Are clusters more resilient in crises? Evidence from French exporters in 2008-2009

Ph. Martin, Th. Mayer and F. Mayneris

Discussion Paper 2013-26

Institut de Recherches Économiques et Sociales
de l'Université catholique de Louvain

UCL

Are clusters more resilient in crises? Evidence from French exporters in 2008-2009*

Philippe Martin† Thierry Mayer‡ Florian Mayneris§

September 19, 2013

Abstract

Clusters have already been extensively shown to favor firm-level economic performance (productivity, exports, innovation etc.). However, little is known about the capacity of firms in clusters to resist economic shocks. In this paper, we analyze whether firms that agglomerate in clusters and firms that have been selected to benefit from the "competitiveness cluster" industrial policy, implemented in France in 2005, have performed better on export markets during the recent economic turmoil. We show that, on average, both agglomeration and the cluster policy are associated with a higher survival probability of firms on export markets, and conditioning on survival, a higher growth rate of their exports. However, these effects are not stronger during the 2008-2009 crisis; if anything, the opposite is true. We then show that this weaker resilience of competitiveness cluster firms is probably due to the fact that firms in clusters are more dependent on the fate of the "leader", i.e. the largest exporter in the cluster.

JEL: F1, R10, R11, R12, R15.

Keywords: Clusters, Competitiveness clusters, Exports, Crisis, Resilience.

*This paper was prepared for the conference "The Factory Free Economy: What next for the 21st century", organized on June 17-19 2013 in Paris (`https://sites.google.com/site/ffeconference/home`). We thank the conference participants, Maria Bas and an anonymous referee for useful comments. Philippe Martin thanks the Banque de France-Sciences Po partnership for financial assistance. Florian Mayneris thanks the Belgian French-speaking Community (Convention ARC 09/14-019 on "Geographical mobility of factors") for financial support.

†Sciences-Po and CEPR. philippe.martin@sciencespo.fr

‡Sciences-Po, CEPII and CEPR. thierry.mayer@sciencespo.fr

§Université catholique de Louvain, IRES and CORE. florian.mayneris@uclouvain.be

1 Introduction

During the 2008-2009 financial crisis, manufacturing has been hit severely in many countries. The collapse of international trade in particular led many firms to exit export markets, or even to cease activities. In this paper we analyze the factors behind the resilience of exporters during the crisis. Using French firms as a case study, we ask the data why were some exporters less severely affected than others during the trade collapse.

Let us first return to the alternative explanations that have been provided to explain the collapse of trade during financial crises. Chor and Manova (2012) analyze the effect that credit conditions had on international trade during the recent global crisis by examining the evolution of monthly US imports over the November 2006 to October 2009 period, and compare trade patterns before and during the crisis. They find that during the crisis period, countries with tighter credit availability exported less to the US, relative to other countries. Amiti and Weinstein (2011) show that Japanese banks transmitted financial shocks to exporters during the systemic crisis in Japan that took place in the 1990s. Ahn et al. (2011) review evidence that financial factors may have resulted in a greater decline in exports than were predicted in models without financial frictions. In the same vein, Bricongne et al. (2012) find that the exports of French firms in more external finance-dependent sectors were more adversely hit during the recent global crisis. Finally, Berman et al. (2012) found that the fall in trade caused by financial crises is magnified by the time-to-ship goods between the origin and the destination country. Because risk of default increases with time to ship, this aggregate and firm level evidence points to the existence of financial frictions that are exacerbated during a financial crisis.

However, some economists have downplayed the role financial frictions when explaining the drop in international trade. Levchenko et al. (2010) emphasize the disruption of global production lines and the reduction in trade in intermediate goods during the recent financial crisis to explain that the fall in trade has been larger than the fall in output, and therefore conclude that trade finance has played a minor role in the trade collapse of 2008-2009. Eaton et al. (2011) quantify the relative contributions of changes in demand versus changes in trade frictions, using a general equilibrium model of production and trade. They also conclude that the fall in demand was more important.

Whatever the exact mechanisms behind the trade collapse may be, some firms have been more resilient than others, which is our topic of interest. It is well known that larger and more productive firms are more resilient to shocks than others. However, we know little about how the local environment of firms and how public policies affect this resilience. In this paper, we focus on a specific dimension of the local environment of firms and on a specific type of public policy, namely clusters and cluster policies, as determinants of a specific type of resilience, namely resilience on the export markets. To document the resilience of clusters and firms that benefit from cluster policies, we use data on the French exporters from 2004 to 2009.

Since the end of the 1980's, agglomeration economies have been used to justify cluster policies by national and local governments. This has been the case in Germany, Brazil, Japan, Southern Korea, Spanish Basque country or more recently in France (see Duranton et al., 2010). The economic literature on the empirical evaluation of these cluster policies is relatively scarce, when compared in particular to the numerous studies conducted by government agencies and consulting firms. Most of these use qualitative methodologies and are descriptive (for a recent survey of evidence, see Duranton, 2011).

