

Direction des Études et Synthèses Économiques

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in the Face of the 2008/2009 Crisis**

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Document de travail



Institut National de la Statistique et des Études Économiques

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French Firms in the face of the 2008/2009 crisis

Abstract

During the 2008/2009 crisis French businesses were hit by a slump in domestic and world demand, while French banks encountered difficulties that may have encouraged them to tighten their credit conditions.

This crisis strongly affected the number of business start-ups as well as the initial size of these start-ups; firm growth was also slashed, in particular that of the most promising among them.

In 2008 and 2009 subsidiaries of groups experienced a sharper drop in activity than independent enterprises, particularly in the manufacturing industry. The companies that were least likely to be affected by financial constraints were those that most adjusted their short-term output, as well as their employment and investment levels. These elements suggest that in France, unlike in the United States, enterprises suffered more from a demand shock than from a credit shock.

Keywords: Financial crisis, financing constraints, firm growth.

Les ajustements des entreprises françaises pendant la crise de 2008/2009

Résumé

Durant la crise de 2008/2009, les entreprises françaises ont été affectées par un effondrement de la demande domestique et mondiale, tandis que les banques françaises rencontraient des difficultés de nature à les inciter à resserrer les conditions de crédit.

Cette crise a fortement affecté le nombre de créations d'entreprises et leur taille initiale ; la croissance des entreprises a aussi été amputée, notamment celle des plus prometteuses.

Les filiales des groupes ont connu une baisse d'activité en 2008 et 2009 plus forte que les entreprises indépendantes, en particulier dans le secteur de l'industrie manufacturière. Ce sont les entreprises les moins susceptibles d'être contraintes financièrement qui ont le plus ajusté leur volume de production à court terme, ainsi que leurs niveaux d'emploi et d'investissement. Ces éléments suggèrent qu'en France, contrairement aux États-Unis, les entreprises ont davantage pâti d'un choc de demande que d'un choc de crédit.

Mots-clés : Crise financière, contraintes de financement, croissance des entreprises.

Classification JEL : L11, G31.

A worldwide shock with a lesser effect on France, relatively speaking, than on its main economic partners

Like that of its main industrialised partners, the French economy was hard hit by the downturn in 2008. Activity mainly shrank in Q4 2008 and Q1 2009, when the world stock markets plunged following the collapse of Lehman Brothers in mid-September 2008.

In the short-term, however, French companies were relatively less affected than their European and American counterparts: the value-added of non-financial companies grew slightly in volume between 2007 and 2008 in France (+0.5 percent), as it did in Germany (+0.8 percent), whereas it contracted in Italy (–1.8 percent), in the United Kingdom (–2.1 percent) and in the United States (–1.7 percent, *figure 1*). In 2009 too, the contraction in value added was not as sharp in France (–5.1 percent) as in Germany (–7.9 percent), the United States (–6.6 percent) or Italy (–7.5 percent). British companies saw a similar trend to French businesses (–5.1 percent).

This uneven situation from country to country can be ascribed to various factors: the difference in scale of the demand shock, the heterogeneous credit supply shock that companies suffered in terms of external financing, particularly from banks; and the differences between the policies implemented by national governments in response to the crisis (*insert 1*).

Insert 1

In France, a very business-focused response from the State

Intervention strategies in response to the crisis (amounts committed, schedule) differed from State to State.

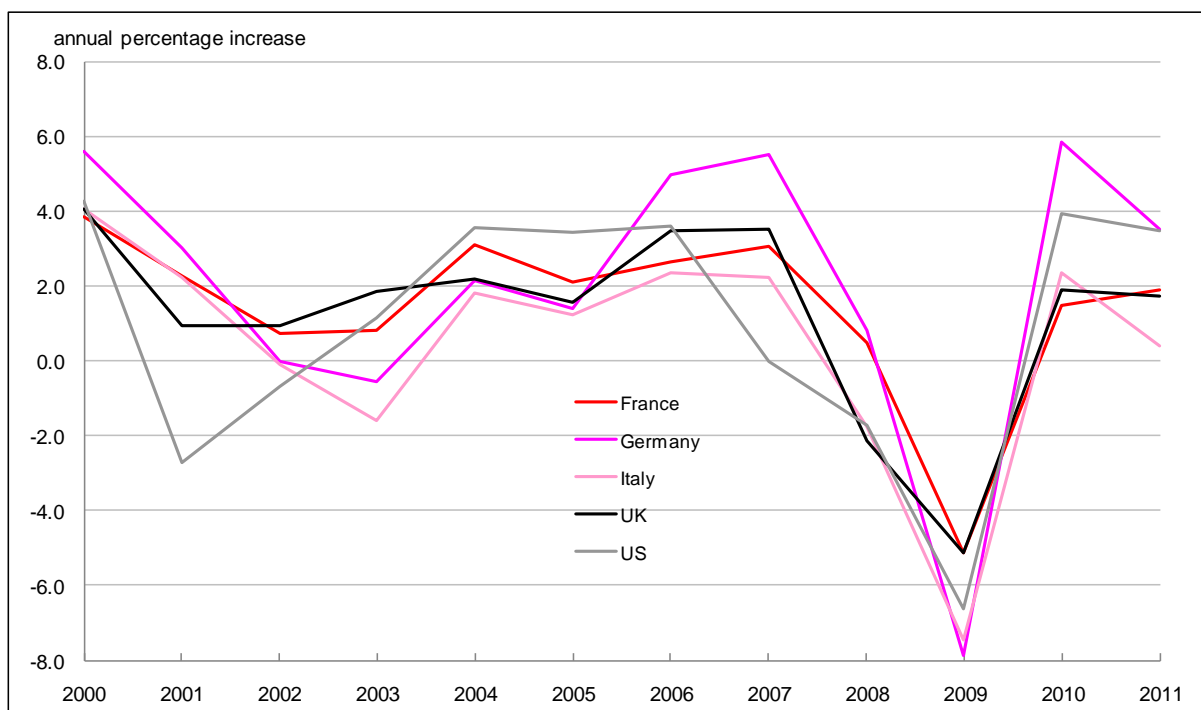
In 2008 and 2009, the French stimulus plan corresponded to around 1.5 GDP points, which is higher than the amounts committed in Italy and Great Britain, but lower than those of the United States or Spain (OECD, 2009a and 2009b, IMF, 2009 and 2012, Minefi, 2010). On average, the countries with larger automatic stabilisers opted for smaller-scale discretionary measures.

The countries affected by the bursting of property bubbles (USA, UK, Spain, Ireland) set up stimulus plans as early as 2008 (for at least 15% of the total amounts), while the other OECD countries only did so in 2009. In France, 75% of the total amount was distributed in 2009 and 25% in 2010.

Lastly, the French plan was more focused on businesses and investment than the American and British plans, which were more targeted to households (OECD, 2009b, IMF, 2009b). Among other things, it included measures to support the financing and cash-flow of SMEs (credit mediator; interventions targeted to the banking sector), sectoral measures (benefiting the automotive industry, for example), and an infrastructure investment plan.

Figure 1

Value added produced by non-financial corporation: international comparisons



Coverage: Non financial firms.

Interpretation: in Germany, the total value added produced by non-financial firms decreased by 7.9 percent in 2009 as compared to 2008.

Note: Value added has been deflated by the VA price index provided in national accounts.

Source: OECD.

A sharp contraction in domestic demand and, above all, in world trade

One of the most notable aspects of the 2008/2009 downturn was the collapse of world trade, which fell by 10 percent overall in 2009, according to IMF estimates (2012). The smaller participation by French companies to world trade¹ (combined with their lower level of specialisation in the manufacturing industry) kept them relatively better protected from the massive contraction in this demand component than their German counterparts, for example. The contraction in exports in France came to 3.1 GDP points in 2009, and the concomitant fall in imports restricted the negative contribution of world trade to just 0.5 GDP points.

Furthermore, domestic demand was not affected by the massive wealth effects observed in some countries (USA, UK, Spain), where certain categories of over-indebted agents proceeded to a significant correction of their balance sheet [Fortin and Bouveret, 2009].

