

**WEB APPENDIX FOR “JOB POLARIZATION AND AGING”, BY EVA MORENO-GALBIS AND THEPTHIDA SOPRASEUTH. NOVEMBER 2013.**

**DESCRIPTIVE STATISTICS ON THE VARIABLES USED TO ESTIMATE THE ELASTICITY OF SUBSTITUTION BETWEEN GOODS AND SERVICES (HOUSEHOLD BUDGET SURVEY).**

**SECTION 4.3 OF THE PAPER “JOB POLARIZATION AND AGING”**

OLD HOUSEHOLDS	Obs	Mean	Std. Dev.
log q <sub>cleaning</sub>	2500	0,7790492	1,732245
log q <sub>All</sub>	2507	0,898443	1,836622
log y	2405	9,502361	0,7737825
log p <sub>cleaning</sub>	2500	1,904576	0,4066285
log p <sub>All</sub>	2507	1,912013	0,4147527

YOUNG HOUSEHOLDS	Obs	Mean	Std. Dev.
log q <sub>cleaning</sub>	1839	0,3080569	1,206872
log q <sub>All</sub>	1838	0,3228595	1,236022
log y	1808	10,32014	0,6649706
log p <sub>cleaning</sub>	1839	1,926381	0,2462915
log p <sub>All</sub>	1838	1,926292	0,2529172

