thorough investigation of the link between EPL and stress at work.

2. Nickell (1978) is the first to explore a firm's choice of workers, hours and capital with a fluctuating demand and dynamic costs to adjustment, assuming perfect foresight. This assumption is criticized by Chen and Funke (2004) who stress the importance of uncertainty and draw upon real options literature for a more realistic model. The realism of their assumptions allows for several meaningful results, such as a description of a range of prices where only hours are adjusted, a consequence of linear labor adjustment costs.

with EPL, limits on hour reduction help to understand key stylized facts regarding turnover and average working hours of different labor markets.

From the model, I also derive two stylized predictions : (i) Labor adjustment costs increase the variability of work hours, especially in sectors with high layoff rates ; (ii) A temporary rise in labor requirements increases demand for work hours, especially when workforce adjustment is costly. These predictions serve as identification strategies in the empirical part of the paper.

The link between employment protection and work hours variability has been scarcely empirically studied.[3] In the macroeconomics literature, Abraham and Houseman (1995) find that the speed of employment adjustment following output variations is slower in France, Belgium and Germany than in the United States, but they cannot measure any difference for hour adjustments. Merkl and Wesselbaum (2009) compare the relative importance of the extensive and intensive margins in German and American labor markets and do not find significant differences.

In contrast, the present empirical analysis is based on micro data within a single country, Canada. Using information on employment and paid overtime from the Canadian Labor Force Survey, I test whether advance notice requirements affect the demand for paid overtime work. Notice requirements are an important part of employment protection legislation and vary measurably between Canadian provinces in two dimensions : one, notice for individual dismissal and two, additional notice in case of collective dismissal. In the spirit of difference in differences techniques, I compare the impact of EPL on various subsamples of workers, using strategies devised from the model's predictions. This allows to include province dummies controlling for unobserved province differences in the use of overtime work and their willingness to regulate labor contracts. In the first strategy, EPL is interacted with the average layoff rate specific to each activity sector, since employment protection should be more binding for firms who need to lay off workers more frequently. In the second strategy, EPL is interacted with employment rate variations. The effect of this interaction term should be positive since the impact of EPL impact on overtime work should not be uniform over time. Rather, EPL increases the need for overtime work when labor demand is high and may

3. The most recent macroeconomics literature on work hours has documented the significant decrease in average working hours in several European countries compared to America, but few papers have looked at hour variations over time.

decrease it when labor demand is low. In other words, labor adjustment costs should amplify the correlation between labor demand and overtime hours. A third approach exploits the fact that collective notice depends on the number of workers laid off, thus indirectly on firm size, allowing for the comparison of firms of different size within provinces.

The results generally confirm the link between employment protection and the variability of work hours. Individual notice requirements have a positive and statistically significant impact on overtime work through their interaction with layoff rates and employment rate variations. Collective notice requirements have no significant impact on overtime. After briefly discussing the magnitude of the coefficients, I present robustness checks and regressions on subgroups of workers.

The rest of the paper is as follows : section 2.2 presents the model, section 2.3 exposes the empirical analysis and section 2.4 concludes.

2.2 A model of labor force and work time adjustment under uncertainty

The model follows Nickel (1978) in its adjustment process and wage function. I introduce uncertainty by allowing two price levels, following Bertola (1990). Contrary Bertola (1990), however, I allow the hourly wage rate to increase with with work hours.

2.2.1 Structure of the model

The static model

Labor n and hours h are perfect substitutes in the production function

$$y = y(nh)$$

with $y(nh)$ continuous, $y' > 0$ and $y'' < 0$ embodying decreasing returns to scale. The labor cost is

$$C = nw(h)$$

with $w(h)$ continuous, $w(0) > 0$, $w' > 0$ and $w'' > 0$. Here, h represents the average number of *effective* hours worked in the firm and $w'' > 0$ means that for a given number of employees, longer average hours increase the portion of employees who will work for an overtime pay. A similar wage function is used by Nickell (1978). This approach differs from the traditional kinked wage function with every hour under a threshold paid at normal rate and a premium paid for every overtime hour. Appendix B.1.2 provides three microeconomic justifications for this choice. I also assume an endless supply of workers willing to work for the given wage contract $w(h)$.

The firm is a price taker on the product market. The instantaneous profits are

$$\Pi = py(nh) - nw(h). \tag{2.1}$$

In the benchmark case, work hours can be adjusted at will without cost. I also explore the case where hours cannot be set lower than a floor $h_{\min}$, which is probably a more appropriate model for the North American labor market. Note that assuming market power would accentuate the decreasing value of labor (nh), but would not qualitatively affect the tradeoff between workers and hours.

Static solution

The first order conditions are for hours :

$$npy'(nh) = nw'(h) \tag{2.2}$$

and for labor :

$$hpy'(nh) = w(h) \tag{2.3}$$

A simple substitution of 2.3 in 2.2 shows that in this static setting, hours per worker would be independent of the price level, labor or output. It is a realistic result given the lack of correlation between firm size and average work hours per worker :

$$hw'(h) = w(h) \tag{2.4}$$

Differentiating equation 2.2 shows how $\frac{dn}{dp}$ is positive. Since a price increase increases the marginal value of labor, the firm wants to employ more workers :

$$\frac{dn}{dp} = \frac{y'(nh)}{-py''(nh)h} > 0 \tag{2.5}$$

Before considering any dynamics, it is already possible to consider what would happen to work hours if the firm was prevented to fully adjust its workforce following a price change. To see this, instead of the full adjustment $\frac{dn}{dp}$ of equation 2.5, we can assume that the firm only adjusts partially a fraction $1-\alpha$ of its full desired adjustment : $(1-\alpha)\frac{y'(nh)}{-py''(nh)h}$, with $0 \leq \alpha \leq 1$. Taking the total derivative of 2.2 and substituting $\frac{dn}{dp} = (1-\alpha)\frac{y'(nh)}{-py''(nh)h}$, we get :

$$\frac{dh}{dp} = \frac{py''(nh)h\frac{dn}{dp} + y'(nh)}{w''(h) - py''(nh)n}$$

$$\frac{dh}{dp} = \frac{\alpha y'(nh)}{w''(h) - py''(nh)n} > 0 \tag{2.6}$$

Hence, following a price increase, the if the firm does not increase its labor force optimally, it will compensate by also increasing hours per workers. This result applies to any dynamic setup and any type of labor adjustment cost. With this result in mind, the goal of the next section is to illustrate this result in a simple dynamic setting with general functional forms for adjustment costs.

Demand fluctuation

The demand for the firm's output, as reflected by its sales price, varies between a high price $\overline{p}$ and a low price $\underline{p}$ following a Markov process. There is a probability $\overline{q}$ of switching from $\overline{p}$ to $\underline{p}$ and probability $\underline{q}$ of switching from $\underline{p}$ to $\overline{p}$. This high and low bar notation designating a variable when prices are high ($\overline{p}$) or low ($\underline{p}$) will be kept throughout the model for notation consistency.

2.2.1.1 Labor adjustment costs

The model considers infinitely lived firms over continuous time. In period t, the firm inherits workers from an instant ago n_{t-dt} and gets a price $p_t \in \{\overline{p}, \underline{p}\}$. The firm is free to adjust its labor force by $\Delta n_t = n_t - n_{t-dt}$. Adjustment costs are allowed to be asymetrical and have general functional forms. Hiring costs are denoted c_h and the firing costs is denoted c_f. Consider a change in the workforce Δn, have the following :

- If $\Delta n \geq 0$:
  - $c_h(\Delta n) \geq 0$, $c'_h(\Delta n) > 0$

  - $c_f = 0$
- If $\Delta n \leq 0$
  - $c_f(\Delta n) \geq 0$, $c'_f(\Delta n) < 0$
  - $c_h = 0$

We can therefore express adjustment costs as $c_A(\Delta n) = c_h(\Delta n) + c_f(\Delta n)$. Both c_h and c_f are twice differentiable.

The shape of these costs will determine the amount and speed of adjustment (see Durlauf and Blume (2008) for a review of the most common adjustment costs used in macroeconomics). Two cases are possible : gradual adjustment, typically the result of convex adjustment costs, or instantaneous adjustment, a corner solution that generally results from weakly concave adjustment costs or from the presence of fixed adjustment costs.

With only two price levels, if the firm adjusts instantly after a price shock there will also be only two level of workers, and hours. For its simplicity, the derivations showed later will consider this case.

In the presence of convex costs however, the firm can instead prefer to delay labor adjustment over time. Appart from specific cases [4], gradual labor adjustment would have to be solved through numerical simulations. Note that the results of section 2.2.1 will always guarantee that following a price shock, the more a firm delays labor adjustment, the more it will compensate by temporarily adjusting hours in the direction of the price change.

2.2.1.2 The dynamic optimization problem

In terms of Bellman equation, the value of the firm $V_t(p_t, n_{t-dt})$ is its instantaneous profits over the instant dt, $\Pi(p_t, n_t)\,dt$, minus the labor adjustment costs, $c_A(\Delta n_t)$ plus its expected future value $V_{t+dt}(p_{t+dt}, n_t)$, discounted by the interest rate r. In time $t + dt$, if $p_t = \overline{p}$, there is a probability $\overline{q}$ that it will have changed to $\underline{p}$, while conversly, if $p_t = \underline{p}$, there is a probability $\underline{q}$ that it will have changed to $\overline{p}$. The values of the firm for each price level can thus be expressed for $\overline{p}$ and $\underline{p}$ as :

4. With gradual labor adjustment, analytical results are possible for the steady state values of labor and hours when $p = \overline{p}$ if firing costs are linear, or when $p = \overline{p}$ if hiring costs are linear.

$$V_t(\overline{p}, n_{t-dt}) = \Pi(\overline{p}, n_t)\,dt - c_A(\Delta n_t) + \frac{1}{1+r}\left\{\overline{q}V_{t+dt}(\underline{p}, n_t) + (1-\overline{q})V_{t+dt}(\overline{p}, n_t)\right\} \tag{2.7}$$

$$V_t(\underline{p}, n_{t-dt}) = \Pi(\underline{p}, n_t)\,dt - c_A(\Delta n_t) + \frac{1}{1+r}\left\{\overline{q}V_{t+dt}(\overline{p}, n_t) + (1-\overline{q})V_{t+dt}(\underline{p}, n_t)\right\} \tag{2.8}$$

For simplicity, there is no workers quit, the hiring process is instantaneous and I ignore alternative means of output smoothing, such as shift work or inventory adjustments. The full derivation of the model is shown in technical appendix B.1.1.

2.2.2 Benchmark results

To summarize the results, I present graphically the firm's decisions for various values of linear firing costs. Appendix B.1.1 shows that if these adjustment costs are neither too concave or too convex, these results hold for any functional form meeting the assumptions described in section 2.2.1.1.

Figure 2.1 (on the left) shows the benchmark case of the firm's choice of labor force, hours and output for both price levels, $\overline{p}$ and $\underline{p}$, as a function of firing costs. For clarity, there are no hiring costs ($c_h = 0$) and firing costs are linear ($c_f'' = 0$). Plain lines are the benchmark model while dotted lines show the firm's actions if hours were fixed.

We first consider the dotted lines. Looking at the labor force adjustments, as seen on the upper graph of figure 2.1, when firing costs are zero ($c_f = 0$), the firm can freely choose its optimal labor force, hiring when prices go up and firing when prices go down. But for positive values of firing costs c_f, the firm starts to limit firing, but also hiring, to avoid turnover costs. At point A, firing workers is simply too expensive and the work force is kept constant regardless of the price level. Looking at the bottom panel of figure 2.1, we see that output varies most at $c_f = 0$ when labor varies most, and remains fixed at point since labor is fixed and hours are not allowed to vary.

Now let's consider plain lines showing the same firm's decisions if both workers and hours per workers are allowed to vary. Looking at the middle panel, we see that at $c_f = 0$, since no adjustment cost prevents the use of the workers at their marginal instantaneous value, hours are kept steady at their optimal level. This is simply a special case of equations 2.4's result. For positive c_f, since the firm does not want to adjust its workforce fully, it will compensate by adjusting hours as well, using longer work hours when prices go up and shorter hours when prices go down. Again, this is a special case of the general result showed by equation 2.6. Since the productive loss from not adjusting the workforce is now mitigated by the capacity to adjust hours, the point where workers are kept constant, point B, occurs for a smaller value of c_f than point A. As for the impact of hours adjustment on the firm output, it is initially ambiguous. But close to point A where the number of workers is always fixed, the flexibility of hours allow for output to remain more flexible as well.

The general results derived in appendix B.1.1 can be summarized as follows :

- Firing costs :
  - Increase the variation of work hours
  - Decrease the variation of the number of workers and the variation in firm output
- The probabilities of shocks $\overline{q}$ and $\underline{q}$ and the interest rate r :
  - Reduce workers turnover an increase hours adjustment.
  - Magnify the impact of adjustment costs on hours.

As discussed by Bertola (1990), the effect of adjustment costs on average employment is ambiguous and depends on the functional forms of the production function. The effect on average hours is also ambiguous. The previously discussed effects apply to a firm that undergoes labor adjustment.

If adjustment costs are too large, price fluctuations too small or shocks too frequent, labor force will be kept constant (past point A or B of figure 2.1). All output adjustment comes through hours and additional adjustment costs obviously have no impact neither workers nor hours.

2.2.3 Hours regulations : minimum hours

The assumption of freely adjustable work hours is probably a strong one. As pointed out by Huberman and Lacroix (1996), temporary work hours reductions are more common in certain European countries than North America. While European workers generally agree to hours reductions since they help to stabilize employment, American labor unions since the 1930's have viewed them as arbitrary concessions asked from

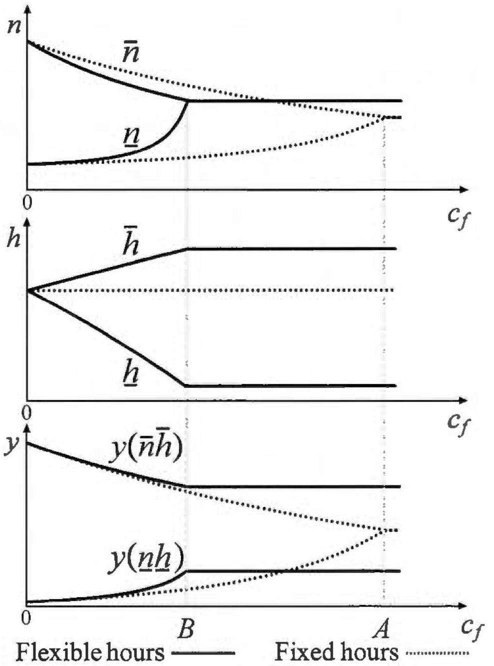


FIGURE 2.1: Labor, hours and output as a function of firing costs c_f, with fixed or flexible work hours.

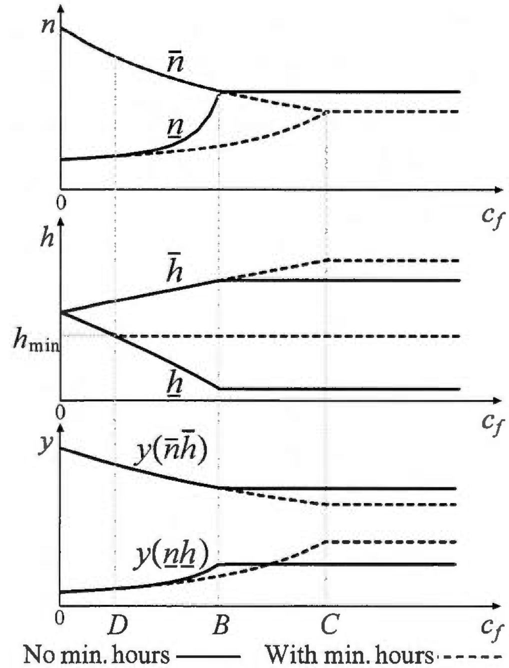


FIGURE 2.2: Labor, hours and output as a function of firing costs c_f, with flexible work hours or with minimum hours.

Note : The functional forms are $y(nh) = (nh)^{\alpha}$ and $w(h) = w_{\min} + wh^{\gamma}$. The parameters are $\gamma = 1.5$, $\alpha = 0.8$, $c_h = 0$, $c_f \in [0,7]$, $\overline{q} = \underline{q} = r = 0.1$, $w_{\min} = w = 1$.

workers. As North-American collective agreements progressively included guaranties of minimum hours, tenure has become the accepted path to job security while work-sharing agreements and collective hours reductions have remained mostly out of favor.

Since the following empirical section uses Canadian data where hour reductions are uncommon, it is advisable to verify that the model's results hold even when the firm's ability to reduce work hours is hindered. The derivations of the firm's reaction in the presence of a floor on work hours are presented in Appendix B.1.1.4.

To illustrate the main findings, figure 2.2 shows in dashed lines how a floor to hours affect the firm's decisions, using otherwise the same functional forms and the same parameters as the benchmark case with free hours adjustments. On the central panel of the figure, we see that for firing costs c_f superior to point D, the minimum hours requirements become binding when the price is $\underline{p}$. The firm has to keep work hours longer than it would like. To compensate for this excess output per worker, the number employees $\underline{n}$ is reduced more than the benchmark case. Until point B, this floor on hours did not impact $\overline{n}$ and $\overline{h}$, but for c_f superior to B, it causes the firm to keep less workers working longer, even when the price is $\overline{p}$. To sum up, the price floor

- forces the firm to keep more workers when the price is low and when the price is high (past point B) ;
- increases turnover rate (between points A and C) ;
- induces a shift toward longer hours, even when the price is high (past point B).

As shown in Appendix B.1.1.4, with general functional forms, these results are qualitatively the same as long as adjustment costs are not too convex or too concave.

In jurisdictions with minimum hours institutions, work hours should be longer on average and worker flows should be greater. We are easily reminded of the contrast between some European workers enjoying strong employment security, but accepting temporary reductions in weekly hours while their American counterpart enjoy a more dynamic labor market, but with longer and more stable hours.

Note that *maximum* hours regulations also exist in most jurisdictions. For example, the European Union member states introduced the Working Time Directive in 1993 that caps the work week at 48 hours. When binding, a limit on weekly hours forces a firm to compensate by hiring more workers and have them work shorter hours during low demand periods. It also forces the firm to rely more on staff adjustments. However, these effects should not be overstated since overtime work is already costly and never involves more than a fraction of the workforce.

2.2.4 Two testable predictions

The main claim of this paper is that employment protection should increase the variation of work hours. Although a simple cross section analysis would be of great value, confounding factors or the interplay of many different labor market institutions could cause spurious correlations. Instead, in the spirit of difference in differences strategies, I will address the risk of endogeneity by exploiting its different effect on different subsamples. Note that to compute the impact of employment protection, we will simply consider a change in a linear component of firing costs, designated L.[5]

5. Let us redefine the function $c_f(\Delta n) \equiv c_{f0}(\Delta n) + L \times \Delta n$, where L is a linear component of c_f that will be allowed to vary.

First prediction : Employment protection should increase hours variations more in sectors with higher layoff rates.

Pioneered by Rajan and Zingales (1998), the first mechanism exploits the different effect c_f should have on various activity sectors. If firms in a certain industry seldom fire workers, employment protection should have little impact on their overtime decision compared to others.

In terms of the model, consider the different impact c_f will have on a firm that fires workers compared to one that does not. The impact of firing costs on hours variations for a firm that fires workers is

$$\frac{d\left(\overline{h}-\underline{h}\right)}{dL}=\frac{\frac{\overline{q}}{\overline{h}w''\left(\overline{h}\right)}+\frac{\underline{q}+r}{\underline{h}w''\left(\underline{h}\right)}+\Gamma}{1+\Psi}$$

where Γ and Ψ are second order terms that should be small if the second order terms of adjustment costs are not too large.[6] The impact on a firm that does not fire workers is simply zero. Hence, sectors in which more firms lay off employees should see more variations in work time.[7]

Second prediction : Employment protection should increase the demand for hours, especially when demand for workers is high.

The second mechanism exploits the time dimension. As seen on figure 2.1, there is a positive comovement between employees and hours ($\overline{h}\geq\underline{h}$) and ($\overline{n}\geq\underline{n}$). Moreover, with low c_f, large variations in workers are accompanied by low variations in hours, while for larger c_f, hours variations get larger and employment variations get smaller. The 'effect' of employment on hours is $\frac{\Delta h}{\Delta n}=\frac{\overline{h}-\underline{h}}{\overline{n}-\underline{n}}$ and the impact of firing costs on this effect is

$$\frac{d}{dL}\left(\frac{\Delta h}{\Delta n}\right)=\frac{1}{\overline{n}-\underline{n}}\frac{d\left(\overline{h}-\underline{h}\right)}{dL}-\frac{\overline{h}-\underline{h}}{\left(\overline{n}-\underline{n}\right)^2}\frac{d\left(\overline{n}-\underline{n}\right)}{dL}$$

which should again be positive for reasonable curvatures of the adjustment costs functions. This mechanism is clearly illustrated by figure 2.1. Hours fluctuations are

6. $\Gamma=r\left(\underline{q}+\overline{q}+r\right)c_h''\left(\overline{n}-\underline{n}\right)\left[\frac{1}{\underline{h}w''\left(\underline{h}\right)}\frac{1}{\overline{h}^2}\left(\frac{\overline{n}}{w''\left(\overline{h}\right)}-\frac{1}{\overline{p}y''\left(\overline{n}\overline{h}\right)}\right)-\frac{1}{\overline{h}w''\left(\overline{h}\right)}\frac{1}{\underline{h}^2}\left(\frac{\underline{n}}{w''\left(\underline{h}\right)}-\frac{1}{\underline{p}y''\left(\underline{n}\underline{h}\right)}\right)\right]$ and $\Psi=\frac{1}{\overline{h}^2}\left(\frac{\overline{n}}{w''\left(\overline{h}\right)}-\frac{1}{\overline{p}y''\left(\overline{n}\overline{h}\right)}\right)\left[\left(\overline{q}+r\right)c_h''\left(\overline{n}-\underline{n}\right)+\overline{q}c_f''\left(\overline{n}-\underline{n}\right)\right]+\frac{1}{\underline{h}^2}\left(\frac{\underline{n}}{w''\left(\underline{h}\right)}-\frac{1}{\underline{p}y''\left(\underline{n}\underline{h}\right)}\right)\left[\underline{q}c_h''\left(\overline{n}-\underline{n}\right)+\left(\underline{q}+r\right)c_f''\left(\overline{n}-\underline{n}\right)\right]$

7. Note that the exact layoff rates and their variations can be due to various parameters such as price variations or shock probabilities and depend on the third derivatives of $y(nh)$, $w(h)$ and $c_f\left(\overline{n}-\underline{n}\right)$.

positively correlated to labor demand (since $\overline{n} \geq \underline{n}$ and $\overline{h} \geq \underline{h}$). But we can observe how c_h affects this correlation. When c_h is near zero, large fluctuations in labor demand are linked to tiny variations in hours, while near point B, small variations in labor demand are accompanied by large fluctuations in work hours.

2.3 Empirical section

In this section, I use Canadian employee level data to test whether employment protection increases work hours variations. Canada is a good context to test hypotheses related to employment protection because employment protection differs between provinces on an important dimension, advance notice requirements, that was exploited by several authors. [8] Also, Statistics Canada collects highly detailed labor market data that can be compared between provinces.

2.3.1 Dependant variable : Paid overtime

Since no firm-level data on work hours is available in Canada at sufficient frequency, hours data will be derived from the Canadian Labor Force Survey. Unfortunately, information from a single worker is not enough to deduce employment and hours variations of his employer since individual variations in hours, especially working fewer hours, often reflect personal choices like vacations or illness. What we need are variables specifically related to firm's labor needs. Luckily, the Labor Force Survey has one such item : paid overtime.

In most types of jobs, paid overtime specifically indicates a higher than normal demand for work. Overtime work signals that a firm would rather have a limited number of workers paid at a higher average wage rather than more workers paid at the regular wage. In other words, for the firm, the price of overtime is smaller than the price of extra workers. Of course, labor schedules of different sectors may be affected by other factors, but these should be common for the whole sector accros Canadian provinces and be accounted for by sector dummies. The precise question regarding paid overtime was introduced in 1997 with the wording : "Last week, how many hours of paid overtime did he/she work at this job ?" The definition of paid overtime is : "any hours

8. For example Friesen (2001) or Kuhn (1993).

worked during the reference week over and above standard or scheduled paid hours, for overtime pay or compensation (including time off in lieu)."

Almost 60% of employees worked no paid overtime in the reference week, while for those who did, the mode was eight hours. If the objective was to model the exact number of overtime hours, the best way to do so would be with a selection model. However, since the interest is the demand for overtime hours, not the exact number of hours for a particular individual, I collapse the problem in a binary response model : overtime work or no overtime work. If a firm needs more hours to complete the daily work, it can extend the overtime hours of a handful of workers, but it is also very likely to ask for a greater number of them to stay longer. This is especially true if their tasks are complementary. Note also that each province has laws imposing minimum rest periods, capping the amount of overtime available per employee. Although I consider this binary response model to be more adequate, I will also fit a linear model on the number of overtime hours as robustness check.

2.3.2 Empirical approach

Given that advanced notice requirements in Canada have not changed since the mid 1980's, the time dimension cannot be used as a source of variation for EPL. Thus, I propose three empirical strategies to measure the impact of employment protection on work hours that rely on the variation of EPL's effect on different subgroups of observations. They will rely on the two strategies derived from theory in section 2.2.4 and, for collective notice requirements, its impact that varies between provinces and firm size. The goal of these approaches is to allow for the inclusion of province fixed effects to addresses the problem of confounding factors or unobserved province characteristics both linked to employment protection and overtime work. In other words, it is possible that differing cultural attitudes of workers, labor unions and judicial decisions both affect the stringency of employment protection and the average work hours within a province. But it would be harder to argue that the different work hours between subgroups of workers would be linked to a province's legislative process other than by the causal relationship implied by the current model.

First strategy : Overtime should be used more often when employment protection is stringent, especially in sectors with a high layoff rate.

As detailed in the previous section, the first strategy assumes that employment protection should be especially stringent for sectors that rely heavily on layoffs, an approach pioneered by Rajan and Zingales (1998), and used ever since in many contexts. [9] In a difference in difference analogy, the high layoff sectors are the treatment group and the low layoff sectors are the control group. [10]

The latent propensity to work overtime can be expressed as

$$\begin{aligned}\text{Overtime}^*_{i,p,s} = \quad & \beta_1 \text{Ind. not.}_p \times \text{Layoff Rate}_s + \beta_2 \text{Coll. not.}_{pf} \times \text{Layoff Rate}_s \\ & + \beta_3 \text{Coll. not.}_{pf} + \gamma_1 \text{Empl. rate}_{ps} + \gamma_2 \text{Empl. dev.}_{pst} \\ & + \phi\,\mathbf{ind.\ controls}_i + FE_p + FE_t + FE_s + u_{ip}\end{aligned}$$

where $\text{Overtime}^*_{i,p,s}$ is the propensity for overtime work for individual i in province p working in sector s. [11] Ind. not._p is the average advance notice requirement for individual dismissal in province p, weighted by average layoff rate by tenure length., Coll. not._{pf} is the advance notification period for collective dismissals in province p for a firm of size f (note that since province×firm size dummies are not included, Coll. not._{pf} also has to be included on its own), Layoff Rate_s is the average "frictionless" layoff rate of activity sector s, Empl. rate_{ps} is the average employment rate for province p and sector s, Empl. dev._{pst} is the quarterly deviation at time t of the employment level of sector s in province p from its period average : Empl. dev._{pst} = Empl. rate_{pst} − Empl. Rate_{ps}, **ind controls**$_i$ is a vector of individual specific controls. FE_p, FE_t and FE_s are sets of province dummies, time dummies (11 year dummies and 4 quarter dummies) and of sector dummies. The error term is $u_{ip} = v_{ip} + \varepsilon_{ip}$, where v_{ip} is an error term that can be correlated within province p and the error term ε_{ip} is a idiosyncratic error term of individual i.

9. See for example Micco and Pagés (2006), Cingano et al. (2009) or Ciccone and Papaioannou (2006).

10. Some authors using this strategy simply split sectors into two groups : high layoff rates and low layoff rates sectors. Apart from avoiding the assumption of a linear relationship, the purpose of such a simplification is unclear. Interacting advance notice requirement with layoff rates is both more precise and less arbitrary.

11. Individuals can be in the sample more than once, but since the time dimension is irrelevant for the identification, it is not indicated for clarity's sake.

Second strategy : Employment protection should Increase the correlation between overtime variations and employment variations.

The model predicts that hours and the labor force used by a firm should both be correlated with the demand for its product. But note that if adjustment costs are small, the firm should adjust mostly with staff adjustments, while if firing costs are high it should adjust mostly using the intensive margin, work hours. Hence, this second identification strategy looks at second order effects.

The Labor Force Survey does not provide any information on the labor demand of the worker's employer. However, it is perfectly reasonable to expect demand for firms output to be correlated, say within a particular province and industrial sector. If so, the demand for workers should be correlated accordingly and have an impact on the aggregate labor market. Overtime hours should thus be positively correlated to aggregate employment levels. Since the goal is to identify temporary demand shocks, I use the quarterly deviation of the employment rate from its sample average.

The model evaluated becomes :

$$\text{Overtime}^*_{ipst} = \begin{array}{c} \beta_1 \text{Ind. not.}_p \times \text{Empl. dev.}_{pst} + \beta_2 \text{Coll. not.}_{pf} \times \text{Empl. dev.}_{pst} \\ +\beta_3 \text{Coll. not.}_{pf} + \gamma_1 \text{Empl. rate}_{ps} + \gamma_2 \text{Empl. dev.}_{pst} \\ +\phi \textbf{ind. controls}_i + FE_p + FE_t + FE_s + u_{ip}. \end{array}$$

Note that since the first and second strategies are not mutually exclusive, I also include them both in a single regression to see that the coefficients are stable.

Third Strategy : Comparing the impact of collective notice between provinces and firm sizes

Since collective notice requirements depend on the number of employees fired, this dimension can be used on its own to allow for province dummies as well. The model is

$$\text{Overtime}^*_{ipf} = \begin{array}{c} \beta_1 \text{Coll. not.}_{pf} + \gamma_1 \text{Empl. rate}_{ps} + \gamma_2 \text{Empl. dev.}_{pst} \\ +\phi \textbf{ind. controls}_i + FE_p + FE_t + FE_s + u_{ip}. \end{array}$$

Additional evidence : Cross province estimates

Finally, a simple cross-province model will be estimated to see whether employment protection increases average overtime. Of course, a causal interpretation would be much harder to make in this setting since province dummies cannot be included in this model. All that can be done is to control for them as much as possible. Specifically, Canadian provinces differ substantially in their laws on overtime per se. Among the most important ones, the overtime wage is 1.5 times the normal wage rate in seven provinces whereas in Newfoundland, Nova Scotia and New Brunswick, it is 1.5 times the minimum wage. Additionally, overtime starts after a 40 hours week in Newfoundland, Manitoba, Saskatchewan and British Columbia, after 44 hours in New Brunswick, Quebec, Ontario and Alberta and after 48 hours in Prince Edward Island and Nova Scotia. To control for these laws, I include in the regression the length of the standard work week, along with a dummy for Newfoundland, Nova Scotia and New Brunswick. More specific laws exist (see Friesen 2001 for more details). I also control for the province's GDP per capita. The cross province model is

$$\begin{aligned}\text{Overtime}^*_{ip} = \; & \beta_1 \text{Ind. not.}_p + \beta_2 \text{Coll. not.}_{pf} + \gamma_1 \text{Empl. rate}_{ps} + \gamma_2 \text{Empl. dev.}_{pst} \\ & + \phi \textbf{ind. controls}_i + \psi \textbf{prov. controls}_p + FE_t + FE_s + u_{ip}.\end{aligned}$$

2.3.3 Estimation

Cluster robust standard errors Since Moulton (1986), it is well known that the standard errors of institutional variables tend to be seriously downward biased when they are regressed on micro data. The standard procedure is to correct them by accounting for within-group correlation at the level of the variable of interest, which is the province level. Keeping in mind that Moulton's intragroup correlation corrected standard errors are quite restrictive in their assumptions, the cluster-robust formula introduced by Huber (1967), White (1980) and Liang and Zeger (1986) [12] are preferred for the benchmark estimates since they correct for more general forms of heteroscedasticity [13]. This also accounts for the autocorrelation within province over time, especially individual overtime decisions since households stay in the survey for several consecutive months.

12. The estimated covariance structure for N observations within J groups is

$$\widehat{Var\beta} = \frac{J}{J-1}\frac{N-1}{N-K}\left(\frac{1}{N}\sum_j X_j'X_j\right)^{-1}\left(\frac{1}{N}\sum_j X_j'\widehat{u}_j\widehat{u}_j'X_j\right)\left(\frac{1}{N}\sum_j X_j'X_j\right)^{-1}$$

13. See Hoxby 2005 for a discussion of the difference between the two cluster corrections.

Probit and two step estimation procedures To have uniform framework in which all the strategies can be included simultaneously, the empirical models will first be estimated by probit. Unfortunately, with few clusters and institutional variables that are fixed within cluster, there is still a risk that cluster-robust standard errors be biased, a serious concern with only ten provinces. With a fixed variable at the cluster level, the cluster-specific error term do not average out even as the within-cluster number of observations goes to infinity (see Donald and Lang, 2007 or Wooldridge, 2003). As advocated by the authors, a minimum distance approach will be implemented.

Note that the marginal effect of interacted variables can be misleading when part of a non-linear model like probit. To make marginal effects's interpretation more transparent, the first stage of these two step estimates will be modeled as a linear probability model. The detailed estimation procedure are described in appendix B.2.

2.3.3.1 Robustness checks and sub-group estimations

Although the probit model is considered more appropriate, I verify that the results hold under simple OLS regressions on the number of overtime hours. Since the interaction of collective notice with layoff rates or employment rates always turned out insignificant, I make sure that the results still hold with individual notice alone. I also exclude the employment rate from the regression since it is potentially related to both employment protection and overtime work. Finally, I perform estimations on subsamples of the data, looking at various firm sizes.

2.3.4 Right hand side variables

Advance notice requirements in Canada

In Canada, most dimensions of employment protection legislation have been shaped by case law and are generally difficult to quantify. Fortunately, the advanced notice requirements adopted during the 1970's and 1980's are a notable exception. As shown in table B.2 of appendix B.3, they vary between provinces along two dimensions : protection against individual dismissals and protection against collective dismissals.