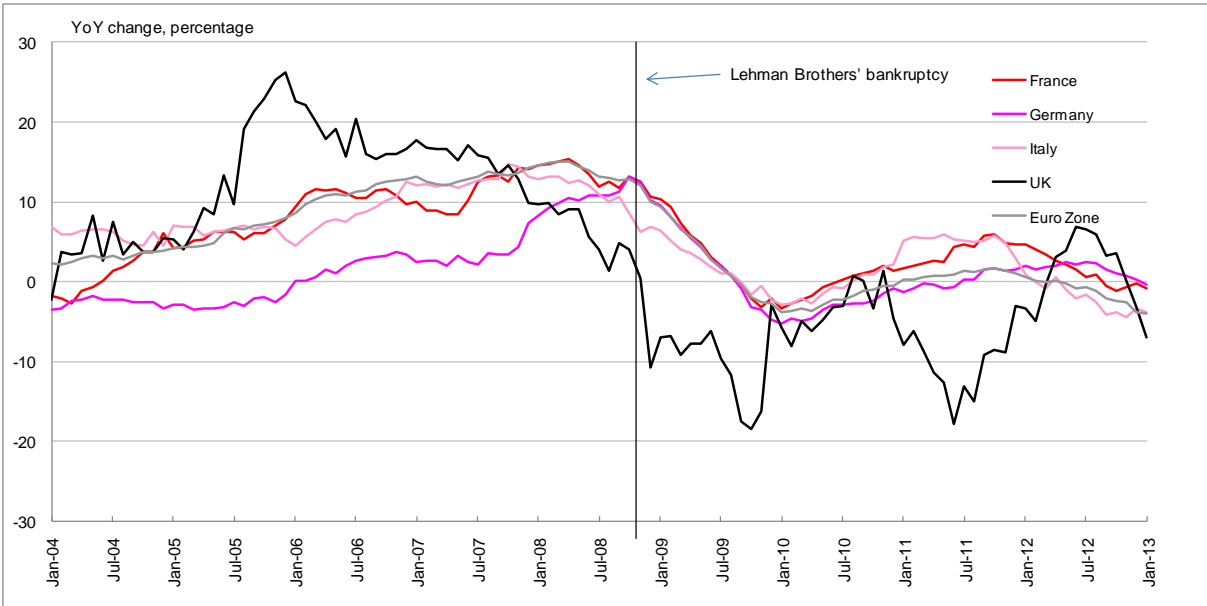
Nonetheless, the drop in French GDP was exceptionally large: -3.1 percent, a figure unmatched over the last 50 years. Corporate behaviour contributed heavily to this drop: the decline in investment by non-financial companies contributed -1.5 GDP points and the mass destocking trend -1.2 GDP points.

¹ Export weight in terms of GDP was 27 percent in France in 2008 against more than 47 percent in Germany.

A drastic reduction in lending to companies, although with little short-term influence on the capital structure of French companies

Outstanding bank loans to companies collapsed in the main European countries. This occurred in 2009 at the latest and as early as 2007 in Italy and the United Kingdom (figure 2).

Figure 2
Credit distributed to non-financial firms – comparison across European countries



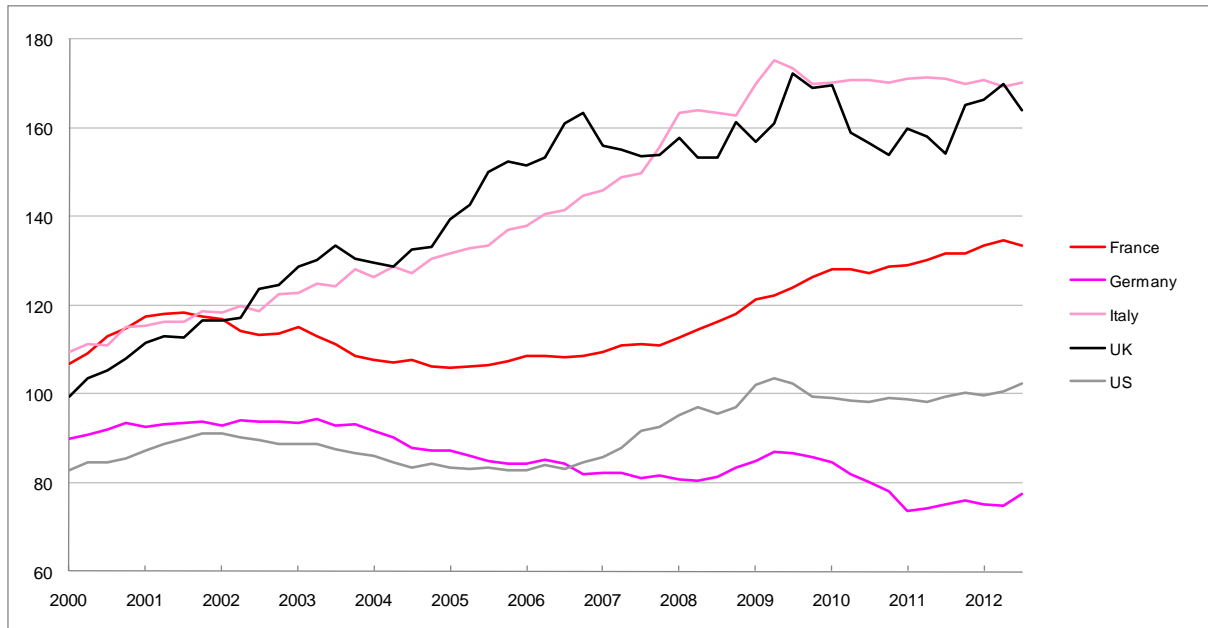
Coverage: Credit distributed by financial institutions (excluding central banks) to non-financial firms.
 Interpretation: credit distributed to German non-financial firms decreased by 5.2 percentage point in January 2010, as compared to January 2009.
 Source: Banque de France

However, the outstanding debt of non-financial companies diminished less than their value added, so that the average debt ratio of non-financial companies continued to grow in France after Q4 2008, whereas it fell in all the other countries under study (figure 3).

We refer to a “demand shock” when companies adjust their activity downwards because of a fall in orders. However, when the drop in activity stems from companies’ inability to complete their projects due to lack of financing (in this case, because the banks exposed to the financial crisis restricted access to credit), we refer to a “credit shock”. The macroeconomic elements above suggest that in France, companies suffered more due to a demand shock than to a credit shock. An analysis of the individual behaviour of businesses in France using microeconomic data sources allows refining the diagnostic: in the same way as the impact of the crisis on various long- and short-term strategy components, the scale of the supply and demand shocks may differ substantially according to the population of enterprises under consideration. In particular, the French productive fabric is characterised by the significant economic weight of groups in terms of value added and employment, contrasting with the significant demographic weight of independent legal units [Béguin *et al.*, 2012]: in 2009, while only 6% of legal units belonged to a group, they employed 64% of employees and produced 70% of value added.

Figure 3

Financial leverage (defined as outstanding debt over value added) – international comparisons



Coverage: Non financial corporations.

Interpretation: in the first quarter of 2009, the outstanding debt of French non-financial firms represented 121% of the value added they produced.

Source: Banque de France.

In contrast, the renewal of the production fabric² was in the main achieved by 94% of independent companies, often very small and without any access to the internal capital markets of groups: these companies might have been affected differently by the 2008 shock.

The crisis significantly reduced the number of independent business start-ups and their initial size

Data from the DADS and EPURE datasets contain information on employees and the companies they work for; this allows a detailed analysis of business start-up processes and the growth rate of these businesses at the start of their lifecycle (*insert 2*). The analysis conducted here covers independent businesses that employ at least one person.

In an unfavourable macroeconomic context, it is expected that numerous entrepreneurs would tend to postpone or abandon their decision to start up a business, or else do it on a smaller scale than previously planned (size effect). Conversely, if only the most productive companies remain capable of entering the market (selection effect) and entrepreneurs barely adjust the size of their projects when they decided to deploy them (limited-scale size effect), then the average size observed at start-up is likely to increase when the cycle is low. We assess the respective contribution of these two mechanisms thanks to a combined analysis of the start-up rate and the initial size of companies.

² The vast majority of “real” business start-ups and destructions occur among independent “legal units” (Picart, 2004; Duhautois and Lagarde, 2004; Accardo and Cordellier, 2013).

The number of start-ups of businesses employing at least one person began to fall in number in 2008 in the non-agricultural market sector (*figure 4*) and the reduction was even more marked in 2009. However, the number of employer start-ups in 2009 was still slightly higher than that of 2003, which suggests that the size effect might have been stronger than the selection effect.