In two previous papers (Martin et al., 2011a,b), we find mixed evidence on the effect of clusters and cluster policies. In Martin et al. (2011a), we use firm and plant panel data to measure the strength and the shape of agglomeration externalities in France, very closely to the micro theories. The sample of those papers covers the whole manufacturing sector. The estimation relies on GMM, and thus on short-run (yearly) variations of the variables. We find that in the short-run, taking into account several possible biases, localization economies are the only significant agglomeration externalities in the French economy. Hence, the starting point of those who favor cluster policies is right: there are productivity gains associated to clusters. However, the elasticity of firm-level TFP to the size of its own sector at the local level is rather low, equal to 5% (in line with measures obtained in other contexts, see Rosenthal and Strange, 2004), not because agglomeration economies are weak, but because those gains seem to be already well internalized by firms in their location decisions. Indeed, we show that localization economies are bell-shaped, and the comparison between an estimated geographical distribution of plants that would maximize productivity and the one that is actually observed suggests no large gap, at least in the French case. It points neither to a situation where geography is too concentrated and specialized, nor to a geography that needs more clustering. In the same vein, note that many papers studying firm location decisions show that the presence of other firms in a region increases significantly the probability that a plant chooses to locate in this region (see, e.g., Head et al., 1999; Crozet et al., 2004; Devereux et al., 2007). Consequently, the gains we can expect from more clustering are, at least in the short-run, relatively small. Of course, this result is "only" about productivity and is not about welfare, which agglomeration could affect through other channels than productivity. However, this suggests that even though the starting point of cluster policy advocates is right, their conclusion advocating costly public intervention to favor agglomeration is dubious, at least in France. Moreover, in Martin et al. (2011b), we use the same dataset to evaluate the first cluster policy implemented in France, the "Systèmes Productifs Locaux" policy. We find that the policy, contrary to its official goal, helped declining firms operating in declining sectors and areas, and had no measurable impact on firm-level productivity, employment or exports.

Another strand of the literature focuses on export spillovers, i.e. on the role of surrounding exporters on firm-level export activities. The underlying idea is that the presence of other exporters might reduce the fixed and/or the variable export costs firms have to pay to serve

foreign markets, through the exchange of information or the mutualization of some of these costs. In a pioneer work, Aitken et al. (1997) show for example that the probability that Mexican plants export in a given year is positively related to the presence of multinationals. More recently, Koenig (2009) and Koenig et al. (2010) show on French data that the presence of other exporters (whatever their nationality) increases the probability that French firms start exporting a given product to a given country; however, these spillovers occur at a very fine level in terms of activity, being stronger when specific to the product and the destination country that are considered. Moreover, existing studies suggest that export spillovers mainly affect the firm-level extensive margin of trade (export status or export entry), rather than the intensive margin (value of exports).

While the positive impact of agglomeration on firm-level productivity, exports or innovation is now well documented, little is known about the potential effect of clusters on firm resilience. In the present paper, we deal with this issue and ask whether the probability to remain on an export market and, conditioning on staying, the growth rate of firm-level exports, are correlated to the presence of other exporters, and to the fact that firms benefit from cluster policies. We are specifically interested on how this correlation behaves during the financial crisis of 2008-2009. Such an issue is particularly important for developed economies in a context of structural change, where more and more industrial activities are offshored; indeed, if the presence of other producers and exporters positively affects firm-level resistance to shocks, the "desindustrialization" process could be reinforced in a context of crisis due to weaker spillovers.

In our analysis, we distinguish the effect of surrounding exporters from the specific behavior of French firms that are part of clusters benefiting from public support. We are more specifically interested in a cluster policy, the "poles de competitivité (competitiveness clusters)" policy, which was launched in 2005. The policy is based on calls for tender leading to financial subsidies for innovative projects which are managed collectively by firms, research departments and universities. The map of these clusters shows that they are quite dispersed on the French territory. Most commentators have analyzed this geography (which does not correspond fully to the industrial geography of France) as the result of political constraints that obliged policy-makers to "give" a cluster to each of the French large regions. Regarding the effect of the competitiveness cluster policy, we do not want to interpret the correlations we observe as causal, since many unobservable characteristics of the firms could both make them good candidates to be selected in publicly subsidized clusters and to be more resilient. This is so even though we control for many characteristics of the firms and of their local environment.

Our results show that the agglomeration of exporters positively affects the survival probability of firms on export markets, and conditioning on survival, the growth rate of their exports. These spillover effects are not stronger during the crisis; if anything, the opposite is true. Moreover, we find that on average, exporters that belong to competitiveness clusters are

Figure 1: Map competitiveness clusters

more likely to survive on export markets, and conditioning on survival, their exports increase more rapidly. However, this premium is considerably reduced during the 2008-2009 crisis. We then show that this weaker resilience of competitiveness cluster firms is probably due to the fact that firms in clusters are more dependent on the fate of the "leader", i.e. the largest exporter in the cluster. Section 2 details our empirical strategy and section 3 presents our results. Section 4 concludes.

2 Determinants of firm-level resilience on export markets: estimation strategy

We use the French customs dataset that is now well-known and has been extensively used in other studies (see Berman et al., 2012, for example). We exploit the information available on firm-level export values from 2004 to 2009 at the firm-sector (hs2)-destination country level. The information on the municipality where firms are located is taken from the SIRENE database, which records various data for all plants operating in France.

2.1 Estimating equation

We study two dimensions of firm-level resistance on export markets: the probability to survive, and conditioning on surviving, the growth rate of exports. We conduct the analysis at the firm-sector (hs2)-destination country level. Firm-level export activities are subject to a lot of annual entries and exits which are linked to experimentations or occasional transactions for firms (see, e.g., Eaton et al., 2007; Albornoz et al., 2012). These movements do not necessarily reflect deep patterns of firm-level exports; in order to smooth the possible noise introduced by these multiple entries and exits, we focus on survival and export growth over periods of two years. Since we analyze customs data from 2004 to 2009, we have in the end a sample composed of four waves (from 2004-2006 to 2007-2009).