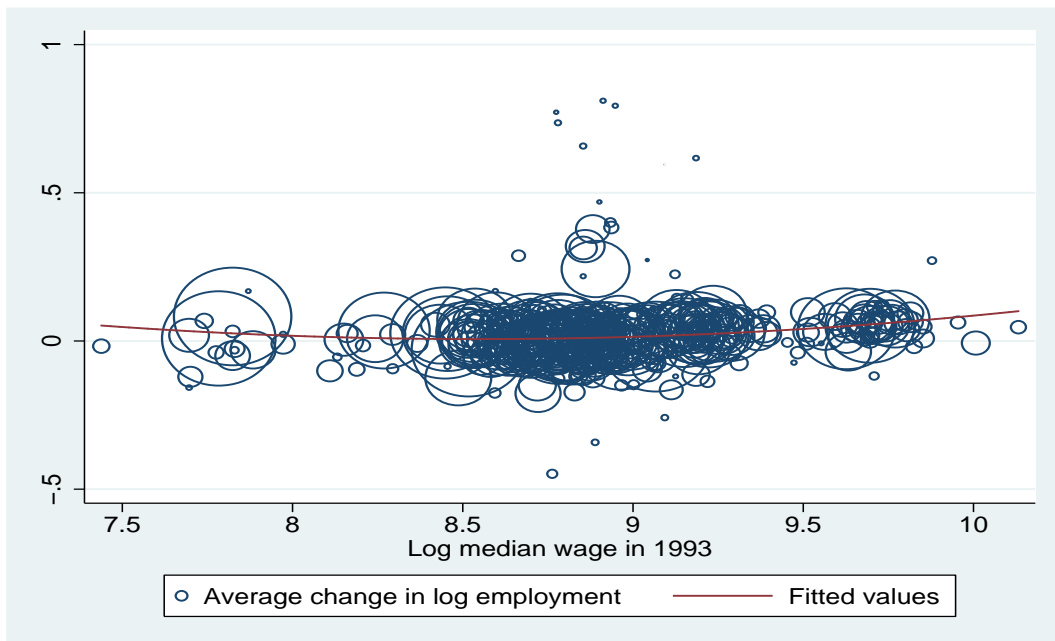
**TOBIT ESTIMATIONS OF THE AVERAGE MARGINAL EFFECTS. HOUSEHOLD BUDGET SURVEY**

**SECTION 4.3 OF THE PAPER “JOB POLARIZATION AND AGING”**

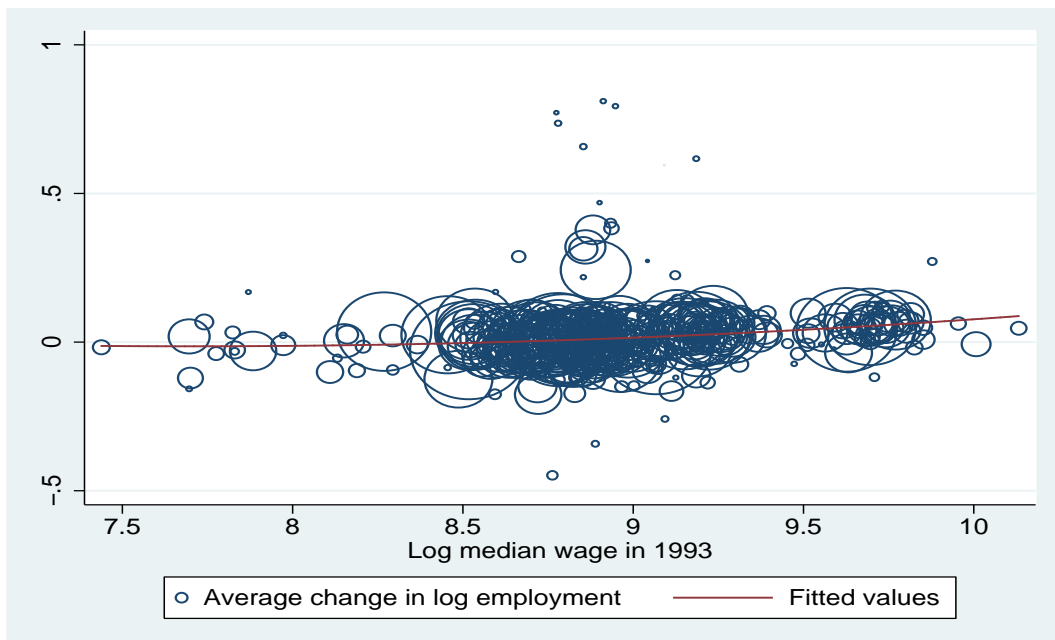
	HOUSE CLEANING				ALL SERVICES			
	Seniors-TOBIT	Seniors-TOBIT	Young-TOBIT	Young-TOBIT	Seniors-TOBIT	Seniors-TOBIT	Young-TOBIT	Young-TOBIT
log y	0.766*** (0.0051464)	0.831*** (0.0051131)	6.942*** (0.0215763)	6.623*** (0.0207321)	0.594*** (0.004819)	0.639*** (0.0047831)	6.972*** (0.0214501)	6.655*** (0.0206109)
log ps	-2.520*** (0.0067839)	-2.515*** (0.0067969)	-3.552*** (0.0199905)	-3.889*** (0.0207689)	-1.651*** (0.0064065)	-1.711*** (0.0064593)	-2.860*** (0.0193258)	-3.153*** (0.019892)
GEOGRAPHICAL DUMMIES	YES	NO	YES	NO	YES	NO	YES	NO
Observations	2362	2362	1802	1802	2370	2370	1801	1801
R-squared								
Pseudo r <sup>2</sup>	0.0261	0.0131	0.1135	0.0805	0.0208	0.0062	0.1050	0.0744
LR chi2(2)	306678.55	154245.18	307344.61	218101.36	269414.47	80694.00	296310.70	210052.42
Prob>chi2	0.0000	0.0001	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000

**GRAPHS OF JOB POLARIZATION WITH OUTLIERS (Recall that outliers are included in computing the quadratic regression curves in the paper)**

