

Employment reallocation and productivity during the Great Recession

Evidence from French manufacturing firms

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Reallocation and productivity: background

Continuous reallocation of resources among producers in market economies
Empirical evidence shows that this process is linked to productivity

Cleansing hypothesis: during recessions, productivity-enhancing reallocation accelerates (Caballero and Hammour, 1994; Schumpeter, 1942)

But this might not be the case:

- the cleansing effect might be hampered or reversed by labour market (Caballero and Hammour, 1996) or financial constraints (Barlevy, 2003);
- recessions might have other effects: 'sullyng' (Barlevy, 2002), 'scarring' (Ouyang, 2009)

Emerging empirical firm-level evidence that the cleansing hypothesis may not hold during recessions (Hallward-Driemeier and Rijkers, 2013), and during the Great Recession in particular (Carreira and Teixeira 2016; Foster et al. 2016; Ikeuchi 2017; Bartelsman @ CAED 2017)

Our contribution

To investigate the micro-dynamics of productivity and reallocation among manufacturing firms during the Great Recession:

- in France (no systematic evidence so far)
- taking into account different dimensions of firm heterogeneity, in particular exporting and patenting activities

Analytical framework:

- productivity growth decomposition (Griliches and Regev, 1995)
- regressions analysis of firm exit (Cox, 1972)
- regressions analysis of firm growth (OLS, FE)

Macroeconomic trends

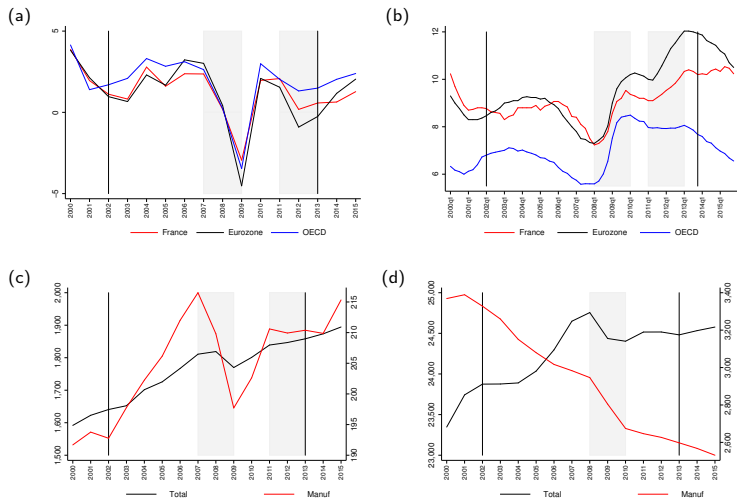


Figure: (a) GDP growth; (b) Unemployment rate; (c) Value added; (d) Employment.

Data sources

DADS: employer-employee database (social security forms)

Data on all French manufacturing firms (NAF rev. 2 divs. 10-33) *with employees*, 2002-2013

The following are matched via the unique firm identifier (SIREN):

- **FICUS/FARE**: balance-sheet and revenue-account data, general firm information (fiscal statements)
- **customs data**: quantity, value, product sector, and country of destination of every international transaction of goods
- **patent data**, matched via BVD's Amadeus

Definitions

Employment (Emp): headcount at 31/12

- log-difference rate of growth: $g_t = \ln(\text{Emp}_t) - \ln(\text{Emp}_{t-1})$

Entry (exit) refers to (dis)appearance from the database

Productivity (π):

- Hourly Labour Productivity: $HLP_t = \frac{VA_t}{\text{Hours}_t}$
- Total Factor Productivity (TFP) (Levinsohn and Petrin, 2003)

Exporter (Exp): dummy denoting $\text{Exports}_t > 0$

- using a country-diversification measure (not displayed here) does not alter inferences

Patentee (Pat): dummy denoting $\sum_{i=0}^4 \text{Patents}_{t-i} > 0$

Liquidity proxied by Return On Sales: $ROS_t = \frac{\text{Profits}_t}{\text{Sales}_t}$