The main equation we estimate has the following form:

$$\begin{aligned} y_{idsct} &= \alpha cc_i + \beta cc_i \times \text{crisis}_t + \delta X_{i(sc)t-2} + \gamma X_{i(sc)t-2} \times \text{crisis}_t \\ &\quad + \eta Y_{d(sc)t-2} + \nu Y_{d(sc)t-2} \times \text{crisis}_t + u_{sct} + \epsilon_{idsct}, \end{aligned} \tag{1}$$

where, on the left-hand side, we are interested by either the probability to remain on an export market or, conditioning on survival, by the growth rate of exports for firm i, located in département d[1], exporting in hs2 sector s, to country c, at time t.[2] cc_i is a dummy that equals 1 if firm i is in a competitiveness cluster, whatever the year. Since the competitiveness clusters are labeled in 2005 and the first subsidies are allocated in 2006, there is no before/after analysis for the estimation of α in our regressions. This is why we do not claim to provide an evaluation of the impact of the French competitiveness cluster policy on firm-level resilience on export markets. We rather document a possible gap in terms of survival between firms selected in these clusters and other firms, this gap being possibly different during the crisis, as captured by the coefficient β. Indeed, crisis_t is a dummy that equals 1 if the observation is during the crisis period (2008 and 2009). $X_{i(sc)t-2}$ correspond to firm-level controls at the beginning of the two-year period considered. These are the number of sectors and countries the firm exports to, and the value of its total exports by sector and/or destination. Hence, we take into account the fact that bigger exporters or exporters with a larger portfolio in terms of sectors and/or destinations are probably more resilient to negative shocks. Note that since we use customs data only, and not balance sheet data, these variables proxy for firm-level TFP, more productive firms being also bigger exporters. We also include $Y_{d(sc)t-2}$ which are département-level controls: these are the number of exporters by sector and/or destination, to measure potential externalities from surrounding exporters on firm-level resistance on export markets, and the Balassa index of specialization of exports at département-sector and département-

[1] Départements are administrative entities; there are a bit less than 100 départements in France.

[2] Note that following Davis et al. (1998), the growth rate of exports is computed taking the average size of exports in t and $t-2$ as the denominator, so as to reduce noise and regression to the mean issues. As a consequence, the growth rate of exports is bounded by -2 for disappearing flows and 2 for new trade flows.

country level, to control for local comparative advantage.[3] Finally, we include u_{sct} which are sector-country-year fixed effects. They control for all time-varying characteristics that are specific to both the sector and the destination country: these fixed effects capture in particular both supply and demand shocks that are sector and destination specific. Firm and département controls are also interacted with the dummy identifying the years of the crisis.

Given this specification, our estimation is based on repeated cross-sections: the coefficient on the competitiveness cluster dummy is obtained comparing competitiveness cluster firms to other firms exporting to the same market (sector-destination country) in a given year, while spillovers are estimated comparing firms exporting to the same market but located in different départements.[4]

The interaction terms capture the difference in the impact of these variables during crisis as compared to normal times.

Finally, the information on exports is available at the firm-level, and not at the plant-level. For multi-plant firms which are active in different départements, all the département-level variables are thus subject to measurement error.[5] Our baseline results restrict the sample to single-plant firms to minimize those measurement issues. However, we have checked that results are the same when we use all firms, considering in that case that multi-plant firms are located in the département of their headquarters (Tables A-2 and A-3).

2.2 Descriptive statistics

We first provide descriptive statistics on the survival rate and the growth rate of exports (conditioning on survival) separately for competitiveness cluster firms and for the other firms. "Normal times" corresponds to the waves 2004-2006 and 2005-2007, and the "Crisis" to the waves 2006-2008 and 2007-2009; indeed, as shown by Bricongne et al. (2012), the collapse of French exports associated with the crisis starts in September 2008.

Table 1 reveals that competitiveness cluster firms are much bigger than the others: they export more and have a wider export portfolio, both in terms of sectors and destinations, resulting into a higher number of observations at the firm-sector-destination country level. This is in line with the results obtained by Fontagné et al. (2013), who analyze the characteristics of the exporting firms selected in the French competitiveness clusters. Their survival rate on export markets and the growth rate of their exports are also higher. Competitiveness cluster firms are thus bigger and more resistant exporters as compared to other firms, both in normal times and during the crisis. However, given the results of Fontagné et al. (2013)

[3] Which might explain both the agglomeration of exporters for certain types of sectors and destinations and firm-level export performance.

[4] We do not take into account potential spatial correlation in the explanatory variables or in the residuals. However, other papers studying export spillovers on firm entry, such as Koenig et al. (2010) or Mayneris and Poncet (2013), show that taking into account agglomeration in surrounding regions does not affect the results.

[5] Since a firm is "located" in the département of its headquarters, which might be different from where its actual production for export is.

Table 1: Firm-level descriptive statistics

	exp. value total	# hs2	# dest.	# obs. Firm×hs2×des.	surviv. rate Firm-hs2-dest	exp. growth Firm-hs2-dest	exp. growth total
				Competitiveness cluster firms			
Normal times	49.12	5.7	16.3	37.4	0.66	0.10	0.12
Crisis	47.17	5.7	16.4	37.8	0.63	-0.04	-0.07
				Other firms			
Normal times	2.63	2.6	5.2	9.1	0.53	0.06	0.03
Crisis	2.66	2.6	5.3	9.4	0.53	-0.06	-0.09

Note: All figures are averages for the considered cell. Export values are in Million euros. Survival rates and export growh rates are calculated from $t-2$ to t.