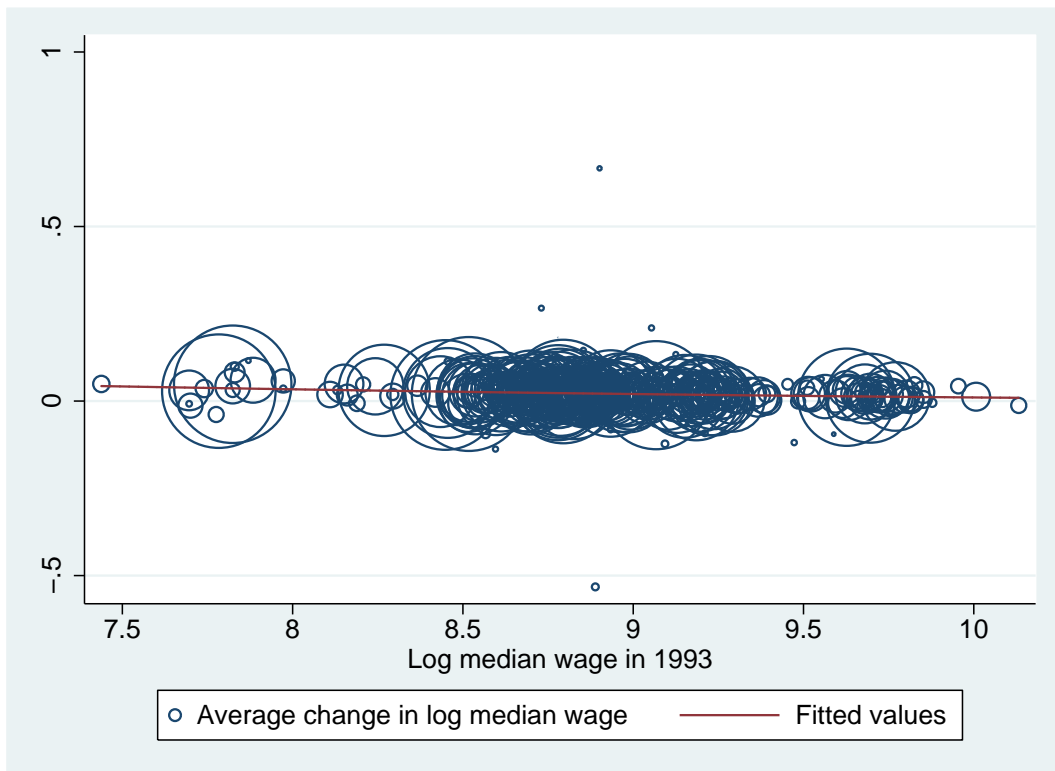
**SECTION 5.2 OF THE PAPER "JOB POLARIZATION AND AGING"**



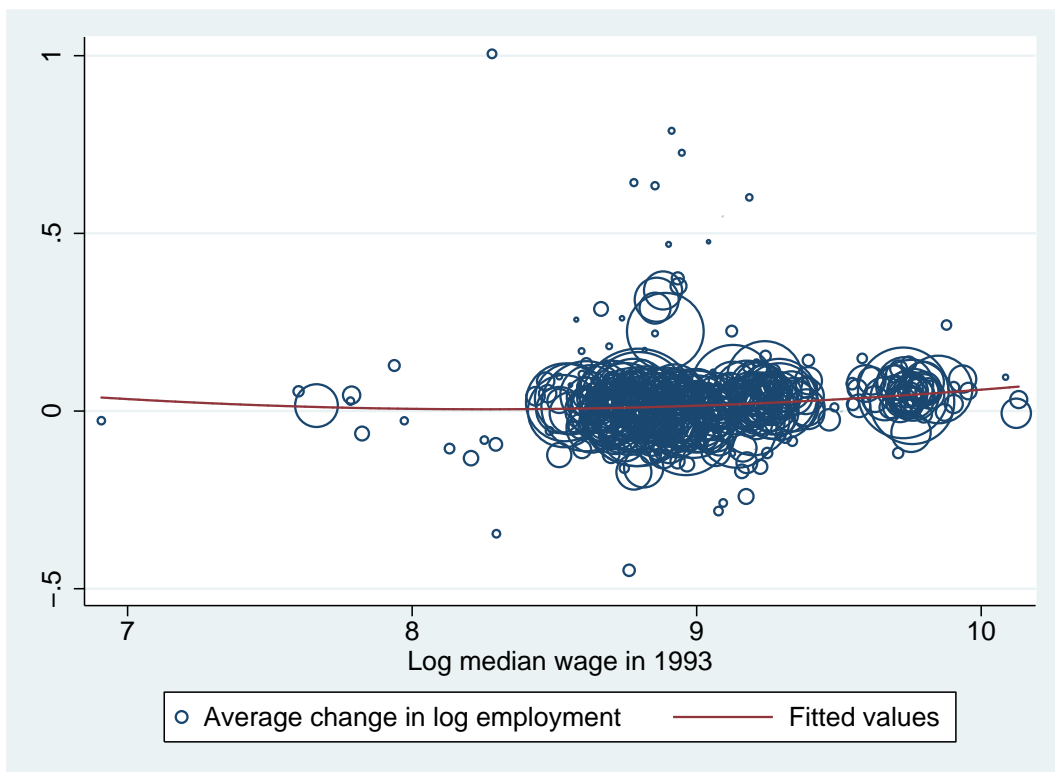
**Average employment growth by job median wage (1993-2007): Benchmark**