The length of individual notice requirement is proportional to a worker's seniority. But this dimension will not be used, simply because there is no a priori reason for a firm to give more overtime work to senior employees. Hence, provincial averages will be used. [14]

Contrary to individual notice, advance notice for collective dismissal is a function of the number of dismissed employees. With only the firm size as relevant information, the simplest approach is to assume that a firm with n employees faces potential notice requirements for layoffs of up to n employees. Given that mass layoffs often occur as a result of firm closures, this does not seem like an unfair assumption.

The construction of individual and collective advance notice requirement indices from the specific laws is shown in table B.3. Note that since advance notice requirements do not cover employees in seasonal jobs, temporary contracts or construction sector contracts, they are removed from the sample.

Layoff rates A good measure of layoff rates can be obtained directly from the LFS. The layoff rate is simply the number of workers who have been fired (i.e. have been unemployed for a certain time lap after a lay off) divided by the number of employed workers. Since layoffs are a flow, the shortest time lap is best. Otherwise, unemployed workers start to find new jobs and the flow becomes a stock. The best compromise between a short time lap and an appreciable sample size must be based on the rate at which unemployed workers find new jobs. Figure B.3 shows the distribution of unemployment durations for workers who suffered a permanent layoff due to business conditions (categories 12 and 13 of table B.4) from a private sector job with permanent contract. Up to four weeks in unemployment, the frequency is stable, suggesting that few of them find work. This pattern is the same for every industrial sector taken separately. Hence, layoff rates are computed with workers who lost their job within two weeks ago, but robustness checks will also be tried as robustness check.

14. To compute these averages, the most natural set of weights is the proportion of layoffs in each seniority category, since it accounts for both the average fraction of workers in each category and the actual chance of being fired. But obviously, different employment protection between provinces will influence workers' seniority. In a province with higher EPL, workers will be fired less often, accumulate more tenure and enjoy even more protection through this feedback mechanism. Computing average individual protection using province specific weights on tenure lengths would de facto take this into account. This might be fine in principle, but since I am interested in the impact of laws themselves - and this effect is itself part of their impact - I will instead weight by country average layoff ratios for each tenure. Still, I will use province specific weights as robustness checks, noting that either set of weights changes the average only very slightly. As for the measure of layoffs, it will be discussed thoroughly in the following section.

A net advantage of layoff rates computed from the LFS is that the LFS records the precise reason for which the job was terminated. By contrast, firm-level data rarely states when a layoff was motivated by economic conditions. Instead, researchers often use the net number of separation or turnover as a proxy for it, lumping layoffs for any causes and quits together. But as shown by table B.4, economic layoffs only represent a mere 16% of all job separations.

Unfortunately, there is no way in the Labor Force Survey to detect layoffs for multiple job holders or layoffs during the period if a new job was found before answering the survey. Additionally, with layoff questions, there is always a risk of bias from misreporting the reason of job termination. However, without a priori reason why such bias should be different between provinces, it should not affect the outcomes of interest.

Since almost no province require advance notice requirements for temporary layoffs, I exclude them from the computation of the layoff rates. Of course, seasonal jobs, temporary contracts, self-employed and public sector workers are also excluded.

Controls The employment rate is a necessary control, capturing the general demand for work, which could affect both overtime use an legislative processes. In the theoretical model of section 2.2, the labor supply is assumed infinite. In general equilibrium however, if firms have a hard time meeting their labor needs purely because of labor market tightness, they could use overtime to also avoid search an recruitement costs. Of course, there is a real risk that the employment rate may itself be affected by employment protection, although the literature is not settled on this issue (see OECD Employment Outlook 2004). To address this uncertainty, I split the employment rate into long term province×activity sector specific employment rate (Empl. Rate_{ps}) and its quarterly deviation from the sample mean (Empl. dev._{pst}) : Empl. $\text{dev.}_{pst} =$ Empl. $\text{rate}_{pst} -$ Empl. Rate_{ps}. The quarterly deviation does not present any problem because it is orthogonal to the time invariant provincial laws. Since the average unemployment rate is potentially endogenous, it will be included but estimates without it will be presented as robustness checks. I use employment rates that are activity sector specific to make sure that the diversity of industrial compositions in each Canadian provinces is accounted for and because the sector×province is the fundamental unit of identification.

At the individual level, controls include sex, age dummies, employee tenure, firm size dummies, industrial sector dummies, occupation type dummies, and the type of union membership, all described in appendix B.3.

To increase the model's precision, I also add nine year and four quarter dummies to capture seasonal variation.

2.3.5 Results

Table 2.1 shows the benchmark results of the probit estimation. Table 2.2 shows the minimum distance estimates using a linear probability model as the first stage.

2.3.5.1 First identification strategy

Column 2 of table 2.1 shows the first identification strategy which interacts advance notice requirements with sectorial layoff rates. The coefficient for individual notice×Layoff Rate is highly significant, but the interaction of collective notice with layoff rates is not significant. These results are confirmed by the minimum distance estimates in column 1 of table 2.2.

The linearity of the model of table 2.2 makes it straightforward to interpret. Consider the difference of impact of a 1 week increase in individual notice requirement (it is the difference between New Brunswick and Saskatchewan). For a sector with a layoff rate 0.0035 points higher than another sector (the standard deviation is .0035), the increase in the likelihood that a worker is asked to work overtime is $1 * 0.0035 * 5.695 = 0.02$ points. Given that the average proportion of overtime workers is 10%, this is a 20% increase of the number of overtime workers. This number is substantial given that advance notice requirements are only one aspect of employment protection.

Of course, this number is a second order effect. We would like to get a sense of the first order effect of employment protection for each sector, which is the sum of the average first order effect and the interacted effect. The average first order effect cannot be identified while controling for province dummies, so we will have to be cautious when interpreting it. To compute it, column 2 of table 2.2 presents the same estimation, replacing province fixed effects with average individual and collective notice requirements, as well as and province controls. As shown in column 2, doing so reduces slightly the magnitude of the impact of individual notice×layoff rate to 4.177, but it is still significant. Table 2.3 presents these first order effects for a low layoff rate sector and for a high layoff rate sector. The impact of individual notice on workers in low layoff rate sectors is not significant, but for workers in high layoff rates sectors, it is positive and significant. A one week increase in individual notice is associated with a 3.4 point increase in the probability of overtime work, or a 34% increase of the number of overtime workers.

2.3.5.2 Second identification strategy

Column 3 of table 2.1 presents the second identification strategy interacting advance notice requirements with the deviation of the employment rate. In agreement with the model, the correlation between overtime work and employment deviation is amplified by individual notice requirements. Notice for mass layoff interacted with employment rate deviation has no effect.

Column 3 of table 2.2 confirms the probit estimates. Using table 2.2's estimates, we can compute the impact of a temporary increase of the layoff rate for different levels of individual notice requirements, shown in column 3 and 4 of table 2.3. For a low notice province where average individual notice is 1.28, the impact of a one point increase in employment rate (at the average collective notice of 5.47) is $0.01 * (0.1947 * 1.282 - 0.01962 * 5.471 - 0.1576) = -0.000154$. For a long individual notice province where individual notice is 2.36, the impact of an increase $0.01 * (0.1947 * 2.355 - 0.01962 * 5.471 - 0.1576) = 0.00193$. Hence, as shown in table 2.3, the correlation of employment rate and overtime work is essentially zero for low EPL provinces, but it is positive and significant for high EPL provinces. In these provinces, a one point increase in employment rate is accompanied with a $0.00193/0.1 = 1.9\%$ increase in the number of overtime workers.

Column 1 of table 2.1 presents both strategies within the same regression, confirming that they are independent and one does not affect the other.

2.3.5.3 Third identification strategy

Column 4 of table 2.1 suggests that when controlling for province effect and firm size effect, collective notice increases the likelihood of overtime work on its own. However, the minimum distance estimation shown in table 2.2, column 4 shows that this coefficient is not very stable and that its standard error is larger than the earlier estimation would suggest. This echoes Friesen (2005)'s findings that individual notice requirements greatly reduce the likelihood of layoffs for Canadian workers, but that collective notice requirements had no discernible impact.

2.3.5.4 Cross-province estimates

Column 5 of table 2.1 shows that neither individual nor collective notice requirements are significant in a cross province setting. It confirms the suggestion of figure 2.5 that shows a cross section of the fraction of employees working paid overtime against average individual and average collective notice requirements for each province. The relation is slightly positive with individual notice requirements, and inexistent for collective layoffs. All else being equal, a positive relation could have been expected, although as previously discussed, possible endogeneity precludes any causal relationship here.

2.3.5.5 Robustness checks and sub sample regressions

Table 2.4 shows various robustness checks, counterfactuals and subsample regressions for the same specification as table 2.1' column 1 that combines both strategies.

Column 1 fits the same model, but through a linear model on the exact number overtime hours, including the zeros. Although less significant, especially for individual notice interacted with layoff rates, the results are qualitatively the same.

Column 2 confirms that the interacted individual notice is still significant, even when excluding collective notice from the model.

Column 3 excludes average employment rate, likely to be correlated both with notice requirements and overtime, but this has no discernible impact on the coefficients of interest.

Columns 4 through 6 split the sample by firm size, with column 6 lumping together the firms of 100 to 500 employees with the 500+ employees. The effect of collective notice is absorbed by the firm size dummies for column 4 and 5, but remains for column 6. For individual notice$\times$layoff rate, the impact of individual notice is strongest for medium sized firms (20 to 99 employees). As for the interaction of individual notice with employment rate deviation, it is slightly larger but much less significant for medium-sized firms. Collective notice interacted with layoff rates is negatively correlated with overtime work in small firms which lacks a clear interpretation given that these firms are hardly concerned with mass layoffs.

Finally, column 7 and 8 compare the impact of notice requirements on overtime for union members (or those covered by a union) or non-members. The impact is comparable for both groups. This is understandable given that unions should tend to make jobs safer and regulate more the use of paid overtime.

2.3.6 Discussion

Outside the realm of proper experimental settings, it is always risky to speak of causal links. However, thanks to these three identification strategies, a confounding factor linked to employment protection and overtime work would have to be felt especially by workers in sector with high layoff rates, in high labor demand periods, or in larger firms. As for reverse causality, it seems even more unlikely since this legislation has existed since the 1980's and would have to assume that overtime work in a single sector had influence on the legislative process of an entire province.

One could still ask whether these findings capture a real relationship or could they be due to pure chance. Are advance notice requirements really binding for firms ? In the Canadian context, the general consensus is that they are. Friesen (2005) points out that notice periods may force firms to employ a worker under its marginal productivity, especially since the prospect of being laid off may reduce his motivation. The worker could also leave abruptly if he finds a new job before the end of the notice period. Citing Jones and Kuhn (1995), she also notes that many Ontarian firms prefer to pay the wage equivalent of the notice period in severance payments instead of keeping them for the mandatory period, a clue that advance notice periods are a significant burden for them.

Furthermore, Wasmer (2006) points out that notice requirements do not stand alone, but are part of a larger body of employment protection legislation and customs. They are the end product of several legal decisions that reflect the general attitude of each province vis-à-vis layoffs for economic reasons. He also shows how individual and collective advance requirements are correlated with the Index of labor Market Regulation compiled by the Fraser Institute. This index incorporates several dimensions such as the processes of certification and decertification ; arbitration process ; union security ; successor rights ; treatment of technology ; replacement workers ; third-party picketing ;

and openness of the provincial labor Relations Boards." [15]

Finally, thanks to LFS data on layoffs, it is actually possible to use the present data to verify the link empirically. Figure 2.5 shows monthly permanent layoff rates as a function of the provincial individual and collective advance notice requirements. For individual dismissals, the relationship is clearly negative, whereas it is unclear for collective dismissal. These stylized results match the more formal conclusions of Friesen (2005) that individual advance notice requirements reduces layoffs in the Canadian context.

2.4 Conclusion

By restricting the leeway of labor management, employment protection reduces the risk of layoffs for employed workers, as documented by ample empirical research. However, if firms try to offset these restrictions by tampering with work schedule and increasing overtime work, these laws can have adverse side effects for employees. In a model of labor adjustment under fluctuating prices, I showed how an increase in dynamic costs to labor adjustment generate fluctuations in work time.

These results help explain how firms in highly regulated labor markets can remain competitive by adjusting labor through the intensive margin. They also show how "at-will" employment doctrines combined with restrictions to downward work hours adjustments can explain the high turnover rates observed in American labor markets.

I tested two stylized predictions from the model, using overtime data from the Canadian Labor Force Survey and differences in Canadian advance notice requirements legislation. The impact of individual advanced notice requirements on overtime work is positive and statistically significant when interacted with layoff rates or with employment rate variation. The extra notice requirement in case of mass layoff is not significant.

Of course, Canada is a North American economy with rather low employment protection. This analysis should be replicated in other contexts such as OECD countries, ideally using high frequency firm level data on employment and hours. However, since firm data of this kind is seldom available, this paper showed how to approach the question indirectly using detailed employee data from labor surveys.

15. See Clemens et al. (2003).

Finally, these findings should not be construed as advocating for the withdrawal of employment protection legislation. Rather, they highlight additional concerns that policy makers and labor unions should keep in mind when choosing between EPL and other labor market institutions such as unemployment insurance. For workers, they reflect the trade-off between the risk of becoming unemployed and variable work schedules.

Do workers prefer stable hours or stable employment ? Modeling this trade-off more formally should be part of future work. For now, the increasing popularity of work-sharing programs [16] suggests that a growing number of Canadian workers may prefer collective reductions in work hours instead of selective layoffs, especially during economic downturns. For employers, work-sharing is a way of avoiding costly layoffs and the loss of experienced workforce while waiting for demand to rise again. These programs should stabilize employment during economic slowdown. Their macroeconomic impact has received little attention to this date also point to future research paths.

16. Work-Sharing programs are designed to allow managers and employees to agree on a temporary reduction of work hours to avoid temporary layoffs during economic downturns. They must be approved by the Employment Insurance Commission and range between 6 and 26 weeks, up to at most 38 weeks.

Similar programs also exist in other OECD countries. They are present in 17 U.S. States, but few companies use them because the state contribution is not large enough to make them attractive. On the contrary, they are important in many European country's strategy to stabilize employment. For example, in Germany, if a worker sees his work hours reduced, the program replaces 60% of his lost income.

2.5 Tables and figures

TABLE 2.1: Paid overtime, probit

Dep. Variable :			Probit		
Works overtime[a]	**All**	**Strat. 1**	**Strat. 2**	**Coll.**	**Between**
	1	2	3	4	5
Ind. not.$_p$[b] $\times$Layoff rate$_s$[c]	32.21***	32.35***			
	(8.34)	(8.34)			
Coll. not.$_{pf}$[d] $\times$Layoff rate$_s$	0.42	0.42			
	(0.35)	(0.35)			
Ind. not.$_p$ $\times$Empl. dev.$_{pst}$[e]	1.03***		1.07***		
	(0.36)		(0.37)		
Coll. not.$_{pf}$ $\times$Empl. dev.$_{pst}$	0.00		0.00		
	(0.03)		(0.03)		
Collective notice$_{pf}$	0.02	0.02	0.01**	0.01**	-0.004
	(0.01)	(0.01)	(0.00)	(0.00)	(0.003)
Empl. rate$_{ps}$[f]	-0.11	-0.12	0.60	0.59	0.55
	(0.47)	(0.48)	(0.42)	(0.43)	(0.50)
Empl. dev.$_{pst}$	-1.37*	0.69***	-1.47*	0.68***	0.68***
	(0.76)	(0.17)	(0.78)	(0.17)	(0.18)
Individual notice$_p$					-0.19
					(0.11)
Ind. controls[g]	Y	Y	Y	Y	Y
Activity sector dummies	Y	Y	Y	Y	Y
Firm size dummies	Y	Y	Y	Y	Y
Province dummies	Y	Y	Y	Y	
Time dummies[h]	Y	Y	Y	Y	Y
Province controls[i]					Y
Number of observations	4 379 885	4 379 885	4 379 885	4 379 885	4 379 885
Number of clusters	10	10	10	10	10
Adjusted R^2	0.092	0.092	0.092	0.092	0.091

(cluster robust std. error in parenthesis) ; *** p<0.01, ** p<0.05, * p<0.1

[a] Dummy for overtime work

[b] Average provincial advance notice requirement for individual layoffs, weighted by the countrywide tenure layoff rate.

[c] 'Frictionless' activity sector layoff rate

[d] Provincial advance notice requirement for collective layoffs, firm size specific

[e] Quarterly deviation from the province×activity sector specific average employment rate for the period.

[f] Province×activity sector specific average employment rate for the period.

[g] Controls includes employee tenure, firm size dummies, age dummies, occupation type dummies and contract type dummies.

[h] Include year and quarter dummies

[i] Includes a dummy for NS, NB and NF, where the overtime premium is equal to one and a half times the minimum wage. Also includes for the provincial number of hours in the standard work week and provinces GDP per capita.

Only include private sector employees with permanent contract in non-seasonal jobs. Excludes construction workers.

TABLE 2.2: Paid overtime, 2-step linear probability model

Dep. Variable :	2^{nd} stage of 2-step linear probability model				
Works overtime[a]	**Strat 1**	**Strat 1, marg**[j]	**Strat 2**	**Coll.**	**Between**
	1	2	3	4	5
Ind. not.$_p$[b]×Layoff rate$_s$[c]	5.695***	4.177**			
	(1.601)	(1.615)			
Coll. not.$_p$[d]×Layoff rate$_s$	-0.205	-0.201			
	(0.164)	(0.131)			
Ind. not.$_p$×Empl. dev.$_{pst}$[e]			0.195**		
			(0.077)		
Coll. not.$_p$×Empl. dev.$_{pst}$			-0.020		
			(0.012)		
Individual notice$_p$		0.154**			-0.011
		(0.060)			(0.012)
Collective notice$_{pf}$				0.000	
				(0.001)	
Collective notice$_p$		-0.008			-0.000
		(0.005)			(0.001)
Empl. dev.$_{pst}$			-0.158		
			(0.139)		
Ind. controls[g]	Y	Y	Y	Y	Y
Activity sector dummies	Y	Y	Y	Y	Y
Firm size dummies	Y	Y	Y	Y	Y
Province dummies	Y		Y	Y	
Province controls		Y			Y
Time dummies[h]	Y	Y	Y	Y	Y
Province controls[i]	Y	Y	Y	Y	Y
Number of observations	312	312	509	40	10
Number of clusters	10	10	10	10	.
R^2	0.823	0.805	0.675	0.901	0.747

(std. error in parenthesis) ; *** p<0.01, ** p<0.05, * p<0.1

[a] Dummy for overtime work

[b] Average provincial advance notice requirement for individual layoffs, weighted by the countrywide tenure layoff rate.

[c] 'Frictionless' activity sector layoff rate

[d] Provincial advance notice requirement for individual layoffs, firm size specific

[e] Quarterly deviation from the province×activity sector specific average employment rate for the period.

[f] Province×activity sector specific average employment rate for the period.

[g] Controls includes employee tenure, firm size dummies, age dummies, occupation type dummies and contract type dummies.

[h] Include year and quarter dummies

[i] Includes a dummy for NS, NB and NF, where the overtime premium is equal to one and a half times the minimum wage. Also includes for the provincial number of hours in the standard work week and provinces GDP per capita.

[j] This specification is used for the next table's estimates. Instead of province dummies, it includes province controls described in section 2.3.2.

Only include private sector employees with permanent contract in non-seasonal jobs. Excludes construction workers.

TABLE 2.3: Paid overtime, marginal effects (2-step lin proba model)

Var.	Strategy 1 (col. 2)		Strategy 2 (col. 3)	
At	Layoff rate$_s$ $= -.0410$	Layoff rate$_s$ $= -.0287$	Ind. not.$_p$ $= 1.28$	Ind. not.$_p$ $= 2.36$
	1	2	3	4
Ind. notice	-.017	.034**		
	(.012)	(.016)		
Coll notice$_p$	.0003	-.0022		
	(.0004)	(.0016)		
Empl. dev.$_{pst}$			-.015	.194***
			(.051)	(.045)

(std. error in parenthesis) ; *** p<0.01, ** p<0.05, * p<0.1

TABLE 2.4: Results : Various specifications and subgroup regressions

Works paid overtime[a]	**OLS**[i]	**Only**	**No emp.**		**Firm size**		**Union Member**	
Probit estimation	**notice**	**ind. not.rate**	**rate**	**small**	**medium**	**large**	**Yes**	**No**
	1	2	3	4	5	6	7	8
Ind. $not._p{}^b \times$Layoff $rate_s{}^c$	79.85**	31.56***	31.50***	18.93***	30.67***	-2.34**	33.26***	27.40***
	(26.17)	(7.51)	(9.37)	(6.29)	(9.45)	(1.05)	(10.81)	(7.87)
Coll. $not._{pf}{}^d \times$Layoff $rate_s$	1.73		0.42	-0.98	0.07	-0.13**	0.54	0.53
	(1.64)		(0.35)	(0.69)	(0.43)	(0.06)	(0.35)	(0.45)
Ind. $not._p \times$Empl. $dev._{pst}{}^e$	2.72*	1.03***	1.03***	0.97***	1.29*	0.42*	1.22*	1.10***
	(1.35)	(0.37)	(0.35)	(0.30)	(0.74)	(0.22)	(0.66)	(0.35)
Coll. $not._{pf} \times$Empl. $dev._{pst}$	0.10		0.00	-0.08*	0.01	0.02	0.05	-0.03
	(0.13)		(0.03)	(0.05)	(0.03)	(0.02)	(0.05)	(0.02)
Coll. $not._{pf}$	0.07		0.02	-0.22***	0.02	-0.01*	0.03**	0.03
	(0.07)		(0.01)	(0.05)	(0.01)	(0.00)	(0.01)	(0.02)
Activity sector dum.	Y	Y	Y	Y	Y	Y	Y	Y
Ind. controls[g]	Y	Y	Y	Y	Y	Y	Y	Y
Province dummies	Y	Y	Y	Y	Y	Y	Y	Y
Time dummies[h]	Y	Y	Y	Y	Y	Y	Y	Y
Number of observations	4 387 429	4 387 429	1 335 652	1 677 687	1 423 001	1 286 741	897 070	3 482 786
Number of clusters	10	10	10	10	10	10	10	10
Adjusted R^2	0.084	0.084	0.099	0.071	0.076	0.069	0.066	0.086

note : *** p<0.01, ** p<0.05, * p<0.1 (std. error for probit estimate in parenthesis)

[a] Dummy for overtime work

[b] Average provincial advance notice requirement for individual layoffs, weighted by the countrywide tenure layoff rate.

[c] 'Frictionless' activity sector layoff rate

[d] Provincial advance notice requirement for individual layoffs, firm size specific

[e] Quarterly deviation from the province×activity sector specific average employment rate for the period.

[f] Province×activity sector specific average employment rate for the period.

[g] Controls includes employee tenure, firm size dummies, age dummies, occupation type dummies and contract type dummies.

[h] Includes 11 year dummies and 4 quarter dummies.

[i] Contrary to other columns, the dependent variable is the number of overtime hours, zeros included.

note : Only include private sector employees with permanent contract in non-seasonal jobs. Excludes construction workers.

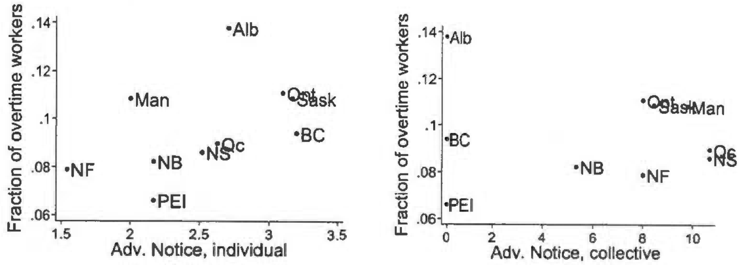


FIGURE 2.3: Ratio of employees working paid overtime and average individual and collective notice requirement

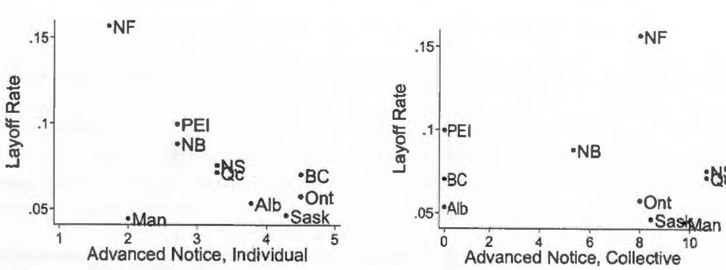


FIGURE 2.4: Layoff rates and provincial Individual and Collective notice requirements

Chapitre 3

Employment Protection Laws and Work Stress

Abstract

This paper investigates the effects of employment protection on workers' stress and well-being. Employment protection legislation (EPL) helps in securing workers in partial equilibrium, by lowering the risk of job loss, but may have adverse effects too. Costly separations may induce firms to exert pressures on workers or raise the intensity of monitoring.

We undertake an exhaustive empirical analysis to verify whether stress increases or decreases with employment protection, using seven international surveys and one national health survey. The effects are heterogeneous across sectors and components of EPL. We obtain positive and significant effects of EPL on stress *in high turnover sectors relative to low turnover sectors* with a causal interpretation. The net effect is positive in high turnover sectors and sometimes negative in lower turnover sectors. The positive effect of EPL on stress comes from collective layoff regulations, restrictions on the use of temporary contracts and the interaction of said restrictions on the use of temporary contracts with both individual and collective employment protection. [1]

1. This chapter is written with Etienne Wasmer

3.1 Introduction

Is employment protection legislation (EPL) a good device for increasing workers' well-being ? It is known from research in labor economics that the answer is often negative. All else being equal, employment protection increases job duration and might therefore be beneficial to currently employed workers. However, it is also well established that EPL reduces the hiring of permanent employees. That is, it fails to increase the well-being of outsiders, i.e. non-employed workers and workers not covered by EPL, including temporary workers, part-timers and those under probationary periods. On the positive side, employment protection also protects specific human capital investments and secures workers, as it can be a substitute for private insurance against layoffs in a world of imperfect insurance markets, given the numerous moral hazard problems. [2]

EPL may, however, also have additional and unexpected adverse effects : in the same way that divorce costs may force couples to stay together in spite of chronic conflicts, employment protection may exacerbate strain and tension within firms. The most obvious example is the case of an economically non-viable job. To save on layoff costs, firms may pressure workers to leave. Firms may even induce workers to quit by decreasing the quality of work environments and, in extreme cases, harassing workers. But even in a productive job, firms may react to high layoff taxes by adjusting monitoring methods, routines, workplace organization and management techniques in a way unfavorable to workers' well-being. None of these outcomes is particularly gratifying for workers, potentially resulting in increased stress and job dissatisfaction.

We identified seven recent international surveys containing information on stress at work : the European Quality of Life Survey (EQLS) of 2003 ; the International Social Survey Program (ISSP) of 1997 and 2005 ; the Eurobarometer of 1996 and 2001 and the European Working Conditions Survey (EWCS) of 2000-2001 for EU candidates and 2005. These surveys contain three different stress-related questions. In the EWCS 2000-01 and 2005, and in Eurobarometer 1996, the question was "Does your

2. See Lazear (1990), Burda (1992), Kugler and Saint-Paul (2004) and Autor et al. (2006) for the effect of EPL on employment and wages, Mortensen and Pissarides (1999) for the effects on worker turnover and job creation, Delacroix and Wasmer (2006) for investments in specific human capital, Pissarides (2001) and Blanchard and Tirole (2008) for EPL as a substitute for insurance in imperfect markets, Acemoglu and Angrist (2001) for the effect on discrimination, Ichino and Riphahn (2005) for the effect on absenteeism, Saint-Paul (2002) for the effect of EPL on international trade and specialization and Belot et al. (2007) for the effect on productivity and welfare, among many others.

work affect your health ? If yes, how ?", where stress is a possible answer. In the ISSP 1997 and 2005, and in Eurobarometer 2001, the question was "How often do you find work stressful ? : Always, Often, Sometimes, Hardly ever, Never ?". Finally, in EQLS 2003, the question was "My work is too demanding and stressful : Strongly Agree, Agree, Neither agree nor disagree, Disagree, Strongly disagree". An additional database, the Canadian National Population Health Survey, NPHS hereafter, can be used to investigate the relations between EPL and stress, using cross-province differences in employment protection. All surveys can be used to establish the sign of a correlation of stress indicators with the OECD Employment protection legislation index (OECD 2004).

Causal inference, however, requires additional information : it has to deal with the issue of the endogeneity of employment protection laws across countries or across provinces. Factors affecting stress in a country (or a region), such as employment or wages, may have an influence on the determination of employment protection. We propose two strategies. The first uses time variations in EPL, to the extent that they are exogenous and provide enough variance. The second one, our and preferred strategy, is based on a recent line of research and uses the fact that while EPL may be uniform within a country or region, its stringency will differ between activity sectors due to their different layoff needs. This idea was pioneered by Rajan and Zingales (1998) in finance, and subsequently adapted to several other fields, including labor economics. More precisely, a growing body of literature on the macroeconomic impact of employment protection has used this exact same strategy (Cingano et al. 2010, Claessens and Laeven 2003, Galindo et al. 2003). This amounts to a difference-in-differences approach in which the control group would be a low job destruction sector and the treatment group would be a high job destruction sector, and the treatment would be a high level of EPL. Of course, this strategy and the time variations can be combined, in the equivalent of a triple-differences approach.

This second order identification strategy based on sectors is widely used, but clearly subject to various interpretations. First, as it will be made clear later on, the effect of employment protection is an interaction one : The total effect of EPL is the sum of the linear effect, applying to all sectors, and the interaction effect, with the degree of job destruction of the sectors. Second, if the interaction effect can be interpreted as the direct effect of EPL on management on stress as we do, it can also be interpreted in a different way : it could be argued that higher sectoral job destruction rates raise stress in countries where EPL is high, because EPL reduces hiring in these sectors. This second interpretation is consistent with the view of this paper that EPL may have adverse effects even on insiders, but through a general equilibrium effect. The inclusion of sector and sector time dummies as well as group-specific unemployment rates in our regressions should however absorb these general equilibrium effects to a large extent.

Our results are as follows. In all datasets, we find that EPL is either positively and significantly correlated with various indicators of stress or uncorrelated. In cross-country analysis, we never found a negative and significant correlation between average work stress and EPL. When data availability allows for the identification strategy described above, we find positive causal effect of EPL *in high turnover sectors relative to low turnover sectors*. The results are robust to the addition of unemployment insurance and indicators of collective wage settings institutions as controls. In addition, the total effects of EPL taking into account the linear effect would vary from positive (in high turnover sectors) to negative (in low turnover sectors). As for more specific components of stress, available in Canada, the evidence is less clear-cut and depends on the type of employment protection, whether it is protection for individual dismissal or additional provisions for mass layoffs. In particular, we find that the perception of risk of job loss is reduced by individual EPL, but hostility at work, the incidence of hectic jobs and repetitiveness of tasks are all increased by individual EPL. Collective EPL reduces help from colleagues but individual protection increases it.

Alternative identification strategies, such as diff-in-diff approaches based on large policy changes in EPL across provinces or states, such as those used by Autor et al. (2006) or Kugler and Saint-Paul (2004) in the United States, would provide a very useful confirmation of these results. However, US data on work-related stress covering the relevant period are difficult to obtain. The only surveys with workplace stress and information on state of residence only cover the post-2002 period. Unfortunately, there is little or no variation in EPL across US states posterior to 2002. Hence, this research agenda is left to future work.

Beyond, one of this paper's conclusions is that the quality of labor relations is adversely affected by labor regulation. This confirms the importance of industrial relations and, further, of trust in the social relationships between unions and employers, as emphasized in Blanchard and Philippon (2004). Our paper suggests that EPL does generate individual conflicts and poor industrial relations, which provides a possible explanation for the poor quality of labor relations in European countries with high EPL. It is also consistent with improvements in British industrial relations, as indicated by Blanchard and Philippon (2004, p. 24), following the experience of Thatcher's deregulation in the 1980s. Another of this paper's lessons pertains to the need to understand and generalize other results regarding EPL's paradoxically adverse consequences : recently, Postel-Vinay and Saint-Martin (2005), Clark and Postel-Vinay (2009), and Deloffre and Rioux (2004) have documented, using the European Community Panel survey, a strong negative link between perceived job security and employment protection. The ISSP and the NPHS data used here contain specific questions on how respondents perceive the risk of losing their job and the stress this perceived risk provokes. Our paper investigates the same question posed as a special case by these three papers.

The paper is organized as follows. **Section 3.2** develops the economics of stress and EPL. **Section 3.3** develops the empirical strategy. **Section 3.4** investigates, with a cross-sectoral cross-country identification strategy based on Eurobarometer 1996 and the EWCS 2000-01 and 2005, the links between EPL and work-related stress causing health disorders. based on Eurobarometer 1996 and the EWCS 2000-01 and 2005 **Section 3.5** uses Canadian health data to go deeper into the analysis of the components of job stress, using an identification based on provincial differences in EPL interacted with sectoral job destruction rates. **Section 3.6** provides additional insights from all three surveys by using harassment data, work disorder data and the fear of job loss. **Section 3.7** concludes.

3.2 Mechanisms

3.2.1 Economic intuitions

To develop the main theoretical points, let us reduce EPL to the area pertaining to its main economic impact, namely, pure taxes on layoffs. Two potentially important aspects of EPL are thus ignored : its redistributive side between firm and worker, the impact of which is generally neutral because it is internalized in wages (Lazear 1990, Burda 1992), and the complexity for firms involved in laying off for fault.

We summarize here the economic intuitions of EPL's impact when firms are in a position to affect workers' environments, for better or for worse, based on a model developped fully in Appendix **C.4**. The model's mechanisms can be summarized as follows. Jobs and workers match in period 1 ; at the end of the period 1, the firm and the worker know the productivity of the match and the utility of the worker in this match. Based on this, continuation or separation decisions are taken. Separation can be implemented in several ways. The firm can fire the worker for economic reasons (that is, a no-fault layoff denoted by NF-layoff). This has a cost τ to the firm, a part of it is a pure tax, a part is a severance payment to the worker. The firm can also try to save on firing costs in two different ways : first, by attempting to layoff for fault or for cause (a F-layoff), which has no direct cost but has uncertain success, and second, by letting the worker quit. In the case of a quit, there is no cost of separation for the firm.