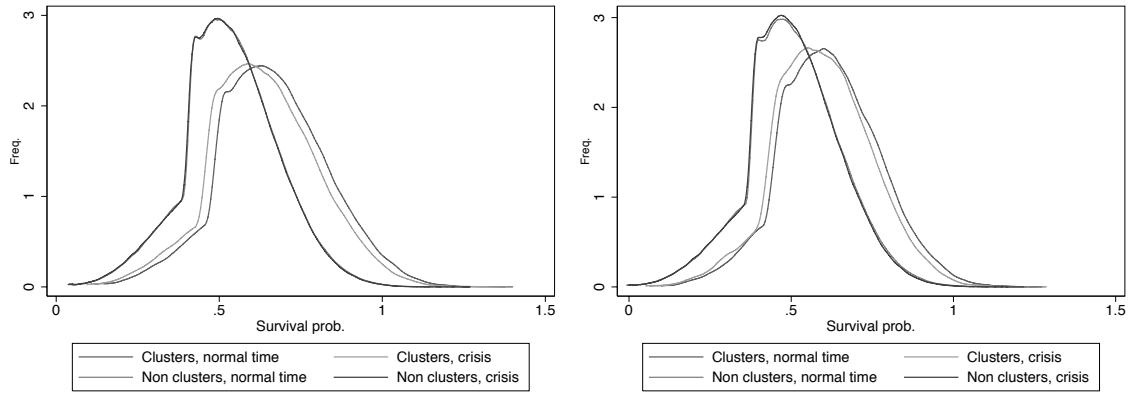
a clear selection effect may be at work here in the sense that better performing and more resilient exporters may have been selected to be part of competitiveness clusters. Hence, we will be careful not to draw causality interpretations from our regressions relating performance or resilience and the competitiveness cluster status.

However, the evolution of the gap between competitiveness cluster firms and the other exporters provides a slightly different picture. Both the survival rate and the growth rate of total exports decreases during the crisis for competitiveness cluster firms: 63% of their export flows survive during the crisis on average, vs 66% in normal time, and their total exports decrease by 7% during the crisis, while they are increasing by 12% on average in normal times. Hence, the survival rate of their transactions decreases by 3 percentage point, and the growth rate of their overall exports by 19 percentage point. For the other exporters, the survival rate remains the same, equal to 53%, while the growth rate of their exports decreases by 12 percentage points only, from 3% to -9%. Quite surprisingly, when comparing normal to crisis times, it thus seems that competitiveness cluster firms suffered more during the crisis.

These patterns could be due to the fact that big firms were more affected by the crisis. Figure 2 presents the predicted survival probability at the firm-sector (hs2)-destination country level, estimated from a linear probability model[6] that controls for the initial size of the export flow and time trends. It is clear that on average, firms in competitiveness clusters are more resistant on export markets. But while non-cluster firms exhibit a very similar survival probability is in normal and in crisis times, those in competitiveness clusters see their survival probability decrease during the crisis. This is true for the entire sample of firms and for single plant firms only. Hence, controlling for the size of the initial export flow does not affect the picture provided by Table 1.

Other firm-level characteristics, such as the sector of activity and the width of the export portfolio, or local characteristics such as the number of surrounding exporters and local

[6]Graphs are very similar when the predicted probabilities are computed with a logit estimation.



All firms

Single-plant firms

Figure 2: Survival probability (firm-sector-destination country export flow)

comparative advantages, could be correlated to both the presence in competitiveness clusters and survival on export markets during the crisis. We address these issues in the econometric analysis.

3 Empirical results

3.1 Baseline results

We first estimate the determinants of the probability that firms exporting in a given sector to a given country at time $t-2$ remain active on that market in t. We use a linear probability model, which has the decisive advantage of making interpretation of interaction terms much easier. We moreover investigate whether these determinants vary during crisis, as compared to normal times.

Regression (1) in Table 2 shows that when we do not control for firm performance indicators, exporters that belong to competitiveness clusters have a much higher probability to stay on a given export market: their survival probability is higher by 10 percentage points. However, this is less the case during the crisis, as the interaction term with the two years of crisis (2008-2009) turns out to be negative and significant (even though it is small): during the crisis, their survival probability is higher by 8.3 percentage points only. Hence, in line with previous descriptive statistics, firms belonging to competitiveness clusters appear to be *less* resilient, even when the sector and the destination of exports are controlled for.

In regression (2) we control for some of the characteristics of the environment of the firm. We control in particular for the number of exporters located in the same département. We distinguish four types of surrounding firms: those that export to the exact same market (same sector-same destination) as the one considered on the left-hand side, firms exporting in other sectors but to the same country, firms exporting in the same sector but to other countries, and firms exporting to completely different export markets. These variables can be interpreted

as a measure of "natural" clusters. Note first that this measure is also correlated to the survival of firms on export markets. In particular, being surrounded by firms exporting to the exact same market positively affects firm-level survival probability on that market. This is interesting and to our knowledge this is a first time that firm resilience has been shown to be related to clustering. However, these spillovers are not stronger during the crisis; if anything, the opposite is true. Controlling for the size and the composition of the pool of surrounding exporters barely changes the gap between competitiveness cluster firms and the others in terms of survival probability, either in normal time or during the crisis.

In regression (3), we control for some firm-level observable performance characteristics, such as the size and the composition of exports (following the same decomposition as the one adopted for the pool of surrounding exporters) and the number of sectors and countries in the export portfolio of the firm; the "average" premium of competitiveness cluster firms in terms of survival rate falls a lot, and is now equal to 3.1 percentage points only: this suggests that a selection effect into these competitiveness clusters exists. To save space, the coefficients on firm-level characteristics are not detailed, but by and large, bigger firms have higher survival rates.[7] Hence, around two thirds of the survival premium of competitiveness cluster firms in normal times can be attributed to their bigger size. However, the weakening of this correlation during the crisis persists, with a coefficient that remains equal to -0.016. The introduction of local comparative advantage measures in regression (4) does not change the results. Hence, even when sector, destination, firm-level and local characteristics are controlled for, competitiveness clusters appear less resilient, i.e. they suffer more during a crisis. The picture is even reinforced in relative terms, since in the end, their survival premium is reduced by more than half during the crisis, from 3.1 percentage points to 1.5 percentage points.