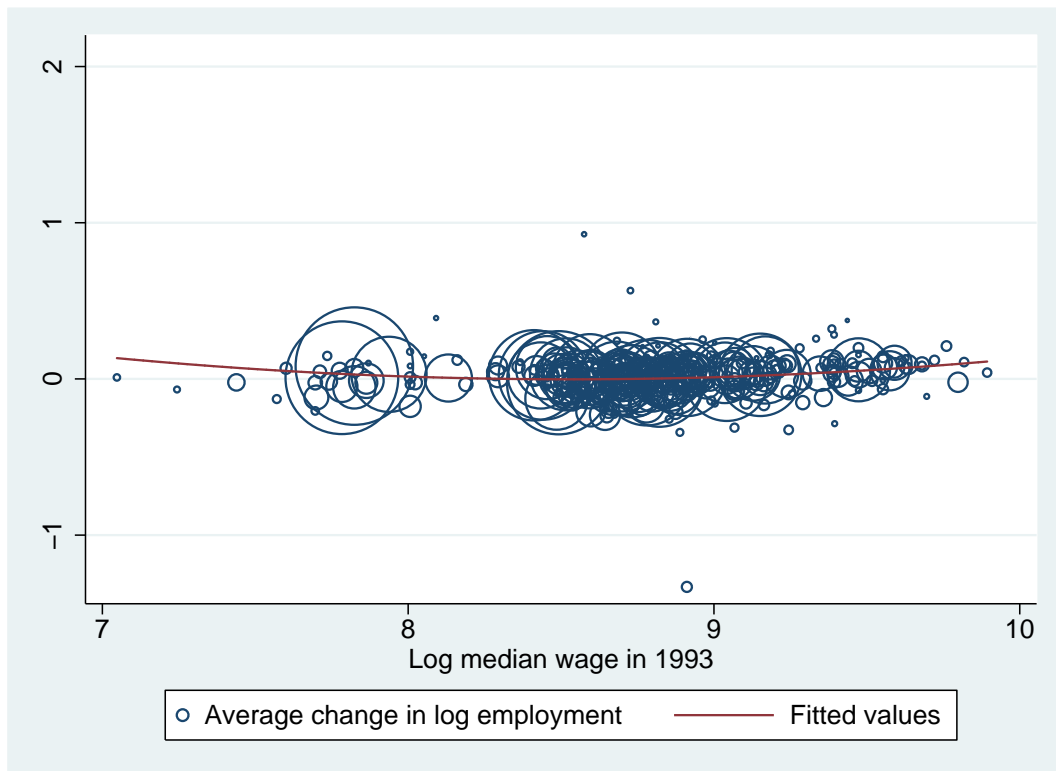
**Average employment growth by job median wage (1993-2007): No personal services**