Figure 4

Creations of employer firms in the for-profit, non agricultural industries, from 2003 to 2009

	2003	2004	2005	2006	2007	2008	2009
Number	76,437	85,233	92,150	90,688	92,178	89,866	79,498
Index (base: 2003)	100	112	121	119	121	118	104

Coverage: French economy; firms that are active in the for-profit, non-agricultural industries and that are employer within the first year after creation. Affiliates of corporate groups are excluded.

Source: Insee, DADS and Epure datasets, matched with the LIFI survey.

Insert 2

Analysis of the business start-up and growth processes: sources and measurement

The analysis of the business start-up and growth processes is based on DADS data (annual employer declaration data) and that of the EPURE (extension of the income and employment project), which come from the payroll tax forms filled out by companies. The only companies considered were those that are independent (not belonging to any group). They were isolated by means of the LIFI survey (survey on financial ties). More precisely, to study the growth between years n and $n+1$ of companies that were independent in year n , companies belonging to a group in n were thus excluded, although companies that were independent in n and joined a group in $n+1$ were retained. However, they were excluded for the analysis of later transitions.

The scope of analysis includes sole proprietorships and commercial companies belonging to the non-agricultural market sector and employing at least one paid employee. This latter criterion causes a sharp divergence between this scope and the much broader scope of the series of business start-ups published by Insee (and used in e.g. Accardo and Cordellier, 2013). Our concept of size is that of full-time equivalent paid workers.

A company is considered as started up in year n when it is present in the DADS data in year $n+1$. Although a number of businesses are not included (those that do not survive from n to $n+1$), this methodology does account for the numerous companies that did not have any employees the first year (and hence did not feature in DADS that year) but hired staff after a few months.

As an illustration, for 2009 this methodology leads to a count of 79,498 independent business start-ups. This corresponds to 67,594 independent companies that started up with employees in 2009, minus the 6,488 businesses that disappeared between 2009 and 2010, plus the 18,392 companies started up in 2009 but which only had employees from 2010.

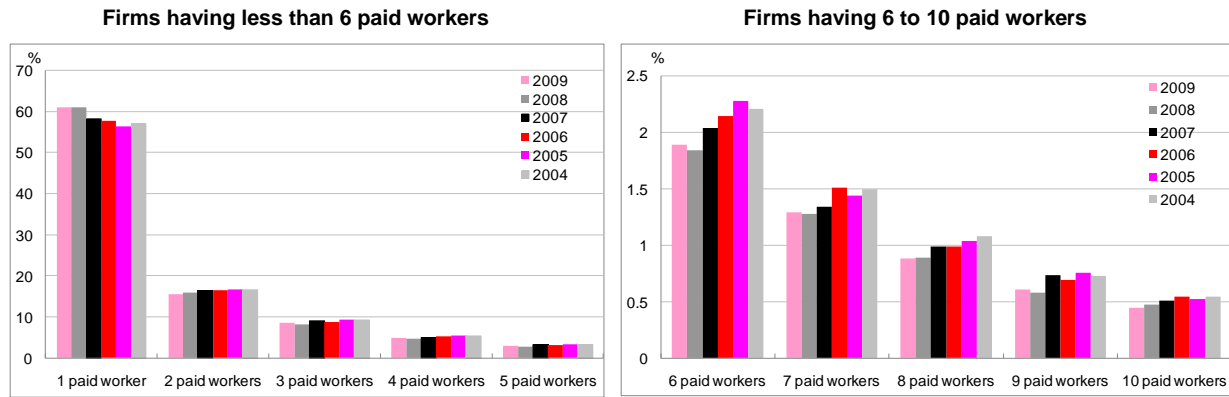
Initial size is measured at the age of one year, for the same reason: many companies have no employees in the year of their creation but hire the year after.

The businesses started up in 2008 and 2009 were also smaller, in terms of employment, than those started up previously: slightly more of them were started up with just one employee, and slightly fewer of them with more than two employees (*figure 5*). The differences are significant, as shown by χ^2 tests applied to the deviations,

taken one by one, in the size distributions of 2002 to 2007 cohorts relative to those of 2008 or 2009 cohorts³. The size effect was thus very important, and in all cases predominated over any selection effects.

Figure 5

Firm size distribution, one year after creation, by cohort



Coverage: French economy; firms that are active in the for-profit, non-agricultural industries and that are employer within the first year after creation. Affiliates of corporate groups are excluded.

Interpretation: Among firms that were created in 2009 and were still active in 2010, 1.9% have 6 (full-time equivalent) paid workers.

Source: Insee, DADS and Epure datasets, matched with the LIFI survey.

The crisis also slowed down growth in young companies

The growth of companies was also hampered by the crisis: irrespective of age, companies saw weaker growth in their workforce in 2009 and 2010 than prior to the crisis. However, this decline in growth mostly affected young companies, which normally enjoy higher growth rates. Companies can be ranked according to their “growth potential” measured from their workforce growth dynamic in the course of the period under analysis, taking account of the average dynamic for companies in the sector (*insert 3*). We find that among young enterprises, it was respectively those with the highest and lowest growth potentials that most suffered in the crisis; companies with intermediate growth potential were almost unaffected (*figure 6*).

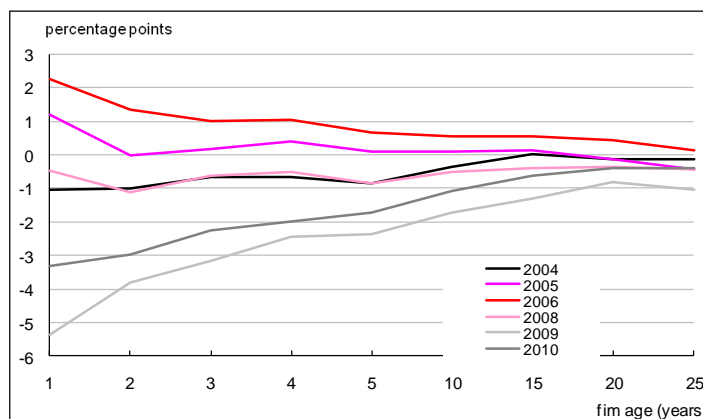
Furthermore, Fougère *et al.* (2012) show those young companies saw a sharp rise in excess mortality because of the crisis, in the order of 30% in the trade sector and almost 50% in manufacturing industry.

³ For this test all companies with at least 21 employees are grouped together in a single cell, while one cell per size is retained for the rest of the distribution.

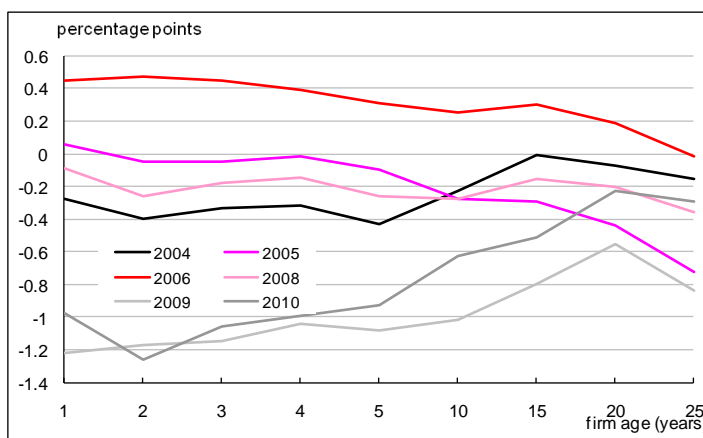
Figure 6

Annual growth of firms, across firm age classes (as compared to growth in 2007)

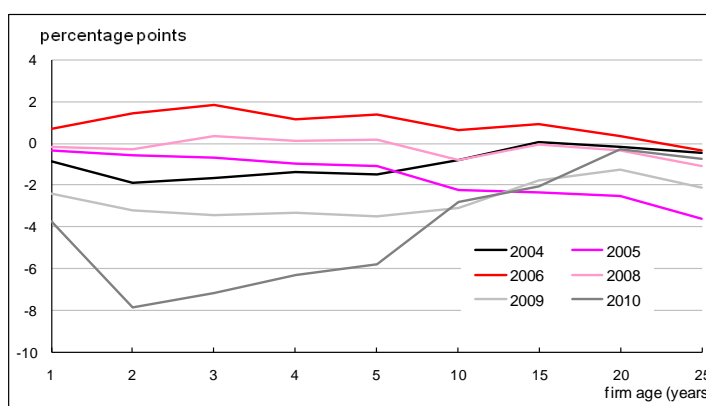
(a) Firms having a high growth potential



(b) Firms having an intermediate growth potential



(c) Firms having a low growth potential



Coverage: French economy; firms that are active in the for-profit, non-agricultural industries and that are employer within the first year after creation. Affiliates of corporate groups are excluded.