Each period, the worker chooses an effort level e on the job, and receives a wage w. The wage is assumed to be exogenous. [3] Overall, the flow utility of a worker is

$$\mathscr{U} = \underbrace{w}_{\text{wage}} + \underbrace{\left(\underbrace{-[c(e)+q^m]}_{\text{disutility from effort and of monitoring}} + \underbrace{q^w}_{\text{firm's effort to affect } \mathscr{U}} + \underbrace{v}_{\text{random utility of match}} \right)}_{\text{non-pecuniary component of the job}}, \tag{3.1}$$

where the utility of the worker is reduced by $c(e)+q^m$, where $q^m \geq 0$ is the intensity of monitoring, and $c(e)$ is increasing convex in effort. The quantity q^w is a variable chosen by the firm to affect the utility of the worker. It is interpreted as the quality of the working environment. This quantity can be either positive or negative. In addition, v is a random variable reflecting unknown factors ex-ante, such as the quality of the relationship of the worker with his/her colleagues or with the management. The modeling choices imply that monitoring and working conditions are perfect substitutes and thus, in this case, are formally the same "object". The quantity $q^m - q^w + v$ reflects the general environment of the firm, which is both random through v and chosen by the firm through the q's.

3. By this exogeneity assumption, we want to prevent employers to cut down the wage so that the worker would necessarily quit at zero cost for the firm. This assumption is meant to capture the fact that such an explicit behavior by firms is limited by nominal downwards wage rigidity. The fact is that a strong wage cut may be as efficient as bullying to make workers quit, but this can be detected by a judge much more easily and thus ex-post quite costly. We will come back on this point in the conclusion of this Section.

The worker can obtain a level of utility $\overline{\mathcal{U}}$ outside the firm. This level of utility depends a priory on search frictions and is lower in a more sclerotic labor market, although we do not explicit this link in the paper. Thus, if not fired, the worker will quit the firm at the end of period 1 if utility on the job in period 2 is lower than $\overline{\mathcal{U}}$.

On the firm's side, monitoring and affecting working conditions is not costless. Let $C(q^m, q^w)$ be the cost function with $q^m \geq 0$ and $q^w \gtrless 0$. The monitoring intensity q^m is set each period. In contrast, working conditions are persistent through the two periods, and are decided in period 1.[4] So, by the cost of q^w, we refer here to the cost paid in period 1, which does not have to be repaid in period 2. The cost function is assumed increasing and convex in both arguments. Further, the minimum cost is reached in $C(0,0) = 0$. This means that it costs some money to affect—either positively or negatively—the working conditions of the worker. Note that the cost of a negative q^w can be interpreted as a reputation cost.

The effort of the worker enters linearly in the revenue function, as a normalization. There is a random productivity component denoted by ε. So, overall, the flow profit of the firm is

$$\pi = \underbrace{e}_{\text{worker's effort to affect } \pi} - \underbrace{w}_{\text{wage}} - \underbrace{C(q^m, q^w)}_{\text{cost from monitoring and working conditions}} + \underbrace{\varepsilon}_{\text{random productivity of match}}.$$

Compared to the NF-layoff, the F-layoff has two additional features. First, it generates additional stress to the worker, denoted by Σ and entering negatively in the utility function. It can be thought as the supplementary cost of effort to bring the case to an arbitrage court. Second, it is a random procedure. In many cases, such labor conflicts are arbitrated by an outside party (judge, semi-professional court) and the decision, based on several informal factors and cannot be perfectly anticipated. We will denote by F the probability of success of this procedure, where F depends on the effort of the worker and the monitoring intensity of the firm. Figure 3.1 conveniently summarizes the partition in a diagram representing the productivity of the match and the utility of the worker. The existence of positive layoff costs τ creates an incentive to F-layoff. This arises with a probability monotonic in $\tau/(1-F)$, thus higher with τ and F. The existence of stress from being in a F-layoff procedure creates an additional incentive to quit to avoid such a procedure. This arises with a probability monotonic in $\Sigma/(1-F)$, thus higher with Σ and F.

4. This is not important : what matters is that the firm sets q^w before the information on productivity and idiosyncratic utility is revealed.

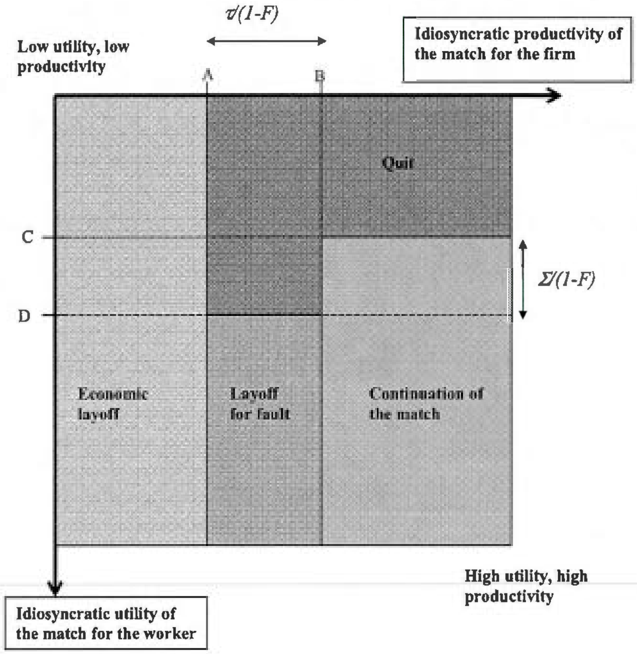


FIGURE 3.1: Phase diagram of separation / non-separation decisions where τ is the layoff cost, Σ is the stress from a layoff for fault and F is the success (for the firm) of a layoff for fault.

Overall, the model delivers a relation between the layoff cost τ and the non-pecuniary part of the present discounted value of utility of the worker, which may be positive (we call thise the "*job security effect*"), or negative. Broadly speaking, the negative effects fall into two categories, partial equilibrium effects and general equilibrium effects.

In partial equilibrium, the first effect of EPL comes from the fact that firing is a worker discipline device in a moral hazard context (Shapiro and Stiglitz, 1984b). As laying off becomes increasingly expensive or difficult, managers may instead have to resort to psychological pressure to ensure workers effort, thereby increasing stress. One can group these mechanisms under the label *"psychological pressure effect"*. The latter generates a positive link between individual EPL (as opposed to collective EPL, applicable in the event of mass layoffs) and stress.

A second set of mechanisms arises when jobs are nonviable, i.e. in recessions or when a task becomes obsolete. In such cases, an efficient labor market would require firing for economic reasons (no-fault layoff). As this becomes more costly, the firm with one or several redundant workers negatively affects working conditions. It can also try to establish professional faults by raising monitoring intensity and thereby obtaining dismissals at lower cost, which potentially generates further stress. We call this the *"harassment effect"*. Employers pushing employees to quit would be a slightly different mechanism, referred to as *"bullying effect"*.

Finally, in general equilibrium, EPL reduces labor turnover : it reduces the rate of job separations, resulting in firms opening fewer positions. This lengthens periods of unemployment and possibly raises the quasi-rent associated with holding a job. In terms of stress and well-being, this has two consequences. First, the fear of layoff is exacerbated, since workers have more to lose : this is a stress-factor and could presumably explain the results of Clark and Postel-Vinay (2009).[5] The second effect is the reduction of gains from quitting. As a result, at the margin, employees do not leave firms even when they dislike their jobs, colleagues or managers. This is referred to as the *"mismatch effect"*.

It is worth mentionning a last effect, not present in this static model, but that could be included in a dynamic extension. Indeed, when product demand fluctuates over the business cycle, firms have an interest to adjust total hours. The adjustment may occur through the extensive margin (employment) or the intensive margin (hours per worker). If layoffs are more costly due to EPL, firms will tend to choose the latter, generating

5. See also Postel-Vinay and Saint-Martin (2005) and Deloffre and Rioux (2004).

stress from work hours and work load fluctuations. [6] We call this the *"workload effect"*.

3.2.2 Insights on workplace bullying from other social sciences

The phenomenon of bullying (harassing, mobbing) has become recognized in several countries as an important source of workplace stress. This can be described as specific situations in which a victim is repeatedly targeted by negative or offensive actions over an extended period of time (Einarsen et al., 2003). The incidence of bullying varies according to which population was interviewed or to survey methodology. In our own dataset of European countries, 7.2% report having experienced bullying or harassment. Among all stressors, bullying is one of the best predictor of work stress and low self confidence, as evidenced by many studies, including a 2002 analysis by the Department of Psychology at the Finnish Institute of Occupational Health among municipal employees (Vartia-Väänänen, 2003). These results echo earlier findings by Wilson (1991) and Zapf et al. (1996), reviewed in Einarsen (1999). Among consequences, Bjorkqvist et al. (1994) find victims reporting insomnia, nervousness, melancholy, apathy, concentration and social problems.

Organizational rearrangements are often a cause or a factor in the onset of bullying. They can include off-shoring, downsizing, unpaid overtime and plant closures (Liefooghe and Davey, 2001). Similarly, a survey of Irish workplaces showed that organizational changes often lead to bullying (OMoore et al., 2003), as did earlier studies (Seigne, 1998; McCarthy, 1996; Sheehan, 1998). Linked to the organization is the fact that bullies are mostly supervisors, followed by coworkers and subordinates. In their meta-analysis, Einarsen et al. (2003) note that out of 25 studies in 10 European countries, 17 of them find managers to be the first perpetrators.

In line with the model of the previous section, and according to a 2003 survey conducted by the Workplace Bullying and Trauma Institute, 70% of bullied workers are ultimately dismissed or quit by themselves, an eventuality that Leymann (1990) called the '*expulsion*' stage. Zapf and Gross (2001) report that bullying victims strongly advise other victims to leave the organization. The judicial literature often refers to this 'voluntary' leaving as constructive dismissals. In recent years, several countries have

6. Lepage-Saucier (2009) shows theoretically and empirically that a higher degree of employment regulation leads firm to vary more hours and less employment. It follows that workers may temporarily be overloaded, resulting in more stress.

included anti-bullying provisions in their employment law (Einarsen et al. (2010) look at the cases of Australia, Canada, Quebec, the European Union, Sweden, the United Kingdom, the United States and France). Unfortunately, from the victim's point of view, making the case for a constructive dismissal is not easy, especially without obvious changes in working conditions such as pay cuts or serious task reassignments [7]

In France, Seiler-Van Daal (2000), surveying 1210 employees in Alsace at "Médecine du Travail" in a non-representative sample, found that 9.6% of the workers met the criterion for moral harassment (bullying), although only 7.3% reported it. It came from the hierarchy in 49% of cases, from co-workers in 25% of cases, from both in 17% and only in 5% of cases from employees under supervision. It started after workplace reorganization (29%), leave of absence by the worker (26%), the arrival of a new manager (28%) or after some conflict. It led to various disorders (mood 72%, sleep 70%, psychological disorder 52%) and resulted also in anxiety (60%) and abnormal fatigue. Finally and most relevant for our purpose, the hostility faced by these employees led them to leave the firm in 61% of cases, including 44% after a voluntary quit.

In a study carried out by the IPSOS Social Research Institute, in 2000, based on a sample of 471 representative employees, 30% answered yes to the question "Have you ever faced bullying, moral harassment ?", including 31% for men, 29% for women, 30% in the private sector, and interestingly, 29% in public firms, 37% reported having witnessed bullying, moral harassment, 24% answered yes to "Did your supervisor ever avoid or refuse to talk, repeatedly and visibly ?", 16% answered yes to "Did your supervisor ever take away your responsibilites, give your workload to colleagues ?", 12% had been once subjected to insults or offending behavior from supervisor (repeatedly). Finally, in line with the model, 12% out of the 30% facing bullies believed that these intended to make them leave or move to another branch of the firm *without indemnity.*

An official government agency from the French government [8] wrote « *Recurrent observations link the rise in layoff for cause to new human resources management practices. In order to avoid mass layoffs (who generally imply risk and litigation), layoffs for cause may become one of the various ways to downsize or reallocate workers in case of a restructuring. Less visible than layoffs for economic reasons, they may*

7. In the UK, a famous case is Mrs Gaynor Meikle who lost her case for constructive dismissal in the Employment tribunal, but successfully appealed the first instance decision.(Hughes, 2004)

8. DARES (Research unit from the Ministry of Labor) (2003). « Les nouveaux usages du licenciement pour motif personnel".

preserve the reputation of the firm and would be painless for the "corps social" (social body). They may also allow for more finely tuned and selective layoffs.» Indeed, in the 1990's and early 2000's, there had been a strong decline in economic layoffs in France. At the end of the period, layoffs for cause became the second reason of the entry into unemployment, with twice as many inflows as the number of layoffs for economic reason.

3.3 Empirical strategy

3.3.1 The regressor : the OECD Employment protection legislation index

The OECD produces various indicators of employment regulations for each country. The indicator we will use is the composite indicator, that is, a weighted average of the estimated costs imposed on firms from various employment regulations. It is meant to be comparable across countries and time. Its three components are i) protection against individual dismissal, ii) protection against collective dismissal and iii) restriction on temporary contracts. The latter dimension is important, because restrictions on temporary contracts can force firms to provide permanent contracts with job security when they would have preferred not to. Appendix C.2, Table C.10 and Figure F.3 provide details on EPL in OECD countries.

3.3.2 Identification

Our approach to causality follows pioneering work by Rajan and Zingales (1998). *We interact EPL levels with job destruction rates of the sector of activity of the worker.* Sectors such as services that experience smaller demand fluctuations and keep a more stable workforce should be less affected by stringent employment protection than those that require large and frequent layoffs. [9]

9. A growing body of literature on the macroeconomic impact of employment protection has used this strategy (Cingano et al. 2010, Claessens and Laeven 2003, Galindo et al. 2003). Turnover is proxied by the *activity sector's natural rate of job destruction*, where the natural rate of job destruction is defined as the average of job destruction rates of a given sector across countries.

The intuition of this method is a difference-in-differences approach. The *treated* workers are those most affected by employment protection. They should be the ones working in activity sectors with high job destruction rates. The *control group* is made of workers in sectors with low job destruction rates. The presumption is that EPL is country-specific but common to all sectors of activity within a country. Hereafter, we refer to this strategy as a difference-in-differences approach when it is applied to a single survey, or as a triple-difference approach when we use the time dimension and pool the surveys for the three years.

The most general econometric model using the time dimension is :

$$WorkStress_{health_{i,c,s,t}} = \beta_1 \text{EPL}_{c,t} \times \text{JD}_s + \beta_2 X_{c,t} + \beta_3 Z_i + \text{FE}_{c,t} + \text{FE}_{s,t} + \text{FE}_{c,s} + \varepsilon_{i,c,s,t} \quad (3.2)$$

where $WorkStress_{health_{i,c,s,t}}$ is the reported stress of individual i, in country c, sector s and at time t, $\text{EPL}_{c,t}$ is as described earlier the employment protection level of country c at time t, JD_s is a measure of job destruction of sector s in which individual i works, described in subsection 3.3.4. Z_i is a vector of controls for individual i, including sex, five age dummies, household children dummies, household size dummies, firm size dummies, job title and weekly hours, as well as age and sex specific unemployment rate. $\text{FE}_{c,t}$,$\text{FE}_{s,t}$ and $\text{FE}_{c,s}$ are vectors of country×year, sector×year and country×sector effects, respectively. In specifications not including $\text{FE}_{c,t}$ (table 3.1, Columns 4 to 6), we replace it by a vector $X_{c,t}$ of country×time controls, including bargaining coverage, union density, wage centralization, wage coordination, unemployment insurance and per capita GDP. In specifications with no country-time effects, EPL in the country and time is obviously added. Finally, the residuals have two parts : $\varepsilon_{i,c,s,t} = \mu_c + \nu_i$ where μ_c is the unobserved cluster effects of country c. The noise ν_i is assumed to be asymptotically normally distributed.

Note that work stress may be linked to other labor market institutions. If such institutions were correlated with EPL, or if the timing of their reform matched that of EPL reforms, it could potentially be a confounding factor. Without an actual natural experiment, the best strategy is to control for as many other institutions as possible with the vector $\text{X}_{c,t}$.[10]

10. Section 3.4.4 investigates this question in more depth.

3.3.3 Two stage estimation

We will however proceed in two steps to estimate this equation, to avoid downward biased standard deviations. We first aggregate the data at the country×sector×year level in a first stage assuming a linear probability model :

$$p\left(WorkStress_{health_{i,c,s,t}} \mid c,s,t,Z_i\right) = D_{c,s,t} + \beta_3 Z_i$$

where $D_{c,s,t}$ is a vector of country×sector×time dummies for the individual i. This linear probability model will facilitate the interpretation of the marginal impact of cross-terms in the second stage [11]. In a second stage, we then estimate the dummy variables :

$$\hat{D}_{c,s,t} = \beta_1 \mathrm{EPL}_{c,t} \times \mathrm{JD}_s + \beta_2 X_{c,t} + \mathrm{FE}_{c,t} + \mathrm{FE}_{s,t} + \mathrm{FE}_{c,s} + u_{c,s,t} \quad (3.3)$$

where each cell is weighted by its number of observations in the 1^{st} stage. The residuals have two parts : $u_{c,s,t} = \mu_c + v_{c,s,t}$ where μ_c is the unobserved cluster effects of country c. Residuals are clustered at the country level to avert the risk of within-country autocorrelation.

We will discuss the various alternative interpretations and the possible limitations of the tests in the result Section 3.4.3.

3.3.4 Job separation rates

To be valid, it must be possible to show that layoff rates are comparable within the same industry across countries. Internationally comparable layoff rates are uneasy to compute, but Micco and Pagés-Serra (2004) show how job reallocation of different industrial sectors, an important determinant of layoffs, are highly correlated across countries in a panel of 18 countries. They also show in a simple model how the impact of EPL should indeed be more important in sectors with high job reallocation rates compared with those with low rates.

11. As described in Wooldridge (2001), p. 455, the model is first estimated by ordinary least squares to produce unbiased estimates of $Var\left(WorkStress_{health_{i,c,s,t}} \mid c,s,t,Z_i\right) = \hat{\sigma}_i^2 = Work\hat{Stress}_{health_{i,c,s,t}} * \left(1 - Work\hat{Stress}_{health_{i,c,s,t}}\right)$, where values of $Work\hat{Stress}_{health_{i,c,s,t}}$ larger than 0.99 are set to 0.99 and values lower than 0.01 are set to 0.01 to maintain predicted probabilities within the unit interval. Then, we use $\hat{\sigma}_i^2$ to produce feasible GLS estimates to re-estimate $p\left(WorkStress_{health_{i,c,s,t}} \mid c,s,t,Z_i\right)$ with weighted least squares. Note that earlier specifications involving probit estimations yielded very similar results.

Unfortunately, no standardized measure of layoffs rates exist across the OECD. As proxy, we use net annual job destruction rates *JD*, defined as the total net loss of jobs by firms over a year divided by the average total employment over the two years, described in Section 3.4.2.

The job destruction rates are computed from firm data of the Amadeus database of Bureau van Dijk, a rich firm level database covering all EU countries. Our job destruction measure is the sum of year to year negative employment changes within all firms who had a negative employment change, divided by average employment over the two years :

$$JD = \frac{\sum_{W_{i,t}-W_{i,t-1}<0} \left|W_{i,t} - W_{i,t-1}\right|}{\frac{1}{2}\sum_i (W_{i,t} + W_{i,t-1})}$$

To avoid the criticism that job destruction is itself impacted by EPL, some authors have used job destruction levels of a country with low employment protection. Cingano et al. (2010) convincingly argue that the use of the sample country average of turnover rate is a better measure than the turnover rate of a single country such as the US. Since no large European countries have sufficiently low level of EPL, we instead follow the method proposed by Ciccone and Papaioannou (2006) and Ciccone and Papaioannou (2009) to obtain 'frictionless' job destruction levels by removing the sector-specific linear impact of EPL from our JD measures. In other words, we perform the following estimation :

$$JD_{c,s,t} = \alpha_s EPL_{c,t} + \beta_s + \gamma_{c,t} + \varepsilon_{c,s,t}$$

where $JD_{c,s,t}$ is the country×sector×year specific job destruction level, $EPL_{c,t}$ is the country×year employment protection, α_s captures the sector specific impact of EPL on JD, β_s is a sector-specific set of dummies and $\gamma_{c,t}$ is a set of country×year dummies. We weight the observations by the underlying number of employees in each cell, and remove the ones with less than 10 firms. Our measure of sectoral job destruction level for sector s will be $\hat{\beta}_s$, interpreted as the hypothetical job destruction rate for a country with EPL of zero.

Finally, instead of a continuous job destruction variable, several authors use a dummy for highly affected and non-affected sectors, based on a threshold job destruction rate.

We will explore these specifications in robustness checks.

3.4 How does EPL affect health through work-related stress ?

3.4.1 Definition of workplace stress

We start our empirical investigation with the health effects of work-related stress. This is arguably the most interesting one : it places emphasis on *abnormal stress affecting health*, not normal stress that every worker experiences now and then. It is thus in line with the theory section as it is more related to objective health conditions than alternative measures of stress.

The phrasing of the question related to work stress is : *Does your work affect your health, or not ? – in what way ?* and the possible answers include *stress ; anxiety ; headaches ; heart disease ; irritability ; sleeping problems ; stomach ache ; backache.*

This work-related health question is thus a binary variable. We create a variable $WorkStress_{health}$ taking values 1 or 0 depending on whether the individual reported work-related stress affecting health. This variable $WorkStress_{health}$ is only available in three databases :

- Eurobarometer 44.2 Working Conditions in the European Union Survey, Nov. 1995 - Jan. 1996
- European Working Conditions survey 2000-2001
- European Working Conditions survey 2005

3.4.2 Sample

We only keep individuals between 25 and 64 years old working full time in the private sector, not self employed and *having a permanent contract.* We group together the Eurobarometer surveys of 1996 and the European Working Conditions Survey of 2000-2001 (EU candidate countries) and 2005 to build a harmonized unbalanced pseudo-panel. Keeping only OECD countries for which EPL is available, this panel of countries contains a total of 21 European countries for years 1996, 2000-01 and 2005, that is a total of 53 country×periods. The database contains 28 367 workers, each country×period containing between 229 and 1072 observations. It is not a true panel since there is no follow-up of single respondents over time. Since weighting procedures were different between surveys, we did not weight the data. All variables and their summary statistics are described in more detail in Tables C.2 and C.3 in Appendix C.1.

Figure 3.2 reports cross-country correlations between the EPL indicator and stress. In all cross-sections (Eurobarometer 1996, EWCS 2000-01 and EWCS 2005), there is a positive relation between EPL and the fraction of workers affected by stress-related health problems.

3.4.3 Results

Our main regression result, based on equation (3.3) is reported in Table 3.1. It can be summarized as follows : *Reforms increasing EPL cause stress-related health problems in high job destruction sectors relative to low job destruction sectors.* Columns 1 and 2 exhibit our main identification strategy : interacting job destruction rates in the sector with EPL, controlling for country×year and country×activity sector and also for sector×year in Column 1. Column 1 is our benchmark specification, and reports three bilateral interaction dummies (country×sector, country×time and sector×time). In both, the coefficient of interest, $EPL_{c,t} \times JD_s$ is very significant. Following a reform of employment protection, employees in sectors with high job destruction rates are more likely to report work stress related health problems compared to employees in sectors with low job destruction rates. Additional results are as follows.

1. *In high EPL countries, workers in high job destruction sectors experience more work stress-related health problems, relative to low job destruction sectors.* By removing country×sector dummies, Column 3 measures the absolute impact of EPL on worker's stress, according to the job destruction rate of their activity sector. Like in the benchmark specification, the coefficient is positive, although only significant at the 10% level.

2. *Quantitatively, the benchmark effects of Columns 1 and 2 are potentially large :* if a country faces an increase by 1 of EPL index (over a scale 0-4), the level of additional stress-related health problem induced by a 1 percentage point difference in sectoral job destruction rate (the median sector has a JD rate of 3.7%) leads to

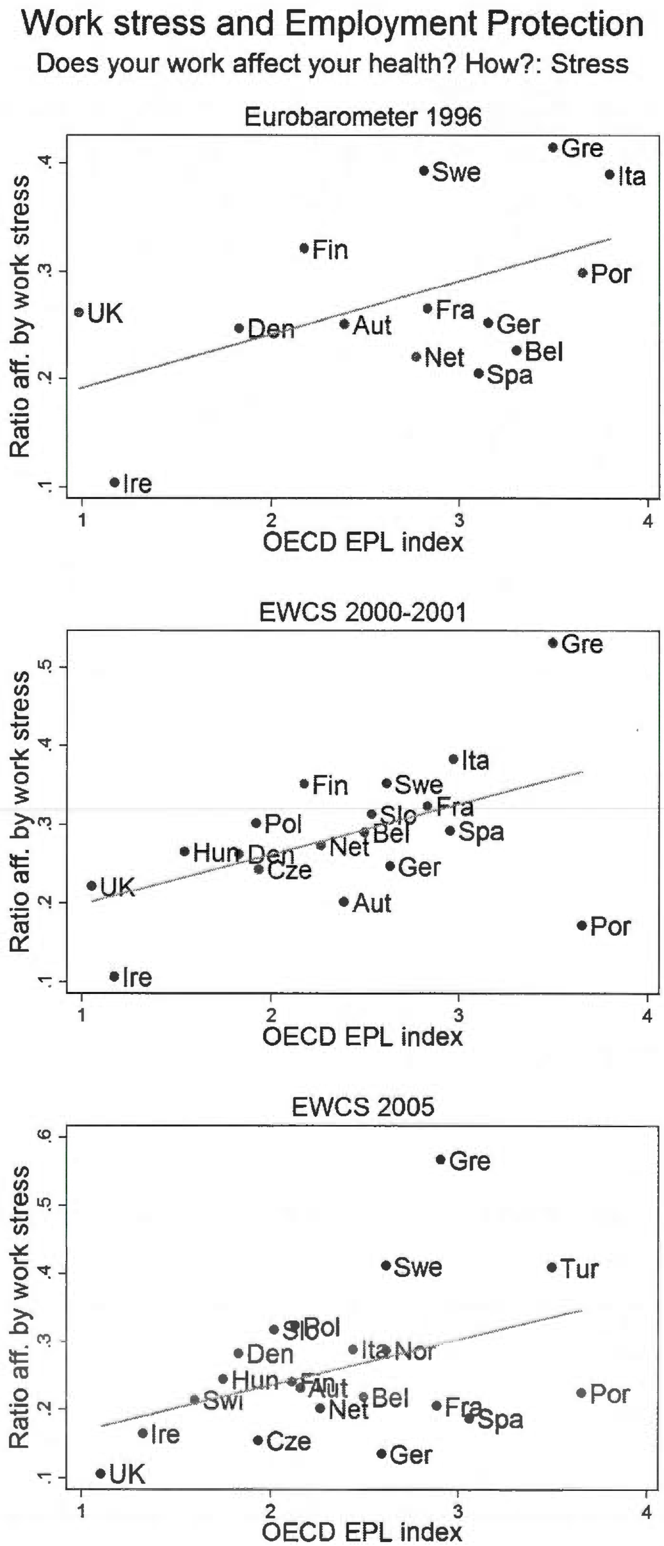


FIGURE 3.2: EPL indicator and stress-related health problems

an effect on stress of $4.51 * 1 * 0.01 = 0.045$. Knowing that 26,7% of individuals report stress, the fraction reporting stress increases by $0.045/0.267 = 17\%$ or 4.5 percentage points. This is not a small effect, even though time variations of EPL are smaller than 1 point.

3. *Within-country variations in EPL have no overall effect on stress-related health problems.* Columns 4 represent within country effect. They are not significant : i) either there is not enough time variations in EPL to generate enough variations to identify the effects of changes in EPL on stress-related health problems, ii) or those variations have not produced any effect on stress-related health problems, iii) or finally the effect is heterogenous across sectors.

4. *EPL is positively correlated with stress-related health problems in the cross section of countries.* Column 5 of Table 3.1 shows the regression results for the simple cross section of European countries without country fixed effects. The link between employment protection and stress is positive and highly significant.

5. Column 6 separates EPL into its country average over the period and its yearly deviation, with interaction terms. The effect of EPL changes are indeed larger in high job destruction sectors, consistent with the third interpretation of the insignificance of the coefficient of interest in Column 4 (see #4 above).

6. The total decomposition of EPL's effect in Column 6 allows to compute the total effect of EPL and of EPL changes for different sectors. Table 1b provides such calculations. For instance for sector with high job destruction levels such as manufacturing, with JD = 0.064, an increase by 1 unit of EPL has a positive and significant effect. For workers in low job destruction sectors, such as hotels and restaurants with JD = 0.032, the absolute impact of an EPL increase on stress is negative and significant, pointing out, in line with the theory part, that the amount of effective EPL (that is, interacted with JD) may have a U-shape pattern with regards to its effect on stress. The other two Columns (2 and 3) present alternative specifications where EPL is interacted with two dummies reflecting the intensity of job destructions : in Column 2, it is interacted with $(JD_s < 0.037)$ or $(JD_s \geq 0.037)$; in Column 3, it is interacted with a higher threshold (0.041). The positive effects of EPL or of its change over time is positive and significant in high turnover sectors. In low turnover sectors, it is either insignificant or negative

significant for the change in EPL, and still positive for the mean effect. Overall, this summary table suggests that, in levels, the effect of EPL is always positive, while the effect of changes in EPL are positive only in high JD sectors and negative in low job destruction sectors, thus pointing out to an ambiguous effect of EPL on stress, as also suggested in the model.

7. In addition to stress, the EWCS surveys also ask for other stress-related work health problems, such as anxiety, headaches, stomach problems, irritability, sleeping problems. We claim that these health problems are more precisely self-assessed than stress which can greatly depends on one's own perception. Thus, we use them to replicate in Table 3.2 our main identification strategies, corresponding to Table 3.1, Column 1 (interacting job destruction rates in the sector with EPL with three bilateral interaction dummies country×sector) and Column 6 (decomposing the impact of EPL and EPL changes between sectors). The variables of interest are "Stress-related health consequences excluding stress", Table 3.2, Columns 1 and 2 and "Stress-related health consequences including stress", Columns 3 and 4. All effects are extremely similar, apart from their lower magnitude.

An alternative interpretation to these results is that the positive interaction coefficient reflects another mechanism : in countries with high EPL, a high rate of job destruction generates more stress in the sector relative to a sector with lower job destruction. This is due to the fact that EPL reduces re-employment probabilities overall. This interpretation, in line with the general equilibrium properties of EPL on stress in our introduction, would actually be dismissed if we had perfect sector-time controls in the regressions, because those variables would totally capture this general equilibrium effect of EPL. And indeed, in this regression, [12] these controls do not undo our positive and significant interaction term. We are confident that our results are driven by the partial equilibrium effects (bullying, pressure, management), and are perfectly comfortable that a part of the effects are amplified by general equilibrium interactions. [13] In sum, given that our specifications include country effects, country time effects, sector country effects and

12. as in the regression of Table 3.3 discussed below.

13. To minimize the risk that the interaction coefficient be affected by the general equilibrium effects of EPL that might be felt differently by workers according to sector's job destruction rate, we also tried a specification where job destruction was interacted with both EPL and unemployment rate of the age and sex category of the worker, which did not change in the coefficient of interest.

sector time effects, as well as the rate of unemployment in the gender and age category of the worker, such general equilibrium effects would already be largely captured by these variables. The coefficient of interaction can be safely interpreted as net of these effects, which in our view, favors the interpretation of partial equilibrium effects.

3.4.4 The role of unemployment insurance

In this Sub-section, we further explore the role of other labor market institutions, in part to provide a robustness check, in part to investigate the role of unemployment insurance. Indeed, the amount of stress generated by the risk of layoff may be reduced by the existence of a generous unemployment compensation. Table 3.3 investigates these questions in introducing country and time specific unemployment insurance. [14]

It shows that the effects of EPL on stress is robust, as the inclusion of additional labor market institutions does not affect the sign and significance of our effects. Further, we sometimes find mildly significant and negative effects of unemployment insurance (UI) on stress in Columns 4 and 5, in a cross-section of countries and sectors. In unreported results, we also explored the respective role of more labor market institutions, with similar conclusions, and additional interesting effects : union density and bargaining coverage marginally raise stress, while wage centralization seems to be reducing stress. We also included unemployment rates and per capita GDP .

3.4.5 The effect of sub-components of EPL

In this subsection, we further investigate the role of components of EPL. We separate out the three main sub-components described in Section 3.3.1 and Appendix C.2 : protection against individual layoffs, against collective dismissals and regulation of temporary employment. As Columns 1 and 2 in Table 3.4 reveal, the positive effect of employment protection comes from the last two components : regulation on collective dismissals and temporary layoffs strongly and significantly raise stress in high job destruction sectors, relative to low job destruction sectors. Protection against individual layoff is not significant. Regarding the effect of EPL_{temp} on stress, we explain in Appendix C.2 that this indicator is an index of the restrictions of use of temporary contracts : it

14. The OECD summary measure is defined as the average of the gross unemployment benefit replacement rates for two earnings levels, three family situations and three durations of unemployment.

is the sum of indicators of the maximum number of successive temporary contracts and of indicators of the maximum cumulated duration of temporary contracts. In Column 3, we looked deeper in the details of EPL_{temp} by grouping the subcomponents, available from the OECD and described in Appendix C.2, in these two broader categories : Restriction to the scope of temporary contracts, $EPL_{temp-valid}$, and limits to their maximum duration, $EPL_{temp-limit}$,. It appears from Column 3 that the positive effect comes from the second component, the maximum cumulated duration of temporary contracts. Hence, our interpretation is that when employment protection on regular layoffs (individual and collective) cannot be alleviated through the recourse to temporary contracts, the stress effects of EPL for regular contracts is augmented, all the more that there are restrictions on temporary contracts. This is very much in line with a discussion from the OECD (2004) who argues that these various components of employment protection are complementary with each other. [15] Indeed, in Columns 4 and 5 of our Table 3.4, we further document evidence of a strong complementarity between the three components where the variable EPL_{prod} is the product of individual, collective and temporary protection. In Columns 6 to 10, we test the complementarity of the components of EPL two by two and find that they are all positive, and that $EPL_{temp} \times EPL_{ind}$ is significant when introduced separately, and that $EPL_{temp} \times EPL_{coll}$ is significant when introduced separately or simultaneously. Hence, two are complements to each other : *ind* and *temp* on the one hand and *coll* and *temp* on the other hand.