Age: years since foundation

Descriptive statistics: employment dynamics

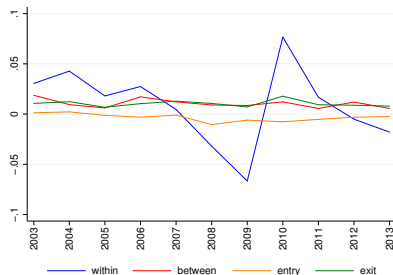
	Entry	Exit	Growth (g)				N
			mean	sd	p25	p75	
2003	8.1	8.0	-0.5	35.8	-7.4	5.7	143,945
2004	6.7	8.3	-0.3	35.6	-7.4	6.1	142,467
2005	6.4	8.3	0.3	36.3	-6.4	6.8	138,876
2006	6.1	8.1	0.4	35.3	-6.1	7.6	137,918
2007	6.1	8.1	0.3	34.2	-5.4	8.0	135,710
2008	5.6	8.2	-1.0	34.2	-7.2	5.4	133,252
2009	5.1	6.3	-3.7	34.6	-10.5	0.0	128,645
2010	5.3	9.4	-1.0	33.0	-6.3	4.3	128,316
2011	5.3	8.1	0.1	32.3	-3.6	6.9	123,804
2012	5.2	7.6	-1.0	32.1	-5.7	3.8	120,831
2013	4.7	8.2	-1.1	31.6	-5.7	3.2	118,303

Descriptive statistics: firm characteristics

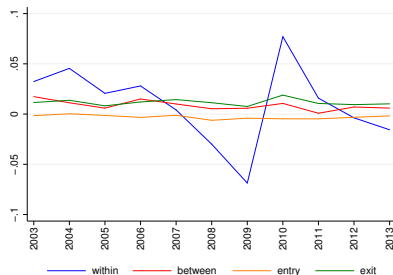
	HLP		TFP		Emp		Age		Exp		Pat		ROS		N
	mean	p50	mean	p50	mean	p50	mean	p50	mean	p50	mean	p50	mean	p50	
2003	31.9	22.4	52.2	38.5	25.1	5.0	14.8	11.0	20.7	0.0	1.3	0.0	11.2	10.2	143,945
2004	34.1	23.8	54.4	40.7	24.8	5.0	15.2	12.0	20.4	0.0	1.5	0.0	11.2	10.3	142,467
2005	34.3	24.3	56.3	41.6	25.1	5.0	15.6	12.0	20.6	0.0	1.6	0.0	10.9	10.1	138,876
2006	36.8	25.1	58.2	43.5	24.7	5.0	15.8	13.0	20.3	0.0	1.7	0.0	10.7	10.1	137,918
2007	36.2	25.9	59.7	44.9	24.9	5.0	15.9	13.0	20.2	0.0	1.8	0.0	11.0	10.4	135,710
2008	34.3	25.6	57.7	44.6	24.9	5.0	16.2	13.0	20.1	0.0	1.9	0.0	10.7	10.0	133,252
2009	32.7	24.4	58.4	42.4	24.1	5.0	16.5	13.0	20.0	0.0	1.9	0.0	8.6	8.8	128,645
2010	37.4	26.4	62.9	45.2	24.3	5.0	16.8	14.0	20.1	0.0	1.8	0.0	8.8	8.8	128,316
2011	36.9	27.3	63.2	46.5	24.6	5.0	17.1	14.0	19.3	0.0	1.7	0.0	8.9	8.7	123,804
2012	35.1	26.8	63.0	46.5	24.8	5.0	17.4	14.0	19.6	0.0	1.6	0.0	8.1	7.9	120,831
2013	34.6	26.4	61.3	45.9	24.9	5.0	17.8	14.0	19.8	0.0	1.5	0.0	7.8	7.9	118,303

Productivity growth decomposition

$$\Delta \Pi_{st} = \underbrace{\sum_{i \in C} \bar{s}_{ist} \Delta \pi_{ist}}_{\text{within}} + \underbrace{\sum_{i \in C} \Delta s_{ist} (\bar{\pi}_{ist} - \bar{\Pi}_{st})}_{\text{between}} + \underbrace{\sum_{i \in N} s_{ist} (\pi_{ist} - \bar{\Pi}_{st})}_{\text{entry}} + \underbrace{\sum_{i \in X} s_{ist-1} (\pi_{ist-1} - \bar{\Pi}_{st})}_{\text{exit}}$$