Interpretation: "All else equal", firms having a high growth potential and which had been created in the previous year (1 year old) grew up by 3.3 percentage point less between 2009 and 2010, as compared to their growth between 2006 and 2007.

Note: These figures describe firm growth "all else equal" between year n-1 and year n, as compared to growth between 2006 and 2007. The definition of "growth potential" (75th, 50th, 25th quantiles) and the estimation method are described in insert 3.

Source: Insee, DADS and Epure datasets; LIFI survey.

Insert 3

Econometric modelling of firm growth

An econometric model inspired by Evans (1987) is used to analyse heterogeneity in the effects of macroeconomic shocks on corporate growth. Through this methodology we assess the economic cycle effect for different company populations defined according to their “growth potential”, and account for the fact that a company can disappear or be created.

The specification models the quantiles of the logarithm for company size (quantile regression) and takes the following form:

$$\ln(S_{n+1}) = c(U) + \alpha(U) \cdot \ln(S_n) + X' \beta(U) + \sum_{\substack{k=2004 \\ k \neq 2007}}^{2010} \gamma_k(U) \cdot I_{\{n+1=k\}}$$

where S_n is firm size in year n , and X the industry where the company operates. The company's “growth potential” U is the conditional quantile in $n+1$, that is, the “ranking” (ranging between 0 and 1) of companies, ranked according to the dynamism of their growth. At given size S_n , sector X and observation period n , having a higher growth potential U leads to a larger size at date $n+1$. This variable U captures the effect of all the unobserved company characteristics likely to affect growth over the period.

The coefficients $\gamma_k(U)$ measure the scale of macroeconomic effects on corporate growth, with 2007 as the reference year. These effects are estimated from individual company data for each quartile of growth potential U , and by age level (different estimates are made for companies aged 1 year, 2 years, etc.).

They are shown in *figure 6* according to age and growth potential. We can see that the economic cycle was less favourable to companies with high growth potential (belonging to the last distribution quartile of U) in 2009 than in 2007, with 2010 being slightly better. The coefficients obtained fall sharply with age until they reach zero: this suggests that the effect of the crisis was greater for the youngest companies, which did not benefit from a catch-up effect. The same is true, although in a lesser proportion, of companies with intermediate or low growth potential. For companies with lower growth potential, 2010 was even more difficult than 2009, at least among young companies.

Among “mature” companies, affiliates of groups reduced their volume of activity by more than independent companies

The SUSE and ESANE data sources (*insert 4*) taken from the accounting documents filed by companies with the tax administration serve to enrich the diagnostic by comparing legal units belonging to groups with independent companies in terms of their operating accounts and financial accounts.

In the trade (section G of the NAF rev. 2 classification of activities), manufacturing industry (section C) and services to businesses (specialised, scientific and technical activities, section M) industries, the volume of activity measured by revenue fell more sharply among affiliates of corporate groups than among independent enterprises (*figure 7*). The 2009 shock was particularly big in the manufacturing industry and for enterprises in the trade sector, where the contraction in revenues exceeded 10% for groups and stood at around 7% for independent companies, i.e. twice as much as in the business services sector.

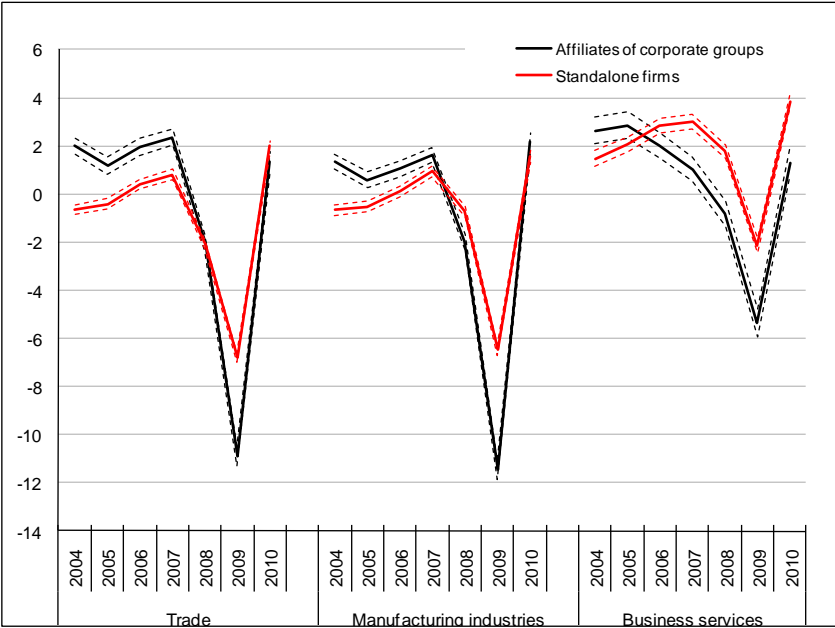
Adjustments made to employment were also very different according to company type and sector (*figure 8*). The manufacturing industry saw by far the most negative trend, particularly in 2009 and 2010, but in this sector employment was already experiencing a downward trend before the shock occurred.

Conversely, in the trade and services to businesses sectors, the 2008 downturn had limited effects: growth in employment was reduced among independent companies, while companies belonging to a group only reduced their employment slightly.

Across all sectors, firms belonging to groups made larger adjustments to both their volume of activity and their level of employment (and thus payroll). As a result of this dual behaviour, the margin rate, defined as the ratio of gross operating profits (value added minus payroll) to value added, did not vary in a particularly contrasting manner between groups and independent companies (figure 9).

Figure 7
Sales growth in the trade, manufacturing and business services industries

Average growth rate (%)

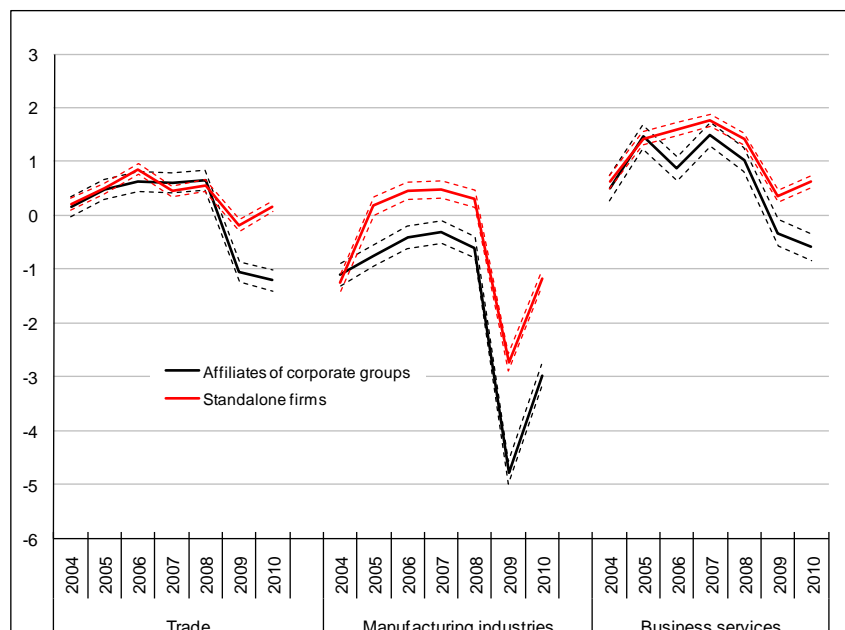


Coverage: French economy, firms reporting to the “BRN” (Bénéfice Réel Normal) tax scheme and active in the trade (NAF G), manufacturing (NAF C) and business services (NAF M) industries.
 Interpretation: In 2007, the average sales growth in the trade industry was 2.4% among affiliates of groups, and 1% among standalone firms. When the confidence intervals delimited by the dashed lines do not overlap, then the average growth rates in the two groups are statistically different.
 Source: Insee, BRN and Esane Information systems; LIFI survey.