This exercise suggests an interesting avenue for research : the cost of regulations can sometimes be alleviated when there are ways to get around them. When there are no ways, the costs are actually much larger as the inconsistencies between market forces (here, the need to layoff for firms) and regulations reinforce each other.

15. Quoting the OECD : "However some complementarities between different components of employment protection regulation remain. Despite some notable exceptions, strict regulation for temporary contracts tends to go hand-in-hand with strict regulation for permanent contracts (Chart 2.1, Panel B). Otherwise, employers may have an incentive to substitute regular contracts with temporary work and fixed-term contracts. The various provisions that contribute to the strictness of dismissal regulation for permanent contracts appear to be complementary to each other."

3.5 A cross-province analysis in Canada : work stress and its components

We obtained a privileged access to a detailed national health survey in Canada. This database contains variables on stress that can be partly compared to the variables in the international surveys. In addition, it contains detailed components of workplace activity leading to a more accurate description of the effects of EPL. Finally, Canada's employment protection can be decomposed into individual protection and protection against mass layoffs, leading to new insights. We can replicate the cross-sectional results of previous sections, and attempt to replicate the cross-industry results. In the latter case, however, the analysis suffers from a caveat : the sector-specific job destruction data used in Canada are obtained from the same sample of countries as in the earlier section. Future works should be based on job-destruction data in Canada, even if we have already explored proxies based on Canadian workers flows. Finally, we obtain some within-regions estimates, in using individual time variations in the degree of employment protection described next.

3.5.1 Provincial employment protection

In Canada, employment protection differs across provinces in dimensions such as firing taxes, severance payments, maximum number of days of temporary layoff and finally advance notice.

An interesting feature in light of this paper's purpose is that advance notice has two distinct dimensions in Canada : advance notice in case of individual layoff, and advance notice in cases of mass layoff. The length of notice for individual layoffs depends on worker seniority. EPL in cases of mass layoff is determined by the size of the layoff. Some provinces, such as Alberta or British Columbia, have no provisions for collective layoffs, while others have relatively large provisions, up to four months in the largest firms in Quebec, for example. For individual EPL, the total length of the notice period varies across region and either progresses rapidly or remains relatively flat. Averaging across firm size provides a regional average of EPL denoted by EPL_coll_{basic}. Averaging across seniority levels provides a measure of EPL denoted by EPL_ind_{basic}. These two indicators were shown to be correlated with indices of regulation of provincial labor markets (Friesen 1997) and with turnover in the labor market.

However, given the specific nature of the dataset, we can improve the accuracy of EPL indicators applicable to individuals in the survey as follows. First, we may want to use information on individual seniority and individual's firm size. The difficulty is the absence of information on firm size and to some extent on seniority of employees in the NHPS in the relevant sample. [16] In addition, these two variables are endogenous : individuals sensitive to stress may quit jobs in which they are less protected against dismissal. One can address both problems using an imputation technique for seniority and firm size, in using the Canadian labor Force Survey (LFS). The dataset contains information on tenure in months and establishment and firm size, as well as a set a variables denoted by Z_{it} common with the NPHS (region, industry, occupation, gender and age). [17]

From the information on tenure and on the region of individuals in LFS, we built the exact number of weeks of advance notice protecting individuals from individual layoffs. Similarly, from information on establishment size, one obtains the exact number of weeks of advance notice in case of mass layoffs. We will use the imputed measures at the individual level, which are exogenous by construction. They are denoted by $EPL\_ind_{imputed,it}$ and $EPL\_coll_{imputed,it}$. Since roughly 10% of layoffs are group layoffs [18] and that individual protection also applies in the case of a mass layoff, we create a measure of total EPL defined as $EPL\_all = EPL\_ind_{imputed,it} + 0.1EPL\_coll_{imputed,it}$.

3.5.2 The Canadian National Population Health Survey (NHPS)

The database is the Canadian National Population Health Survey (NHPS hereafter) and specifically its Household longitudinal component. [19] It consists of 8 cycles : 1994-1995, 1996-1997, 1998-1999, 2000-2001, 2002-2003, 2004-2005, 2006-2007, and finally 2008-2009. It includes 17 276 persons of all ages, with a longitudinal dimension and individual identifiers. The survey is designed to be representative of the cross-

16. Tenure can be constructed from the NPHS questionnaire only from cycles 1, 2 and 3, whereas stress is available from cycle 4 onward, that is, 2 to 10 years after the last observation of tenure.

17. We used the monthly files for years 1994, 1996, 1998, 2000 and 2002, that is a total of 60 files, containing overall slightly more than 3 million observations, and about 500 000 different individuals (there is a rotating scheme of about 6 months).

18. This is based on numbers from Morissette et al. (2007) and the authors' own calculations.

19. A detailed description is available at Statistics Canada's website, at http ://www.statcan.ca/cgi-bin/imdb/p2SV.pl ?Function=getSurvey&SDDS=3225&lang=fr&db=IMDB&dbl=E&adm=8&dis=2

section and has a longitudinal follow-up. For most regressions involving chronic stress, cycles 1, 2 and 3 could not an be exploited.[20]

The questionnaire has several questions related to stress classified into four broad categories : family stress in relation with partner, family stress in relation with children, work stress, and stress due to financial problems. Detailed workplace stress questions were constructed independently by a team of sociologists and the derived variables were made available by Statistics Canada to the research community and directly included in the dataset.[21] There are 12 questions related to job stress used to build an aggregated job stress index.[22]

The relevant stress questions for our analysis are described as follows in the Manual : you are exposed to hostility or conflict from the people you work with ; your job requires that you do things over and over ; your job is very hectic ; your job allows you freedom to decide how you do your job ; you have a lot to say about what happens in your job ; your supervisor is helpful in getting the job done ; the people you work with are helpful in getting the job done ; your job security is good ; with possible answers : 1 Strongly agree, 2 Agree, 3 Neither agree nor disagree, 4 Disagree, 5 Strongly disagree. We will report results with these questions.[23] Adding up the stress dimensions from these questions, the NHPS survey provides its general work stress index. It is constructed by summing up the score of all questions with valid answers (reversed for questions on repetitiveness, hectic, physical effort and hostility) in order to create a general scale

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20. The Manual of the longitudinal survey states that, due to a translation problem, "In Quarter 3 of Cycle 1 (1994) collection, not all eligible working people were asked the work stress questions in the French interview. This may result in some bias." Further, a correction for refusals, included in Cycles 4 and 5, has not been implemented for Cycle 1. For this reason, we will do most regressions with Cycle 4 through 8. The implication is that most regressions will be based on five observations per individual, excluding the possibility of having efficient fix effect estimators. Cluster-corrected standard errors at the province level deal with the issue of within-province correlation, including the correlation of an individual's stress over time.

21. This team was lead by Blair Wheaton from the University of Toronto. The full description of the data can be found on pages 122-128 in the Derived Variables Documentation 2004, available at http ://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl ?Function=getSurvey&SDDS=3225&lang=en&db=imdb&adm=8&dis=2

22. Many of these questions are also available in the two international datasets of previous Sections, notably the European Quality of Life Survey and the International Social Survey Program. The methodology is thus considered as relatively standard in quantitative sociology.

23. Additional questions are : Your job requires that you learn new things. Your job requires a high level of skill. You are free from conflicting demands that others make. Your job requires a lot of physical effort.

where a higher score means more stress.[24] It scales from 0 to 48. Some of these twelve questions are combined into sub-components of stress : in particular, stress from psychological demands ; stress from skill needs ; stress from job loss. Figure 3.3 reports cross-province correlations between overall stress and these three sub-components.

3.5.3 Sample and data description

We provide in Table C.4 of the Appendix C.1 the sample composition per province, with a significant number of individuals in each. The analysis will be restricted to a sample of respondents between 25 and 64 and excludes retirees and the self-employed. The 15 to 24 year old population is also excluded because it is often employed part-time, there being no available control for part-time employment in the relevant cycles. However, including the 15-24 year old population in regressions does not change the results much. Construction workers are also excluded because they are generally not covered by advanced notice requirements. After keeping full-time private sector workers between 25-64 years old who are not self-employed and not in the construction sector, the final dataset contains over 5000 individuals, or over 20 000 observations.

3.5.4 Empirical strategy : a difference-in-differences analysis

As in previous sections using cross-country data, we find that stress in the workplace is positively associated with individual employment protection, as well as imputed stress within province, allowing for province fix effects. We will estimate an equation similar to that of equation 3.2, but without time subscript given the lack of time-series variation in provincial EPL in Canadian provinces over the sample period. Note also that we do not aggregate the data first since doing so would defeat the purpose of imputing EPL at the individual level. The equation estimated is :

$$WorkStress_{component_i} = \beta_1 \mathrm{EPL}_p \times \mathrm{JD}_s + \beta_2 Z_i + \mathrm{FE}_p + \mathrm{FE}_s + \mathrm{FE}_t + \varepsilon_{i,p} \qquad (3.4)$$

where p refers to a specific province and "*component*" refers either to the main index or to each of the sub-component described above. As before, we control for several

24. For more information on the psychological literature motivating this index, see Schwartz et al. (1988).

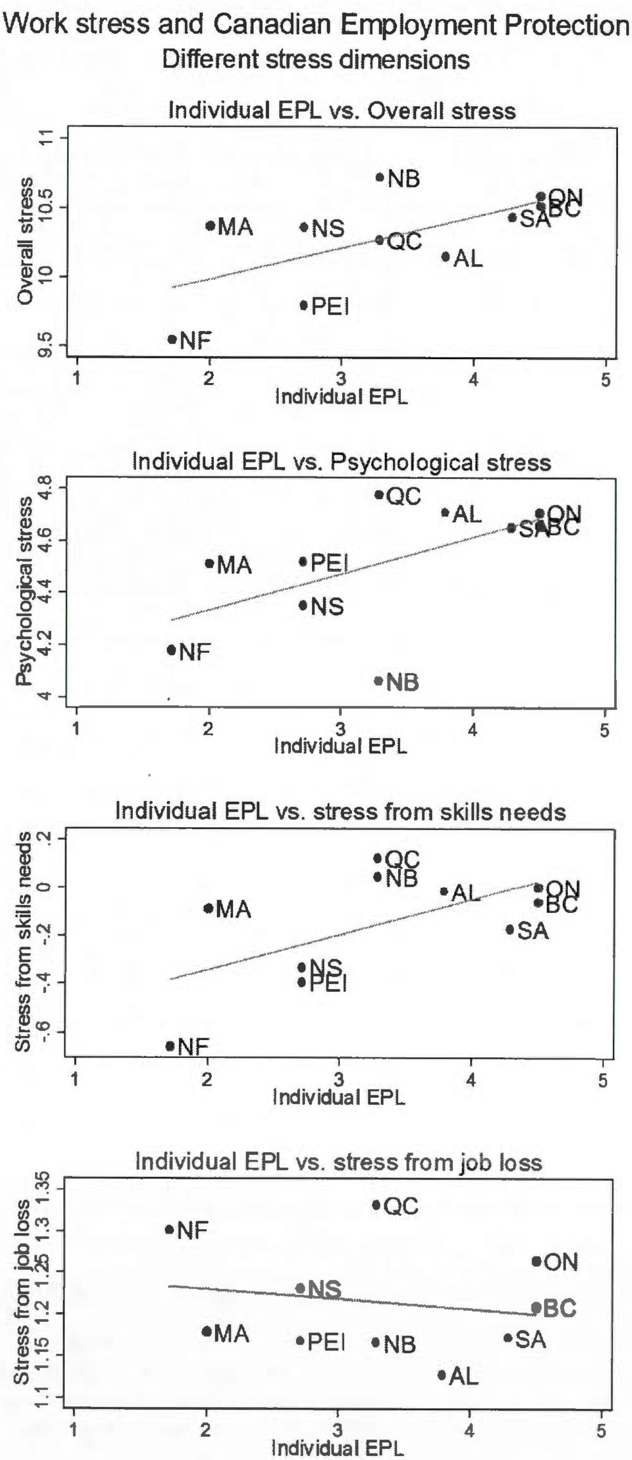


FIGURE 3.3: EPL and various stress components

individual characteristics, such as childhood traumas, sex, urban/rural, household size, household type, children in household, education, recent immigration, country of origin, 19 age dummies and 47 occupation dummies.

As stated above, our job destruction index (JD) was built with Amadeus data on European firms. It may thus not be a good proxy for actual Canadian-specific job destruction rates. We however lack equivalently good data for Canada. However, we tried to address this issue in constructing alternative "layoff rates" index using worker flows instead, with no dramatic change in the results of next Section. Time dummies are included for precision, even though the variable of interest, EPL, do not vary over time. [25]

3.5.5 Results

3.5.5.1 Overall stress

Table 3.5 presents the benchmark Canadian results based on equation (3.4) regressing the WorkStress index and its components on individual and collective advance notice requirements. In Columns 1 to 4, we present between-province results for the impact on stress of individual and collective employment protection, either basic or imputed and their sum (weighted by the incidence of each type of layoff in the data). We confirm the positive correlation between each measure of EPL and workplace stress. When we include province effects to obtain within-estimates (Columns 5 and 6) we still obtain positive effects for total EPL and individual EPL, although collective EPL now has a negative sign. Finally, the interaction with job destruction, that may be interpreted as causal, now exhibits a non-significant coefficient for individual EPL, a positive but marginally significant effect for collective EPL, and no significance for total EPL. See Columns 7 and 8.

3.5.5.2 Components of stress and job's characteristics

We also investigate the link between EPL and the various sub-components of workplace stress. The regression results are reported in Appendix in Table C.5 and the marginal effects are calculated in Appendix Table C.6. The results are as follows. The effect of individual EPL is to raise hostility at work, raise the incidence of repetitive tasks,

25. Namely, we used employee data of the Canadian labor Force Survey or the Canadian Workplace and Employee Survey (WES). None yielded substantially different, statistically significant results.

raise the incidence of hectic jobs, but reduce the absence of decision freedom (it may raise the stress from deciding oneself), reduce the probability of having little to say on the job, and raise the probability of having helpful supervisors and colleagues. It also reduces the perception of job insecurity. The effect of collective EPL has more insignificant coefficients. When significant, it reduces the incidence of repetitive tasks, of hectic jobs, raise the absence of decision freedom and of having unhelpful colleagues. It does not seem to have an effect on job insecurity, hostility at work and on having little to say on the job.

3.6 Alternative variables describing workplace problems

3.6.1 Harrassment and health effects of work disorder and job satisfaction in EWCS

The 2000/2001 European Working Conditions Survey includes a question related to harassment and bullying. The exact phrasing is "Over the past 12 months, have you or have you not, been subjected at work to intimidation ?". In 2005, the phrasing was more precise "[Over the past 12 months] have you personally been subjected at work to bullying / harassment ?" The wording is not the same (and we have no way of assessing how close these two formulations are in other languages), but since we control for country×time, we choose to lump the two variables in a common 'harassment' question.

Both specifications of Columns 1 and 2 in Table 3.6, based on equation (3.3), find that the fraction of workers reporting bullying is positively affected by the interaction of EPL and job destruction, although mildly significantly. The magnitude of the effect is roughly similar to the stress effect in Table 1's benchmark specification. The remainder of Table 3.6 reports the link between EPL and Anxiety, Headaches, Irritability and Sleeping problems, four of the most likely symptoms of work stress. The results exhibit similar patterns, although mostly insignificant individually. Notably, EPL×JD is significant for Anxiety at the 1% level for Columns 3 and dEPL×JD is significant at the 10% level for Column 4, and dEPL×JD is also significant for irritability at the 5%

level in Column 8.

Finally, all waves of the EWCS survey included a question on general job satisfaction, simply worded "Are you very satisfied, satisfied, not very satisfied or not at all satisfied with working conditions in your main paid job ?". Job satisfaction is another interesting subjective variable to consider : it encompasses work stress, salary and other working conditions. Column 11 of Table 3.6 shows that an increase in EPL is associated with an insignificant decrease in job satisfaction difference between sectors. Column 12's specification shows that high EPL countries have least job satisfaction, and that EPL changes are mildly associated with job satisfaction improvements, but confirm the absence of differentiated impact between sectors.

3.6.2 Incidence of stress at work, job satisfaction and fear of job loss in ISSP and Eurobarometer 2000-2001

3.6.2.1 Sample and data description

The International Social Survey Program and Eurobarometer 2000-2001 contain useful information on stress and workplace disorder. We grouped together the ISSP 1997, the Eurobarometer 2001 and ISSP 2005, in a second pseudo-panel. Keeping OECD countries, this panel contains 20 European countries plus Australia, Canada, New Zealand and Turkey over three periods, or 53 country×periods. The panel contains a total of 14 084 observations, each country×periods containing between 126 and 1081 individuals. However, the database do not contain information about sectors. Thus, the causal inference is based on within-country variations which are sometimes relatively small. The contract type is unavailable for ISSP 2005. Workers with temporary or no contract could therefore not be excluded from this wave, contrary to the analysis of previous Section. All variables are described in more detail in Tables C.8 and C.9 in Appendix C.1.

The stress variable measures the frequency of stress in the workplace. The exact question in the three surveys is : "*How often do you find work stressful ?*" with possible answers *Always ; Often ; Sometimes ; Hardly ever ; Never.* They are coded 1 to 5. We create a dichotomous variable taking value 1 if often or always stressed and 0 otherwise, as we are seeking abnormally high stress level. We call it $WorkStress_{frequency}$.

3.6.2.2 Correlations

A first look at the dichotomous variable $WorkStress_{frequency}$ averaged at the country level indicates that, in all years, it is positively correlated with the degree of employment protection. In the first chart (ISSP 1997), the Czech Republic seems to be an outlier, possibly generating a U-curve in stress, although such non-linear relations in this paper have not been found to be significant.

A drawback in the datasets is the absence of information on sectors of activity of the surveyed individuals. The previous identification strategy based on sectors can therefore no longer be implemented. We therefore make use of the panel dimension of the survey instead, in trying to capture country fixed effects and using the within-dimension and using partial reforms of EPL within countries.

3.6.2.3 An identification strategy based on time differences in EPL

The most general regression is therefore

$$WorkStress_{frequency_{i,c,t}} = \beta_1 \text{EPL}_{c,t} + \beta_2 Z_i + \text{FE}_c + \text{FE}_t + \varepsilon_{i,c,t} \quad (3.5)$$

where $\text{EPL}_{c,t}$ is the employment protection level of country c at time t, $Z_{i,t}$ is a vector of individual controls at time t for individual i, and FE_c and FE_t are vector of country and time dummies, respectively.[26] As before, explained in section 3.3.3, we perform a two stage estimation clustering the residuals of the second stage at the country level : have two parts : $\varepsilon_{c,t} = \mu_c + \nu_{c,t}$ where μ_c is the unobserved cluster effects of country c. In the first stage, depending on the nature of the dependent variable, we fit a least square, probit or ordered logit model[27]. Accordingly, we assume a residual distributed normally logistically when we use an ordered logit estimate with the original, untransformed data with five possible answers.

The individual controls in $Z_{i,t}$ are sex, age, education, marital status, rural or urban area, job title, occupation type, firm size, working with dangerous substances and weekly hours. Their summary statistics are reported in Table C.9 in Appendix C.1.

26. Contrary to the regressions in Section 3.4, the fewer number of countries×periods prevents us from including country controls.

27. Since we cannot interact EPL with job destruction rates, there is no reason to use a linear probability model instead of probit.

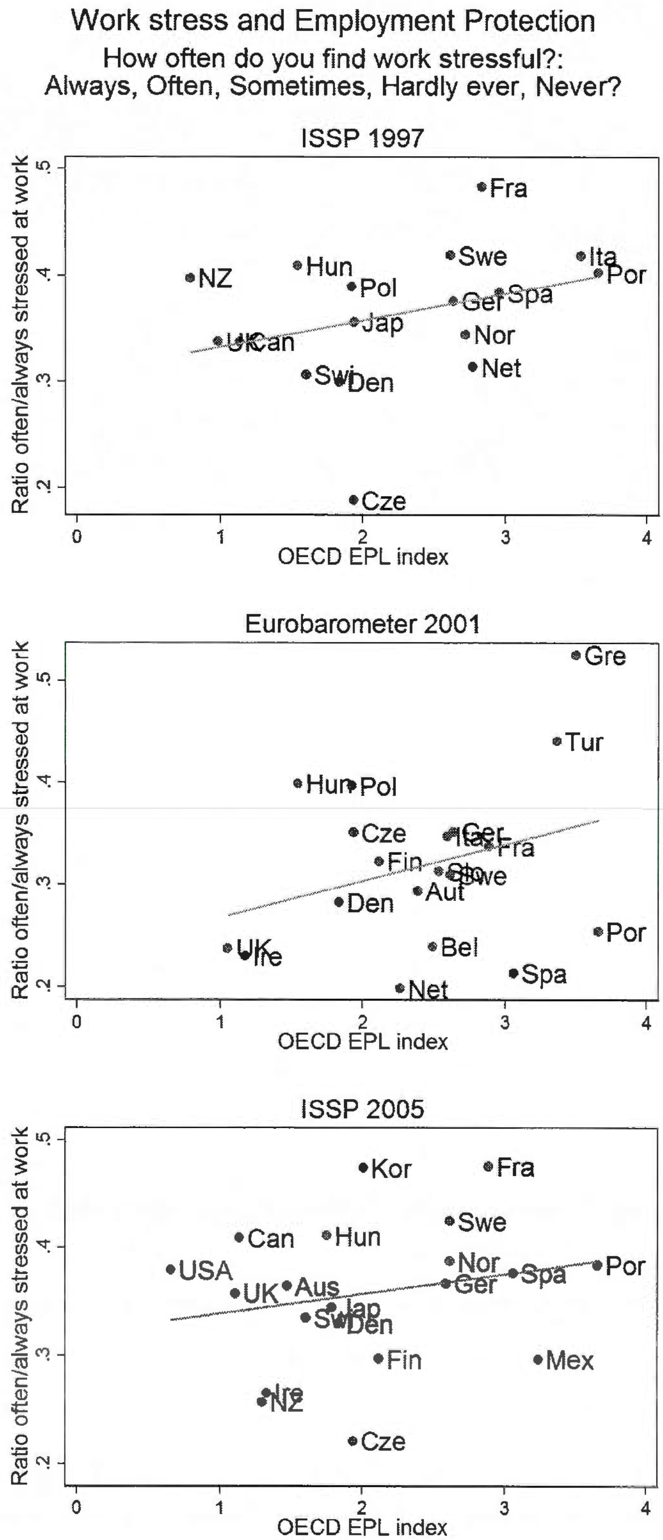


FIGURE 3.4: EPL indicator and stress incidence

Appart from stress incidence, we also investigate various additional variables reflecting the perceived quality of relations at the workplace and work satisfaction. Table 3.7 reports cross-sectional correlations as well as within-country effects from changes in EPL. Recall that we cannot use the triple difference based on job destruction data as the sector of activity of the individuals is not available in the survey. Column 1 shows that more protected countries are also more stressed, and Column 2 also show that EPL increases are mildly associated with more stress. Columns 3 and 4 show no link between EPL and work relations. Column 5 suggests that in low-EPL countries, workers tend to be less optimistic about finding new jobs, but that but that over time, the effect seems to be opposite. Columns 7 shows that the fear of job loss is higher in high EPL countries (significant at the 10% level), a result that was also found by Clark and Postel-Vinay (2009), but the effect on the feeling of job security is insignificant. One interpretation is a general equilibrium effect : EPL protects jobs but raises the risk of not finding a new job after displacement. Finally, Column 12 shows a weak improvement on job satisfaction following an EPL increase.

3.6.3 Is work too demanding and stressful ? (EQLS 2003)

The European Quality of Life Survey 2003 contains a question on whether work is "too demanding and stressful". The drawback is that this is only a one year survey. As reported in Figure 3.5, there is a strong cross-country correlation between EPL and this specific measure of the intensity of workplace stress.

Unfortunately, we will not be able to implement a good empirical strategy with EQLS 2003, given the absence of repeated cross section with this variable and the absence of an activity sector variable to implement Rajan and Zingales' strategy. We do not report any regression here, even though the effect of EPL on stress is obviously large and significant, but without a causal interpretation.

3.6.4 Use of psychoactive drugs and depression incidence in NHPS

In NHPS, several variables based on objective clinical characteristics of individuals are available, such as depression scale, predicted probability of depression, use of tranquilizers such as Valium or Ativan, of anti-depressants such as Prozac, Paxil or Effexor, of sleeping pills such as Imovane, Nytol or Starnoc). In Wasmer (2006b), in instru-

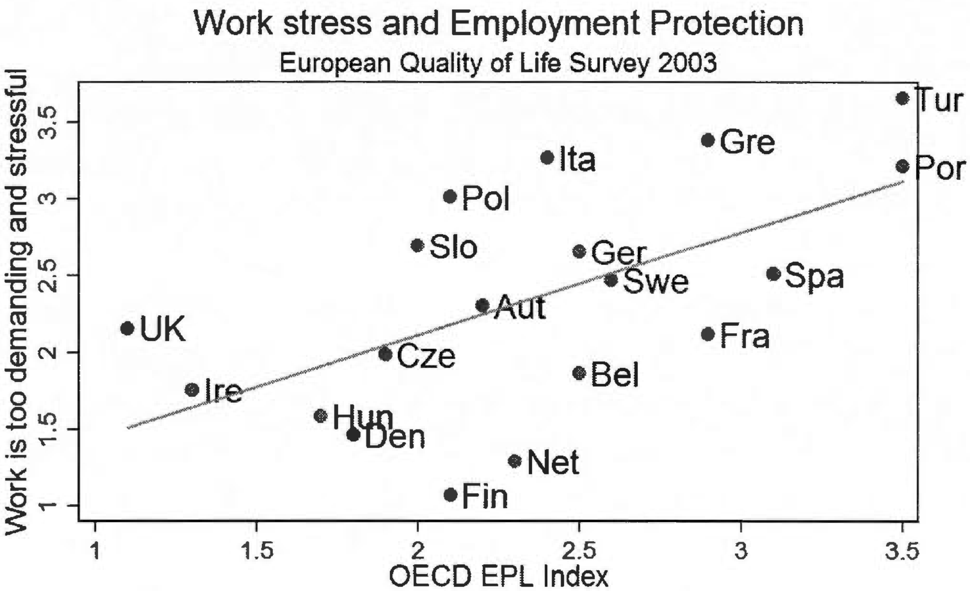


FIGURE 3.5: EPL and stressful work

menting the individual employment variable by local labor market conditions (such as county-level employment and participation rates), it is found that that for some variables, EPL has a significant effect : it is associated with a rise in the incidence of depression, on the consumption of anti-depressants and of tranquilizers, but shows no effect on the use of sleeping pills and on the incidence of abnormally high pressure.

3.7 Policy implications and concluding comments

Does EPL improve the well-being of employed workers ? This may be the conventional wisdom, but theory suggests counteracting effects due to employers' response : stress and work strain may depend positively, and not negatively, on EPL. In this paper, we have explored systematically these effects and tried to be as exhaustive as possible regarding the available datasets.

The data analysis indicates positive correlations between EPL and many areas of stress in the data ; as regards to the causal effects, when the identification permits it, we find heterogeneous effects, positive in high turnover sectors and sometimes negative in low turnover sectors, where the protective role of EPL dominates. When separating out the effects of various components of EPL, it seems that regulations on temporary employment amplify the main effect of employment protection on regular contracts, while unemployment insurance reduces stress.

As a final remark, it is important to have a better understanding of the potential negative effects of EPL on workers' well-being. This may open the way to labor market reforms in several European countries. Many observers appear to agree that EPL harms outsiders (unemployed, female, and young workers). But if it also affects workers closer to the political core (protected workers), the terms of the debate could drastically change, and this implies even more scope for reform. Our research has several policy implications. First and paradoxically, employment protection may not always raise the welfare of employees. This arises both from adjustment of firms' behaviour and from a perception of increased risk of longer unemployment duration implied by higher turnover costs faced by firms. Although most of these adverse effects of employment protection may not be consciously perceived by employees and their representatives, they suggest that, a few months or years after a successful deregulation of the labor market, the well-being of workers may not have worsened, but instead have improved. This will not make the reform easier to pass, but at least it will ease the transition to a new, and hopefully better, equilibrium.

A second insight is that unemployment compensation is partially substitutable to employment protection : a more generous unemployment insurance could reduce the level of stress experienced by workers, although our results may require further investigation. Therefore, a policy package raising unemployment insurance and reducing employment protection may raise workers' well-being, with two additional concerns however. It could increase moral hazard regarding job search, as the unemployed workers may search less actively. There is also a public finance externality since firms may transfer the costs of layoffs on social security, instead of internalizing them through severance pay and the various costs of firing regulations, solved by a system of experience rating (the system is carefully described in Blanchard and Tirole (2003), Blanchard and Tirole (2008)) : firms would pay higher social contributions when they have had a higher rate of layoff in the past years. In addition, one should take into account the potential effects of additional taxes on layoffs on workers' well being. This would lead to a different level of optimal experience rating system if such effects of EPL on stress were incorporated in the calculations of social welfare, as they should.

Tables and figures

TABLE 3.1: Effect of EPL on workplace stress : cross-sector/country

Main variable	Linear probability model (2-Step GLS estimation)					
Work affects health : stress[a]	Main spec. : DDD		DD	Within-country	Cross-country	Effects decomposition
	1	2	3	4	5	6
$EPL_{c,t}$[b] $\times JD_s$[c]	4.508*	4.765***	0.713			
	(2.248)	(1.219)	(0.418)			
$EPL_{c,t}$				-0.0399	0.0476***	
				(0.0359)	(0.0142)	
$dEPL_{c,t}$[d] $\times JD_s$						5.250***
						(1.115)
mean EPL_c[e] $\times JD_s$						0.256
						(0.380)
$dEPL_{c,t}$						-0.233***
						(0.0535)
mean EPL_c						0.0468**
						(0.0222)
Indiv. Controls[f]	Y	Y	Y	Y	Y	Y
Country $Controls_{c,t}$[g]				Y	Y	Y
Time dum.				Y	Y	Y
Sector dum.			Y	Y	Y	Y
Country dum.				Y		
Country × Time dum.	Y	Y	Y			
Sector × Time dum.	Y					
Country × Sector dum.	Y	Y				
Num. of obs.	584	584	584	543	543	543
Num. of clus.	21	21	21	19	19	19
R^2	0.782	0.747	0.512	0.375	0.290	0.317

note : *** p<0.01, ** p<0.05, * p<0.1. Robust s.e. in parentheses.

[a] Does your work affect your health ? How ? - Stress ?

[b] Employment protection index (OECD 2004) of country c at time t

[c] 'Frictionless' Job destruction rate of activity sector s a la Ciccone-Papaioannou (2006)

[d] Deviation of $EPL_{c,t}$ from the country average over the period : $dEPL_{c,t} = EPL_{c,t} - \text{mean } EPL_c$

[e] Mean EPL of country c over the period

[f] Includes sex, 5 age dummies, household children dummies, household size dummies, 5 firm size dummies, 12 job title dummies, 11 weekly hours dummies and age and sex speciific unemployment rate.

[g] Includes bargaining coverage, union density, wage centralization, wage coordination, UI replacement rate and per capita GDP of country c at time t.

note : Only includes full-time private sector workers in a permanent contract between 25 and 65 years old.

Table 1b : Total marginal effects on workplace stress of EPL change and of mean country EPL in various sectors

Main variable	Linear probability model (2-Step GLS)					
Work affects health :	Inter. with JD_s[b]		Inter. with $(JD_s \geq 0.037)$[c]		Inter. with $(JD_s \geq 0.041)$[d]	
stress	1		2		3	
Marginal effects	JD_s		JD_s		JD_s	
	= 0.032	= 0.064	<0.037	≥0.037	<0.041	≥0.041
Effect of $dEPL_{c,t}$	-.065**	.103***	-.053	.027	-.069**	.062**
	(.027)	(.033)	(.034)	(.021)	(.028)	(.027)
Effect of mean EPL_c	.055***	.063***	.054***	.061***	.054***	.063***
	(.016)	(.018)	(.017)	(.016)	(.016)	(.016)
Indiv. Controls	Y		Y		Y	
Country $Controls_{c,t}$	Y		Y		Y	
Time dum.	Y		Y		Y	
Sector dum.	Y		Y		Y	
Num. of obs.	543		543		543	
Num. of clus.	19		19		19	
R^2	0.317		0.306		0.316	

note : this table reports the total effect of EPL on stress, adding up the linear term of EPL and the interaction with JD at different values of JD and for different specifications.

*** p<0.01, ** p<0.05, * p<0.1. Robust s.e. in parentheses. (same spec. and sample as Table 3.1)

[a] 'Frictionless' Job destruction rate of activity sector s a la Ciccone-Papaioannou (2006)

[b] Same as Table 3.1, Column 6.

[c] Includes Mines, Manufacturing, Financial intermediation, Real estate, Electricity, gas and water supply, Transportation and utility. Excludes Construction, Other services, Hotels, Wholesale, Agriculture

[d] Includes Mines, Manufacturing, Financial intermediation, Real estate. Excludes Construction, Electricity, gas and water supply, Transportation and utility. Other services, Hotels, Wholesale, Agriculture

TABLE 3.2: Health consequences on workplace stress of EPL (EWCS 2000, 2001, 2005 and Eurobarometer 1996)

Other stress-related health problems[a]	Linear probability model (2-Step GLS estimation)			
	Stress-related health consequences excluding stress		Stress-related health consequences including stress	
	1	2	3	4
$EPL_{c,t}$[b] $\times JD_s$[c]	2.802		3.285	
	(2.430)		(2.507)	
$dEPL_{c,t}$[d] $\times JD$		2.852**		4.366***
		(1.216)		(1.223)
mean $EPL_{c,t}$[e] $\times JD$		0.523		0.517
		(0.408)		(0.357)
$dEPL_{c,t}$[d]		-0.138**		-0.191***
		(0.0587)		(0.0550)
mean EPL_c[e]		0.0380		0.0563**
		(0.0267)		(0.0266)
Indiv. Controls[f]	Y	Y	Y	Y
Country $Controls_{c,t}$[g]		Y		Y
Three time dummies		Y		Y
Twelve sector dummies		Y		Y
Country × Time dum.	Y		Y	
Country × Sector dum.	Y		Y	
Sector dum. × Time dum.	Y		Y	
Number of observations	584	543	584	543
Number of clusters	21	19	21	19
R^2	0.783	0.359	0.803	0.363

note : *** p<0.01, ** p<0.05, * p<0.1. Robust s.e. in parentheses.