**Average wage growth by job median wage (1993-2007)**



**Average employment growth by job median wage (1993-2007): Men**



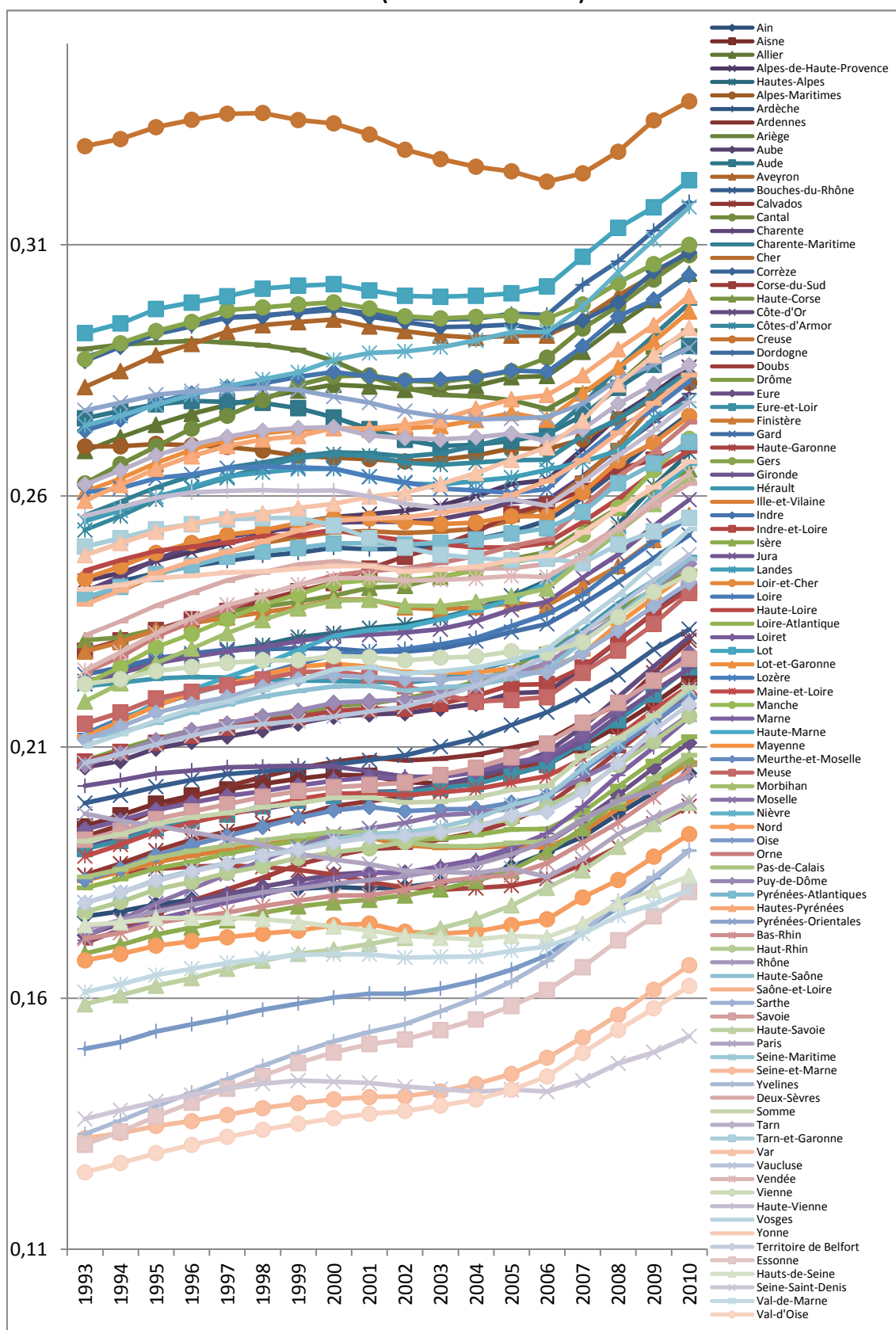
**Average employment growth by job median wage (1993-2007): Women**

**DESCRIPTIVE STATISTICS ON THE VARIABLES USED TO ESTIMATE THE INTERACTED IMPACT OF AGING AND TECHNOLOGICAL CHANGE ON THE CHANGE OF SERVICE EMPLOYMENT SHARE.**

**SECTION 5.3 OF THE PAPER "JOB POLARIZATION AND AGING"**

	Obs	Mean	Std. Dev.
Change in service employment	192	0,0022463	0,0053894
Old <sub>t-1</sub>	192	0,2211983	0,042115
Routine <sub>t-1</sub>	192	0,133411	0,0425649
General Routine <sub>t-1</sub>	192	0,147024	0,0455812
Unemployment <sub>t-1</sub>	192	0,0864583	0,0216582
Female <sub>t-1</sub>	192	0,3668778	0,0622633
Manufacture <sub>t-1</sub>	192	0,2080908	0,0628601
Managers <sub>t-1</sub>	192	0,0807747	0,0555416