Figure 8

Employment growth in the trade, manufacturing and business services industries

Average growth rate (%)



Coverage: French economy, firms reporting to the “BRN” (Bénéfice Réel Normal) tax scheme and active in the trade (NAF G), manufacturing (NAF C) and business services (NAF M) industries.

Interpretation: In 2007, the average employment growth (in full-time equivalent) in the trade industry was 0.6% among affiliates of groups, and 0.4% among standalone firms. When the confidence intervals delimited by the dashed lines do not overlap, then the average growth rates in the two groups are statistically different.

Source: Insee, BRN and Esane Information systems; LIFI survey.

Independent enterprises in the business services sector were less successful in protecting their margins, but the most significant fact is still the scale of the drop in margin rate in the manufacturing industry, both for legal units belonging to groups and for independent enterprises⁴.

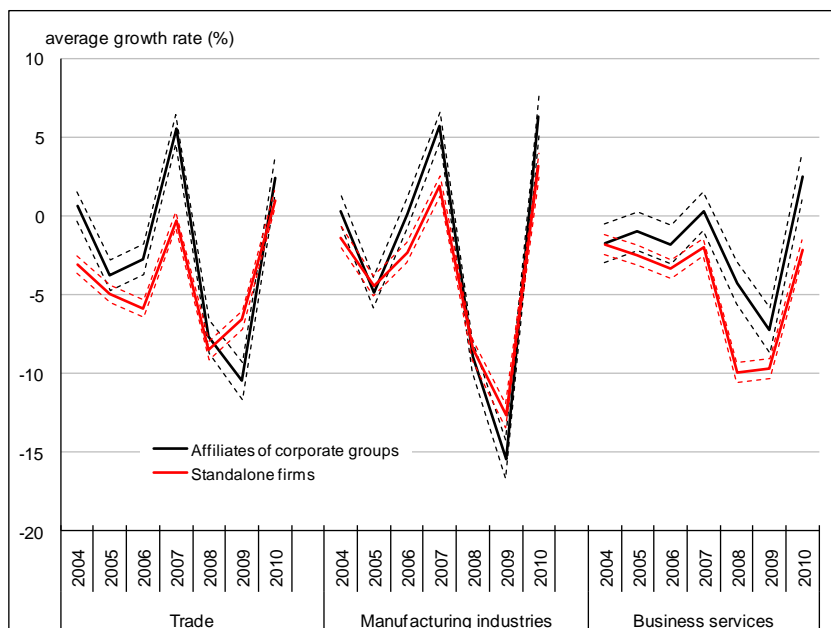
Industry level heterogeneity in terms of variation in margin rate is not reflected in the average variation in investment (*figure 10*). In all sectors the amounts invested fell by around 30% in subsidiaries of groups, before a slightly positive or barely negative variation in 2010. Once again, this slump tended to be less severe among independent companies.

⁴ According to the national accounts, the margin rate of non-financial companies deteriorated once again in 2011, after the temporary recovery in 2010.

Figure 9

Evolution of the profit margin in the trade, manufacturing and business services industries

Average growth rate (%)



Coverage: French economy, firms reporting to the “BRN” (Bénéfice Réel Normal) tax scheme and active in the trade (NAF G), manufacturing (NAF C) and business services (NAF M) industries.

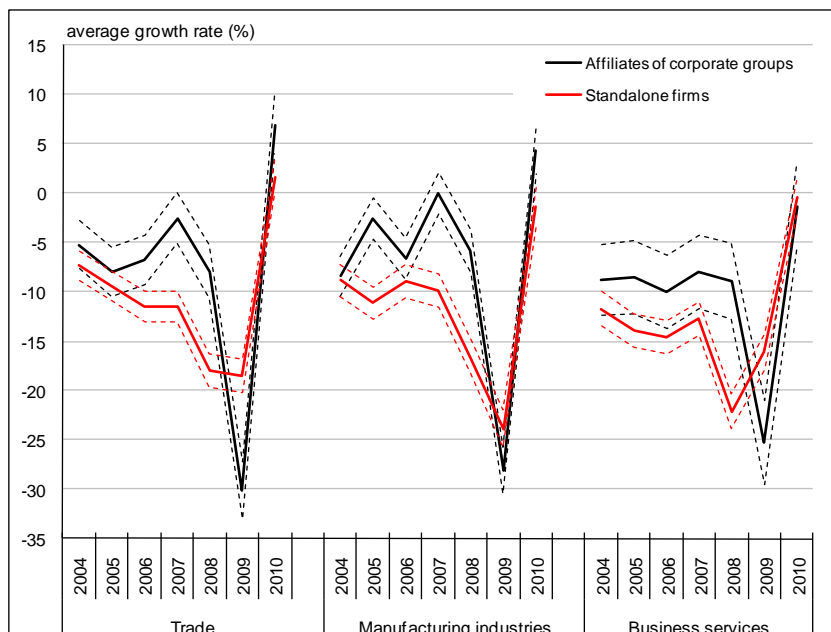
Interpretation: In 2007, the profit margin in the trade industry increased by 5.5% among affiliates of groups, and decreased by 0.3% among standalone firms. When the confidence intervals delimited by the dashed lines do not overlap, then the average growth rates in the two groups are statistically different.

Source: Insee, BRN and Esane Information systems; LIFI survey.

Figure 10

Evolution of investment in the trade, manufacturing and business services industries

Average growth rate (%)



Coverage: French economy, firms reporting to the “BRN” (Bénéfice Réel Normal) tax scheme and active in the trade (NAF G), manufacturing (NAF C) and business services (NAF M) industries.

Interpretation: In 2007, investment in tangible assets decreased by 2.5% among affiliates of groups, and by 11.5% among standalone firms. When the confidence intervals delimited by the dashed lines do not overlap, then the average growth rates in the two groups are statistically different.

Source: Insee, BRN and Esane Information systems; LIFI survey.

A predominant demand shock?

All these aggregated trends suggest that subsidiaries of groups, which are generally larger in size and have access to an internal capital market, and are thus potentially less exposed to credit constraints, suffered more during the crisis than independent companies. It appears that independents continued to finance their projects, perhaps thanks to the many support programmes for access to credit and liquidity implemented during this period and mainly targeted to SMEs (*insert 1*).

According to economic analysis (*insert 5*), this asymmetric adjustment indicates that the demand shock suffered by companies predominated over the credit shock. Moreover, subsidiaries of groups and independent enterprises suffered different demand shocks because of their differentiated exposure to international trade.

We complement the descriptive approach by regressions that allow an “all else being equal” approach. These regressions serve to compare enterprises that are active on the same markets and that initially (before the crisis) present an identical level of efficiency.

The criterion of being backed (or not) by a larger corporate group is a good indicator of probable exposure to financing constraints [Garicano and Steinwender, 2012]. However, affiliates of corporate groups and independent enterprises are only comparable in terms of their “real” corporate strategies, but not in terms of their financial strategies. Indeed, the structure of the balance sheets of groups is very specific as it is significantly affected by intra-group holdings and other borrowings. Therefore, to refine the analysis we use two additional indicators correlated with the probability of being financially constrained that have been proposed in the economic literature and that are specific to each sub-population of enterprises (affiliates on the one hand, and independent firms on the other hand).

- For independent enterprises we use collateral, since this characteristic probably determines their debt capacity [Almeida and Campello, 2007]. We measure it by fixed tangible assets per employee.
- For affiliates, we use the global wealth level of the group because this characteristic determines the ability of the internal capital market to make up for the deficiencies of the external capital market [Boutin *et al*, 2012]. “Wealth” is calculated as the total gross operating surplus generated by the group as a whole on the national territory plus the total net liquid assets held by French subsidiaries⁵.

In each case, we split the sub-population into firms having an indicator below, or above the sample median. The comparison of the results obtained with these alternative indicators of financing constraints allows assessing the robustness of our findings related to the magnitude of financing constraints during this period.

⁵ Our measure of the wealth of groups does not include foreign subsidiaries (which do not feature in our data) and thus probably underestimates the total wealth of highly internationalised groups. However, (unreported) analyses conducted on a sample excluding subsidiaries whose group head is located abroad (for which this problem is particularly severe) give very similar results to those presented, which suggests that our conclusions are robust to this measurement problem.