In unreported regressions, we have conducted several robustness checks. Results remain similar when we focus on the sectors that are most relevant for the exporting firms, i.e. when we eliminate the sectors representing less than 5% of overall firm-level exports, when we distinguish intra-EU and extra-EU exports, when we control for the fact that firms have benefited from the first cluster policy implemented in France at the end of the 1990's[8], or when we control for the value of exports of surrounding exporters instead of their count.

Table A-1 presents the same regression as in column (4) of Table 2, but at the sectoral level. We see that the survival premium for competitiveness cluster firms is the largest for the transport sector. It is positive and significant for all sectors except for mineral products. Note also that the negative coefficient on the interaction term between competitiveness cluster and times of crisis mainly comes from three sectors: agrifood, machinery and miscellaneous, which represent altogether around 40% of the observations in the entire sample. The weaker resilience of competitiveness cluster firms is thus not a general feature of French exporters; it

[7] And this correlation tends to be reinforced during the crisis.

[8] The "Systèmes Productifs Locaux" policy hat we evaluate in Martin et al. (2011b).

Table 2: Survival probability: linear probability model (Single-plant firms)

Dep. variable	Prob. to stay. in t			
	(1)	(2)	(3)	(4)
Cluster dummies				
Competitiveness cluster firm	0.099***	0.094***	0.031***	0.031***
	(0.003)	(0.003)	(0.002)	(0.002)
Competitiveness cluster firm × crisis	-0.017***	-0.017***	-0.016***	-0.016***
	(0.004)	(0.004)	(0.003)	(0.003)
Export cluster variables				
Log(# exp., same hs2-country-dep+1)		0.021***	0.018***	0.018***
		(0.001)	(0.001)	(0.001)
Log(# exp., same hs2-country-dep+1) × crisis		-0.005***	-0.003**	-0.003**
		(0.001)	(0.001)	(0.001)
Log (# exp., same hs2-other count., same dep+1)		0.014***	-0.010***	-0.009***
		(0.001)	(0.001)	(0.001)
Log (# exp., same hs2-other count., same dep+1) × crisis		-0.002	-0.003*	-0.003*
		(0.002)	(0.002)	(0.002)
Log (# exp., other hs2-same country, same dep+1)		-0.007***	0.013***	0.009***
		(0.001)	(0.001)	(0.001)
Log (# exp., other hs2-same country, same dep+1) × crisis		0.007***	0.005***	0.005***
		(0.002)	(0.002)	(0.002)
Log (# exp., other hs2-other country, same dep+1)		-0.036***	-0.024***	-0.023***
		(0.002)	(0.001)	(0.002)
Log (# exp., other hs2-other country, same dep+1) × crisis		-0.002	0.000	0.000
		(0.002)	(0.002)	(0.002)
Observations	1941836	1941836	1941836	1941836
Avg prob.	0.51			
Country-hs2-year fixed effect	yes	yes	yes	yes
Firm-level controls	no	no	yes	yes
Local comparative advantages	no	no	no	yes

Note: All explanatory variables taken in $t-2$. All regressions clustered at the country-hs2-dep-year level.

mainly concerns a few sectors, that are still quite important in overall French exports.

Finally, Table 3 shows that the results on the survival probability extend to the growth rate of exports, conditioning on survival. Firms in competitiveness clusters experience on average higher growth rates of exports, but not so during the financial crisis, which seems to have hit them more strongly. When firm-level and local characteristics are taken into account, their average premium on a given market in terms of export growth rate decreases by more than one third, from 8.6 percentage points in normal times to 5.6 percentage points.

3.2 The role of the leader

After having shown that competitiveness cluster firms suffer more than others during the crisis, even when individual and local characteristics are controlled for, we dig deeper to understand the reasons explaining this weaker resilience. One explanation could be that the survival of competitiveness cluster firms on export markets heavily depends on the export performance of a leader firm. Indeed, clusters are often viewed as a network of firms with strong relations, whether these relations go through market mechanisms (between input and

Table 3: Growth-rate between $t-2$ and t - Firm/hs2/country (Single-plant firms)

Dep. variable	Δ log(firm-hs2-country exports)			
	(1)	(2)	(3)	(4)
Cluster dummies				
Competitiveness cluster firm	0.054***	0.054***	0.090***	0.086***
	(0.007)	(0.007)	(0.006)	(0.006)
Competitiveness cluster firm × crisis	-0.029***	-0.029***	-0.031***	-0.030***
	(0.010)	(0.010)	(0.009)	(0.009)
Export spillover variables				
Log(# exp., same hs2-country-dep+1)		-0.013***	0.010***	-0.011***
		(0.003)	(0.002)	(0.003)
Log(# exp., same hs2-country-dep+1) × crisis		0.004	0.002	0.001
		(0.004)	(0.004)	(0.004)
Log (# exp., same hs2-other count., same dep+1)		0.006*	-0.009***	-0.036***
		(0.003)	(0.003)	(0.003)
Log (# exp., same hs2-other count., same dep+1) × crisis		-0.008*	-0.005	-0.009*
		(0.005)	(0.004)	(0.005)
Log (# exp., other hs2-same country, same dep+1)		0.014***	0.052***	0.058***
		(0.004)	(0.004)	(0.004)
Log (# exp., other hs2-same country, same dep+1) × crisis		-0.017***	-0.016***	-0.003
		(0.005)	(0.005)	(0.006)
Log (# exp., other hs2-other country, same dep+1)		-0.014***	-0.058***	-0.021***
		(0.004)	(0.004)	(0.005)
Log (# exp., other hs2-other country, same dep+1) × crisis		0.024***	0.021***	0.013**
		(0.006)	(0.006)	(0.006)
Observations	995251	995251	995251	995251
Country-hs2-year fixed effect	yes	yes	yes	yes
Firm-level controls	no	no	yes	yes
Local comparative advantages	no	no	no	yes