# SHARE OF OLD PEOPLE (60 YEARS OR MORE) BY DEPARTMENT



## **POLARIZATION AND AGING: ROBUSTNESS TESTS.**

### **A) EXPLANATORY VARIABLES IN VARIATION**

An alternative specification of our approach would consist of setting the explanatory variables in variation. In this case, we cannot interpret the coefficients associated with the explanatory variables in causal terms and we must refer to correlations between variables. We expect a positive variation in the share of old workers during the periods 1993-2001 and 2002-2010 to be positively correlated with the variation in the share of personal services during the same period. In contrast, according to our model, the variation in the share of people employed in routine positions should be negatively correlated with the share of people employed in personal services: if there is an increasing proportion of individuals employed in the routine sector, that means that the machines are not replacing labor input in routine positions. There will not be a switch of workers towards the personal service sector.

Interacting the variation in the share of senior individuals with the share of workers in routine positions is pointless since both variables correlate to the dependent variable with opposite signs so they will neutralize each other's impact. We therefore implement a regression including the variation in the share of seniors and the variation in the share of routine jobs as separate variables. Estimations in Table 6 reveal that the only significant correlation corresponds to the routinization hypothesis. A positive variation in the share of workers in routine positions is negatively correlated with the variation in the share of workers employed in the personal service sector. In contrast, coefficients associated with the variation in the proportion of senior individuals arises as positive but insignificant. Again, population aging alone seems uncorrelated to the positive variation in the share of individuals employed in the service sector.

While the coefficients in Table 6 do not provide a causal link between the dependent and the explanatory variables, they tend to confirm the idea that the increase in the share of senior individuals needs to be associated with technological change (replacement of labor input in routine tasks by machines) in order to influence the share of personal service jobs.

Table 6: Change in service employment share. Department level (1993-2010). Explanatory variables in variation

	Dependent variable: Change in service employment share						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\Delta Old$	0.129 (0.609)		0.317 (0.649)	0.280 (0.602)		0.264 (0.636)	0.209 (0.598)
$\Delta Routine$		-0.200** (0.0889)	-0.203** (0.0884)	-0.217** (0.0827)			
$Unemployment_{t-1}$				0.0166 (0.0503)			0.00824 (0.0513)
$Female_{t-1}$				-0.00347 (0.0106)			-0.00397 (0.0109)
$Manufacture_{t-1}$				0.0251*** (0.00915)			
$Managers_{t-1}$				0.0144 (0.0121)			0.0153 (0.0123)
$\Delta G.Routine$					-0.147* (0.0857)	-0.150* (0.0851)	-0.165** (0.0801)
$G.Manufacture_{t-1}$							0.0254*** (0.00958)
Fixed effects:							
year	Yes	Yes	Yes	Yes	Yes	Yes	Yes
department	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prop. Min. Wage	-0.0326** (0.0131)	-0.0300** (0.0120)	-0.0306** (0.0120)	-0.0232** (0.0117)	-0.0312** (0.0128)	-0.0316** (0.0128)	-0.0237* (0.0122)
Observations	192	192	192	192	192	192	192
R-squared	0.538	0.570	0.571	0.593	0.556	0.557	0.579
VIF	2.42	2.27	2.43	4.43	2.27	2.43	4.40
Standard errors in parentheses							
*** $p < 0.01$ , ** $p < 0.05$ , * $p < 0.1$							

## B) ALTERNATIVE SPECIFICATION AND DEFINITION OF ROUTINE TASKS

Table 7, column 1, provides an estimation including the interacted variable and the two individual variables. Due to the very stringent nature of our specification (we are only considering two large periods, 1993-2001 and 2002-2010, we have 192 observations and there are 98 fixed effects), when introducing together the individual and the interacted variables a huge multicollinearity problem arises. The VIF associated with the interacted variable is above 200 and that associated with individual variables above 150. This suggests that we are unable to identify the individual effect associated with each of the explanatory variables. In line with our theoretical model, the focus of the econometric analysis will be therefore on the whole effect associated with the interacted relation between aging and technological change, the aim of the paper being to analyze the impact of aging on the demand for personal services in a context of technological change.

Column 2 in Table 7 displays the estimation results when implementing the same regression as in column 6 of Table 2 (in the paper) but with a larger definition of routine positions. The results are much the same in terms of the size and significance of the coefficients.