[a] Does your work affect your health ? How ? - Anxiety, headaches, stomach problems, irritability, sleeping problems.

[b] Employment protection index (OECD, 2004) of country c at time t

[c] 'Frictionless' Job destruction rate of activity sector a la Ciccone-Papaioannou (2006)

[d] Deviation of $EPL_{c,t}$ from the country average over the period : $dEPL_{c,t} = EPL_{c,t} - \text{mean } EPL_c$

[e] Mean EPL of country c over the period

[f] Includes sex, 5 age dummies, household children dummies, household size dummies, 5 firm size dummies, 12 job title dummies, 11 weekly hours dummies and age and sex specific unemployment rate.

[g] Includes bargaining coverage, union density, wage centralization, wage coordination, UI replacement rate and per capita GDP of country c at time t.

note : Only includes full-time private sector workers in a permanent contract between 25 and 65 years old.

TABLE 3.3: Control for unemployment insurance (EWCS 2000, 2001, 2005 and Eurobarometer 1996)

Main variable	Linear probability model (2-Step GLS estimation)				
Work affects	Three components				
health : stress[a]	Main specification DDD		DD	Within-country	Cross-country
	1	2	3	4	5
$EPL_{c,t}{}^{b} \times JD_s{}^{c}$	5.277**	5.502***	0.814**		
	(2.113)	(1.788)	(0.360)		
$UI_{c,t} \times JD_s$	0.219	0.205	-0.0332		
	(0.239)	(0.245)	(0.0329)		
$EPL_{c,t}$				-0.0399	0.0476***
				(0.0359)	(0.0142)
UI				-0.00345*	-0.00125*
				(0.00199)	(0.000690)
Indiv. Controls[d]	Y	Y	Y	Y	Y
Wage coor. $dum_{c,t} \times JD_s$				Y	Y
Wage coor. $dum_{c,t}$				Y	Y
Time dum.				Y	Y
Sector dum.			Y	Y	Y
Coun. dummies				Y	
Other coun. controls[e]				Y	Y
Coun. × Time dum.	Y	Y	Y		
Sector × Time dum.	Y				
Coun. × Sect. dum.	Y	Y			
Num. of obs.	574	574	574	543	543
Num. of clusters	20	20	20	19	19
R^2	0.784	0.748	0.516	0.375	0.290

note : *** p<0.01, ** p<0.05, * p<0.1. Robust s.e. in parentheses.

[a] Does your work affect your health ? How ? - Stress ?

[b] Individual dimension of employment protection index (OECD, 2004) of country c at time t

[c] 'Frictionless' Job destruction rate of activity sector s a la Ciccone-Papaioannou (2006)

[d] Includes sex, 5 age dummies, household children dummies, household size dummies, 5 firm size dummies, 12 job title dummies, 11 weekly hours dummies and age and sex speciific unemployment rate.

[e] Includes bargaining coverage, union density, wage centralization, and per capita GDP of country *c* at time *t*.

note : Only includes full-time private sector workers in a permanent contract between 25 and 65 years old.

TABLE 3.4: Effect on workplace stress of EPL components, interaction between EPL components (EWCS 2000, 2001, 2005 and Eurobarometer 1996)

Main variable	3 components individually			Product of 3 comp.		Product of EPL components 2x2			
Work affects health : stress[a]	1	2	3	4	5	6	7	8	9
$EPL\_ind_{c,t}{}^{b} \times JD_s{}^{c}$	-5.226	-4.362	-6.504						
	(6.475)	(5.361)	(7.241)						
$EPL\_coll_{c,t}{}^{d} \times JD_s$	39.31**	36.68***	43.80***						
	(14.09)	(9.887)	(5.291)						
$EPL\_temp_{c,t}{}^{e} \times JD_s$	3.997*	4.626***							
	(1.974)	(1.146)							
$EPL\_temp\_valid_{c,t}{}^{f} \times JD_s$			0.425						
			(1.391)						
$EPL\_temp\_limit_{c,t}{}^{g} \times JD_s$			1.832*						
			(0.954)						
$EPL\_prod_{c,t}{}^{h} \times JD_s$				8.670**	8.932***				
				(4.094)	(1.757)				
EPL_ind×EPL_coll						13.39			12.56
						(17.96)			(12.88)
EPL_temp×EPL_ind							5.213*		0.950
							(2.950)		(3.570)
EPL_temp×EPL_coll								6.402**	5.382*
								(2.652)	(2.601)
Indiv. Controls[i]	Y	Y	Y	Y	Y	Y	Y	Y	Y
Coun.×Time dum.	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sector×Time dum.	Y		Y	Y		Y	Y	Y	Y
Coun.×Sect. dum.	Y	Y	Y	Y	Y	Y	Y	Y	Y
Num. of obs.	584	584	573	584	584	584	584	584	584
Num. of clusters	21	21	21	21	21	21	21	21	21
R^2	0.785	0.749	0.794	0.783	0.748	0.778	0.782	0.782	0.784

note : *** p<0.01, ** p<0.05, * p<0.1. Robust s.e. in parentheses. ; For [ac di i] see Table 1 (same specification (Linear probability model (2-Step GLS estimation)) and basic sample) ;

[b] Individual dimension of employment protection index (OECD, 2004) of country c at time t

[d] Collective dimension of employment protection index (OECD, 2004) of country c at time t

[e] Restriction against temporary contracts dimension of employment protection index (OECD, 2004) of country c at time t

[f] EPL_temp_valid = Valid cases for use of fixed-term contracts*0.5 + Types of work for which is legal *0.5 (OECD, 2004) of country c at time t

[g] EPL_temp_limit = Max. num. of successive FTC*0.25 + Max. cum. duration FTC*0.25 + Restr. on num. of renewals TWA*0.25+Max. cum. duration TWA*0.25 (OECD, 2004) of country c at time t. (FTC means fixed term contract, TWA means temporary work agency)

[h] $EPL\_prod_{c,t} = EPL\_ind_{c,t} \times EPL\_coll_{c,t} \times EPL\_temp_{c,t}$

TABLE 3.5: Effect on Work Stress of EPL (Canadian NHPS)

Dep. Var. : Work Stress[a]	Between provinces				Within province		Interrac. with JD	
(Least squares)	1	2	3	4	5	6	7	8
$EPL\_ind_{basic\,p}$[b]	0.126**							
	(0.057)							
$EPL\_coll_{basic\,p,w}$[c]	0.034**							
	(0.017)							
$EPL\_ind_{basic\,p}+0.1*EPL\_coll_{basic\,p,l}$		0.156**						
		(0.063)						
$EPL\_ind_{imputed\,p,i}$[d]			0.142***		0.115***		0.236	
			(0.039)		(0.027)		(0.149)	
$EPL\_coll_{imputed\,p,i}$[e]			0.032		-0.044***		-0.109***	
			(0.020)		(0.008)		(0.034)	
$EPL\_ind_{imputed\,p,i}+0.1*EPL\_coll_{imputed\,p,i}$				0.175***		0.088***		0.124
				(0.050)		(0.027)		(0.127)
$EPL\_ind_{imputed\,p,i}\times JD_s$[f]							-3.60	
							(3.47)	
$EPL\_coll_{imputed\,p,i}\times JD_s$							1.67*	
							(0.94)	
$(EPL\_ind_{imputed\,p,i}+0.1*EPL\_coll_{imputed\,p,i})$								-1.35
$\times JD_s$								(2.85)
Indiv. Controls[g]	Y	Y	Y	Y	Y	Y	Y	Y
Activity sector dummies	Y	Y	Y	Y	Y	Y	Y	Y
Province dummies					Y	Y	Y	Y
Time dummies	Y	Y	Y	Y	Y	Y	Y	Y
N. observations	20,480	20,480	20,480	20,480	20,480	20,480	20,413	20,413
N. clusters	10	10	10	10	10	10	10	10
adj. R^2	0.068	0.068	0.068	0.068	0.069	0.069	0.069	0.069

note : *** p<0.01, ** p<0.05, * p<0.1. Cluster-robust s.e. in parentheses at the province level.

note : Imp. denotes imputed advanced notice requirements using information on province, year, sex, education, age dummies, activity sector and occupation.

[a]Derived variable : Respondent's perception about all dimensions of their work (0-48) based on 12 work stress items.

[b]Average notice requirement for individual layoff in province p (weeks)

[c]Notice requirement for group layoff in province p for layoff size l (weeks)

[d]Imputed notice requirement for individual layoff for individual i in province p (weeks)

[e]Imputed notice requirement for group layoff for individual i in province p (weeks)

[f]'Frictionless' Job destruction rate of activity sector s a la Ciccone-Papaioannou (2006)

[g]Includes sex, urban region, family type, household type, education dummies, country of birth, age dummies, occupation dummies, dummy for many jobs, dummy for immigrant of less than 10 years, for more than 10 years, weekly hours dummies.

TABLE 3.6: Additional effects of EPL on subjective measure of quality of jobs (EWCS 2000, 2001, 2005 and Eurobarometer 1996)

	Linear probability model (2-Step GLS estimation)										Ordered logit	
Variables (0/1)	**Harassment**		**Anxiety**		**Headache**		**Irritability**		**Sleeping problems**		**Satisfied with job**	
	1	2	3	4	5	6	7	8	9	10	11	12
$EPL_{c,t}{}^{a} \times JD_{s}{}^{b}$	4.065		1.977**		2.051		1.014		-0.498		0.829	
	(3.444)		(0.810)		(2.506)		(1.342)		(1.020)		(2.976)	
$dEPL_{c,t}{}^{c} \times JD_{s}$		4.463*		1.021*		1.209		1.580**		0.208		-3.761
		(2.260)		(0.528)		(1.329)		(0.594)		(0.898)		(2.240)
mean $EPL_{c}{}^{d} \times JD_{s}$		0.881**		0.357*		0.267		0.552		0.0157		-0.129
		(0.401)		(0.199)		(0.429)		(0.403)		(0.195)		(0.603)
$dEPL_{c,t}$		-0.233**		-0.0660**		-0.0570		-0.104***		-0.00788		0.219*
		(0.0996)		(0.0310)		(0.0513)		(0.0315)		(0.0417)		(0.113)
mean EPL_{c}		-0.0663***		0.0182		0.0273		-0.0185		0.00754		-0.105**
		(0.0223)		(0.0145)		(0.0213)		(0.0238)		(0.0103)		(0.0428)
Indiv. Controls[e]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country $Controls_{c,t}$[f]		Y		Y		Y		Y		Y		Y
Three time dummies		Y		Y		Y		Y		Y		Y
Sector dummies		Y		Y		Y		Y		Y		Y
Country × Sector dummies	Y		Y		Y		Y		Y		Y	
Country × Time dummies	Y		Y		Y		Y		Y		Y	
Sector × Time dummies	Y		Y		Y		Y		Y		Y	
Number of observations	436	405	584	543	584	543	584	543	584	543	584	543
Number of clusters	21	19	21	19	21	19	21	19	21	19	21	19
R^2	0.815	0.260	0.825	0.346	0.735	0.299	0.731	0.216	0.734	0.264	0.878	0.529

note : *** p<0.01, ** p<0.05, * p<0.1. Robust s.e. in parentheses.

[a]Employment protection index (OECD, 2004) of country c at time t

[b]'Frictionless' Job destruction rate of activity sectors à la Ciccone-Papaioannou

[c]Deviation of $EPL_{c,t}$ from the country average over the period : $dEPL_{c,t}=EPL_{c,t}-$ mean EPL_{c}

[d]Mean EPL of country c over the period

[e]Includes sex, 5 age dummies, household children dummies, household size dummies, 5 firm size dummies, 12 job title dummies, 11 weekly hours dummies and age and sex speciific unemployment rate.

[f]Includes bargaining coverage, union density, wage centralization, wage coordination, UI replacement rate and per capita GDP of country c at time t.

note : Only includes full-time private sector workers in a permanent contract between 25 and 65 years old.

TABLE 3.7: Effects on workplace stress of EPL : within-country identification (ISSP 1997, 2005 and Eurobarometer 2001)

Variable	**Often/always stressed** Probit		**Good relation w. management** Least squares		**Would be easy to find new job** Ordered logit		**Worry about losing job** Least squares		**My job is secure** Ordered logit		**Job satisfaction** Least squares	
	Cross-C	Within	Cross-C	Within	Cross-C	Within	Cross-C	Within	Cross-C	Within	Cross-C	Within
	1	2	3	4	5	6	7	8	9	10	11	12
$EPL_{c,t}$[a]	0.123**	0.642	-0.0933	0.424	-0.177*	1.996	0.253	-1.332	-0.0600	0.303	-0.0414	1.094
	(0.0472)	(0.608)	(0.117)	(1.263)	(0.0901)	(2.000)	(0.149)	(2.172)	(0.0462)	(0.949)	(0.0387)	(0.976)
Indiv. Controls[b]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Time dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country dummies		Y		Y		Y		Y		Y		Y
Number of obs.	40	40	41	41	27	27	27	27	41	41	41	41
Number of clusters	23	23	23	23	18	18	18	18	23	23	23	23
R^2	0.255	0.942	0.048	0.861	0.200	0.905	0.162	0.966	0.191	0.795	0.033	0.832

note : *** p<0.01, ** p<0.05, * p<0.1. Robust s.e. in parenthesis.

[a] Employment protection index (OECD, 2004) of country *c* at time *t*

[b] Include sex, 5 age dummies, education dummies, marital status dummies, rural or urban dummies, 11 weekly hours dummies and sex and age specific unemployment rate.

note : Only includes full-time private sector employees between 25 and 65 years old.

Conclusion

How should workers be protected against labor market uncertainties ? The goal of this thesis has been to see how layoffs and hours losses affected worker's consumption choices and to consider the impact of various institutions, especially employment protection legislation, on non-pecuniary aspects of labor relations.

Chapter one computed the consumer's response to layoffs and involuntary cutbacks in work hours using propensity score estimates, followed by a structural approach. The impact of being laid off with unknown recall date is -13.7%, compared to workers who remained employed ; it is insignificant for layoffs with known recall dates or for cutbacks in work hours. The structural model reproduced well the reduced form estimates. Simulating various reforms to unemployment insurance, it was shown that their impact on the unemployed households' consumption is small and that their impact on welfare is very modest. All in all, both approaches suggest quite convincingly that workers' consumption reactions to hour cuts is very small. Hence, given the choice between one layoff or two partial reductions in work hours, a firm choosing the latter would probably have less impact on employees' marginal propensity to spend and their consumption utility. From a macroeconomics perspective, reducing hours would also have a smaller effect on aggregate demand. This would add to the benefits for the firm of not breaking a match with well trained workers in response to a temporary reduction of the firm's need for labor. Since the structural model seems to fit well the present data, future avenues of research should test this Markov income process on consumption data containing more than two periods per household, such as the PSID or CEX.

Chapter two explored whether employment protection could induce firms to adjust labor through the intensive margin, hours per worker, instead of the extensive margin, the number of workers. A model of firm labor adjustment showed how restrictions to worker adjustments inevitably lead firms to compensate by varying hours. The model was extended to show that the minimum hours agreements present in many European countries and North American, tend to increase average working hours and to decrease hiring. Using Canadian survey data, it was shown that longer individual advanced notice requirements increase overtime use in sectors with high layoff rates and in moments when the employment rate is higher than average. Policymakers should be aware of the risk of the excess use of overtime work if labor contracts are too rigid. Of course, Canada being country with mild employment protection, the same empirical analysis should be reproduced in other contexts, such as European countries where employment protection is stricter.

Finally, chapter three challenged the preconception that employment protection is always beneficial to workers holding a permanent contract. It was shown that overly rigid labor contracts could backfire if firms try to circumvent layoff costs when jobs are non-viable. When decomposing the total effect of employment protection in the triple difference setting, employment protection changes increased stress in high turnover sectors, but decreased stress in low turnover sectors. In cross section, it was also clear that the countries with the most stringent employment protection legislation were home to the most stressed workers. The most important source of stress in the OECD index of employment protection is the restrictions to temporary contracts. Such restrictions amplify the impact of the protection of permanent contracts. It is also the subcomponent of EPL that has undergone the most reforms in recent years as governments find it politically difficult to reform permanent contracts that constitute a rent held by insiders. What this research shows, however, is that even insiders may suffer from too much protection and would likely benefit from legislative reforms. This issue will only become more acute in the years to come as the trend in capital-biased technological change puts more pressure on workers in declining sectors and accelerates the Schumpeterian process of creative destruction. If firms find it hazardous to hire workers in permanent contracts, they may intensify their use of capital, or keep workers in temporary positions. This will accentuate the problem of labor market dualism emerging in many OECD countries, as pointed out by research such as Lepage-Saucier et al. (2013). Hence, the goal should not be to protect specific jobs, but rather to protect workers' income. It is especially true for declining sectors, where workers would benefit from a strong safety net rather than continue to be protected in non-viable jobs. Protection should be done through policies that encourage rather than hinder hiring, such as the Danish flexicurity approach that combines weak employment protection, strong unemployment insurance and help to retrain and assist unemployed workers in their job searches.

Annexe A

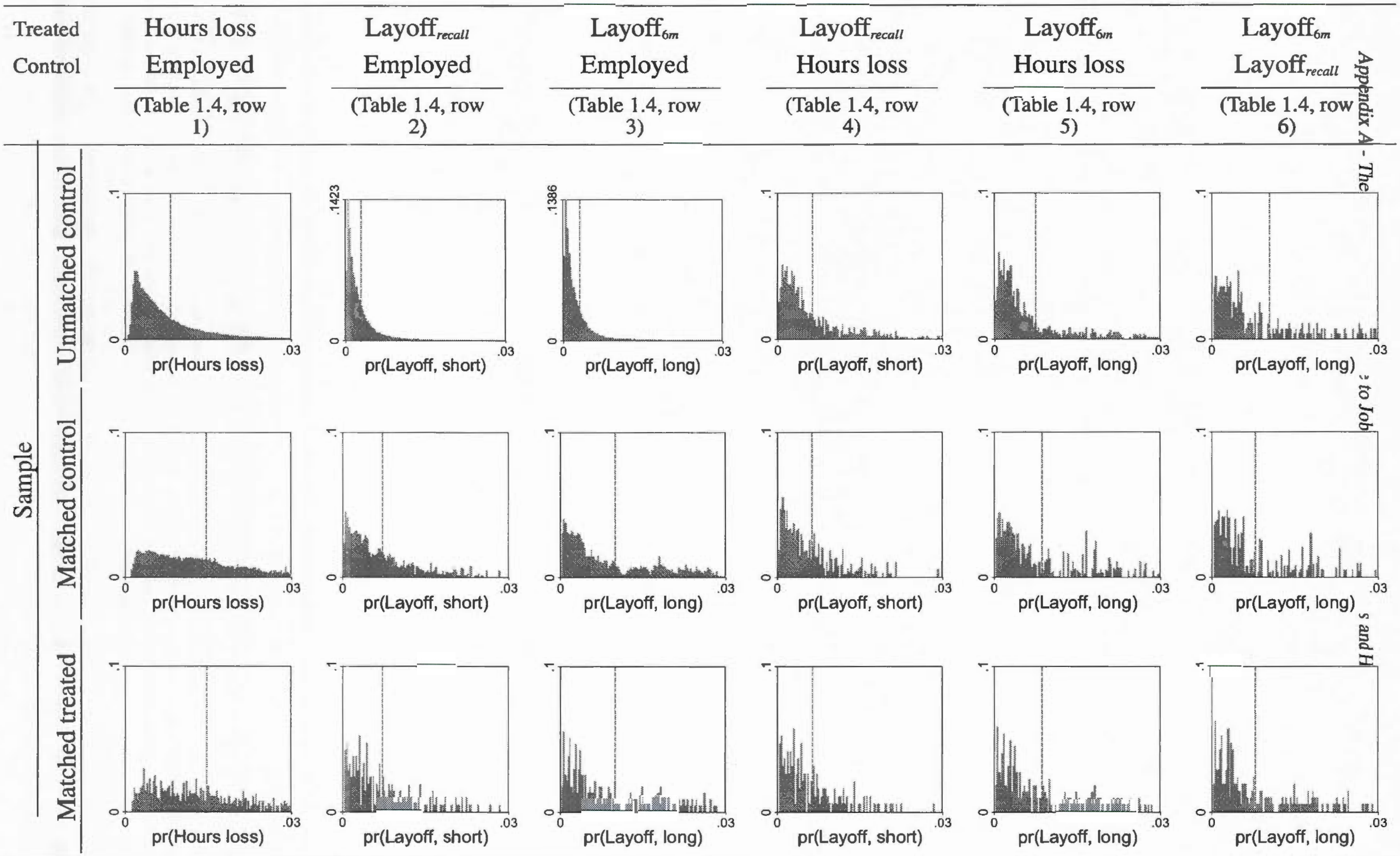
The Consumption Response to Job Displacements, Layoffs and Hours Losses

TABLE A.1: Descriptive Statistics

Food and monthly CPS variables	Mean	SD	Min	Max	Variable	Mean	SD	Min	Max
Food & related weekly spending	178.1	117.7	1	1875	Agri., mining, forestry, etc.	0.018	0.133	0	1
Spend on food outside home[a]	51.8	51.8	1	999	Professional, educ., med., etc.	0.056	0.230	0	1
Spend on food, excl. food outside	137.3	98.3	0	1800	Construction	0.064	0.245	0	1
Not in the labor force, discouraged.	0.001	0.026	0	1	Manufacturing - durable goods	0.152	0.359	0	1
Layoff_{perm}	0.007	0.085	0	1	Manufacturing - non-durable	0.128	0.334	0	1
Layoff_{6m}	0.003	0.054	0	1	Transportation	0.059	0.236	0	1
Layoff_{recall}	0.003	0.051	0	1	Communications	0.028	0.164	0	1
Works < 35 hours, slack work/business	0.008	0.089	0	1	Utilities and sanitary services	0.069	0.253	0	1
Number of hours lost (> 0)	13.42	9.32	1	83	Wholesale trade	0.086	0.281	0	1
Works overtime	0.113	0.317	0	1	Retail trade	0.174	0.379	0	1
Sex : is a man	0.58	0.49	0	1	Finance, insurance & real estate	0.054	0.227	0	1
Age	43.7	11.1	17	69	Private households	0.016	0.124	0	1
Race : white	0.77	0.42	0	1	Business, auto & repair services	0.078	0.269	0	1
Race : black	0.06	0.24	0	1	Public administration	0.017	0.129	0	1
Household Size	3.03	1.44	1	15	Northeast	0.21	0.41	0	1
Some college	0.30	0.46	0	1	Midwest	0.27	0.44	0	1
University	0.36	0.48	0	1	South	0.29	0.46	0	1
House owner	0.76	0.43	0	1	West	0.23	0.42	0	1
Executive, administrative & managerial occup.	0.177	0.382	0	1	2002	0.112	0.315	0	1
Professional speciality occupations	0.221	0.415	0	1	2003	0.111	0.315	0	1
Technicians & related support occupations	0.088	0.283	0	1	2004	0.092	0.289	0	1
Sales occupations	0.095	0.293	0	1	2005	0.106	0.308	0	1
Administrative support occup., incl. clerical	0.146	0.353	0	1	2006	0.106	0.307	0	1
Private household occupations	0.005	0.069	0	1	2007	0.103	0.304	0	1
Protective service occupations	0.047	0.212	0	1	2008	0.098	0.298	0	1
Service occupations, except protective & hhld	0.051	0.220	0	1	2009	0.091	0.288	0	1
Precision production, craft & repair occup.	0.090	0.286	0	1	2010	0.092	0.289	0	1
Machine operators, assenblers & inspectors	0.061	0.239	0	1	2011	0.089	0.284	0	1
Transportation occup., laborors, farming, etc.	0.020	0.140	0	1	State × Year unemployment rate	0.061	0.022	0.02	0.13

Observations : 96 102

[a] Only 75 689 observations



Note : Each graph shows the distribution of propensity score for being in the treatment group indicated in the title row. In row 1, the sample is the unmatched controls, in row 2, the sample is the matched controls and in row 3, the sample is the matched treated. The dashed red line is the sample mean. The *x* axis is truncated at 3%. The underlying multinomial logit estimation is shown in A.3, columns 1 to 3.

FIGURE A.1: Propensity score distributions before and after matching

TABLE A.2: Descriptive Statistics

Mobility supplement variables	Mean	SD	Min	Max
Lost job last year & found new job	0.015	0.123	0	1
Lost job last year & still not working	0.015	0.123	0	1
Firm closure*	0.270	0.444	0	1
No unemployment insurance*	0.268	0.443	0	1
Expired unemployment insurance*	0.176	0.381	0	1
Lost health insurance*	0.331	0.471	0	1
Months since job loss*	3.285	3.459	0	17
Observations : 27 500				

*Subset of respondents who lost job last year and are still not working

Earnings variables	Mean	SD	Min	Max	Observations
Weekly earnings	925.121	573.824	0.03	2884.61	21 866
Hourly wage	16.082	7.815	1.13	99	9 359
Household income in the last 12 months (thousands)	75.282	42.375	4.25	175.000	75 153

TABLE A.3: Propensity scores estimation

	Multinomial Logit					
Sample :	September to March			Only December		
Propensity score :	pr(Hours lost)	pr(Layoff, known return date)	pr(Layoff, ret. in 6 months)	pr(Hours lost)	pr(Layoff, known return date)	pr(Layoff, ret. in 6 months)
	1	2	3	4	5	5
sex (man)	0.119***	0.480***	0.564***	0.210***	0.314**	0.807***
	(0.037)	(0.074)	(0.075)	(0.070)	(0.140)	(0.171)
age	-0.044***	-0.055***	-0.016	-0.014	-0.089***	-0.010
	(0.011)	(0.019)	(0.019)	(0.020)	(0.033)	(0.037)
age^2	0.000***	0.001***	0.000	0.000	0.001***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
White	0.064	0.161	0.001	0.210	0.300	0.270
	(0.075)	(0.145)	(0.140)	(0.167)	(0.293)	(0.345)
Black	0.056	0.398**	0.227	0.110	0.623*	0.406
	(0.094)	(0.179)	(0.173)	(0.208)	(0.349)	(0.427)
(lag) Blue Collar	0.634***	1.195***	1.585***	0.713***	1.337***	1.583***
	(0.045)	(0.070)	(0.072)	(0.088)	(0.144)	(0.156)
(lag) Service sect.	-0.644***	-0.950***	-1.032***	-0.531***	-1.312***	-1.232***
	(0.077)	(0.150)	(0.157)	(0.133)	(0.270)	(0.220)
ln(household size)	0.071***	0.028	0.010	0.024	0.095	-0.002
	(0.019)	(0.033)	(0.035)	(0.030)	(0.071)	(0.071)
Some college	-0.009	-0.035	-0.047	0.086**	-0.129	-0.011
	(0.025)	(0.045)	(0.047)	(0.043)	(0.092)	(0.086)
University	-0.376***	-0.459***	-0.403***	-0.373***	-0.505***	-0.355**
	(0.041)	(0.074)	(0.075)	(0.082)	(0.146)	(0.145)
House owner	-0.959***	-1.317***	-1.350***	-0.871***	-1.564***	-1.320***
	(0.056)	(0.115)	(0.116)	(0.113)	(0.268)	(0.221)
num. hh Children	-0.242***	-0.225***	0.031	-0.326***	0.023	-0.003
	(0.052)	(0.087)	(0.083)	(0.090)	(0.176)	(0.162)
State-level	8.986***	10.620***	14.419***	7.875***	8.192***	15.202***
unemp. rate	(1.046)	(1.919)	(2.057)	(1.625)	(3.073)	(4.798)
lag. hh Income dum.		Y			Y	
Region dummies		Y			Y	
Year dummies		Y			Y	
Month dummies		Y			Y	
Observations		501,116			116,929	
Pseudo R^2		0.0794			0.0859	

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

[a]Clustering at the individual level.

Full sample includes private for profit or government workers employed full time last year and are now either still employed in similar conditions, worked less than 35 hours last week for business-related reasons or are on on temporary layoff.

TABLE A.4: Propensity score correlations

	pr(Employed)	pr(Hours loss)	pr($Layoff_{recall}$)	pr($Layoff_{6m}$)
pr(Employed)	1			
pr(Hours loss)	-0.9469	1		
pr($Layoff_{recall}$)	-0.956	0.8316	1	
pr($Layoff_{6m}$)	-0.9125	0.7395	0.9366	1

Note : Unmatched propensity scores estimates, the underlying multinomial logit estimation is shown in table A.3, columns 1 to 3.

TABLE A.5: Matching, alternative specifications

Dep. Var : **Δlog food expend.**[a]			**ATT**[b]		
	Treatment	Controls	Matching only on prop. scores	Matching on 2 nearest neighbors	Only December obs. for propens scores estimates
1	Layoff_{6m}	Employed	-0.151*** (0.043)	-0.151*** (0.053)	-0.14*** (0.044)
2	Layoff_{recall}	Employed	-0.048 (0.055)	-0.087 (0.062)	-0.051 (0.057)
3	Hours loss	Employed	0.001 (0.03)	-0.01 (0.035)	0.013 (0.029)
4	Layoff_{6m}	Hours loss	-0.141** (0.061)	-0.145** (0.063)	-0.138** (0.061)
5	Layoff_{recall}	Hours loss	-0.075 (0.068)	-0.042 (0.071)	-0.033 (0.073)
6	Layoff_{6m}	Layoff_{recall}	-0.149* (0.078)	-0.157** (0.079)	-0.054 (0.082)

Standard errors in parentheses, s.e. = *** p<0.01, ** p<0.05, * p<0.1.

[a]Yearly change in weekly household spending at supermarkets, grocery stores, meat markets, produce stands, bakeries, restaurants, fast food places, cafeterias and vending machines, etc.

[b]Mahalanobis distance matching on propensity score of the treated, propensity score of the controls and sex, as described in Lechner(2002) BIB. The multinomial logit estimates of the propensity scores is shown in table A.3 of the Appendix.

[c]Note, 3 728 observations were initially excluded to ensure common support on all propensity scores.

Full sample includes private for profit or government workers employed full time last year and are now either still employed in similar conditions, worked less than 35 hours last week for business-related reasons or are on on temporary layoff.

TABLE A.6: Alternative parameter specifcations

Dep. var :	Bench.[a]			Alternative parameters								
Δlog expend.				$\beta = 0.9975$			Debt Limit × 1.5			Other job change pr.[b]		
	1	2	3	4	5	6	7	8	9	10	11	12
$\text{Layoff}_{\text{perm}}$	-0.190	-0.148	-0.190	-0.084	-0.062	-0.084	-0.176	-0.136	-0.176	-0.179	-0.138	-0.179
$\text{Layoff}_{\text{6m}}$	-0.137	-0.119	-0.137	-0.046	-0.037	-0.046	-0.119	-0.102	-0.119	-0.134	-0.117	-0.134
$\text{Layoff}_{\text{recall}}$	-0.098	-0.082	-0.098	-0.023	-0.015	-0.023	-0.077	-0.062	-0.077	-0.100	-0.085	-0.100
Hours loss	-0.019	-0.019	-0.019	-0.007	-0.007	-0.007	-0.017	-0.017	-0.017	-0.027	-0.027	-0.027
Months since Layoff		-0.012			-0.006			-0.011			-0.011	
lag $\text{Layoff}_{\text{perm}}$			0.130			0.026			0.115			0.121
lag $\text{Layoff}_{\text{6m}}$			0.107			0.015			0.088			0.099
lag $\text{Layoff}_{\text{recall}}$			0.083			0.008			0.063			0.077
lag Hours loss			0.012			0.001			0.010			0.015

[a] Benchmark parameters are monthly $\beta = .99573$, interest rates $r = 0.004$, inflation rate $i = .0021$ and limit to debt service is 8% of current income. Probability of transition between states $p(S_{t+1} = s \mid S_t)$ are described in table 1.1, fractions of current income for each state are $\phi = (1;\ 0.7919;\ 0.3;\ 0.3;\ 0.3)$ and probabilities of changing job when going back to work are $\psi = (0;\ 0.069;\ 0.075;\ 0.452, 1)$.

[b] The new probabilities of changing job (not being recalled to the original job), based on changes of both sector and occupation : $\psi = (0;\ 0.206;\ 0.282;\ 0.625, 1)$.