Insert 4

Statistical sources and methodology for the analysis of real and financial strategies of enterprises

Company tax reports (full balance sheet, profits and losses statement) contain extremely rich information about companies' choices in terms of financing, production and investment strategies. Here we use information from the most detailed tax reports from companies subject to the "Actual Profits" taxation scheme (BRN). The corresponding files cover the years 2003 to 2010. We restrict the analysis to the manufacturing (section C), trade (section G) and business services (section M) industries, for which coverage is the most comprehensive: this taxation system is compulsory for firms making revenue of over 234,000 Euros excluding VAT in the services industries, and 777,000 Euros in other sectors; but smaller companies may choose it as an option. This source therefore offers almost total coverage of the legal units of relatively large size but less coverage of smaller companies: in 2003, the coverage rate was over 80% for companies employing more than 10 people and almost 100% for those with more than 20 employees.

These files are then matched to the DADS files, as well as to the LIFI survey (financial ties) in order to reconstruct the structure of groups and analyse the functioning of internal capital markets.

The resulting file is used to describe the impact of the crisis on various dimensions of corporate strategies, financial or "real" (e.g. relating to investment or employment).

We implement a "difference in differences" estimation strategy that is very simple and intuitive. It is based on comparisons of variations in indicators between different populations of companies, which (we assume) would have been exposed differently to a potential reinforcement of credit constraints.

We introduce a rich set of control variables into the regressions (firm fixed effects controlling for differences between units that are stable over time, firm age, trends in workforce growth, capital intensity and productivity) which allow an "all else being equal" analysis. All the regressions also integrate the logarithm of global value added produced in the industry to which each enterprise belongs in order to control for potential demand shocks that are specific to each sector.

To interpret the results of our regressions we assume that for given size, sector and level of productivity, enterprises globally face the same demand shocks. The differences in growth or adjustments are then interpreted as the impact of potential financing constraints, or more precisely of their amplification, on the various strategies that we analyze.

The "all else being equal" analysis globally confirms the descriptive results found previously (*figure 11*) which would suggest a far more prominent role played by the demand shock than the credit shock: independent companies adjusted their production volume, be it in terms of value added or revenue, significantly less than those that were members of a group. The adjustment was also smaller for independent companies with low collateral than for those with high collateral, while the subsidiaries backed by groups with varying wealth levels did not see differentiated adjustments. Complementary analyses reported in appendix B3 and contrasting individual companies and group subsidiaries according to their export activity show that subsidiaries of groups exported more often and were in fact more exposed to the contraction in world demand. The (fewer) independent enterprises that also participated to international trade suffered a shock that was comparable in magnitude⁶.

Moreover, group subsidiaries ran down their inventories more often than independent enterprises over the period. This result is compatible with the hypothesis of a strong demand shock if we assume that prior to the crisis, independent companies faced tougher financing constraints: the companies which during that period were operating at an activity level close to optimum would have been forced to adjust more suddenly than those which

⁶ However, they drew from their inventories less frequently.

had financing difficulties before 2008 and thus had a lower than optimum production. However, the result is less compatible with the hypothesis of an increase in credit constraints, which should have produced an equally asymmetric adjustment between these two populations, but in the opposite direction (see also Kremp and Sevestre, 2012).

Figure 11

The 2008/2009 shock (as compared to the 2004 to 2007 period),

for sub-populations of firms that were differentially exposed to financing constraints

	Standalone firms (A)	Group affiliates (B)	Difference (A) - (B)	Standalone firms			Affiliates of corporate groups		
				low collateral (C)	high collateral (D)	Difference (C) - (D)	cash poor (E)	cash rich (F)	Difference (E) - (F)
Value added	-9.1 (***) (0.1)	-10.4 (***) (0.3)	1.3 (***) (0.3)	-8.5 (***) (0.1)	-9.8 (***) (0.2)	1.3 (***) (0.2)	-9.8 (***) (0.3)	-10.5 (***) (0.5)	0.6 (0.5)
Sales	-5.2 (***) (0.1)	-7.7 (***) (0.2)	2.5 (***) (0.2)	-4.9 (***) (0.1)	-5.6 (***) (0.1)	0.7 (***) (0.2)	-5.8 (***) (0.3)	-6.2 (***) (0.4)	0.4 (0.5)
Increase in inventories (yes / no)	0.5 (***) (0.1)	2.8 (***) (0.2)	-2.3 (***) (0.2)	0.4 (***) (0.1)	0.6 (***) (0.1)	-0.2 (0.1)	1.8 (***) (0.2)	4.0 (***) (0.4)	-2.3 (***) (0.4)
Outstanding debt	-13.2 (***) (0.3)	-8.9 (***) (0.8)	-4.3 (***) (0.9)	-10.1 (***) (0.4)	-17.4 (***) (0.4)	7.3 (***) (0.6)	-7.1 (***) (0.010)	-13.8 (***) (1.6)	6.7 (***) (1.9)
Probability to draw on credit lines	8.8 (***) (0.1)	5.5 (***) (0.2)	3.3 (***) (0.3)	9.4 (***) (0.1)	8.2 (***) (0.2)	1.2 (***) (0.2)	6.5 (***) (0.3)	2.8 (***) (0.4)	3.7 (***) (0.5)
Cash held	-4.9 (***) (0.3)	-8.7 (***) (0.9)	3.8 (***) (0.9)	-5.9 (***) (0.4)	-3.8 (***) (0.5)	-2.1 (***) (0.6)	-3.3 (***) (1.1)	-19.2 (***) (1.8)	15.9 (***) (2.1)
Operating profit margin (operating profit / VA)	-12.3 (***) (0.2)	-11.5 (***) (0.5)	-0.8 (0.5)	-11.0 (***) (0.3)	-13.7 (***) (0.3)	2.7 (***) (0.4)	-12.1 (***) (0.7)	-12.4 (***) (0.8)	0.4 (1.0)
Savings rate (net profits / VA)	-8.4 (***) (0.3)	-4.9 (***) (0.7)	-3.5 (***) (0.8)	-6.5 (***) (0.4)	-10.8 (***) (0.4)	4.3 (***) (0.6)	-4.3 (***) (0.9)	-6.7 (***) (1.2)	2.4 (1.5)
Employment	-3.9 (***) (0.1)	-6.3 (***) (0.2)	2.4 (***) (0.2)	-4.8 (***) (0.1)	-2.8 (***) (0.1)	-2.0 (***) (0.1)	-6.1 (***) (0.2)	-6.8 (***) (0.3)	0.6* (0.4)
Investment	-15.8 (***) (0.4)	-12.4 (***) (0.8)	-3.4 (***) (0.9)	-10.7 (***) (0.6)	-21.1 (***) (0.6)	10.4 (***) (0.8)	-13.1 (***) (1.0)	-13.9 (***) (1.3)	0.9 (1.6)

Coverage: French economy, firms reporting to the "BRN" (Bénéfice Réel Normal) tax scheme and active in the trade (NAF G), manufacturing (NAF C) and business services (NAF M) industries.

Interpretation: All else equal, group affiliates experienced a decrease in value added by 10.4% in 2008/2009 relative to 2004/2007. Standalone firms experienced a decrease by 9.1%. The difference between the two sub-populations is 1.3 percentage point and is statistically significant.

Note: These results are from regressions which include a wider set of controls: firm age, lagged employment growth, capital intensity, productivity, firm level fixed effects. All regressions also include the logarithm of the total value added produced in the industry where the firm is operating. Standard errors are reported in parentheses, *** denotes significance at the 1% level, ** denotes significance at the 5% level, and * denotes significance at the 10% level.

Source: Insee, BRN and Esane Information systems; LIFI survey.

A comparison of the variations in capital structure (outstanding debt) between populations of companies – when this comparison is interpretable (between independent companies according to their amount of collateral, or between group subsidiaries according to the wealth of the group) – shows that the adjustments made by the companies that should be facing tighter restrictions were significantly less pronounced than those made by enterprises that were initially less financially constrained. This contrasts strongly with what has been observed in the United States [Campello *et al.*, 2010].

Insert 5

Credit constraints and credit supply shocks

The notion of credit constraints is not intuitive and it is also extremely difficult to measure their magnitude empirically. Indeed a company that is refused a loan is not necessarily constrained: the loan might have been refused simply because the bank deemed the project less profitable than others submitted to it. Credit constraints appear when, at equilibrium, certain projects are not financed despite being socially profitable. This is the case in situations of information asymmetry: Stiglitz and Weiss [1981] show that when investors are not able to assess the profitability or degree of risk of each project submitted to them by entrepreneurs, then it is optimal for them to partially ration the credit.