Note: All explanatory variables taken in $t-2$. All regressions clustered at the country-hs2-dep-year level.

output suppliers for example) or non-market ones (technology spillovers or cooperation on specific projects). These strong relations may generate local dependence, and this local dependence may be hierarchical in that the largest firms/exporters may have more influence than others. This is certainly the case for input suppliers. Think of Airbus in Toulouse for example, and its network of local partners, suppliers and subcontractors. Due to the tight relationships between them, we can imagine that the export performance of Airbus strongly affects the performance of the other local firms active in the aerospace industry. If this the case, part of the weaker resilience of competitiveness cluster firms during the crisis might be related to an amplification of the shock, due to their stronger dependence on one leading exporter in the region, when is itself strongly hit by the crisis. A related literature (Crespo et al., 2013, is a recent example) has formulated several hypotheses linking the resilience of the cluster to key statistics of the network structure linking firms. The definition of cluster resilience in this literature is both larger and richer than in our study and is analyzed in an evolutionary economic geography framework. Our test of the impact of the dependence on the leader can be interpreted as a test of whether linkages to the main node of the network matter in resilience to shocks.

In this section, given the focus of our analysis, we restrict the sample to exporters that are active in sectors and départements in which there are also competitiveness cluster firms. We define the leader as the largest competitiveness cluster exporter in a given sector (hs2) and a given département at time $t-2$.

Since we have restricted our sample, the coefficient on the dummy identifying competitiveness cluster firms is now estimated comparing competitiveness cluster firms to non-cluster firms which are active in the same sector-départements as competitiveness cluster firms. In column (1) of Table 4, we verify that we still measure weaker resilience for competitiveness cluster firms. The "raw" survival premium in normal times is now reduced (from 10 percentage points to 3.8 percentage points), in line with Fontagné et al. (2013) who show that, within sectors, the French competitiveness clusters have been labeled in the best performing départements. However, we still observe a strong reduction of this premium during the crisis. In regression (2), we control for the survival (or not) of the leader. We find that in normal times, the fact that the leader survives on export markets increases the survival probability of firms exporting in the same sector-département. This is indicated by the positive coefficient on the dummy "cluster leader stays".[9] Next, we see that this dependence effect is even stronger when the firm belongs to a competitiveness cluster, as indicated by the positive coefficient on the interaction term "cluster leader stays" × "Comp. cluster". These two results remain very robust in the following regressions, where we add firm-level controls or local (département) controls. This shows that the survival on export markets depends more strongly on the performance of the leader for competitiveness cluster firms than for the other firms.

How this dependence behaves during the crisis is less clear and robust. We see that the crisis reduces the role of the leader, but this effect disappears once local controls are added. For firms in competitiveness clusters there is no specific dependence on the leader during the crisis. However, it seems now that once firm-level characteristics are controlled for (regressions (3) and (4) of Table 4), the survival rates of competitiveness firms during the crisis and in normal times are not significantly different. These results consequently suggest that the weaker resilience measured so far was due to a stronger dependence of competitiveness cluster firms on the export activity of the local leading firm, both in normal an in crisis times.

4 Conclusion

Clusters are popular among policy makers. There are good reasons for this: geographical concentration of firms operating in the same industry has been extensively shown to favor firm-level economic performance (productivity, exports, innovation etc.). However, the previous literature has also shown that the gains to expect from more agglomeration are relatively modest, since they are already partly internalized by firms in their location choices. Much

[9] This dummy is equal to 1 for around 72% of the observations.

Table 4: The role of the leader (Single-plant firms)

Dep. variable	Prob. to stay. in t (linear probability model)				
	(1)	(2)	(3)	(4)	(5)
Cluster dummies					
Competitiveness cluster firm	0.038***	-0.116***	-0.107***	-0.022*	-0.031**
	(0.004)	(0.011)	(0.015)	(0.013)	(0.012)
Competitiveness cluster firm × crisis	-0.021***	-0.026***	-0.047**	-0.000	-0.000
	(0.006)	(0.006)	(0.021)	(0.018)	(0.018)
Dummy "cluster leader stays"		0.014***	0.018***	0.006***	0.006***
		(0.001)	(0.002)	(0.002)	(0.002)
Dummy "cluster leader stays" × Comp. cluster firm		0.168***	0.156***	0.056***	0.061***
		(0.011)	(0.016)	(0.013)	(0.013)
Dummy "cluster leader stays" ×crisis			-0.007***	-0.006**	-0.003
			(0.002)	(0.002)	(0.002)
Dummy "cluster leader stays" × Comp. cluster firm×crisis			0.026	-0.023	-0.024
			(0.022)	(0.019)	(0.019)
Cluster leader exp. growth		-0.001	-0.003***	-0.001	-0.000
		(0.000)	(0.001)	(0.001)	(0.001)
Cluster leader exp. growth× Comp. cluster firm		0.001	-0.001	-0.005	-0.003
		(0.003)	(0.004)	(0.004)	(0.004)
Cluster leader exp. growth× crisis			0.004***	0.000	-0.001
			(0.001)	(0.001)	(0.001)
Cluster leader exp. growth× crisis× Comp. cluster firm			0.002	0.010**	0.009*
			(0.005)	(0.005)	(0.005)
Observations	1172526	1172526	1172526	1172526	1172526
Avg prob.			0.51		
Country-hs2-year fixed effect	yes	yes	yes	yes	yes
Firm-level controls	no	no	no	yes	yes
Local controls (spillovers and comparative advantage)	no	no	no	no	yes