Annexe B

Employment protection and Work Hours Variability

B.1 Technical Appendix

B.1.1 Solving analytically the benchmark model when adjustment is instantaneous

When adjustment is instantaneous, the number of choice variables is reduced to four : labor and hours when the price is high or when price is low : $\overline{n}$, $\underline{n}$, $\overline{h}$, $\underline{h}$, and $\overline{n}-\underline{n}=\Delta n$. Value functions 2.7 and 2.8 can be written as timeless state variables in which hiring and firing is done only following a shock. We can already substitute $a(\Delta n)$ by $c_h(\Delta n)$ and $c_f(\Delta n)$, anticipating the fact that the firm will find it optimal to hire workers when the price changes to $\overline{p}$ and to fire workers when the price changes to $\underline{p}$.

$$V(\overline{n},\overline{p})=\Pi(\overline{n},\overline{p})dt+\frac{1}{1+rdt}\{(1-\overline{q}dt)V(\overline{n},\overline{p})+\overline{q}dt\left[V\left(\underline{n},\underline{p}\right)-c_f(\Delta n)\right]\} \quad (B.1)$$

$$V\left(\underline{n},\underline{p}\right)=\Pi\left(\underline{n},\underline{p}\right)dt+\frac{1}{1+rdt}\{\left(1-\underline{q}dt\right)V\left(\underline{n},\underline{p}\right)+\underline{q}dt\left[V(\overline{n},\overline{p})-c_h(\Delta n)\right]\} \quad (B.2)$$

Solving for each value,

$$(\overline{q}+r)V(\overline{n},\overline{p})=\Pi(\overline{n},\overline{p})+\overline{q}dt\left[V\left(\underline{n},\underline{p}\right)-c_f(\Delta n)\right]$$

$$\left(\underline{q}+r\right)V\left(\underline{n},\underline{p}\right)=\Pi\left(\underline{n},\underline{p}\right)+\underline{q}dt\left[V(\overline{n},\overline{p})-c_h(\Delta n)\right]$$

When facing a price increase or decrease, the firm's optimization problems are

$$max_{\overline{n},\overline{h}} V(\overline{n},\overline{p}) - c_h(\Delta n)$$
$$max_{\underline{n},\underline{h}} V(\underline{n},\underline{p}) - c_f(\Delta n)$$

B.1.1.1 A 1.1 First order conditions

The first order conditions for hours are

$$\frac{\partial V(\overline{n},\overline{p})}{\overline{h}} = \frac{1}{\overline{q}+r}\frac{\partial \Pi(\overline{n},\overline{p})}{\overline{h}} = 0 \quad (B.3)$$
$$\frac{\partial V(\underline{n},\underline{p})}{\underline{h}} = \frac{1}{\underline{q}+r}\frac{\partial \Pi(\underline{n},\underline{p})}{\underline{h}} = 0 \quad (B.4)$$

And the first order conditions for labor are

$$\frac{\partial V(\overline{n},\overline{p})}{\overline{n}} = \frac{1}{\overline{q}+r}\left[\frac{\partial \Pi(\overline{n},\overline{p})}{\overline{n}} - \overline{q}c'_f(\Delta n)\right] - c'_h(\Delta n) = 0 \quad (B.5)$$
$$\frac{\partial V(\underline{n},\underline{p})}{\underline{n}} = \frac{1}{\underline{q}+r}\left[\frac{\partial \Pi(\underline{n},\underline{p})}{\underline{n}} + \underline{q}c'_h(\Delta n)\right] + c'_f(\Delta n) = 0 \quad (B.6)$$

Note that the second order conditions for a maximum are satisfied for convex or concave adjustment costs, as long as they are not jointly too concave. [1]

B.1.1.2 A 1.2 Optimal hours and labor

Combining equations first order conditions B.3, B.4, B.5, B.6 and the first order derivative of the profit functions $\Pi(\overline{n},\overline{p})$ and $\Pi(\underline{n},\underline{p})$, we see how optimal adjustment costs affect the optimality conditions for firms.

1. Second order conditions require for a maximum that

$$(\overline{q}+r)c''_h(\Delta n) + \overline{q}c''_f(\Delta n) + \overline{h}^2\left[\frac{\overline{n}}{w''(\overline{h})} - \frac{1}{\overline{p}y''(\overline{n}\overline{h})}\right]^{-1} > 0$$

and

$$\underline{q}c''_h(\Delta n) + (\underline{q}+r)c''_f(\Delta n) + \underline{h}^2\left[\frac{\underline{n}}{w''(\underline{h})} - \frac{1}{\overline{p}y''(\underline{n}\underline{h})}\right]^{-1} > 0$$

Optimal hours are now different for different price levels.

$$\overline{h}w'\left(\overline{h}\right) = w\left(\overline{h}\right) + \left(\overline{q}+r\right)c_h'(\Delta n) + \overline{q}c_f'(\Delta n) \tag{B.7}$$

$$\underline{h}w'\left(\underline{h}\right) = w\left(\underline{h}\right) - \underline{q}c_h'(\Delta n) - \left(\underline{q}+r\right)c_f'(\Delta n) \tag{B.8}$$

The reason is that the marginal cost of increasing work hours $\overline{h}$, $\overline{h}w'\left(\overline{h}\right)$, has to equal the wage tag of an extra worker, $w\left(\overline{h}\right)$, plus its immediate hiring cost $\left(\overline{q}+r\right)c_h'(\Delta n)$ and its future discounted firing cost $\overline{q}c_f'(\Delta n)$. On the countrary, when the price falls to $\underline{p}$, keeping an extra worker is 'cheaper' since doing so saves on immediate firing costs $\left(\underline{q}+r\right)c_f'(\Delta n)$ and future rehiring costs $\underline{q}c_h'(\Delta n)$.

The optimal labor force now solves

$$\overline{p}\overline{h}y'\left(\overline{n}\overline{h}\right) = w\left(\overline{h}\right) + \left(\overline{q}+r\right)c_h'(\Delta n) + \overline{q}c_f'(\Delta n) \tag{B.9}$$

$$\underline{p}\underline{h}y'\left(\underline{n}\underline{h}\right) = w\left(\underline{h}\right) - \underline{q}c_h'(\Delta n) - \left(\underline{q}+r\right)c_f'(\Delta n) \tag{B.10}$$

which is the equivalent of the optimal labor condition (8) in Bertola (1990) equating the marginal return of a worker's output to its marginal cost.

A 1.3 Comparative statics for firing costs

To discuss the impact of changes to firing costs, let us redefine the function $c_f(\Delta n) \equiv c_{f0}(\Delta n) + L \times \Delta n$, where L is simply a linear component of c_f that will be allowed to vary. Taking the total derivative of B.7, B.8, B.9, B.10 with respect to $\overline{n}$, $\underline{n}$, $\overline{h}$, $\underline{h}$ and L, we find that the impact of an increase in linear firing costs on hours are

$$\frac{d\overline{h}}{dL} = \frac{1}{\overline{h}w''\left(\overline{h}\right)|J|}\left[\overline{q} - \frac{1}{\overline{h}^2}\left[\frac{\overline{n}}{w''\left(\overline{h}\right)} - \frac{1}{\overline{p}y''\left(\overline{n}\overline{h}\right)}\right]\left(\overline{q}+\underline{q}+r\right)rc_h''(\Delta n)\right]$$

$$\frac{d\underline{h}}{dL} = -\frac{1}{\underline{h}w''\left(\underline{h}\right)|J|}\left[\underline{q}+r+\frac{1}{\underline{h}^2}\left[\frac{\underline{n}}{w''\left(\underline{h}\right)} - \frac{1}{\underline{p}y''\left(\underline{n}\underline{h}\right)}\right]\left(\overline{q}+\underline{q}+r\right)rc_h''(\Delta n)\right]$$

, where $|J| = 1 + \begin{array}{l}\frac{1}{\overline{h}^2}\left[\frac{\overline{n}}{w''(\overline{h})} - \frac{1}{\overline{p}y''(\overline{n}\overline{h})}\right]\left[\left(\overline{q}+r\right)c_h''(\Delta n) + \overline{q}c_f''(\Delta n)\right] \\ +\frac{1}{\underline{h}^2}\left[\frac{\underline{n}}{w''(\underline{h})} - \frac{1}{\underline{p}y''(\underline{n}\underline{h})}\right]\left[\underline{q}c_h''(\Delta n) + \left(\underline{q}+r\right)c_f''(\Delta n)\right]\end{array}$ is the determinant of the Jacobian. Hence, $\frac{d\overline{h}}{dL}$ should be positive, as long as c_h is not too convex, and $\frac{dh}{dL}$ should be negative as long as c_h is not too concave (and $|J|$ is positive, which requires that both costs functions not be too concave at Δn). Hence, linear firing costs increase the gap between $\overline{h}$ and $\underline{h}$.

Note that the magnitude of these effects depend on $\overline{q}$, $\underline{q}$ and r, which has an intuitive interpretation. A firm is less inclined to adjust its workforce if shocks are short-lived or if the future is discounted more.

Price variation $(\overline{p}-\underline{p})$ increase both hours and employment fluctuations, again provided that the second order derivatives of adjustment costs are not too large. Similarly, shock probabilities $\overline{q}$ and $\underline{q}$ and interest rates decrease employment variation and increase hours variations, provided modest second order effects of adjustment costs.

B.1.1.3 A 1.4 No labor adjustment

If prices vary little, if adjustment costs are important or if shocks are too frequent, the marginal productive gain to adjust the work force may not justify the cost of hiring and firing workers. In this case, the best option for the firm is to keep a constant staff $\overline{n}=\underline{n}=n$, within a certain band of n such that the frm does not hire when the price is $\overline{p}$ or $\underline{p}$. This is the equivalent of the inaction condition in Bertola (1990) or the 'no-action-zone' in Chen and Funke (2002). In that regime, hours vary according to equation 2.6 with $\alpha=1$. Obviously, hours are not affected by additional adjustment costs.

B.1.1.4 Minimum hours

Adding minimum hours h_{min} adds two constraints to the optimization problem. , $\overline{h}\geq h_{min}$ and $\underline{h}\geq h_{min}$. The interesting case is when $\underline{h}\geq h_{min}$ is binding and $\overline{h}\geq h_{min}$ is not. Considering this case, conditions B.7 and B.9 are the same, B.8 becomes $\underline{h}=h_{min}$ and B.10 becomes $\underline{p}h_{min}y'\left(\underline{n}h_{min}\right)=w\left(h_{min}\right)-\underline{q}c_h'\left(\Delta n\right)-\left(\underline{q}+r\right)c_f'\left(\Delta n\right)$.

The impact of h_{min} differs whether the firm adjusts or not its labor force to shocks. If it does, h_{min} only has a first order impact on $\underline{n}$: that should be negative, again, provided that adjustment costs are not too concave.

$$\frac{d\underline{n}}{dh_{min}}=\frac{-\frac{1}{|J|}\left[\underline{p}y'\left(\underline{n}h_{min}\right)-w'\left(h_{min}\right)+h_{min}\underline{n}\underline{p}y''\left(\underline{n}h_{min}\right)\right]}{\times\left[\overline{p}y'\left(\overline{n}\overline{h}\right)\overline{h}^2w''\left(\overline{h}\right)+\left[\left(\overline{q}+r\right)c_h''\left(\Delta n\right)+\overline{q}c_f''\left(\Delta n\right)\right]\left[\overline{p}y'\left(\overline{n}\overline{h}\right)\overline{n}-w''\left(\overline{h}\right)\right]\right]}$$

where

$$|J| = \begin{array}{c} \bar{h}w''\left(\bar{h}\right)h_{min}^{2}\underline{p}y''\left(\underline{n}h_{min}\right) \\ -\bar{h}w''\left(\bar{h}\right)\left[\underline{q}c_{h}''\left(\Delta n\right)+\left(\underline{q}+r\right)c_{f}''\left(\Delta n\right)\right] \\ \left[\frac{\bar{n}}{\bar{h}}+\frac{w''\left(\bar{h}\right)}{\bar{h}\bar{p}y''\left(\bar{n}\bar{h}\right)}\right]\left[\left(\bar{q}+r\right)c_{h}''\left(\Delta n\right)+\bar{q}c_{f}''\left(\Delta n\right)\right]h_{min}^{2}\underline{p}y''\left(\underline{n}h_{min}\right) \end{array}$$

The only direct effect of minimum hours h_{min} on firm's decisions when prices are high depends on the concavity or convexity of adjustment costs.

As can be seen clearly on figure 2.2, a direct impact of h_{min} is to force the firm to adjust labor on a range of adjustment costs larger than it would have otherwise. At these values, the impact of h_{min} is to lower labor $\bar{n}$ and increase $\bar{h}$.

B.1.2 Microfoundations for a convex wage function

Since many key conclusions of the model rely on a smooth convex wage function $w(h)$ with $w'(h) > 0$ and $w''(h) > 0$, this assumption should not go without support. I provide three justifications for this assumption.

B.1.2.1 A natural trade-off between consumption and leisure

Under very general assumptions, a convex wage function should be the natural outcome of an unregulated labor market. Assume a representative worker who enjoys consumption C and leisure L with utility function

$$U = U(C, L).$$

He enjoys both consumption and leisure, but with decreasing returns, and consumption and leisure are complements : $U_1 > 0$, $U_2 > 0$, $U_{11} < 0$, $U_{22} < 0$ and $U_{12} > 0$. His consumption depends on his real wage w : $C = w$ and his leisure depends on his total time endowment H minus his work hours h : $L = H - h$. Substituting both :

$$U = U(w, H - h)$$

Suppose a firm employing him wishes to increase his work hours, how much should his wage be increased in order to keep him indifferent ?

$$dU = U_1(w, H - h)\,dw - U_2(w, H - h)\,dh = 0$$

$$\frac{dw}{dh} = \frac{U_2(w, H-h)}{U_1(w, H-h)}$$

And the wage rate increases with the length of hours :

$$\frac{d^2w}{(dh)^2} = \frac{-U_{22}(w,H-h)U_1(w,H-h) + U_{12}(w,H-h)U_2(w,H-h)}{U_1(w,H-h)^2} > 0$$

B.1.2.2 Decreasing returns to hours : an alternative to a convex wage function

Instead of a convex wage function, the same conclusions could be reached with a constant wage rate, simply assuming a declining marginal productivity of hours.

To see this, consider the production function with decreasing returns to hours

$$y = y(nf(h^*))$$

where h^* are real hours and $f(h^*)$ are effective hours, with $f' > 0$ and $f'' < 0$, capturing worker fatigue from long shifts. The profits would be

$$\Pi = py(nf(h^*)) - nwh^*$$

where w is now a fixed wage rate.

To see that the model is equivalent, simply rewrite the profits in terms of effective hours with $h = f(h^*)$ and $f^{-1}(h) = h^*$:

$$\Pi = py(nh) - nwf^{-1}(h)$$

The problem is the same as the benchmark version if the wage rate function has the same properties as the original one. Noting that $f^{-1\prime}(h) > 0$ and $f^{-1\prime\prime}(h) > 0$, we see that it is indeed the case :

$$\frac{\partial wf^{-1}(h)}{\partial h} = wf^{-1\prime}(h) > 0$$
$$\frac{\partial^2 wf^{-1}(h)}{(\partial h)^2} = wf^{-1\prime\prime}(h) > 0$$

Of course, assuming both an increasing wage rate and a decreasing marginal productivity would yield similar results since they both work in the same way.

B.1.2.3 A 'standard' wage function with overtime premium and uncertainty

In reality, standard wage agreements are usually made of two parts : every hour worked under a threshold, say H_0, is paid the standard wage W^- and every hour worked after H_0 is paid W^+ (this section will use capital letters to define the wage function avoiding any confusion with previous sections). In this context, the overtime premium is $W^+ - W^-$. Although this function is a common assumption in the working time literature, it is difficult to include it in the present model because hours and labor are perfect productive substitutes ($y = y(nh)$). From the first order conditions 2.2, we see that the maximization problem would result in corner solutions, the optimal hours being either zero, H_0, or infinitely many.

The trick will be to add uncertainty. If the exact number of hours are uncertain, so will be the wage bill. Denote H and W as the effective hours worked and wage paid. Assuming the firm is risk neutral, hours h and wage $w(h)$ will be

$$h = E(H)$$
$$w(h) = E(W)$$

For simplicity, assume a firm with a single employee with an uncertain hourly productivity ψ. The manager chooses its optimal and mandatory level of output for the day Q, which should be produced in $\frac{Q}{\psi}$ hours. Q is an intermediary variable relating hours and wage, it must not be confused with the general output level $y(nh)$. The productivity level ψ is uncertain, and can vary between 0 and ∞, however unlikely are these extreme values. The probability density function is $f(\psi)$ and the cumulative function is $F(\psi)$.

Work hours are expected to be

$$E(H) = \int_0^\infty \frac{Q}{\psi} dF(\psi). \tag{A.12}$$

Since hours are uncertain, so is the total wage bill at the end of the day. First, note that we must assume a fixed wage W^f paid regardless of the work time. Otherwise, without fixed cost per worker, the optimal solution is an infinite work force working for infinitely short hours. This too is a direct consequence of the perfect substitutability of both inputs in production.

If the productivity level is high, all the work can be completed before H_0 and the total wage bill is $W = W^f + \frac{Q}{\psi} W^-$. But if the daily productivity is low, the time needed to complete Q will exceed H_0 and the wage bill will include an overtime premium for overtime hours : $W = W^f + W^- H_0 + \left(\frac{Q}{\psi} - H_0\right) W^+$. The expected wage bill is thus

$$E(W) = \int_0^{\frac{Q}{H_0}} \left[W^f + W^- H_0 + \left(\frac{Q}{\psi} - H_0\right) W^+\right] dF(\psi) + \int_{\frac{Q}{H_0}}^{\infty} \left[W^f + \frac{Q}{\psi} W^-\right] dF(\psi) \tag{A.13}$$

We now have a function relating the expected wage bill, $E(W)$ to the expected number of hours $E(H)$. All that is needed is to verify that it is concave, that is to say $w'(h) = \frac{dE(W)}{dE(H)} > 0$ and $w''(h) = \frac{d^2E(W)}{(dE(H))^2} > 0$. This is indeed the case :

$$\frac{dE(W)}{dE(H)} = \frac{\partial E(w)}{\partial Q} \frac{\partial Q}{\partial E(H)} = W^- + \left(W^+ - W^-\right) \frac{\int_0^{\frac{Q}{H_0}} \frac{1}{\psi} dF(\psi)}{\int_0^{\infty} \frac{1}{\psi} dF(\psi)} > 0 \tag{A14}$$

and

$$\frac{d^2E(W)}{(dE(H))^2} = \frac{\partial\left(\frac{dE(W)}{dE(H)}\right)}{\partial Q} \frac{\partial Q}{\partial E(H)} = \frac{(W^+ - W^-) f\left(\frac{Q}{H_0}\right)}{Q\left(\int_0^{\infty} \frac{1}{\psi} dF(\psi)\right)^2} > 0. \tag{A.15}$$

Note from A14 that the wage rate is bounded between W^- and W^+. Are corner solutions possible ? If W^- was too high, the optimal work hours would be zero and there would be no labor market. Thus, the market wage would have to decrease. As for the upper bound, the marginal value of an extra hour could in principle always be superior to W^+, which would lead to an infinite number of hours. But in reality, other factors such as extra overtime premiums, workers fatigue or labor law effectively prevent this from happening. Thus, an interior solution can be safely assumed.

B.2 Two-step estimation procedure

For strategy 1, the procedure is the following. Stage one aggregates the data at the province×sector level assuming a linear probability model : [2]

$$p(\text{Overtime}_i \mid p, s, t, \textbf{ind. controls}_i) = d_{ps} + \gamma\phi\textbf{ind. controls}_i + FE_t + \varepsilon_i$$

2. As described in Wooldridge (2001), p. 455, the model is first estimated by ordinary least squares to produce unbiased estimates of $Var(\text{Overtime}_i \mid p, s, \textbf{ind. controls}_i) = \hat{\sigma}_i^2 = \widehat{\text{Overtime}}_i * (1 - \widehat{\text{Overtime}}_i)$, where values of $\widehat{\text{Overtime}}_i$ larger than 0.99 are set to 0.99 and values lower than 0.01 are set to 0.01 to maintain predicted probabilities within the unit interval and avoid probabilities of zero or one. Then, we use $\hat{\sigma}_i^2$ to produce feasible GLS estimates to re-estimate $p(\text{Overtime}_i \mid p, s, \textbf{ind. controls}_i)$ by weighted least squares.

Stage two, estimate by feasable GLS :

$$\widehat{d}_{ps} = \begin{array}{c} \beta_1 \text{Ind. not.}_p \times \text{Layoff rate}_s + \beta_2 \text{Coll. not.}_{pf} \times \text{Layoff rate}_s \\ FE_p + FE_s + \nu_p + \eta_{ps} \end{array}$$

where Ind. Not.$_p$ and Coll. Not.$_p$ are province levels of notice requirement, Layoff rate$_s$ is the sectoral layoff rate, **ind controls**$_i$ is a vector of individual level controls, ν_p is a province specific error component and ε_i is a individual specific error component. each observation is weighted by the number of observations in each province$\times$sector cell used used to compute stage 1 (again, see Donald and Lang (2001) or Wooldridge 2003 for details and justifications). Note that since this estimation is at the province$\times$sector level, the firm size dimension is lost and we must use province average values of collective notice requirements.

To implement strategy 2, we must first discretize the variable

B.3 The data

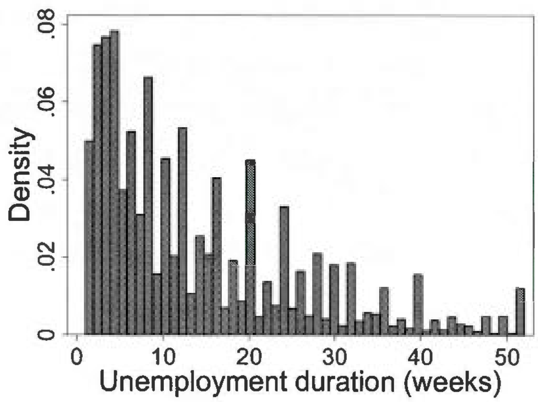


FIGURE B.1: Unemployment Durations Distribution. Only permanent layoffs due to business conditions (categories 12 and 13 of table B.5) from a private sector job with permanent contract.

TABLE B.1: Sample Statistics

Variable	Mean	Std. Dev.
Dummy for "is working overtime"	0,10	0,30
Number of overtime hours worked if > 0	8,33	7,31
Unemployment rate by province*sector	0,06	0,04
Dummy for Newfoundland	0,02	0,15
Dummy for Prince Edward Island	0,02	0,14
Dummy for Nova Scotia	0,05	0,22
Dummy for New Brunswick	0,05	0,22
Dummy for Québec	0,18	0,39
Dummy for Ontario	0,34	0,47
Dummy for Manitoba	0,07	0,26
Dummy for Saskatchewan	0,06	0,25
Dummy for Alberta	0,10	0,30
Dummy for British Columbia	0,09	0,29
Job tenure in months	81,73	80,06
Firm of less than 20 employees	0,39	0,49
Firm of 20 to 99 employees	0,32	0,47
Firm of 100 to 500 employees	0,20	0,40
Firm of More than 500 employees	0,09	0,28
Age 15 to 19	0,07	0,25
Age 20 to 24	0,11	0,31
Age 25 to 29	0,12	0,32
Age 30 to 34	0,12	0,33
Age 35 to 39	0,14	0,35
Age 40 to 44	0,14	0,35
Age 45 to 49	0,12	0,33
Age 50 to 54	0,09	0,29
Age 55 to 59	0,06	0,23
Age 60 to 64	0,03	0,16
Age 65 to 69	0,01	0,08
Age 70 and over	0,00	0,05
Union member	0,19	0,39
Not member of a union but covered by collective agreement	0,02	0,13
Neither union member nor covered by collective agreement	0,79	0,41
Nb of obs.		3 297 825

TABLE B.2: Notice requirements for individual and collective dismissal, various Canadian jurisdictions, 1995

Individual			Mass	
Jurisdiction	**Tenure**	**Notice (wks)**	**Number laid off**	**Notice (wks)**
Federal	3 months +	2	50 +	16
Alberta	3 mos - 2 yrs	1	No special provision	
	2 yrs - 4 yrs	2		
	4 yrs - 6 yrs	4		
	6 yrs - 8 yrs	5		
	8yrs-10yrs	6		
	10 yrs +	8		
British Columbia	6 mos - 3 yrs	2	No special provision	
	3 yrs	3		
	+1 wk/yr up to 8 wks	8		
Manitoba	1 month +	1 pay period	50 - 100	10
			101 - 300	14
			300 +	18
New Brunswick	6 mos - 5 yrs	2	10 +, if they repr. 25% of the workforce	6
	5 yrs +	4		
Newfoundland	1 mo - 2 yrs	1	50 - 199	8
	2 yrs +	2	200 - 499	12
			500 +	16
Nova Scotia	< 2 yrs	1	10 - 99	8
	2 yrs - 5 yrs	2	100 - 299	12
	5 yrs - 10 yrs	4	300 +	16
	10 yrs +	8		
Ontario	3 mos - 1 yr	1	50 - 199	8
	1 yr-3yrs	2	200 - 499	12
	3 yrs - 4 yrs	3	500 +	16
	4 yrs - 5 yrs	4		
	5 yrs - 6 yrs	5		
	6 yrs - 7 yrs	6		
	7 yrs - 8 yrs	7		
	8 yrs +	8		
Prince Edward Island	6 mos - 5 yrs	2	no special provision	
	5 yrs+	4		
Quebec	3 mos - 1 yr	1	10 - 99	2 mths
	1 yr-5yrs	2	100 - 299	3 mths
	5 yrs-10 yrs	4	300 +	4 mths
	10 yrs +	8		
Saskatchewan	3 mos - 1 yr	1	10 - 49	4
	1 yr - 3 yrs	2	50 - 99	8
	3 yrs - 5 yrs	4	100 +	12
	5 yrs -10 yrs	6		
	10 yrs +	8		

Source : labor Canada, Employment Standards Legislation in Canada.

TABLE B.3: Construction of regional indices of employment protection

Individual dismissal

senior.	Alb	BC	Man	NB	NF	NS	Ont	PEI	QC	Sask	% layoffs
0,083	0	0	2	0	1	1	0	0	0	0	3,8
0,25	1	0	2	0	1	1	1	0	1	1	12,3
0,5	1	2	2	2	1	1	1	2	1	1	14,5
1	1	2	2	2	1	1	2	2	2	2	15,4
2	2	2	2	2	2	2	2	2	2	2	15,0
3	2	3	2	2	2	2	3	2	2	4	8,7
4	4	4	2	2	2	2	4	2	2	4	5,9
5	4	5	2	4	2	4	5	4	4	6	3,9
6	5	6	2	4	2	4	6	4	4	6	2,8
7	5	7	2	4	2	4	7	4	4	6	2,2
8	6	8	2	4	2	4	8	4	4	6	1,7
9	6	8	2	4	2	4	8	4	4	6	1,6
10+	8	8	2	4	2	8	8	4	8	8	12,2
W. mean	2,71	3,20	2,00	2,17	1,54	2,52	3,10	2,17	2,63	3,17	

Collective dismissal

size	Alb	BC	Man	NB	NF	NS	Ont	PEI	QC	Sask
0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	6	0	8	0	0	8	4
25	0	0	0	6	0	8	0	0	8	4
50	0	0	10	6	8	8	8	0	8	8
100	0	0	14	6	8	12	8	0	12	12
200	0	0	14	6	12	12	12	0	12	12
300	0	0	14	6	12	16	12	0	16	12
500	0	0	18	6	16	16	16	0	16	12
1000	0	0	18	6	16	16	16	0	16	12

Source : Wasmer (2006) and author's own calculations.

TABLE B.4: Reasons for Leaving the Job

Reason for leaving job, (less than one year ago)		Freq.	Percent	Cum.
1	Left job, Other reasons	29105	2,9%	2,9%
2	Left job, Own illness or disability	49415	5,0%	7,9%
3	Left job, caring for own children	12687	1,3%	9,1%
4	Left job, pregnancy	14468	1,4%	10,6%
5	Left job, other personal or family responsibilities	18966	1,9%	12,5%
6	Left job, going to school	203928	20,4%	32,9%
7	Left job, dissatisfied	62514	6,3%	39,2%
8	Left job, retired	69742	7,0%	46,2%
9	Left job, business sold or closed down (self-employed)	37757	3,8%	50,0%
10	Lost job, end of seasonal job (employee)	153271	15,4%	65,3%
11	Lost job, end of temporary or casual (employee)	159409	16,0%	81,3%
12*	Lost job, company moved or out of business (employee)	22245	2,2%	83,5%
13*	Lost job, business conditions (employee)	139114	13,9%	97,5%
14	Lost job, dismissal or other reasons	25253	2,5%	100,0%
Total		997874	100,0%	

*Categories used in computing layoff rates

TABLE B.5: Mean Weekly Hours by Provinces

	NF	PEI	NS	NB	Qc	Ont	Man	Sas	Alb	BC
Regular	34.64	34.30	34.33	34.85	32.96	34.08	33.76	33.36	35.52	32.60
Hours	(16.28)	(15.28)	(15.88)	(15.02)	(14.59)	(15.10)	(15.29)	(16.16)	(16.57)	(15.35)
Overtime	8.98	8.23	8.33	8.10	7.44	8.36	7.62	8.93	9.98	7.61
Hours (>0)	(8.10)	(6.93)	(7.49)	(7.00)	(6.54)	(6.42)	(6.94)	(8.39)	(9.48)	(7.38)
Ratio Working	0.08	0.07	0.09	0.08	0.09	0.11	0.11	0.10	0.13	0.09
Overtime	(0.27)	(0.25)	(0.28)	(0.27)	(0.29)	(0.31)	(0.31)	(0.30)	(0.34)	(0.29)
Nb of obs.	77 906	67 986	173 622	169 092	601 037	1 117 175	234 922	212 459	330 890	312 736

note : standard deviations in parenthesis

B.4 Data Source

- Labor Force Survey (LFS) of 1997 to 2005, Survey number 71M0001. More information available at http ://www40.statcan.gc.ca/l01/cst01/other/lfs/lfsintro-eng.htm (active the 02/04/2009)

Annexe C

Employment Protection Laws and Work Stress

C.1 Data Appendix, cross-country data

C.1.1 Controls

C.1.1.1 The cross country controls

Regarding country controls, many authors including Lazear (1990), Layard and Jackman (1991) or Blanchard and Wolfers (1999), report links between EPL and other labor market institutions. To dampen the risk of spurious correlations from omitted variable bias, we include control variables at the country level. We add : Unemployment levels (specific for age and sex). Apart of purely self selection risk previously discussed, the cheer prospect of losing a job could be a permanent source of stress especially if the unemployment rate is high ; Union density (the portion of workers members of a trade union) ; Bargaining coverage [1] ; Unemployment insurance benefits : Various authors note that they tend to be negatively related with EPL. Their possible effect on stress is obvious ; Wage coordination (the level (plant/industry/national) at which bargaining takes place) ; Wage centralization (the degree of coordination between negotiating members) ; GDP per capita. Sources are provided in the Online Appendix.

1. Gürtzgen (2005) finds that higher collective bargaining (the portion of workers affected by collective negotiations) tends to nullify the link between local market conditions and wage settings. This could also affect employers responses to shocks.

C.1.1.2 Individual controls

The available individual controls that could be harmonized between the EWCS and Eurobarometer panels are the sex, age, number of children in the household, total household size, firm size, activity sector (12), job title (10), having to respect deadlines, to work at high speed, having enough skill for the job, weekly hours, working in hard positions, with noise, on repetitive work, with dangerous substances, at extreme temperatures, with fumes, having to carry heavy objects, feeling that the work impairs the health by affecting breathing, hearing, sight or the skin, having to work at night, to change methods or speed of work, getting help from colleagues, being a supervisor and being the family main earner.

Many controls are most likely independent to the labor market and will be included in all regressions. But many others are related to the work environment itself. Since stress is suppose to capture the general work climate, we should be careful before introducing too many controls. For example, if demanding workers to change methods or speed of work is a way in which EPL induces work stress, it should stay out of the equation.

C.1.2 Summary statistics

TABLE C.1: 'Frictionless' Job destruction rates

Activity Sector	'Frictionless' Job destruction rates
Mining and quarrying	0,064
Manufacturing	0,057
Financial Intermediation	0,050
Real estate and business activities	0,048
Electricity, gas and water supply	0,040
Transportation and communication	0,037
Construction	0,037
Other services	0,034
Hotels and restaurants	0,032
Wholesale and retail trade repairs	0,032
Agriculture/hunting/forestry/fishing	0,030

TABLE C.2: Cross-country descriptive statistics, EWCS 2000, 2001, 2005 and Eurobarometer 1996

Variable	Mean	SD
Job affects health : stress	0.267	0.443
health consequence	0.264	0.441
Job affects health : anxiety	0.064	0.245
Job affects health : headache	0.155	0.362
Job affects health : heart	0.015	0.12
Job affects health : irritability	0.108	0.31
Job affects health : sleeping	0.08	0.271
Job affects health : stomach	0.052	0.221
Subjected at work to bullying / harassment ?	0.072	0.258
Job involves learning	0.719	0.449
Skills match demands	0.762	0.426
Able to change methods	0.744	0.436
Repetitive tasks	0.475	0.499
Carry heavy loads (1-Never to 7- Always)	2.41	1.77
Can get help from colleagues	0.905	0.294
Satisfied with job (1 to 4)	3.086	0.722

TABLE C.3: Cross-country descriptive statistics, EWCS 2000, 2001, 2005 and Eurobar. 1996

Variable	Mean	SD	Variable	Mean	SD
Sex : is a man	0.58	0.49	Elementary occupations	0.11	0.31
Aged 20 to 25	0.11	0.31	Armed forces	0.00	0.03
Aged 25 to 30	0.15	0.36	16 - 20 weekly hours	0.05	0.21
Aged 30 to 40	0.32	0.47	21 - 25 weekly hours	0.03	0.17
Aged 40 to 50	0.27	0.44	26 - 30 weekly hours	0.04	0.21
Aged 50 to 60	0.16	0.37	31 - 35 weekly hours	0.07	0.25
No children	0.53	0.50	36 - 40 weekly hours	0.54	0.50
1 child	0.24	0.42	41 - 45 weekly hours	0.11	0.31
2 children	0.17	0.37	46 - 50 weekly hours	0.09	0.29
3 children	0.05	0.23	51 - 55 weekly hours	0.02	0.13
4+ children	0.01	0.11	56 - 60 weekly hours	0.03	0.18
household of 1 person	0.15	0.35	61 - 65 weekly hours	0.00	0.07
household of 2 people	0.25	0.43	66 weekly hours +	0.02	0.15
household of 3 people	0.24	0.42	Austria	0.07	0.25
household of 4 people	0.25	0.43	Belgium	0.06	0.24
household of 5 people	0.09	0.28	Czech Rep.	0.04	0.20
household of 6 people	0.03	0.16	Denmark	0.06	0.23
household of 7 or more people	0.01	0.08	Finland	0.05	0.23
2-9 employees in firm	0.30	0.46	France	0.06	0.24
10-49 employees in firm	0.29	0.46	Germany	0.09	0.29
50-99 employees in firm	0.10	0.30	Greece	0.04	0.20
100-499 employees in firm	0.16	0.37	Hungary	0.04	0.20
500+ employees in firm	0.14	0.35	Ireland	0.05	0.22
Agri., hunting, forestry and fishing	0.03	0.16	Italy	0.05	0.22
Mining and quarrying	0.00	0.06	Netherlands	0.07	0.25
Manufacturing	0.28	0.45	Norway	0.01	0.12
Electricity, gas and water supply	0.02	0.12	Poland	0.03	0.17
Construction	0.09	0.29	Portugal	0.05	0.22
Wholesale and retail trade repairs	0.19	0.39	Slovak Republic	0.04	0.20
Hotels and restaurants	0.05	0.21	Spain	0.04	0.20
Transportation and communication	0.07	0.26	Sweden	0.05	0.22
Financial intermediation	0.05	0.22	Switzerland	0.02	0.13
Real estate and business activities	0.07	0.26	Turkey	0.01	0.10
Public administration	0.01	0.12	United Kingdom	0.05	0.22
Other services	0.15	0.35	1996	0.22	0.41
Legislators and senior off.	0.04	0.19	2000/2001	0.46	0.50
Professionals	0.08	0.27	2005	0.33	0.47
Technicians and associate prof.	0.14	0.35	Clerks	0.16	0.37
Craft and related trades workers	0.21	0.40	Operators and assemblers	0.10	0.30
Serv. and sales workers	0.15	0.36	Agricultural and fishery	0.01	0.12

TABLE C.4: Descriptive statistics, Canadian NPHS

Variable	Mean	SD	Variable	Mean	SD
Male	49.7		Depression (score, 0-8)	0.38	1.44
Immigrants	19.6		Depression (proba, 0-1)	0.058	0.22
Urban area	81.4		Blood pressure	0.095	0.29
Age (μ)	43.3	10.9	Stress Overall (0-48)	10.42	4.33
Household size (μ)	3.06	1.39	Stress, skill requirement (0-12)	4.78	2.20
Primary education	17.8		Stress, decision latitude (0-8)	2.53	1.64
Secondary education	15.5		Stress, psychological (0-8)	4.52	1.71
Some post secondary educ.	26.6		Stress, physical exertion (0-4)	1.84	1.22
Tertiary	40.7		Stress, job insecurity (0-4)	1.24	0.96
Trauma (0-7)	1.06	1.23	Stress, coworkers (0-12)	4.12	1.29
No medical insurance	0.23		Stress, job strain (0.2-5)	0.95	0.31
Psychotropic drugs			EPL_ind (Imputed)	4.18	2.88
1.Tranquilizer	0.030	0.947	EPL_coll (Imputed)	6.14	4.60
2.Anti-depressant	0.047	0.930	EPL_ind[a] (Imputed)	4.06	2.96
3.Sleeping pill	0.034	0.943	EPL_coll[a] (Imputed)	5.80	4.65
Yes to one psychotropic drug	0.085				

[a] accounting for the information on whether the employed individual was under a temporary contract and attributing no advance notice in this case.