(a) s: Emp; π: HLP



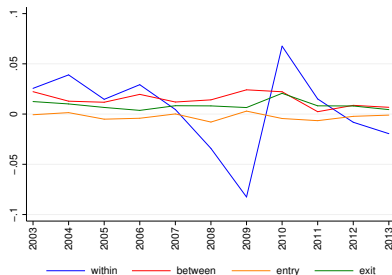
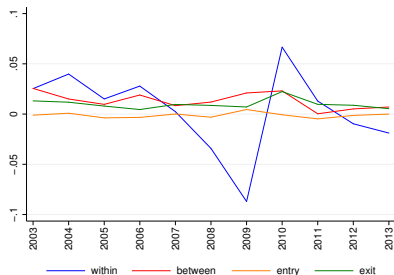
(b) s: Hours; π: HLP

Within predominates, especially during the GR

Between and *Exit* are lower in magnitude, but more stable

Productivity growth decomposition

$$\Delta \Pi_{st} = \underbrace{\sum_{i \in C} \bar{s}_{ist} \Delta \pi_{ist}}_{\text{within}} + \underbrace{\sum_{i \in C} \Delta s_{ist} (\bar{\pi}_{ist} - \bar{\Pi}_{st})}_{\text{between}} + \underbrace{\sum_{i \in N} s_{ist} (\pi_{ist} - \bar{\Pi}_{st})}_{\text{entry}} + \underbrace{\sum_{i \in X} s_{ist-1} (\pi_{ist-1} - \bar{\Pi}_{st})}_{\text{exit}}$$

(a) s: Emp; π : TFP(b) s: Hours; π : TFP

Within predominates, especially during the GR

Between and *Exit* are lower in magnitude, but more stable

Regression analysis: framework

Determinants of firm exit (Cox proportional hazards model)

$$h_{ist}(t) = h_0(t)e^{(\beta_0 + \beta_\pi \pi_{ist-1} + \beta_x \mathbf{x}_{ist-1} + \beta_{\pi C} \pi_{ist-1} Crisis + \beta_{xC} \mathbf{x}_{ist-1} Crisis + \delta_s + \delta_t + \epsilon_{ist})} \quad (1)$$

Determinants of firm growth (pooled OLS and FE)

$$g_{ist} = \beta_0 + \beta_\pi \pi_{ist-1} + \beta_x \mathbf{x}_{ist-1} + \beta_{\pi C} \pi_{ist-1} Crisis + \beta_{xC} \mathbf{x}_{ist-1} Crisis + \delta_s + \delta_t + \epsilon_{ist} \quad (2)$$

Various specifications presented, where \mathbf{x} is progressively extended:

- ① π only (deviations from sector-year mean log HLP/TFP)
- ② (log) Emp and Age added
- ③ Exp and Pat added
- ④ ROS added

Crisis = 2008-2010 / 2008-2013

FE interacted with *Crisis* (based on Wooldridge 2010)

Main focus: interaction term $\pi * Crisis$

Regression results: Cox model

	(1)	(2)	(3)	(4)
<i>Crisis: 2008-2010</i>				
HLP	0.814***	0.692***	0.693***	0.872***
HLP*Crisis	1.005	1.020**	1.021**	0.959***
Exp			0.952***	0.895***
Exp*Crisis			0.965	0.981
Pat			0.134***	0.128***
Pat*Crisis			0.768	0.823
ROS				0.192***
ROS*Crisis				1.349***
Crisis	2.149***	1.161***	1.159***	1.067**
Division dummies	Y	Y	Y	Y
Year dummies	Y	Y	Y	Y
Emp, Age	N	Y	Y	Y
N	1,294,253	1,287,215	1,287,215	1,285,234
Adj. R ²	0.004	0.020	0.020	0.022