All explanatory variables taken in $t-2$. All regressions clustered at the country-hs2-dep-year level.

less is known on whether firms in clusters (whether natural or policy-induced) resist better to economic shocks than others. In this paper, we use French customs data to document how agglomeration of exporters is correlated to export performance of French manufacturing firms during the 2008-2009 crisis. On average, exporters that belong to competitiveness clusters are more resilient in that their probability to continue exporting on a market is higher than for other firms. However, this premium decreases sharply during the 2008-2009 crisis. We show that this can be explained by the fact that firms in competitiveness clusters are more dependent on the fate of the "leader", the largest exporter in the cluster. These "stylized facts" cannot be interpreted in a causal way regarding the effect of the policy itself. However, they suggest that by reinforcing the relationships and the interdependencies between firms, clusters might amplify the transmission of shocks, for the best in case of economic booms, or the worse during crises.

References

Ahn, J., M. Amiti, and D. E. Weinstein (2011). Trade finance and the great trade collapse. *American Economic Review P&P 101*(3), 298–302.

Aitken, B., G. H. Hanson, and A. E. Harrison (1997). Spillovers, foreign investment, and

export behavior. *Journal of International Economics 43*(1-2), 103–132.

Albornoz, F., H. F. Calvo Pardo, G. Corcos, and E. Ornelas (2012). Sequential exporting. *Journal of International Economics 88*(1), 17–31.

Amiti, M. and D. E. Weinstein (2011). Exports and financial shocks. *Quarterly Journal of Economics 126*(4), 1841–1877.

Berman, N., J. de Sousa, P. Martin, and T. Mayer (2012). Time to ship during financial crises. *NBER Working Paper 18274*.

Bricongne, J.-C., L. Fontagné, G. Gaulier, D. Taglioni, and V. Vicard (2012). Firms and the global crisis: French exports in the turmoil. *Journal of International Economics 87*(1), 134–146.

Chor, D. and K. Manova (2012). Off the cliff and back? credit conditions and international trade during the global financial crisis. *Journal of International Economics 87*(1), 117–133.

Crespo, J., R. Suire, and J. Vicente (2013). Lock-in or lock-out? how structural properties of knowledge networks affect regional resilience? *Journal of Economic Geography*. forthcoming.

Crozet, M., T. Mayer, and J.-L. Mucchielli (2004, January). How do firms agglomerate? a study of fdi in france. *Regional Science and Urban Economics 34*(1), 27–54.

Davis, S. J., J. C. Haltiwanger, and S. Schuh (1998). *Job Creation and Destruction*, Volume 1 of *MIT Press Books*. The MIT Press.

Devereux, M. P., R. Griffith, and H. Simpson (2007, April). Firm location decisions, regional grants and agglomeration externalities. *Journal of Public Economics 91*(3-4), 413–435.

Duranton, G. (2011). California dreamin': the feeble case for cluster policies. *Review of Economic Analysis 3*(1), 3–45.

Duranton, G., P. Martin, T. Mayer, and F. Mayneris (2010). *The economics of clusters: Lessons from the French experience*. Oxford University Press Oxford.

Eaton, J., M. Eslava, M. Kugler, and J. Tybout (2007, October). Export dynamics in colombia: Firm-level evidence. NBER Working Papers 13531, National Bureau of Economic Research, Inc.

Eaton, J., S. Kortum, B. Neiman, and J. Romalis (2011, January). Trade and the global recession. Working Paper 16666, National Bureau of Economic Research.

Fontagné, L., P. Koenig, F. Mayneris, and S. Poncet (2013). Cluster policies and firm selection: Evidence from france. *Journal of Regional Science*. forthcoming.

Head, C. K., J. C. Ries, and D. L. Swenson (1999, March). Attracting foreign manufacturing: Investment promotion and agglomeration. *Regional Science and Urban Economics 29*(2), 197–218.

Koenig, P. (2009). Agglomeration and the export decisions of french firms. *Journal of Urban Economics 66*(3), 186–195.

Koenig, P., F. Mayneris, and S. Poncet (2010). Local export spillovers in france. *European Economic Review 54*, 622–641.

Levchenko, A., L. Lewis, and L. Tesar (2010). The collapse of international trade during the 2008-2009 crisis: In search of the smoking gun. *IMF Economic Review 58*(2), 214–253.

Martin, P., T. Mayer, and F. Mayneris (2011a). Public support to clusters: A firm level study of french "local productive systems". *Regional Science and Urban Economics 41*, 108–123.

Martin, P., T. Mayer, and F. Mayneris (2011b). Spatial concentration and plant-level productivity in france. *Journal of Urban Economics 69*(2), 182–195.

Mayneris, F. and S. Poncet (2013). Chinese firms'entry to export markets : the role of foreign export spillovers. *World Bank Economic Review*. forthcoming.

Rosenthal, S. S. and W. C. Strange (2004, June). Evidence on the nature and sources of agglomeration economies. In J. V. Henderson and J. F. Thisse (Eds.), *Handbook of Regional and Urban Economics*, Volume 4 of *Handbook of Regional and Urban Economics*, Chapter 49, pp. 2119–2171. Elsevier.