In this situation, the credit supply corresponds to the total amount of credit offered by banks (according to the interest rate paid), while rationing, which measures the magnitude of credit constraints, corresponds to the difference between supply and demand for given levels of expected profitability and risk. In other terms, credit rationing corresponds to the proportion of businesses that do not obtain credit for projects that are similar (from the investors' viewpoint).

In such a setting, we can show that a reduction in the credit supply results in an increase in the number of rationed companies. We use this result to empirically analyse the compared scale of credit supply shocks and demand shocks on the final goods market, in the context of the 2008 crisis. Indeed, if the supply shock dominated, then the companies that were most likely to be financially constrained before the crisis are those that must have suffered most from the tightening of credit, and hence suffered most during the crisis in terms of production volume and long-term investment capacity. In contrast, if the demand shock dominated, these "credit constrained" enterprises should adjust to the drop similarly to, if not less than, the other companies given their sub-optimal scale of operation prior to the crisis.

Enterprises drew more often from their credit lines, probably in anticipation of a risk of illiquidity, as suggested by Campello *et al.* (2010). The change in terms of this strategy was more pronounced among credit constrained companies, which (in contrast) used their credit lines minimally before the crisis in order to limit the high financial costs associated with this type of very short-term debt. They also asked more often for advance payments on orders from their clients, in such a way that the liquidity shock was relatively limited. A more detailed, year-by-year, analysis would show that after the very large drop between 2007 and 2008, cash flow held preventively tended to increase again slightly in 2009 - 2010 as compared to the pre-crisis period, except for affiliates of groups for which this strategy was pointless because of the size of the internal capital markets upon which they could rely. The savings ratio generally fell by less than the profit margin rate, and independent companies that had little collateral experienced a less unfavourable trend as they made a sharper adjustment in terms of their employment than their collateral-rich counterparts. Lastly, all else being equal, independent companies scaled back their investment level more than group subsidiaries, contrary to what the purely descriptive analysis suggested. However, within the population of independent companies, the units that were a priori more exposed to financing constraints scaled back their investment efforts significantly less.

Further analyses are reported in appendix B3 and show that subsidiaries of multinational corporate groups⁷ tended to reduce their employment by more than affiliates of "fully domestic" groups. This latter pattern is not fully explained by their greater participation to international trade, which suggests that internationalised groups tended to withdraw partially from the French market, either to help offset increased difficulties on markets that were even more exposed to the 2008/2009 downturn, or to reposition their activity on more dynamic foreign markets. □

⁷ The groups owning subsidiaries abroad are identified via the LIFI survey on financial ties (*insert 4*).

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APPENDIX A

As a complement to the analyses presented in the main part of the text, we summarize in this appendix the

Tightening credit declared by banks vs. credit constraints perceived by companies:

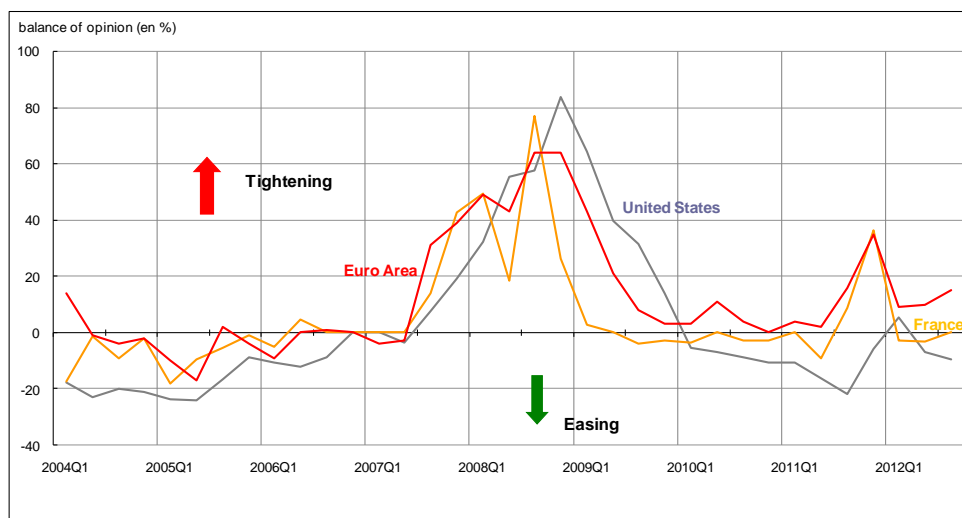
What do European surveys say?

As explained in great detail in insert 5, assessing the relative magnitude of supply and demand shocks is an empirical challenge. In the context of the 2008 crisis, the challenge is to determine whether the observed decline in corporate loans was mainly caused by a decrease in loan demand from business ventures (demand shock), or by a decrease in the supply of credit by the banking system, and particularly in the latter case, if the credit constraints have increased.

Surveys at the bank level, which are collected by the various central banks, provide interesting indicators describing directly the evolution of the supply side of the credit market. They indicate that overall credit conditions (eligibility criteria, the amount of collateral required, etc.) have tightened between August and December 2008 (see Figure 12). Between August and October 2008, 65% of European banks and 80% of U.S. banks reported that they had tightened the lending conditions for businesses. In France, the tightening was stronger than in the Eurozone in the third quarter 2008, but weaker thereafter.

Figure 12

Credit award criteria for companies - Central Bank survey



Note: the insolvency ratio is the weight ratio of net interest paid, in the EBITDA

Coverage: Non financial corporation, France, United States, Euro Area

Interpretation: In the first quarter of 2008, the conditions for granting credit have tightened.

Sources: Federal Reserve Board, European Central Bank, Bank of France.

Figure 13:

Percentage of companies having been denied a credit application - SAFE survey of the ECB



Coverage: Non financial corporation, France

Interpretation: 3% of small businesses were denied credit in the first quarter of 2009.

Source: ECB (SAFE survey: <http://sdw.ecb.europa.eu/browse.do?node=9138811>)

Figure 14:

Summary of indicators of access to credit from three surveys of SMEs, 2010

Survey item:	Credit application was partially or globally rejected			Credit application was globally rejected		
	ECB (SAFE)	INSEE	CAPEB	ECB (SAFE)	INSEE	CAPEB
Percentage of SMEs	5.8	6.1	1.6	3.0	2.5	1.0

Coverage: SMEs, France.

Interpretation: In 2010, 2.5% of SMEs were denied credit by the INSEE survey, and 6.1% had their applications only partially granted.

Sources: INSEE (http://www.insee.fr/fr/themes/document.asp?ref_id=atf2010);

ECB (SAFE survey : <http://sdw.ecb.europa.eu/browse.do?node=9138811>);

Observatoire du financement des entreprises.

Surveys conducted at the firm level by the European Central Bank (SAFE surveys), INSEE or CAPEB⁸ enable to complete the analysis. The main take-aways are summarized in Figures 13 and 14. They show that the refusal rates remained at a relatively low level, even for smaller companies, although these firms correspond to a population with a high risk of default. In particular, changes in denied rates are not in line with the evolution of the indicator of credit conditions reported by lenders (Figure 12), suggesting that increases in the first half of 2010 and the second half of 2011 could be due to rising risks or falling profits in business ventures (ie., a demand shock) rather than to a tightening of credit conditions.

⁸ "CAPEB": Confédération de l'artisanat et des petites entreprises du bâtiment ; cf. Observatoire du financement des entreprises, 2011.

APPENDIX B

This appendix complements the statistical analyses reported in table 11. We first provide detailed descriptive statistics, then describe the empirical specification more precisely, and lastly propose some extensions.

B.1 Sample description and descriptive statistics

Insert 4 provides a description of the different comprehensive data sources that were used to construct our estimation sample. Figure 15 below provides detailed descriptive statistics for both dependant and control variables, in the sub-populations of standalone firms vs. affiliate of corporate groups.

As seen in this table, affiliates of corporate groups tend to be on average an order of magnitude (ten times) larger than standalone firms, but also older, and more productive. These features of the data show that it is important to go beyond the mere descriptive statistics reported in figures 7 to 10 and to control for the structural differences between standalones and affiliates in order to document the (differential) shock experienced by these two populations of firms during the crisis.