Regression results: Cox model

	(1)	(2)	(3)	(4)
<i>Crisis: 2008-2013</i>				
HLP	0.792***	0.682***	0.683***	0.867***
HLP*Crisis	1.052***	1.035***	1.034***	0.987
Exp			0.978	0.916***
Exp*Crisis			0.925***	0.937***
Pat			0.071***	0.069***
Pat*Crisis			2.472***	2.448***
ROS				0.194***
ROS*Crisis				1.141***
Crisis	2.193***	1.088***	1.084***	0.983
Division dummies	Y	Y	Y	Y
Year dummies	Y	Y	Y	Y
Emp, Age	N	Y	Y	Y
N	1,294,253	1,287,215	1,287,215	1,285,234
Adj. R ²	0.004	0.020	0.021	0.022

Regression results: Cox model

	(1)	(2)	(3)	(4)
<i>Crisis: 2008-2010</i>				
TFP	0.593***	0.686***	0.686***	0.862***
TFP*Crisis	1.051***	1.023**	1.023**	0.977*
Exp			0.918***	0.879***
Exp*Crisis			0.995	1.003
Pat			0.130***	0.127***
Pat*Crisis			0.789	0.834
ROS				0.187***
ROS*Crisis				1.227***
Crisis	1.853***	1.114***	1.114***	1.058*
Division dummies	Y	Y	Y	Y
Year dummies	Y	Y	Y	Y
Emp, Age	N	Y	Y	Y
N	1,270,218	1,264,213	1,264,213	1,262,461
Adj. R ²	0.009	0.020	0.020	0.022

Regression results: Cox model

	(1)	(2)	(3)	(4)
<i>Crisis: 2008-2013</i>				
TFP	0.571***	0.671***	0.671***	0.843***
TFP*Crisis	1.090***	1.049***	1.048***	1.027**
Exp			0.930***	0.893***
Exp*Crisis			0.968	0.966
Pat			0.063***	0.062***
Pat*Crisis			2.670***	2.709***
ROS				0.199***
ROS*Crisis				0.992
Crisis	1.911***	1.051*	1.048*	0.992
Division dummies	Y	Y	Y	Y
Year dummies	Y	Y	Y	Y
Emp, Age	N	Y	Y	Y
N	1,270,218	1,264,213	1,264,213	1,262,461
Adj. R ²	0.009	0.020	0.020	0.022

Regression result: OLS and FE

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Crisis: 2008-2010</i>								
HLP	0.085***	0.067***	0.066***	0.068***	0.174***	0.063***	0.062***	0.048***
HLP*Crisis	-0.005***	-0.006***	-0.005***	-0.007***	-0.002	-0.009**	-0.009**	-0.016***
Exp			0.024***	0.024***			0.024***	0.024***
Exp*Crisis			-0.010***	-0.009***			-0.020***	-0.020***
Pat			0.023***	0.022***			0.017***	0.018***
Pat*Crisis			-0.004	-0.004			-0.018*	-0.018*
ROS				-0.012**				0.112***
ROS*Crisis				0.021***				0.052***
Crisis	-0.005***	-0.006**	-0.007**	-0.010***				
Const.	-0.001	0.114***	0.118***	0.120***	0.010***	1.041***	1.038***	1.036***
Division dummies	Y	Y	Y	Y	Y	Y	Y	Y
Year dummies	Y	Y	Y	Y	Y	Y	Y	Y
Emp, Age	N	Y	Y	Y	N	Y	Y	Y
Firm FE	N	N	N	N	Y	Y	Y	Y
N	1,161,932	1,161,740	1,161,740	1,160,264	1,161,932	1,161,740	1,161,740	1,160,264
Adj. R ²	0.022	0.041	0.042	0.042	0.063	0.307	0.308	0.308