TABLE C.5: Canadian NHPS, Variables used to build stress index, interaction with JD (same spec. as Table 3.5, Column 7)

Dependent variable :	**Hostility at work**	**Repetitive tasks**	**Hectic job**	**No decision freedom**	**Little say on job**	**Unhelpful Supervisor**	**Unhelpful Colleagues**	**Job Insecurity**
(Least squares)	1	2	3	4	5	6	7	8
$EPL\_ind_{imputed\,p,i}$[a]	0.140***	0.176***	0.219***	-	-	-	-0.001	-
				0.146***	0.177***	0.137***		0.216***
	(0.029)	(0.030)	(0.041)	(0.045)	(0.045)	(0.042)	(0.032)	(0.044)
$EPL\_coll_{imputed\,p,i}$[b]	-0.005	-0.019	-0.031*	0.016**	0.000	0.017	0.002	-0.001
	(0.010)	(0.017)	(0.018)	(0.007)	(0.014)	(0.021)	(0.003)	(0.013)
$EPL\_ind_{imputed\,p,ip}$	-1.88***	-2.06***	-2.68***	1.07	1.93*	2.41**	-11.2	2.50***
$\times JD_s$[c]	(0.67)	(0.75)	(0.94)	(1.01)	(1.06)	(0.99)	(7.6)	(0.88)
$EPL\_coll_{imputed\,p,i}$	0.031	0.227	0.452	-0.202	0.074	-0.437	2.92**	0.303
$\times JD_s$	(0.279)	(0.493)	(0.493)	(0.229)	(0.408)	(0.536)	(1.18)	(0.360)
Indiv. Controls[d]	Y	Y	Y	Y	Y	Y	Y	Y
Activity sector dum.	Y	Y	Y	Y	Y	Y	Y	Y
Province dummies	Y	Y	Y	Y	Y	Y	Y	Y
Time dummies	Y	Y	Y	Y	Y	Y	Y	Y
N. observations	23 738	23 738	23 738	23 738	23 738	23 738	23 850	23 738
N. clusters	10	10	10	10	10	10	10	10
adj. R^2	0.158	0.203	0.253	0.256	0.251	0.172	0.229	0.227

note : *** p<0.01, ** p<0.05, * p<0.1. Cluster-robust s.e. in parentheses at the province level.

note : Imp. denotes imputed advanced notice requirements using information on province, year, sex, education, age dummies, activity sector and occupation.

[a]Imputed notice requirement for individual layoff for individual i in province p (weeks)

[b]Imputed notice requirement for group layoff for individual i in province p (weeks)

[c]'Frictionless' Job destruction rate of activity sector s a la Ciccone-Papaioannou (2006)

[d]Includes sex, urban region, family type, household type, education dummies, country of birth, age dummies, occupation dummies, dummy for many jobs, dummy for immigrant of less than 10 years, for more than 10 years, weekly hours dummies.

TABLE C.6: Specific effects : total effect of additional individual EPL by type of sector : level + interaction coefficient x JD

	Hostility at work	Repetitive tasks	Hectic job	No decision freedom	Little say on job	Unhelpful Supervisor	Unhelpful Colleagues	Job Insecurity
	1	2	3	4	5	6	7	8
$EPL\_ind_{imputed\,p,i}\times$								
Manufacturing (JD = 0.057)	0.033	0.058	0.066	-0.085	-0.067	0.001	-0.640	-0.074
Wholesale and retail trade repairs (JD = 0.032)	0.080	0.110	0.133	-0.112	-0.115	-0.060	-0.360	-0.136
$EPL\_coll_{imputed\,p,i}\times$								
Manufacturing (JD = 0.057)	-0.003	-0.006	-0.005	0.005	0.005	-0.008	0.169	0.017
Wholesale and retail trade repairs(JD = 0.032)	-0.004	-0.012	-0.016	0.010	0.003	0.003	0.096	0.009

Note : all marginal effects are based on estimates presented in Table C.5.

TABLE C.7: EWCS 2000, 2001, 2005 and Eurobarometer 1996 : EPL components, interaction between EPL components

Main variable	Temp. and fix		Other		All (incl. self-emp.)	
Work affects	term contracts		contracts		except permanents	
health : stress[a]	1	2	3	4	5	6
$EPL\_ind_{c,t}{}^{b} \times JD_s{}^{c}$	-4.355	-4.942	-4.708	-5.232	-1.200	-1.337
	(15.56)	(15.32)	(13.29)	(14.52)	(9.098)	(9.811)
$EPL\_coll_{c,t}{}^{d} \times JD_s$	12.10	11.30	- 33.32***	-36.70	4.408	3.576
	(10.12)	(9.564)	(11.14)	(26.52)	(11.55)	(9.916)
$EPL\_temp_{c,t}{}^{e} \times JD_s$	-2.775		-2.727		-1.483	
	(2.867)		(3.252)		(2.103)	
$EPL\_temp\_valid_{c,t}{}^{f} \times JD_s$		-0.185		-0.555		0.437
		(1.944)		(2.547)		(1.418)
$EPL\_temp\_limit_{c,t}{}^{g} \times JD_s$		-1.267		-1.413		-1.207
		(3.618)		(1.889)		(1.779)
Indiv. Controls[h]	Y	Y	Y	Y	Y	Y
Coun.×Time dum.	Y	Y	Y	Y	Y	Y
Sector×Time dum.	Y	Y	Y	Y	Y	Y
Coun.×Sect. dum.	Y	Y	Y	Y	Y	Y
Num. of obs.	481	472	350	348	560	551
Num. of clusters	21	21	21	21	21	21
R^2	0.586	0.595	0.807	0.807	0.787	0.799

note : *** p<0.01, ** p<0.05, * p<0.1. Robust s.e. in parentheses.

[a] Does your work affect your health ? How ? - Stress ?

[b] Individual dimension of employment protection index (OECD, 2004) of country c at time t

[c] 'Frictionless' Job destruction rate of activity sector *s* a la Ciccone-Papaioannou (2006)

[d] Collective dimension of employment protection index (OECD, 2004) of country c at time t

[e] Restriction against temporary contracts dimension of employment protection index (OECD, 2004) of country c at time t

[f] EPL_temp_valid = Valid cases for use of fixed-term contracts*0.5 + Types of work for which is legal *0.5 (OECD, 2004) of country c at time t

[g] EPL_temp_limit = Max. num. of successive FTC*0.25 + Max. cum. duration, FTC*0.25 + Restr. on num. of renewals, TWA*0.25+Max. cum. duration, TWA*0.25 (OECD, 2004) of country c at time t (FTC means fixed term contract, TWA means temporary work agency)

[h] Includes sex, 5 age dummies, household children dummies, household size dummies, 5 firm size dummies, 12 job title dummies, 11 weekly hours dummies and age and sex speciific unemployment rate.

note : Only includes full-time private sector workers in the designated contract between 25 and 65 years old.

TABLE C.8: Cross-country descriptive statistics, ISSP 1997, 2005 and Eurobarometer 2001

Variable	Mean	SD
How often - do you find your work stressful ? 1-Never to 5-always	3.193	0.964
Management-employees relations at workplace 1-Very bad to 5-Very good	3.815	0.933
Freedom in planing hours 1-No freedom to 3-Complete freedom	1.572	0.628
Physical work 1 :Never to 5-Always	2.443	1.274
Management-employees relations at workplace 1-Very bad to 5-Very good	3.815	0.933
Job satisfaction 1-Completely dissatisfied to 7-Completely satisfied	5.086	1.283
Easy find other acceptable job ? 1-Very difficult 5-Very easy	2.59	1.18
Likely to find job ? (Unemployed) 1-Very likely to 4-Very unlikely	2.562	1.077
Worry about losing your job ? 1-Don't worry at all to 4-Worry a great deal	1.893	0.937
My job is secure 1-Disagrees to 4-Strongly agree	2.745	0.978
My job is interesting 1-Disagrees to 4 Strongly agree	2.884	0.915
Experience / skills match job requirements	0.681	0.466

TABLE C.9: Cross-country descriptive statistics, ISSP 1997, 2005 and Eurobarometer 2001

Variable	Mean	SD	Variable	Mean	SD
Sex : is a man	0.46	0.498	16 - 20 weekly hours	0.041	0.198
Aged 20 to 25	0.127	0.333	21 - 25 weekly hours	0.033	0.178
Aged 25 to 30	0.136	0.343	26 - 30 weekly hours	0.044	0.205
Aged 30 to 40	0.272	0.445	31 - 35 weekly hours	0.068	0.251
Aged 40 to 50	0.243	0.429	36 - 40 weekly hours	0.454	0.498
Aged 50 to 60	0.223	0.416	41 - 45 weekly hours	0.16	0.367
Age end educ. : still studying	0.027	0.161	46 - 50 weekly hours	0.109	0.312
Age end educ. : less than 10	0.027	0.163	51 - 55 weekly hours	0.025	0.156
Age end educ. : 10 to 15	0.197	0.398	56 - 60 weekly hours	0.039	0.194
Age end educ. : 16 to 17	0.206	0.405	61 - 65 weekly hours	0.005	0.073
Age end educ. : 18	0.238	0.426	66+ weekly hours	0.021	0.142
Age end educ. : 19 to 20	0.154	0.361	1997	0325	0.468
Age end educ. : 21 to 25	0.141	0.348	2001	0.333	0.471
Age end educ. : 26 to 30	0.008	0.088	2005	0.342	0.474
Age end educ. : 31 to 76	0.002	0.047	Legisl., senior officials, managers	0.085	0.279
Married or living as married	0.629	0.483	Professionals	0.114	0.318
Widowed	0.024	0.153	Technicians, associate profes.	0.174	0.379
Divorced	0.073	0.261	Clerks	0.138	0.345
Separated	0.024	0.153	Service, shop and sales workers	0.135	0.342
Single, not married	0.247	0.431	Skilled agricultural, fishery workers	0.015	0.12
Other marital arrangement	0.002	0.047	Craft and related trades workers	0.163	0.37
Urban region	0.305	0.46	Plant/machine op. and assemblers	0.101	0.302
Suburbs, city-town region	0.366	0.482	Elementary occupations	0.075	0.263
Rural region	0.33	0.47			

C.2 OECD employment protection index

The three main components of employment protection are protection against individual layoff, against collective layoff and restrictions of use of temporary contracts (fixed term contracts (FTC), and temporary work agencies (TWA)).

The individual protection index is based on the difficulty of dismissal (the conditions to be met for a dismissal to be considered as "fair" considering the professional and personal situation of the employee), the procedural burden of the dismissal for the employer (the legal possibilities for the worker to challenge the decision and third party involvement in the process) and finally the notice and severance pay for no-fault dismissal (mandatory notification period before the end of the contract and the length of the pay after).

The *collective* protection index corresponds to additional provisions applicable to mass layoffs. It is the sum of several indicators : Strictness of the definition of collective dismissal (thershold of 10, 20 or 50 dismissals or no provision), Additional notification requirements, Additional delays involved before notice can start, Other special costs to employers. The most recent version of the index takes these rules into account.

Finally, restrictions of use of *temporary* contracts are the sum of six indicators : Valid cases for use of fixed-term contracts (FTC), Maximum number of successive FTC, Maximum cumulated duration of successive FTC, Types of work for which temporary work agency (TWA) employment is legal, Restrictions on number of renewals and Maximum cumulated duration of TWA contracts.

The final OECD EPL index also measures the cost of these additional burdens on firms. The summary EPL indicator is $EPL = 5/12 * EPL_{individual} + 5/12 * EPL_{temporary} + 2/12 * EPL_{collective}$.

TABLE C.10: Total EPL indices in OECD countries

Country	Mean EPL	Country	Mean EPL
United States	0,66	Belgium	2,50
New Zealand	1,04	Netherlands	2,52
United Kingdom	1,05	Slovak Republic	2,53
Canada	1,14	Norway	2,67
Ireland	1,25	Sweden	2,68
Australia	1,47	Germany	2,80
Switzerland	1,60	France	2,85
Hungary	1,61	Spain	3,04
Denmark	1,83	Turkey	3,36
Poland	1,92	Italy	3,38
Czech Republic	1,94	Greece	3,50
Finland	2,15	Portugal	3,66
Austria	2,39		

C.3 Cross-country datasets

C.3.1 The micro data

The source of the micro data sets used to build our two OECD panels are the

- International Social Survey Program 1989 : Work Orientations I (ISSP 1989). Identification number : ZA1840 at http ://zacat.gesis.org/webview/index.jsp
- International Social Survey Program 1997 : Work Orientations II (ISSP 1997). Identification number : ZA3090 at http ://zacat.gesis.org/webview/index.jsp
- Eurobarometer 35.A Working Conditions March-April 1991. Identification number : ZA 2033 at http ://zacat.gesis.org/webview/index.jsp
- Eurobarometer 44.2 Working Conditions in the European Union November 1995 -January 1996. Identification number : ZA2789 at http ://zacat.gesis.org/webview/index.jsp
- Eurobarometer 56.1 Social Exclusion and Modernization of Pension Systems. Identification number : ZA3626 at http ://zacat.gesis.org/webview/index.jsp

- Candidate Countries Eurobarometer 2002.1 Identification Number : ZA4153 at http ://zacat.gesis.org/webview/index.jsp
- EQLS (2003) European Quality of Life Survey. http ://www.eurofound.eu.int/living/qual_life/index.htm
- Fourth European Working Conditions Survey (2005). http ://www.eurofound.europa.eu/ewco/surveys/EWCS2005/index.htm

C.3.2 NHPS sample

The target population includes all 1994 residents of Canada, excluding those on Indian Reserves and Crown Lands, in health institutions, Canadian Forces bases and some remote areas in Ontario and Quebec. Northern regions (the Yukon, Nunavut and the Northwest Territories), where population density is low, were excluded from the analysis. The number of longitudinal panel members is 17,276 ; Number of panel members who have died by 2007 : 1,279 ; Number of panel members who have been institutionalized : 161 ; Number of respondent panel members : 12,484 ; Number of non-respondent panel members : 3,352. A full description of the survey can be found on the website [2].

C.3.3 Employment protection in Canadian provinces

For most dimensions of EPL in Canada, no systematic documentation exists at the provincial level because they are often a matter of jurisprudence. The one exception are advance notice requirements for which no provision existed immediately after World War II were progressively incorporated in regional law, following courts decisions in specific cases.

Advance notice requirements are an important area of EPL : they reduce employer discretion regarding dismissals ; they are often an implicit severance payment in cases where workers are asked to stay at home during the period, and finally they have well-known effects on hiring decisions and labor markets dynamics. [3] Differences across

2. http ://www.statcan.ca/cgi-bin/imdb/p2SV.pl ?Function=getSurvey&SDDS=3225&lang=en&db=IMDB&dbg=f&adm=8&dis=2

3. See e.g. Garibaldi (1999) for theory and some data analysis for OECD countries. For Canada, Friesen (1997) has used the same variations to study the impact of advance notice regional differences on employment duration and found that longer advance notice both raises the fraction of job-to-job moves and reduces the hazard rate.

provinces can be seen in a table in Friesen and Kuhn (1997) and Human Resources and Social Development Canada (the Federal labor agency). Advance notice requirements initially reflected the decisions of local courts before being integrated into provincial law. Local judges decided that, for a worker with n years of seniority, a p month's notice period was to be imposed on the firm. Differences across provinces therefore reflect the latter's differing philosophies regarding economic layoffs : it is quite likely that other areas of EPL are correlated with the length of advance notice. This will be our working hypothesis. Details of the construction of EPL indices and ex-post checks of the consistency with other employment regulation indices are provided in Wasmer (2006b).

C.4 Model Appendix

The model summarized in the paper is developed here. It is designed to illustrate the various adjustment mechanisms in a firm facing restrictions on its ability to fire workers. It illustrates the fact that a worker's utility may actually decrease with employment protection if employers react to EPL in a way affecting their working conditions.

The setup is as follows. Workers live two periods only and then die. The firm is indefinitely lived. The model focuses on two relevant time periods where the firm and the worker are matched. In the first period, the worker is already employed in the firm : we do not focus on hiring decisions, although this would be a straightforward extension. Productivity and idiosyncratic utility of the worker are revealed only at the end of the first period. Revelation of this information leads to either a quit, a layoff or the continuation of the employment relationship in second period. Layoff costs affect the separation decision, and thus the first-period effort strategy of the worker and the monitoring by the firm.

C.4.1 Worker and quits

Each period, the worker chooses an effort level e on the job, and receives a wage w. The wage is assumed to be exogenous.[4] Overall, the flow utility of a worker is

$$\mathscr{U} = \underbrace{w}_{\text{wage}} + \overbrace{\left(\underbrace{-[c(e)+q^m]}_{\text{disutility from effort and of monitoring}} + \underbrace{q^w}_{\text{firm's effort to affect } \mathscr{U}} + \underbrace{v}_{\text{random utility of match}} \right)}^{\text{non-pecuniary component of the job}}, \tag{C.1}$$

where the utility of the worker is reduced by $c(e)+q^m$, where $q^m \geq 0$ is the intensity of monitoring, and $c(e)$ is increasing convex in effort. The quantity q^w is a variable chosen by the firm to affect the utility of the worker. It is interpreted as the quality of the working environment. This quantity can be either positive or negative. In addition, v is a random variable reflecting unknown factors ex-ante, such as the quality of the relationship of the worker with his/her colleagues or with the management. The modeling choices imply that monitoring and working conditions are perfect substitutes and thus, in this case, are formally the same "object". The quantity $q^m - q^w + v$ reflects the general environment of the firm, which is both random through v and chosen by the firm through the q's.

The worker can obtain a level of utility $\overline{\mathscr{U}}$ outside the firm. This level of utility depends a priory on search frictions and is lower in a more sclerotic labor market, although we do not explicit this link in the paper. Thus, if not fired, the worker will quit the firm at the end of period 1 if utility on the job in period 2 is lower than $\overline{\mathscr{U}}$.

C.4.2 Firm and layoff

Monitoring and affecting working conditions is not costless. Let $C(q^m, q^w)$ be the cost function with $q^m \geq 0$ and $q^w \gtrless 0$. The monitoring intensity q^m is set each period. In contrast, working conditions are persistent through the two periods, and are decided in

4. By this exogeneity assumption, we want to prevent employers to cut down the wage so that the worker would necessarily quit at zero cost for the firm. This assumption is meant to capture the fact that such an explicit behavior by firms is limited by nominal downwards wage rigidity. The fact is that a strong wage cut may be as efficient as bullying to make workers quit, but this can be detected by a judge much more easily and thus ex-post quite costly. We will come back on this point in the conclusion of this Section.

period 1.[5] So, by the cost of q^w, we refer here to the cost paid in period 1, which does not have to be repaid in period 2. The cost function is assumed increasing and convex in both arguments. Further, the minimum cost is reached in $C(0,0) = 0$. This means that it costs some money to affect—either positively or negatively—the working conditions of the worker. Note that the cost of a negative q^w can be interpreted as a reputation cost.

The effort of the worker enters linearly in the revenue function, as a normalization. There is a random productivity component denoted by ε. So, overall, the flow profit of the firm is

$$\pi = \underbrace{e}_{\text{worker's effort to affect } \pi} - \underbrace{w}_{\text{wage}} - \underbrace{C(q^m, q^w)}_{\text{cost from monitoring and working conditions}} + \underbrace{\varepsilon}_{\text{random productivity of match}}.$$

At the end of period 1, when ε and ν are revealed, the firm may decide to terminate the employment relation which has exogenous value $\overline{\pi}$ minus possible separation costs. Separation can be implemented in several ways. Most simply, the firm can fire the worker for economic reasons (that is, a no-fault layoff denoted hereafter by NF-layoff), which costs τ to the firm. A fraction $\alpha\tau$ accrues to the worker. This is a severance payment with $0 \leq \alpha \leq 1$. The case $\alpha = 0$ corresponds to termination costs being a pure firing tax : the worker receives no transfer. $\alpha = 1$ corresponds to a pure severance payment.[6] The firm can also try to save on firing costs in two different ways : first, by attempting to layoff for fault or for cause (a F-layoff), which has no cost but has uncertain success ; second : by letting the worker quit. In the case of a quit, we assume that there is no cost of separation.

Why would the firm fire for economic reason if it can fire for cause at no cost ? The answer is that a F-layoff is a random procedure, in the sense that, as commonly observed in several countries, the conflict between a firm and a worker is arbitrated by an outside party (judge, semi-professional court) and the decision, based on several informal factors, cannot always be anticipated. We will denote by F the probability of success of this procedure, and F is a function of the various decisions made by the agents in period 1. How does this work here ? Denote by $\overline{e}$ the exogenous, common-knowledge reference effort ; the effort exerted by the worker e may differ from the

5. This is not important : what matters is that the firm sets q^w before the information on productivity and idiosyncratic utility is revealed.

6. A strictly positive α makes sure the worker never quits in the NF-regime : she/he is strictly better off in waiting the layoff and receiving $\alpha\tau$.

target $\bar{e}$. When it is below $\bar{e}$, the firm can try to prove a fault. The randomness of the F-procedure is due to the fact that e is not directly observable by a third party. This is a frequent assumption in the contract literature. Accordingly, the success probability F depends positively on $\bar{e}-e$: the further away from the effort requirement, the easier to establish a fault. Second, we assume that F depends positively on the monitoring intensity : as the information set about the worker's activity is larger due to closer and more accurate control by the firm, it is easier for the firm to establish a fault. Finally, although this is not essential here, we further assume a complementarity between monitoring intensity q^m and the effort gap $\bar{e}-e$, as the marginal impact of shirking should be larger, the more intense the monitoring.

Assumption 1. *The success of the layoff procedure for fault F positively depends on* $q^m(\bar{e}-e)$:

$$F = F[q^m(\bar{e}-e)]$$

where $F' > 0$.

Finally, being subject to a procedure for fault may generate additional disutility to the worker, denoted by -Σ. Fixing $\Sigma = 0$ has however no implication for the results of the model, but a positive Σ helps to understand why in practice, workers under the threat of a procedure for fault may prefer to quit more frequently instead of starting a conflict with the management.

C.4.3 Timing of events

The timing of events is as follows.

- First period starts. The firm and the worker only know the distributions of ε and ν.
- Both jointly determine their levels of e, q^m and q^w in a Nash equilibrium. Recall that the value of q^w is fixed for the two periods of the match.
- The idiosyncratic components of productivity ε and utility ν are revealed.
- Knowing this and correctly anticipating future events, the worker then decides whether or not.

- If (s)he does not quit, the firm may continue the employment relationship or instead lay off the worker, in picking up one of the two available procedures (F or NF).
- Second period starts with predetermined value of q^w, and known values of ε and v.

C.5 Solution of the model

We proceed backward. First, we solve for optimal separation strategies—layoff and then quits in considering e, q^m and q^w as given. Second, we determine the choices on e, q^m and q^w, when agents correctly anticipate the separation strategies.

C.5.1 Optimal separation strategies of the firm

When the worker has not resigned at the end of period 1, the firm needs to decide whether or not to keep the worker or to start a dismissal procedure. In period 2, the firm will face a continuation value $\pi'(\varepsilon)$ with the current worker (remember that ε and v are now known from the firm), and an outside profit value $\overline{\pi}$ with another worker. As the second period is terminal for a worker, we will set $e' = \underline{e}$ the minimum level of effort ; and the firm does not need to reinvest in q^w since it was fixed in period 1. Thus, $\pi'(\varepsilon) = \varepsilon + \underline{e} - w - C(0,0) = \varepsilon + \underline{e} - w$.

We thus need to compare the relative values of the various strategies.

- NF (no-fault) has value $\overline{\pi} - \tau$
- F (fault) has value $\overline{\pi}F + (1-F)\pi'(\varepsilon)$
- C (continuation) has value $\pi'(\varepsilon) = \varepsilon + \underline{e} - w$

These three values for the firm are functions of ε, with a slope respectively of 0, $1-F$ and 1, leading to two reservation rules in ε, denoted by $\overline{\varepsilon}$ and $\widehat{\varepsilon}$:

$$\mathrm{C} \sim \mathrm{F} : \overline{\varepsilon} = \overline{\pi} + w - \underline{e} \tag{C.2}$$

$$\mathrm{NF} \sim \mathrm{F} : \widehat{\varepsilon} = \overline{\varepsilon} - \tau/(1-F) < \overline{\varepsilon}. \tag{C.3}$$

Note that $\overline{\varepsilon}$ is a function of parameters only and notably exogenous to both effort e and firm's controls q^w and q^m.

Proposition 1. *i) If $\varepsilon > \overline{\varepsilon}$, the firm wants to retain the worker ; ii) if $\varepsilon < \widehat{\varepsilon}$, it wants to initiate a no-fault dismissal procedure ; iii) if ε is in between these two quantities, it starts a procedure for fault.*

The proof is in Wasmer (2006b). Its intuition is straightforward. When productivity is high, the firms wants to retain the worker. If productivity is very low, since the F-layoff strategy is risky, the firm is ready to pay the full layoff cost τ. In between, the firm hopes to save on layoff costs with a F-layoff strategy that has a limited downside risk if it fails.

Corollary 1. *Let G be the cumulative density function of ε. The fraction of workers facing a procedure for fault is $G(w-\underline{e}) - G(w-\underline{e}-\tau/(1-F))$. This is increasing in the cost of a no-fault dismissal τ and the success rate of the procedure for professional fault F. With a uniform density function, $w-\underline{e}$ has no impact on that fraction.*

Proof : simple calculations.

The corollary states that the higher $\tau/(1-F)$, that is, the easier to use the F-strategy and the higher the NF-layoff costs, the more likely to observe workers under a layoff for cause.

C.5.2 Optimal quit strategies of the worker

Moving one step backward, one can now investigate the optimal quit strategy of workers. Either the worker quits—and obtain $\overline{\mathscr{U}}$— or (s)he remains in the firm. In the latter case, the worker correctly anticipates the strategy of the firm (C, NF, F) in the next stage and correctly evaluates utility in each case, as follows :

- Q (quit) has value $\overline{\mathscr{U}}$
- NF (no-fault) has value $\overline{\mathscr{U}} + \alpha\tau$
- F (fault) has value $F\overline{\mathscr{U}} + (1-F)(w+\nu+q^w-c(\underline{e})) - \Sigma$
- C (continuation) has value $w+\nu+q^w-c(\underline{e})$

We can show that the worker's strategy depends on the revealed random component of utility ν and is also described by two reservation rules $\overline{\nu}$ and $\widehat{\nu}$:

$$\mathrm{Q} \sim \mathrm{C} : \overline{\nu} = \overline{\mathscr{U}} - w - q^w + c(\underline{e}), \tag{C.4}$$

$$\mathrm{Q} \sim \mathrm{F} : \widehat{\nu} = \overline{\nu} + \Sigma/(1-F). \tag{C.5}$$

At this stage of period 1, the worker knows the revealed value of ε, hence :

Proposition 2. *i) If the match has low productivity ($\varepsilon < \widehat{\varepsilon}$), the worker never quits because (s)he expects a no-fault layoff and thus to obtain severance payment $\alpha\tau > 0$; ii) if the match has high productivity, that is, if $\varepsilon > \overline{\varepsilon}$, the worker expects to be retained by the firm but would quit anyhow if and only if its utility in the match is low ($v < \overline{v}$); iii) for intermediate values of productivity, i.e. if $\widehat{\varepsilon} < \varepsilon < \overline{\varepsilon}$, the worker expects a procedure for fault. (S)he then quits if and only if $v < \widehat{v}$.*

Corollary 2 (mismatch) *The conditional mean of v in surviving matches is decreased by a lower level of higher of $\overline{\mathcal{U}}$. To the extent that EPL affects negatively $\overline{\mathcal{U}}$ in general equilibrium, EPL increases* utility mismatch *(in the sense of more matches associated with a low idiosyncratic utility).*

Most of the effects of the corollaries above are easy to understand. We can now summarize the various mechanisms.

C.5.3 Separation decisions

Figure 1 in the text conveniently summarizes the partition of the plane (ε, v) into different separation / no separation outcomes. The distance between $\widehat{\varepsilon}$ and $\overline{\varepsilon}$ is given by $\tau/(1-F)$: as said above, employment protection as well as successful F procedures raise the inter-frontier space in which firms wish to layoff for fault. The distance between $\widehat{v}$ and $\overline{v}$ is given by $\Sigma/(1-F)$: workers quit when the idiosyncratic component of utility is too low, but there is an extra-quit incentive to quit if workers anticipate stress Σ from the F-layoff procedure. Overall, the surface of the F-layoff area is $[v_{\max} - \overline{U} + w + q^w - \Sigma/(1-F) - \underline{e}] * \tau/(1-F)$, thus at given e, q^m and q^w, F-layoff is more likely with higher frictions (discouraging workers to quit), with higher wages (workers take a chance to win the case with probability $1-F$) and with increased by higher firing cost τ.

To sum up the impact of EPL derived so far, we have that :

1. The no-fault firing costs τ raise the likelihood of a procedure for fault and thus the associated stress (see corollary 1);

2. To the extent that τ discourages hiring in general equilibrium, that is, reduces outside options of workers $\overline{\mathscr{U}}$, a higher τ increases the degree of mismatch of employed workers.

C.5.4 Optimal effort e, monitoring q^m, and working conditions q^w

We now investigate the role of employment protection on the optimal level of e, q^w and q^m. We assume a Nash equilibrium between the firm and the worker in the choice of these quantities. Recall that the level of effort is chosen before the realization of v and ε, but after knowing their distribution, and in taking q^w and q^m as given.

The worker knows exactly how effort e reduces the success of the fault procedure and thus the separation strategy of the firm, as well as her/his own propensity to quit. Symmetrically, the firm knows how its decisions q^w and q^m affect quits, its own separation margins and F. To fix ideas, we assume that the density of ε and v are uniform, with $g(\varepsilon) = g_0$ and $g(v) = h_0$, but this is not essential. A similar convenient assumption is when costs functions are quadratic with unit scale parameter : $c(e) = e^2$ and $C(q^m, q^w) = (q^m)^2 + (q^w)^2$. Finally, a more demanding assumption is that $F'/(1-F)^2$ is constant (see Appendix C.5.5 for the implied F). We however make this assumption only in the next subsection in order to obtain closed-form solutions.

C.5.5 Special case : density of worker's utility v is a mass point (no quit)

Before solving for the full program of both the agent and the firm, one may study the simpler case in which the density of v is collapsed to a mass point higher than $\widehat{v}$: in other words, the worker will never quit the firm, which reduces the problem to studying firms' separation decisions. In this case, the programs of the worker and the firm lead to conveniently simpler first order conditions. All intermediate derivations are in Appendix, as well as a proof of the existence and uniqueness of a Nash equilibrium for general costs functions. In the special case is when $F'/(1-F)^2 = \Phi$ where Φ is a constant, we can further greatly simplify the solutions and illustrate the role of τ quite simply. In this case, solutions to the problem are :

$$e = \frac{\Delta}{1+\Delta}\bar{e}, \; q^m = \frac{\tau^2}{1+\Delta}\frac{g_0}{2}\bar{e}, \; q^w = 0 \tag{C.6}$$

$$\text{where } \Delta = \tau^3(\alpha\tau + \Sigma)g_0^2\Phi^2. \tag{C.7}$$

Proposition 3. *The various effect of EPL are : i) equilibrium effort is increasing in τ with a local exponent 3 when τ is small and in severance payment $\alpha\tau$. As τ goes to infinity, effort converges to the maximum $\bar{e}$; ii) equilibrium monitoring intensity is increasing in τ for low values of τ, reaches a maximum and then gradually goes down to zero when $\tau \to \infty$.*

Most intuitions are easy to get. The elasticity of effort e to layoff costs τ is initially – for low values of τ– of order 3 or even 4 if Σ was small, because several effects reinforce each other : as τ is higher, firms use F-layoffs and for low values of τ, this raises q^m. Workers counteract in raising effort, and so on and so forth. When τ becomes large, the effort of the worker approaches its limit $\bar{e}$ and so after a while, the firm reduces its monitoring, hence the negative slope of q^m when τ is large.