Appendix

Table A-1: Survival probability by sector

Dep. variable	Prob. to stay. in t (linear probability model)							
	Agrifood	Min. Prod.	Chem./Plastics	Leath./Text/App.	Stone/Glass/Met.	Machin.	Transp.	Misc.
Cluster dummies								
Competitiveness cluster firm	0.0435***	0.0228	0.0402***	0.0528***	0.0155**	0.0341***	0.0727***	0.00624
	(0.00721)	(0.0255)	(0.00516)	(0.00889)	(0.00621)	(0.00486)	(0.0124)	(0.00690)
Competitiveness cluster firm × crisis	-0.0167*	-0.0396	-0.00263	-0.00501	-0.000507	-0.0427***	-0.00235	-0.0255***
	(0.00985)	(0.0368)	(0.00712)	(0.0127)	(0.00873)	(0.00682)	(0.0169)	(0.00950)
Observations	205486	13710	300026	282229	271977	409663	91587	228479
R2	0.1439	0.1361	0.1433	0.1550	0.1637	0.1679	0.1651	0.1729
Avg prob.	0.63	0.55	0.55	0.48	0.51	0.50	0.41	0.49
Country-hs2-year fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
Firm-level controls	yes	yes	yes	yes	yes	yes	yes	yes
Local controls (spillovers and comparative advantage)	yes	yes	yes	yes	yes	yes	yes	yes

Note: All firm-level and local characteristics taken into account but not reported. All explanatory variables taken in $t-2$. All regressions clustered at the country-hs2-dep-year level.

Table A-2: Survival probability: linear probability model (All firms)

Dep. variable	Prob. to stay. in t			
	(1)	(2)	(3)	(4)
Cluster dummies				
Competitiveness cluster firm	0.129***	0.129***	0.024***	0.024***
	(0.001)	(0.001)	(0.001)	(0.001)
Competitiveness cluster firm × crisis	-0.024***	-0.024***	-0.025***	-0.025***
	(0.002)	(0.002)	(0.002)	(0.002)
Export cluster variables				
Log(# exp., same hs2-country-dep+1)		0.020***	0.018***	0.018***
		(0.001)	(0.001)	(0.001)
Log(# exp., same hs2-country-dep+1) × crisis		-0.002*	-0.001	-0.002*
		(0.001)	(0.001)	(0.001)
Log (# exp., same hs2-other count., same dep+1)		0.012***	-0.014***	-0.011***
		(0.001)	(0.001)	(0.001)
Log (# exp., same hs2-other count., same dep+1) × crisis		-0.001	-0.001	-0.002*
		(0.001)	(0.001)	(0.001)
Log (# exp., other hs2-same country, same dep+1)		-0.007***	0.005***	-0.004***
		(0.001)	(0.001)	(0.001)
Log (# exp., other hs2-same country, same dep+1) × crisis		0.003**	0.002	0.006***
		(0.001)	(0.001)	(0.002)
Log (# exp., other hs2-other country, same dep+1)		-0.027***	-0.014***	-0.010***
		(0.001)	(0.001)	(0.001)
Log (# exp., other hs2-other country, same dep+1) × crisis		-0.001	-0.000	-0.002
		(0.002)	(0.002)	(0.002)
Observations	3739953	3739953	3739953	3739953
Country-hs2-year fixed effect	yes	yes	yes	yes
Firm-level controls	no	no	yes	yes
Local comparative advantages	no	no	no	yes

Note: All explanatory variables taken in $t-2$. All regressions clustered at the country-hs2-dep-year level.

Table A-3: Growth-rate between $t-2$ and t - Firm/hs2/country (All firms)

Dep. variable	Δ log(firm-hs2-country exports)			
	(1)	(2)	(3)	(4)
Cluster dummies				
Competitiveness cluster firm	0.034***	0.034***	0.081***	0.077***
	(0.003)	(0.003)	(0.003)	(0.003)
Competitiveness cluster firm × crisis	-0.024***	-0.024***	-0.023***	-0.023***
	(0.005)	(0.005)	(0.005)	(0.005)
Export spillover variables				
Log(# exp., same hs2-country-dep+1)		-0.010***	0.015***	-0.004**
		(0.002)	(0.002)	(0.002)
Log(# exp., same hs2-country-dep+1) × crisis		0.005*	0.006**	0.008***
		(0.003)	(0.003)	(0.003)
Log (# exp., same hs2-other count., same dep+1)		0.003	-0.014***	-0.034***
		(0.002)	(0.002)	(0.003)
Log (# exp., same hs2-other count., same dep+1) × crisis		-0.003	-0.001	-0.001
		(0.004)	(0.003)	(0.004)
Log (# exp., other hs2-same country, same dep+1)		0.008***	0.047***	0.057***
		(0.003)	(0.003)	(0.003)
Log (# exp., other hs2-same country, same dep+1) × crisis		-0.020***	-0.016***	-0.010**
		(0.004)	(0.004)	(0.004)
Log (# exp., other hs2-other country, same dep+1)		-0.007**	-0.052***	-0.026***
		(0.003)	(0.003)	(0.003)
Log (# exp., other hs2-other country, same dep+1) × crisis		0.021***	0.013***	0.006
		(0.004)	(0.004)	(0.005)
Observations	2041154	2041154	2041154	2041154
Country-hs2-year fixed effect	yes	yes	yes	yes
Firm-level controls	no	no	yes	yes
Local comparative advantages	no	no	no	yes

Note: All explanatory variables taken in $t-2$. All regressions clustered at the country-hs2-dep-year level.

Institut de Recherches Économiques et Sociales
Université catholique de Louvain

Place Montesquieu, 3
1348 Louvain-la-Neuve, Belgique

ISSN 1379-244X D/2013/3082/26