Regression result: OLS and FE

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Crisis: 2008-2013</i>								
HLP	0.088***	0.070***	0.068***	0.071***	0.217***	0.062***	0.062***	0.046***
HLP*Crisis	-0.010***	-0.008***	-0.007***	-0.010***	-0.049***	-0.010***	-0.010***	-0.011**
Exp			0.024***	0.023***			0.020***	0.020***
Exp*Crisis			-0.005***	-0.004**			-0.011***	-0.010***
Pat			0.031***	0.030***			0.028***	0.027***
Pat*Crisis			-0.018***	-0.018***			-0.021*	-0.020*
ROS				-0.021***				0.125***
ROS*Crisis				0.027***				0.009
Crisis	-0.006***	-0.025***	-0.026***	-0.030***				
Const.	-0.001	0.126***	0.130***	0.133***	-0.013***	1.143***	1.141***	1.139***
Division dummies	Y	Y	Y	Y	Y	Y	Y	Y
Year dummies	Y	Y	Y	Y	Y	Y	Y	Y
Emp, Age	N	Y	Y	Y	N	Y	Y	Y
Firm FE	N	N	N	N	Y	Y	Y	Y
N	1,161,932	1,161,740	1,161,740	1,160,264	1,161,932	1,161,740	1,161,740	1,160,264
Adj. R ²	0.022	0.041	0.042	0.042	0.065	0.354	0.354	0.354

Regression result: OLS and FE

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Crisis: 2008-2010</i>								
TFP	0.047***	0.076***	0.074***	0.075***	0.095***	0.089***	0.088***	0.085***
TFP*Crisis	-0.004**	-0.005***	-0.005***	-0.005***	-0.014**	-0.027***	-0.027***	-0.047***
Exp			0.028***	0.028***			0.022***	0.022***
Exp*Crisis			-0.010***	-0.010***			-0.019***	-0.019***
Pat			0.029***	0.028***			0.017***	0.017***
Pat*Crisis			-0.004	-0.004			-0.017*	-0.017
ROS				0.009**				0.033***
ROS*Crisis				0.013*				0.127***
Crisis	-0.006***	-0.009***	-0.010***	-0.012***				
Const.	-0.004***	0.131***	0.135***	0.133***	0.008***	1.075***	1.073***	1.069***
Division dummies	Y	Y	Y	Y	Y	Y	Y	Y
Year dummies	Y	Y	Y	Y	Y	Y	Y	Y
Emp, Age	N	Y	Y	Y	N	Y	Y	Y
Firm FE	N	N	N	N	Y	Y	Y	Y
N	1,147,408	1,147,217	1,147,217	1,145,879	1,147,408	1,147,217	1,147,217	1,145,879
Adj. R ²	0.008	0.043	0.043	0.044	0.040	0.309	0.309	0.309

Regression result: OLS and FE

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Crisis: 2008-2013</i>								
TFP	0.049***	0.082***	0.081***	0.082***	0.125***	0.077***	0.077***	0.064***
TFP*Crisis	-0.005***	-0.014***	-0.014***	-0.016***	-0.041***	-0.012***	-0.012***	-0.015***
Exp			0.029***	0.028***			0.018***	0.018***
Exp*Crisis			-0.006***	-0.005***			-0.009**	-0.009**
Pat			0.036***	0.035***			0.027***	0.027***
Pat*Crisis			-0.016***	-0.017***			-0.019*	-0.018
ROS				-0.004				0.091***
ROS*Crisis				0.031***				0.017
Crisis	-0.006***	-0.029***	-0.029***	-0.034***				
Const.	-0.004***	0.143***	0.147***	0.148***	-0.016***	1.180***	1.178***	1.169***
Division dummies	Y	Y	Y	Y	Y	Y	Y	Y
Year dummies	Y	Y	Y	Y	Y	Y	Y	Y
Emp, Age	N	Y	Y	Y	N	Y	Y	Y
Firm FE	N	N	N	N	Y	Y	Y	Y
N	1,147,408	1,147,217	1,147,217	1,145,879	1,147,408	1,147,217	1,147,217	1,145,879
Adj. R ²	0.008	0.043	0.044	0.044	0.038	0.354	0.354	0.354

Conclusions

Mixed evidence with regard to the cleansing hypothesis (CH) during the Great Recession (GR):

- the productivity-survival relationship intensified → CH ✓
- the productivity-growth nexus did not intensify → CH ✗

Exporters and patentees enjoy premia, in terms of survival and growth

- the survival premia did not change during the GR
- the growth premium of exporters fell, due to the trade collapse