In equilibrium, the welfare effect of employment protection of a worker in his job can also be calculated. The impact of τ on instantaneous utility is equal to $(-c'(e)\partial e/\partial\tau)+(-\partial q^m/\partial\tau)$: the first term is always negative, while the second one is negative for low values of τ. Intertemporal utility is $\partial U/\partial\tau = \partial U/\partial q^m.\partial q^m/\partial\tau$ and signs as $-\partial q^m/\partial\tau$, i.e. first negative, then positive as τ grows. In other words, the effect of τ on workers' utility is ambiguous : one the one hand, it reduces the firing probability which is positive on the present discounted value (PDV) of utility evaluated in period 1. On the other hand, τ raises monitoring q^m and in reaction, raises efforts. This reduces worker's flow utility and may also reduce the PDV of utility if the second effect dominates over the first one.

C.5.6 General case

In the general case, it is impossible to derive closed form solution for e, q^m and q^w, and not even to prove uniqueness. The reason is that the model contains both tendencies towards multiple equilibria—as e and q^m are strategic complements through F— and towards corner solutions, as shown in the simple cases above—as q^m and q^w are substitute controls variables for the firm. Nevertheless, the first order conditions of the firm and the worker can be derived easily and are fairly intuitive. Thanks to assumption $\Phi = F'/(1-F)^2$ we can further simplify these first order conditions but this is not needed here. See the Appendix for details. Worker's effort is determined by a first order condition :

$$e = q^m g_0 \Phi \tau \left[\alpha \tau + \Sigma (1 - H(\widehat{v}))\right] \tag{C.8}$$

where H is the c.d.f. of random variable v. The left-hand side is the marginal cost of effort, equalized to the marginal return, which is the sum of two terms. The first one is due to the effect of a lower layoff-rate $\partial \widehat{\varepsilon}/\partial e$ and the second one is due to the effect of a higher quit rate -$\partial \widehat{v}/\partial e$ to avoid the stress cost Σ when the worker quits ($v > \widehat{v}$) hence the coefficient $(1 - H(\widehat{v})$. The equation shows that the marginal return on effort is always strictly positive, and is increasing in q^m and τ.

Firm's first order conditions in an interior solution for q^m and q^w imply

$$q^m = g_0 \tau^2 (\bar{e} - e) \Phi \left(1 - \frac{1 - H(\widehat{v})}{2}\right) - \frac{\tau h_0}{2}(1 - G(\widehat{\varepsilon}))\left(\Sigma(\bar{e} - e)\Phi\right) \lesseqgtr 0 \tag{C.9}$$

$$q^w = \frac{\tau h_0}{2}\left(\frac{-\tau}{2(1-F)}\right) + \frac{h_0}{2}(1 - G(\overline{\varepsilon})(\varepsilon_{\max} - \overline{\varepsilon}) \lesseqgtr 0 \tag{C.10}$$

The left-hand side in the first line is the marginal cost of monitoring for the firm. It is equal to the marginal return on the right-hand side. The marginal return is itself the sum of two terms : the first implies that raising monitoring intensity q^m will increase the success of F-procedures and thus increase profits because this saves on layoff costs τ. This effect is mitigated by the second term which is negative : a higher q^m raises the quit rate by workers even in the case in which the firm would make profits, which occurs with probability $1 - G(\widehat{\varepsilon})$. In an interior solution, q^m is increasing in $\bar{e} - e$ and in τ, at a fix Φ. When the second term dominates (high profits), the firm reaches a corner solution $q^m = 0$: it does not monitor the worker to reduce its quit rate, as monitoring reduces utility. The second line has a similar interpretation. When the first negative term in the right-hand side dominates, the firm expects to makes losses and thus, by setting q^w to a negative value, it can induce more quits and save τ. When the second positive term dominates instead, the firm makes profits and can reduce turnover by raising q^m above 0.

These equations point out a key mechanism : the impact of τ on firm's attitude towards the worker depends on its perception of future profits. If, in period 1, the firm expects jobs to be profitable, that is for large values of ε, it prefers to retain the worker, decrease q^m and raise q^w. In nonviable jobs instead, the firm will make negative profits. It may want to save on layoff costs τ, and raises q^m to establish a fault. Summarizing, we have :

Proposition 4. *In viable jobs, firms have to maintain positive working conditions, all the more than current profits are high relative to outside profits. To reduce turnover, firms do not monitor workers.*

Proposition 5. ('placardisation') *In nonviable jobs, working conditions have to be negative, all the more than τ is large.*

Unreported numerical resolutions provide additional insights. In the first case, we investigate the role of layoff costs τ in the context of a relatively viable job. When τ increases, the firm raises monitoring intensity, so as to induce effort and have an option to fire for fault, but at the same time raises working conditions, in order to retain the worker. The net effects on worker's welfare are ambiguous : the instantaneous utility decreases slowly with τ, while the PDV of utility of the worker increases at low τ but then decreases at higher τ. In contrast, when jobs are nonviable, the firm anticipates that it will have to fire at the end of the period. So, when τ increases, the firm rapidly raises its monitoring intensity so as to induce effort, but, contrary to the previous case, the firm worsens working conditions to increase the quit propensity of the worker. Per-period utility of the worker decreases very fast, and the PDV of utility is also strongly reduced.

C.5.7 Summary and further discussion of the model

Precisely, coming back to equation (C.1), we can identify three components which may match the data in the subsequent empirical analysis : $c(e)$, q^m and Σ will all enter additively and negatively into flow utility. There is in addition a fourth component, q^w which can affect utility both ways. Hereafter, by 'stress', we will have in mind $c(e)+q^m-q^w+\Sigma$.

The first effect of EPL identified comes from the fact that firing is a monitoring device (Shapiro and Stiglitz, 1984b). As it becomes more expensive or more difficult to lay off, managers raise monitoring intensity and psychological pressures, thereby raising stress. We can group these mechanisms under the label *"intense monitoring effect"*. It generates a positive link between individual EPL (as opposed to collective EPL, applying in the event of mass layoffs) and stress. A second set of mechanisms arises when jobs are nonviable, i.e. in recessions or when a task becomes obsolete. In such cases, an efficient labor market would require firing for economic reasons (no-fault layoff). As this becomes more costly, the firm wants its worker to leave and affects negatively working conditions q^w. The firm can also try to establish a professional fault by raising monitoring intensity $q^m$and obtain a dismissal at a lower cost, which potentially generates further stress. We call this the *"harassment effect"*.

Through these two partial equilibrium effects, employment protection raises "instantaneous" stress and disutility of work, with some possible adverse effects on the present discounted value of being employed. General equilibrium would reinforce the adverse effects of EPL, if we take as granted that EPL raises frictions and lengthen unemployment spells. Greater frictions indeed reduce the opportunities for workers to quit when they don't like their job, colleagues and manager : in a sclerotic labor market, employees must deal with low idiosyncratic utility seemingly forever. This is referred to as the *"mismatch effect"*. Our model has neglected other potentially relevant and positive channels of EPL : with risk-averse workers, longer-running jobs generate a partial equilibrium positive impact on utility. Further, EPL protects and thus induces specific capital investments, an implication of standard contract theory applied to the labor market, see e.g. Wasmer (2006b).

Two additional issues need to be addressed at this stage. The first one is : why does the firm maintain the wage constant when a wage cut could efficiently induce the worker to quit ? The answer is : both actions (wage cut and harassment) are considered as unfair (often referred to as "constructive dismissals"). If a third party, say a judge, is called to arbitrate, (s)he could command a large fine or a large compensation to the worker. The difference between the two actions is however that psychological pressures are hard to prove, while wage cuts are fairly easy to detect. Raising stress by raising q^m and reducing q^w may be a more effective way of inducing a quit.

A second and related issue is why, if workers anticipate bullying in second period, they do not negotiate a small compensation with the firm and quit, instead of suffering from bullies ? There is no easy answer to this question, but the previous argument still applies : to the extent that moral harassment will make the worker quit, the compensation should indeed be very small : from the amount of compensation, a court would infer that there are unfair practices at the workplace.

C.6 Construction and verification of regional EPL indices in Canada

C.6.1 Construction

To create a single index for individual protection and another one for collective protection against dismissals, we created two grids, common to all provinces : one for seniority (12 categories) and one for firm size (8 categories). We then calculate from Table B an average across all lines of the grid of the notice period. Table C provides the averages per province. We thus obtain two indicators of absolute individual and collective EPL. It is interesting to notice that the correlation across regions of the two indicators is not very strong : it is even negative (-0.24). Alternatively, one can build relative indicators of individual and collective EPL, based on the position of each province in the distribution of EPL. They appear to be highly correlated with absolute measures, with a correlation coefficient of 0.92. Hereafter, we focus only on absolute indicators.

C.6.2 Comparison

We investigate the impact of these variables on EPL indicators. A crucial question is how to identify the EPL effects, both individual and collective. We can now show a number of correlation indicating that our indicators capture some important dimension of regional labor market conditions. A business report from the Fraser Institute provides indicators of provincial "labor market regulations", including EPL but also various other dimensions of labor relations.[7] Provinces are scored from 0 to 10 on each indicator. A score of 10 indicates an optimal labor law in terms of providing labor market flexibility. To ease the comparability with our EPL indices. We take a linear transformation of the Fraser Institute indicator, in applying $x \rightarrow 10 - x$: a positive

7. "The Index of labor Market Regulation assesses several indicators of the provincial labor relations laws. Specifically, the following aspects of the relation laws are examined : (1) processes of certification and decertification ; (2) arbitration process ; (3) union security ; (4) successor rights ; (5) treatment of technology ; (6) replacement workers ; (7) third-party picketing ; and (8) openness of the provincial labor Relations Boards." Details in Clemens et al. (2003b), a report of the Fraser Institute. The website of the institute is presented as follows : "*Established in 1974, The Fraser Institute is an independent public policy organization with offices in Vancouver, Calgary, and Toronto.*"

correlation coefficient between our EPL index and the Fraser Institute index will thus indicate that two indices are similar. The report of Fraser institute in addition reports the ranking of regions (1 for the most flexible to 10 for the less flexible).

We display the correlation matrix between our EPL indices, where EPL_both is the sum of the two EPL indicators and LMR is the index of labor market regulation from Fraser Institute (rk stands for the ranking index and sc for the score). It appears that collective EPL is pretty well correlated with both indicators of the Fraser institute. Individual EPL is positively correlated too but to a lesser extent. Figure C1 confirms that the correlation with the sum of the two indicators is pretty good, especially if British Columbia is excluded from the calculation.

TABLE F.1: EPL dimensions, Canada

	EPL_both	EPL_ind	EPL_coll	$LMR_{(rk)}$	$LMR_{(sc)}$
EPL_both	1				
EPL_ind	0.1782	1			
EPL_coll	0.913	-0.2387	1		
FI-LMR(rk)	0.515	0.2716	0.3956	1	
FI-LMR(sc)	0.4285	0.1083	0.378	0.9257	1

Note : correlation coefficients between various indicators of EPL

Another check is to correlate EPL indicators with the duration of unemployment spells. Indeed, most existing theory points out that employer will be more reluctant to create jobs and take risks when EPL is more important. We find that the correlation between collective EPL and unemployment duration is positive and relatively large, while the correlation between individual EPL and unemployment duration is pretty small and actually negative. The correlation with the sum of the two indicators (EPL_both) is however fairly positive, which is reassuring. Finally, one can simply calculate the correlation between EPL and union density. Again, there is a clear pattern of positive correlation between collective EPL and union density : the correlation is 0.46 and reaches 0.61 if one outlier is taken away. See also Figure C2.

FIGURE F.1: Ex-post check of the EPL variables. EPL_ind+EPL_coll vs. Employment Regulation Index

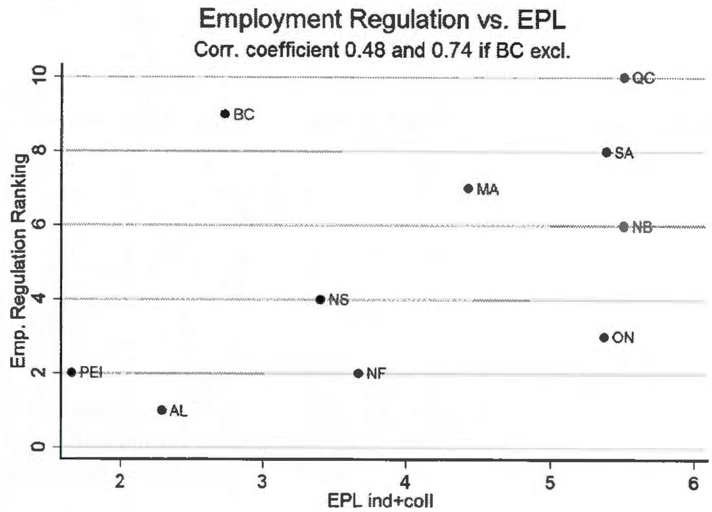
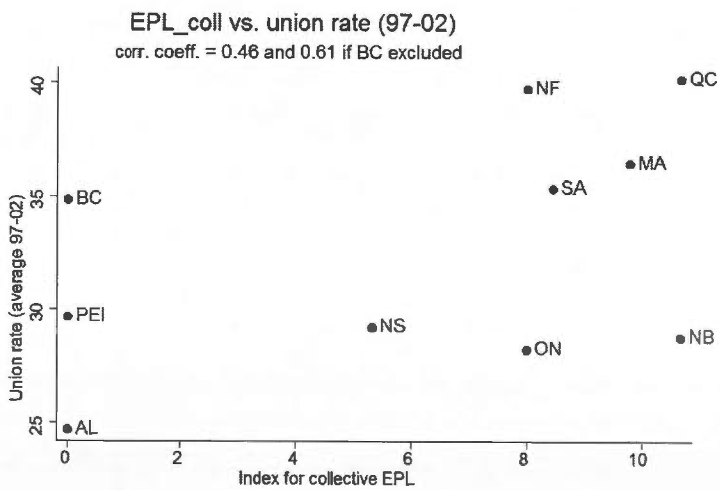


FIGURE F.2: Ex-post check of the EPL variables. EPL_coll vs. union rate



C.7 Data sources

The sources for country controls are

- Unemployment : Data extracted from OECD.StatExtracts. http ://stats.oecd.org/Index.aspx
- Union density : Jelle Visser (2006). Union membership statistics in 24 countries, Monthly Labor Review, January
- Bargaining coverage : OECD Figure A outlook 1997, chapter 5, COLLECTIVE BARGAINING : LEVELS AND COVERAGE, July
- Unemployment benefits : OECD, 2004, Benefits and Wages 2004 (latest update march 2006)
- Wage coordination and wage centralization : OECD Employment Outlook 2004, Chapter 3, Wage-setting Institutions and Outcomes.

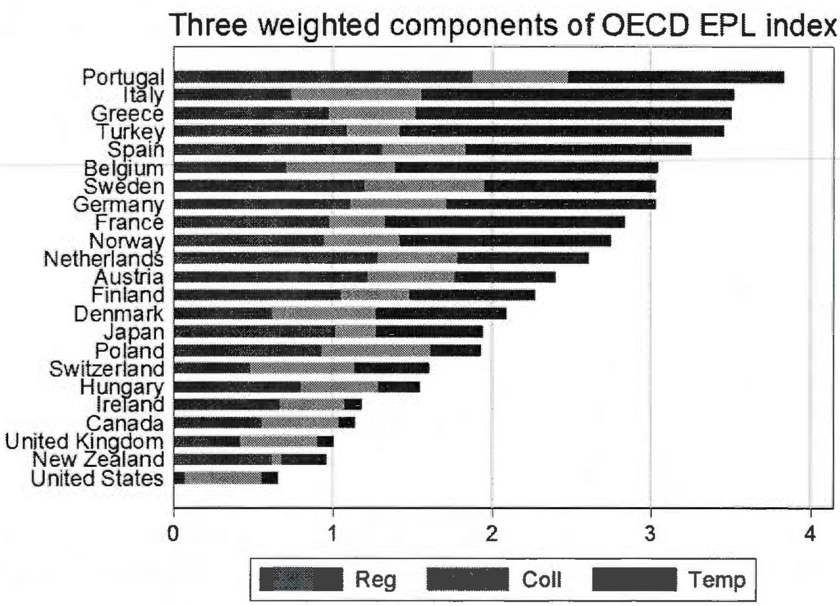


FIGURE F.3: Three dimensions of OECD EPL indicator

Bibliographie

Abraham, K. G. and Houseman, S. N. (1993). Does Employment Protection Inhibit Labor Market Flexibility ? Lessons from Germany, France and Belgium. Staff Working Papers 93-16, W.E. Upjohn Institute for Employment Research.

Acemoglu, D. and Angrist, J. D. (2001). Consequences of employment protection ? the case of the americans with disabilities act. *Journal of Political Economy* 109 : 915–957.

Attanasio, O. P. (1999). *Consumption*, Handbook of Macroeconomics *1*. Elsevier.

Autor, D. H., Donohue, J. J. and Schwab, S. J. (2006). The costs of wrongful-discharge laws. *The Review of Economics and Statistics* 88 : 211–231.

Belot, M., Boone, J. and Ours, J. V. (2007). Welfare-improving employment protection. *Economica* 74 : 381–396.

Bertola, G. (1990). Job security, employment and wages. *European Economic Review* 34 : 851–879.

Bjorkqvist, K., Osterman, K. and Hjelt-Back, M. (1994). Aggression among university employees. *Aggressive Behavior* 20 : 173–84.

Blanchard, O. and Philippon, T. (2004). The Quality of Labor Relations and Unemployment. NBER Working Papers 10590, National Bureau of Economic Research, Inc.

Blanchard, O. and Tirole, J. (2003). La Protection de l'Emploi. Tech. rep., Conseil d'Analyse Economique, La Documentation Francaise.

Blanchard, O. and Wolfers, J. (1999). The Role of Shocks and Institutions in the Rise of European Unemployment : The Aggregate Evidence. NBER Working Papers 7282, National Bureau of Economic Research, Inc.

Blanchard, O. J. and Tirole, J. (2008). The joint design of unemployment insurance and employment protection : A first pass. *Journal of the European Economic Association* 6 : 45–77.

Browning, M. and Crossley, T. F. (2001a). The life-cycle model of consumption and saving. *Journal of Economic Perspectives* 15 : 3–22.

Browning, M. and Crossley, T. F. (2001b). Unemployment insurance benefit levels and consumption changes. *Journal of Public Economics* 80 : 1–23.

Browning, M. and Crossley, T. F. (2008). The long-run cost of job loss as measured by consumption changes. *Journal of Econometrics* 145 : 109–120.

Burda, M. C. (1992). A note on firing costs and severance benefits in equilibrium unemployment. *Scandinavian Journal of Economics* 94 : 479–89.

Canada, S. (2009). Work-sharing (ws) program : Applicant guide.

Card, D., Chetty, R. and Weber, A. (2007). Cash-on-hand and competing models of intertemporal behavior : New evidence from the labor market. *The Quarterly Journal of Economics* 122 : 1511–1560.

Carmichael, L. (1983). Does rising productivity explain seniority rules for layoffs ? *American Economic Review* 73 : 1127–31.

Caruso, C. C., Hitchcock, E. M., Dick, R. B., Russo, J. M. and Schmit, J. M. (2004). Overtime and Extended Work Shifts : Recent Findings on Illnesses, Injuries, and Health Behaviors. Tech. rep., U. S. Department of Health and Human Services, National Institute for Occupational Safety and Health.

Chen, Y.-F. and Funke, M. (2002). Working Time and Employment under Uncertainty. CESifo Working Paper Series CESifo Working Paper No., CESifo GmbH.

Chen, Y.-F. and Funke, M. (2004). Working time and employment under uncertainty. *Studies in Nonlinear Dynamics & Econometrics* 8 : 5.

Ciccone, A. and Papaioannou, E. (2006). Adjustment to Target Capital, Finance, and Growth. Economics Working Papers 982, Department of Economics and Business, Universitat Pompeu Fabra.

Ciccone, A. and Papaioannou, E. (2009). Human capital, the structure of production, and growth. *Review of Economics and Statistics* .

Cingano, F., Leonardi, M., Messina, J. and Pica, G. (2009). The Effect of Employment Protection Legislation and Financial Market Imperfections on Investment : Evidence from a Firm-Level Panel of EU countries. CSEF Working Papers 227, Centre for Studies in Economics and Finance (CSEF), University of Naples, Italy.

Cingano, F., Leonardi, M., Messina, J. and Pica, G. (2010). The effects of employment protection legislation and financial market imperfections on investment : evidence from a firm-level panel of eu countries. *Economic Policy* 25 : 117–163.

Claessens, S. and Laeven, L. (2003). Financial development, property rights, and growth. *Journal of Finance* 58 : 2401–2436.

Clarida, R. H. (1991). Aggregate stochastic implications of the life cycle hypothesis. *The Quarterly Journal of Economics* 106 : 851–67.

Clark, A. and Postel-Vinay, F. (2009). Job security and job protection. *Oxford Economic Papers* 61 : 207–239.

Clemens, J., Karabegovic, A. and Niels, V. (2003a). Measuring Labour Markets in Canada and the United States, 2003 Edition. Tech. rep., Fraser Institute.

Clemens, J., Karabegovic, A. and Niels., V. (2003b). Measuring Labour Markets in Canada and the United States, 2003 Edition. Tech. rep., Fraser Institute.

Cochrane, J. H. (1991). A simple test of consumption insurance. *Journal of Political Economy* 99 : 957–76.

Davis, S. J. and Wachter, T. V. (2011). Recessions and the costs of job loss. *Brookings Papers on Economic Activity* 43 : 1–72.

Delacroix, A. and Wasmer, E. (2006). The dynamics of labor markets in Europe and the US : Specific skills or employment protection ? 2006 Meeting Papers 747, Society for Economic Dynamics.

Deloffre, A. and Rioux, L. (2004). Do workers correctly evaluate their job security ? A European comparison. Tech. rep., mimeo, Conseil de l'Emploi, des Revenus et de la Cohésion Sociale, Paris.

Donald, S. G. and Lang, K. (2007). Inference with difference-in-differences and other panel data. *The Review of Economics and Statistics* 89 : 221–233.

Durlauf, S. N. and Blume, L. E. (2008). *The New Palgrave Dictionary of Economics.* Palgrave Macmillan, 2nd ed.

Dynarski, S. and Gruber, J. (1997). Can families smooth variable earnings ? *Brookings Papers on Economic Activity* 28 : 229–303.

Einarsen, S. (1999). The nature and causes of bullying at work. *International Journal of Manpower* 20 : 16–27.

Einarsen, S., Hoel, H., Zapf, D. and Cooper, C. L. (2003). *Bullying and Emotional Abuse in the Workplace : International perspectives in research and practice.* London : Taylor & Francis.

Einarsen, S. E., Hoel, H., Zapf, D. and Cooper, C. (2010). *Bullying and Harassment in the Workplace : Developments in Theory, Research, and Practice, Second Edition.* London : Taylor & Francis.

Friedman, M. (1957). *A Theory of the Consumption Function.* No. frie57-1 in NBER Books. National Bureau of Economic Research, Inc.

Friesen, J. (1997). Mandatory notice and the jobless durations of displaced workers. *Industrial and Labor Relations Review* 50 : 652–666.

Friesen, J. (2001). Overtime pay regulation and weekly hours of work in canada. *Labour Economics* 8 : 691–720.

Friesen, J. (2005). Statutory firing costs and lay-offs in canada. *Labour Economics* 12 : 147–168.

Friesen, J. and Kuhn, e. a., Peter (1997). Jobs and Labour Market Policy : A Strategic Scan of International Research. Tech. rep., report for the Human Resources Directorate, Gov. of Canada.

Galindo, A., Micco, A. and Serra, C. M. (2003). Better the Devil that You Know : Evidence on Entry Costs Faced by Foreign Banks. RES Working Papers 4313, Inter-American Development Bank, Research Department.

Garibaldi, P. (1999). Search Unemployment with Advance Notice. CEPR Discussion Papers 2164, C.E.P.R. Discussion Papers.

Gervais, M. and Klein, P. (2010). Measuring consumption smoothing in cex data. *Journal of Monetary Economics* 57 : 988–999.

Greg Kaplan, G. M. (2013). Shopping Externalities and Self-Fulfilling Unemployment Fluctuations. Working Paper 18777, The National Bureau of Economic Research, 1050 Massachusetts Avenue Cambridge, MA 02138 February 2013.

Gürtzgen, N. (2005). Rent-Sharing and Collective Bargaining Coverage : Evidence from Linked Employer-Employee Data. ZEW Discussion Papers 05-90, ZEW - Zentrum für Europäische Wirtschaftsforschung / Center for European Economic Research.

Gruber, J. (1997). The consumption smoothing benefits of unemployment insurance. *American Economic Review* 87 : 192–205.

Hall, R. E. (1978). Stochastic implications of the life cycle-permanent income hypothesis : Theory and evidence. *Journal of Political Economy* 86 : 971–87.

Heckman, J. J., Ichimura, H. and Todd, P. E. (1997). Matching as an econometric evaluation estimator : Evidence from evaluating a job training programme. *Review of Economic Studies* 64 : 605–54.

Helliwell, J. F. and Huang, H. (2010). How's the job ? well-being and social capital in the workplace. *Industrial and Labor Relations Review* 63 : 205–227.

Helliwell, J. F. and Putnam, R. D. (2004). The social context of well-being. *Philosophical Transactions of the Royal Society (London)* 359.

Hill, J. L., Reiter, J. P. and Zanutto, E. L. (2004). *In Applied Bayesian Modeling and Causal Inference From an Incomplete-Data Perspective*. Wiley, chap. A comparisons of experimental and observational data analyses. 44–56.

Hoxby, C. M. (2005). Competition Among Public Schools : A Reply to Rothstein (2004). NBER Working Papers 11216, National Bureau of Economic Research, Inc.

Huberman, M. and Lacroix, R. (1996). *Le partage de l'emploi : solution au chômage ou frein à l'emploi ?*. Presses Université Laval.

Hughes, P. (2004). Disability discrimination and the duty to make reasonable adjustments : Recent developments. *Industrial Law Journal* 33 : 358–366.

Ichino, A. and Riphahn, R. T. (2005). The effect of employment protection on worker effort : Absenteeism during and after probation. *Journal of the European Economic Association* 3 : 120–143, doi :10.1162/1542476053295296.

Itzhak Yanovitzkya, R. H., Elaine Zanuttob (2005). Estimating causal effects of public health education campaigns using propensity score methodology. *Evaluation and Program Planning* 28 : 209–220.

Jacobson, L. S., LaLonde, R. J. and Sullivan, D. G. (1993). Earnings losses of displaced workers. *American Economic Review* 83 : 685–709.

Jappelli, T. and Pistaferri, L. (2010). The consumption response to income changes. *Annual Review of Economics* 2 : 479–506.

Jones, S. R. G. and Kuhn, P. (1995). Mandatory notice and unemployment. *Journal of Labor Economics* 13 : 599–622.

Krueger, D. and Perri, F. (2005). Understanding consumption smoothing : Evidence from the u.s. consumer expenditure data. *Journal of the European Economic Association* 3 : 340–349.

Kugler, A. D. and Saint-Paul, G. (2004). How do firing costs affect worker flows in a world with adverse selection ? *Journal of Labor Economics* 22 : 553–584.

Kuhn, P. (1993). Employment protection laws : Policy issues and recent research. *Canadian Public Policy* 19 : 279–297.

Layard, N. S., R and Jackman, R. (1991). *Unemployment : macroeconomic performance and the labour market*. Oxford University Press.

Lazear, E. P. (1990). Job security provisions and employment. *The Quarterly Journal of Economics* 105 : 699–726.

Lechner, M. (2001). *Econometric Evaluation of Labour Market Policies*. Center for European Economic Research, *13*, chap. Identification and estimation of causal effects of multiple treatments under the conditional independence assumption. 1–18.

Lechner, M. (2002). Some practical issues in the evaluation of heterogeneous labour market programmes by matching methods. *Journal of the Royal Statistical Society Series A* 165 : 59–82.

Lepage-Saucier, N. (2009). Flex-time or Flex Work ? Is Employment Protection the Price of Employment Protection. Tech. rep., Sciences Po, Paris and Université du Québec à Montréal.

Lepage-Saucier, N., Schleich, J. and Wasmer, E. (2013). Moving Towards a Single Labour Contract : Pros, Cons and Mixed Feelings. Economics Department Working Paper 1026, OECD.

Leuven, E. and Sianesi, B. (2003). Psmatch2 : Stata module to perform full mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing. Statistical Software Components, Boston College Department of Economics.

Leymann, H. (1990). Mobbing and psychological terror at workplaces. *Violence and Victims* 5 : 119–26.

Liefooghe, A. and Davey, K. M. (2001). Accounts of workplace bullying : The role of the organization. *European Journal of Work and Organizational Psychology* 10 : 375–392.

McCarthy, P. (1996). When the mask slips : inappropriate coercion in organisations undergoing restructuring. In McCarthy, S. M. W. W., P (ed.), *Bullying : from Backyard to Boardroom*. Alexandria, Australia : Millennium Books, 47–65.

Merkl, C. and Wesselbaum, D. (2010). Extensive vs. Intensive Margin in Germany and the United States : Any Differences ? IZA Discussion Papers 5117, Institute for the Study of Labor (IZA).

Micco, A. and Pagés-Serra, C. (2004). Employment Protection and Gross Job Flows : A Differences-in-Differences Approach. RES Working Papers 4365, Inter-American Development Bank, Research Department.

Morissette, R., Zhang, X. and Frenette, M. (2007). Earnings Losses of Displaced Workers : Canadian Evidence from a Large Administrative Database on Firm Closures and Mass Layoffs. Tech. rep., Statistics Canada, Business and Labour Market Analysis Division.

Mortensen, D. T. and Pissarides, C. A. (1999). Job reallocation, employment fluctuations and unemployment. In Taylor, J. B. and Woodford, M. (eds), *Handbook of Macroeconomics*. Elsevier, Handbook of Macroeconomics *1*, chap. 18, 1171–1228.

Moulton, B. R. (1986). Random group effects and the precision of regression estimates. *Journal of Econometrics* 32 : 385–397.

Nickell, S. J. (1978). Fixed costs, employment and labour demand over the cycle. *Economica* 45 : 329–45.

OECD (2004). OECD Employment Outlook. Tech. rep., 2004, Paris.

OECD (2006). General Policies to Improve Employment Opportunities for All, Table 3.2. Tech. rep., OECD, http ://dx.doi.org/10.1787/182506528237.

OMoore, M., Lynch, J. and Daeid, N. N. (2003). The rates and relative risks of workplace bullying in ireland, a country of high economic growth. *International Journal of Management and Decision Making* 4 : 82–95.

Pagés-Serra, C. and Micco, A. (2008). The Economic Effects of Employment Protection : Evidence from International Industry-Level Data. RES Working Papers 4496, Inter-American Development Bank, Research Department.

Pissarides, C. A. (2001). Employment protection. *Labour Economics* 8 : 131–159.

Postel-Vinay, F. and Saint-Martin, A. (2005). Comment les salariés perçoivent-ils la protection de l'emploi ? *Économie et Statistique* 372 : 41–59.

Rajan, R. G. and Zingales, L. (1998). Financial dependence and growth. *American Economic Review* 88 : 559–86.

Rosenbaum, P. and Rubin, D. B. (1982). The central role of the propensity score in observational studies for causal effects. *Biometrika* 70 : 41–55.

Rosenbaum, P. R. and Rubin, D. (1985). Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *American Statistician* 3 : 33–38.

Rubin, D. (1973). The use of matched sampling and regression adjustment to remove bias in observational studies. *Biometrics* 23 : 185–209.

Rubin, D. (1979). Using multivariate matched sampling and regression adjustment to control bias in observational studies. *Journal of the American Statistical Association* 74 : 318–328.

Saint-Paul, G. (2002). Employment protection, international specialization, and innovation. *European Economic Review* 46 : 375–395.

Schwartz, J. E., Pieper, C. F. and Karasek, R. A. (1988). A procedure for linking psychosocial job characteristics data to health surveys. *American Journal of Public Health* 78(8) : 904–909.

Seigne, E. (1998). Bullying at work in Ireland. In Rayner, C., Sheehan, M. and Barker, M. (eds), *Bullying at Work*. Stafford : Staffordshire University.

Seiler-Van Daal, B. (2000). Evaluation du harcèlement moral (enquête dans une population de 1210 salariés et exploitation dans le but de construire un outil de dépistage). Ph.D. thesis, Strasbourg.

Shapiro, C. and Stiglitz, J. E. (1984a). Equilibrium unemployment as a worker discipline device. *American Economic Review* 74 : 433–44.

Shapiro, C. and Stiglitz, J. E. (1984b). Equilibrium unemployment as a worker discipline device. *American Economic Review* 74 : 433–44.

Sheehan, M. (1998). Restructuring : Rhetoric Versus Reality. In *Bullying : Causes, Costs and Cures*. Nathan, Australia : Beyond Bullying Association, 153–66.

Smith, J. and Todd, P. (2005). Rejoinder. *Journal of Econometrics* 125 : 365–375.

Stephens, M. (2001). The long-run consumption effects of earnings shocks. *The Review of Economics and Statistics* 83 : 28–36.

Stevens, A. H. (1997). Persistent effects of job displacement : The importance of multiple job losses. *Journal of Labor Economics* 15 : 165–88.

Vartia-Väänänen (2003). Workplace Bullying : A study on the work environment, well-being and health. People and Work Research Reports 56, Finnish Institute of Occupational Health.

Wasmer, E. (2006a). The Economics of Prozac : Do Employees Really Gain from Strong Employment Protection ? IZA Discussion Papers 2460, Institute for the Study of Labor (IZA), available at http ://ideas.repec.org/p/iza/izadps/dp2460.html.

Wasmer, E. (2006b). The Economics of Prozac : Do Employees Really Gain from Strong Employment Protection ? IZA Discussion Papers 2460, Institute for the Study of Labor (IZA).

Wilson, C. (1991). Us businesses suffer from workplace trauma. *Personnel Journal* : 47–50.

Wooldridge, J. M. (2001). *Econometric Analysis of Cross-Section and Panel Data*. MIT Press.

Wooldridge, J. M. (2003). Cluster-sample methods in applied econometrics. *American Economic Review* 93 : 133–138.

Zapf, D. and Gross, C. (2001). Conflict escalation and coping with workplace bullying : a replication and extension. *Journal of Work and Organizational Psychology* 10 : 4497–522.

Zapf, D., Knorz, C. and Kulla, M. (1996). On the relationship between mobbing factors, and job content, social work environment, and health outcomes. *Journal of Work and Organizational Psychology* 5 : 215–37.