Table 7: Change in service employment share: Robustness tests. Department level (1993-2010). Alternative specification and alternative definition of routine jobs

	Dependent variable: Change in service employment share	
	(1)	(2)
Old <sub>t-1</sub>	0.0784 (0.0733)	
Routine <sub>t-1</sub>	0.0395 (0.0672)	
Old <sub>t-1</sub> ·Routine <sub>t-1</sub>	-0.0562 (0.298)	
Unemployment <sub>t-1</sub>		0.00542 (0.0521)
Female <sub>t-1</sub>		-0.00577 (0.0106)
Manufacture <sub>t-1</sub>		
Managers <sub>t-1</sub>		0.0144 (0.0123)
Old <sub>t-1</sub> ·General Routine <sub>t-1</sub>		0.131** (0.0652)
General Manufacture <sub>t-1</sub>		0.0293*** (0.00951)
Fixed effects:		
year	Yes	Yes
department	Yes	Yes
Prop. Min. Wage	-0.0325** (0.0125)	-0.0245** (0.0123)
Observations	192	192
R-squared	0.561	0.578
VIF	9.35	4.38
VIF Old <sub>t-1</sub> ·Routine <sub>t-1</sub>	210.4	
VIF Old <sub>t-1</sub>	179.22	
VIF Routine <sub>t-1</sub>	154.01	
Standard errors in parentheses		
***p<0.01, **p<0.05, *p<0.1		

### C) CONTROLLING FOR THE EFFECT OF THE LAW FOR THE DEVELOPMENT OF PERSONAL SERVICES

To corroborate the robustness of our results, we implement an additional test. In July 2005, the French government adopted the Law for the Development of Personal Services, which had the objective of creating 500,000 jobs in the personal service sector in the following three years, 2006-2009. Many fiscal advantages were approved to promote the recruitment of workers in the personal sector and there was a simplification of the administrative procedures required to work in this sector. Because this law was adopted at the national level, the major part of its impact on the trend in the share of personal services should be captured by the time dummies. Moreover, the heterogeneous impact of the law across departments should be mostly captured by the progression in the proportion of workers earning the minimum wage, which proxies the interacted time-department fixed effect. However, in order to test the robustness of our results we implement our analysis after eliminating the period 2006-2010 from our sample. The results are summarized in Table 8.

In column 1 of Table 8, we estimate the impact of population aging in a context of technological change on the share of personal service by simply controlling for fixed effects. The coefficient arises as positive and significant. When including the control



variables in column 2, the value and significance of the coefficient associated with  $\text{old}_{t-1} \cdot \text{routine}_{t-1}$  remains fairly stable. This also holds when enlarging the definition of routine positions. So our conclusions remain robust when we eliminate from our sample all years where the demand for personal services was likely to be affected by the Law for the Development of Personal Services.

Table 8: Change in service employment share. Robustness test. Department level 1993-2005.  
Controlling for the effect of the Law for the Development of Personal Services

Dependent variable: Change in service employment share			
	(1)	(2)	(3)
$\text{Old}_{t-1} \cdot \text{Routine}_{t-1}$	0.348** (0.138)	0.366*** (0.137)	
$\text{Unemployment}_{t-1}$		-0.141 (0.0921)	-0.128 (0.0922)
$\text{Female}_{t-1}$		-0.0408* (0.0229)	-0.0419* (0.0229)
$\text{Manufacture}_{t-1}$		0.0399* (0.0203)	
$\text{Managers}_{t-1}$		0.00838 (0.0205)	0.00738 (0.0210)
$\text{Old}_{t-1} \cdot \text{General Routine}_{t-1}$			0.345** (0.133)
G. $\text{Manufacture}_{t-1}$			0.0384* (0.0212)
Fixed effects:			
year	Yes	Yes	Yes
department	Yes	Yes	Yes
Prop. Min. Wage	-0.0325 (0.0202)	-0.0178 (0.0196)	-0.0194 (0.0203)
Observations	192	192	192
R-squared	0.424	0.470	0.464
VIF	2.38	4.38	4.38
Standard errors in parentheses			
*** $p < 0.01$ , ** $p < 0.05$ , * $p < 0.1$			