Figure 15

**Descriptive statistics for the firm-level estimation sample,
2004 to 2010; trade, manufacturing and business services industries**

	Standalone firms (in the pre-crisis period)				
	Observations	Mean	P25	P50	P75
Value added	1359978	467.0	91.5	217.2	460.2
Sales	1485023	1839.8	209.9	573.5	1360.0
Increase in inventories (Yes / No)	1485023	0.061	0.000	0.000	0.000
Outstanding debt	1484100	217.0	5.0	38.8	131.0
Probability to draw on credit lines	1485023	0.373	0.000	0.000	1.000
Cash held	1313236	116.7	9.0	33.1	95.5
Operating profit margin	1102187	0.297	0.116	0.223	0.395
Savings rate	974850	0.305	0.092	0.179	0.326
Employment	1184233	8.6	2.0	4.0	9.0
Investment	1019610	77.1	3.0	10.9	35.7
Productivity	1119718	40.4	21.4	31.0	46.9
Capital intensity (tangible capital / employment)	1145353	45.0	10.0	21.4	43.5
Firm age	1468669	15	6	12	20
	Affiliates of corporate groups (in the pre-crisis period)				
	Observations	Mean	P25	P50	P75
Value added	403159	5156.5	363.3	1022.5	2801.8
Sales	442435	24041.9	820.0	3199.0	11262.1
Increase in inventories (Yes / No)	442435	0.081	0.000	0.000	0.000
Outstanding debt	442257	8501.0	19.0	219.7	1025.0
Probability to draw on credit lines	442435	0.467	0.000	0.000	1.000
Cash held	401231	1080.4	20.7	97.5	360.9
Operating profit margin	316832	0.297	0.123	0.234	0.397
Savings rate	281421	0.648	0.097	0.189	0.339
Employment	386726	67.7	6.0	18.0	45.0
Investment	341810	988.5	13.1	57.4	258.2
Productivity	356492	65.3	22.4	32.7	52.1
Capital intensity (tangible capital / employment)	366779	94.3	12.7	29.2	68.0
Firm age	440788	21	10	17	25

Coverage: French economy, firms reporting to the "BRN" (Bénéfice Réel Normal) tax scheme and active in the trade (NAF G), manufacturing (NAF C) and business services (NAF M) industries.

Note: All amounts are expressed in thousand euros, at the 2005 prices. The index of productivity has been estimated using the Levinsohn and Petrin (2003) methodology⁹.

Source: Insee, BRN and Esane Information systems; LIFI survey.

⁹ Levinsohn, J. and A. Petrin (2003), "Estimating Production Functions Using Inputs to Control for Unobservables", *Review of Economic Studies*, 70(2), 317-341.

B.2 Empirical specification

Insert 4 also contains an intuitive description of the empirical specification underlying figure 11.

The precise equation that has been estimated can be specified as follows:

$$\ln(Y_{ijt}) = (1 - T_i) \cdot \delta_{2008/09}^{(0)} + T_i \cdot \delta_{2008/09}^{(1)} + \beta X_{ijt} + \gamma \cdot \ln(VA_j) + (T_i + u_i) + \varepsilon_{ijt}$$

where t denotes time and corresponds to either the 2004/2007 period (aggregated period 1) or to the 2008/2009 period (aggregated period 2), i denotes firms and j their industry affiliation.

T_i denotes “treatment”, ie one of our three different indicators of exposure to financial constraints¹⁰; VA_j is the total value added produced in the 4-digit industry where the firm is operating. The vector X_{ijt} contains the following control variables: firm age (by category: one for each year until five years, and then one for each 5-year bin), lagged employment, lagged capital intensity and lagged productivity.

Coefficients of interest $\delta_{2008/09}^{(0)}$ and $\delta_{2008/09}^{(1)}$ measure the amplitude of the shock experienced by firms during the crisis period depending on their probable exposure to financial constraints, and are the only coefficients reported in figure 11, along with the difference between the two. The standard deviation of this difference is computed via delta-method.

The identifying assumption is that the pre-crisis exposure to financing constraints is un-correlated with the unobserved *changes* in growth opportunities between the pre-crisis and the post-crisis periods that are specific to the considered firm (since the above specification includes firm fixed effects). In particular, exposure to financial constraints should not be correlated with unobserved demand shocks that are specific to each (treated vs. untreated) group – we go back to this assumption and challenge it in section B.3.

Under this assumption, the demand shock is fully controlled by all control variables (including fixed effects), such that coefficients $\delta_t^{(0)}$ and $\delta_t^{(1)}$ can be interpreted as the differential impact of the potential supply shock experienced by firms during the period of analysis. As a reminder, insert 5 suggests that financing constraints are amplified when the supply of credit drops, such that in this case, the shock experienced by firms that were ex ante more exposed to financing constraints should be larger than the shock experienced by firms weakly exposed to financing constraints. This point is shown more formally in the Stiglitz and Weiss (1981) setting in appendix B.4.

¹⁰ As a reminder, these indicators of exposure to financial constraints are:

- A dummy indicating that a firm is a standalone, as opposed to an affiliate backed by the internal capital market of a larger corporate group.
- Among standalones: firms having low versus high collateral (tangible capital).
- Among affiliates: firms being backed by cash-poor versus cash-rich corporate groups.

B.3 Extension: Adjustments of corporate strategies

Depending on differential exposure to the collapse of international demand

As mentioned in the main part of the text, the asymmetry of the supposedly “supply” shock experienced by constrained vs. unconstrained firms is puzzling, since after controlling “a lot” for the demand shock, the latter seem to have experienced a more severe shock than financially constrained firms.

The answer to this puzzle is that the previous specification does not control sufficiently well for the demand shock. More specifically, we do not control separately for the evolution of the domestic and international components of demand. It appears that affiliates of corporate groups were more often participating in international trade, and that they suffered more from the larger contraction of demand originating from their foreign clients than from their domestic ones.

The fully convincing implementation of our empirical strategy would have involved a richer control structure for demand shocks, such as the following:

$$\ln(Y_{ijt}) = (1 - T_i) \cdot \delta_{2008/09}^{(0)} + T_i \cdot \delta_{2008/09}^{(1)} + \beta X_{ijt} + \gamma_1 \cdot \underbrace{\ln(VA_j - EXP_j)}_{\text{domestic demand}} + \gamma_2 \cdot \underbrace{\ln(EXP_j)}_{\text{international demand}} + (1 - EXP_i^{pre}) \cdot \gamma_{2008/09}^{(0)} + EXP_i^{pre} \cdot \gamma_{2008/09}^{(1)} + (T_i + EXP_i^{pre} + u_i) + \varepsilon_{ijt}$$

Where EXP_i^{pre} is a time invariant control indicating that the corresponding firm was operating on an international market during the pre-crisis period (as opposed to firms operating on the domestic market only).

The (un-reported) results of this estimation are that the differences¹¹ between coefficients $\delta_{2008/09}^{(0)}$ and $\delta_{2008/09}^{(1)}$, become negligible and no longer significant: all else equal, ex-ante financially constrained firms did not experience a larger (nor a smaller) shock than financially un-constrained firms.

Figure 16 describes the results obtained for the $\gamma_{2008/09}^{(0)}$ and $\gamma_{2008/09}^{(1)}$ coefficients, which document the heterogeneity in the demand shock experienced by “domestic” ($1 - EXP_i^{pre}$) as opposed to “internationalized” (EXP_i^{pre}) firms. As before, we experiment with different empirical proxies for “internationalization”, and propose to contrast different sub-populations of firms:

- Standalone firms that were exporting in the pre-crisis period, versus stand-alone firms which were not exporting in that period.
- Corporate group affiliates that were exporting in the pre-crisis period, versus corporate group affiliates which were not exporting in that period. Note that this partition is a less precise indicator of participation into international trade, since we miss (for example) affiliates in the manufacturing industries which export via another affiliate of the same corporate group that specializes in trade (a phenomenon which is called intermediated trade)¹².
- Lastly, affiliates of corporate groups which report at least one foreign affiliate in the LIFI/DIANE survey, versus affiliates of purely domestic groups. We hypothesize that multinationals might have been more exposed to the international demand shock than purely domestic firms.

¹¹ And the coefficients themselves, for most of the outcome variables.

¹² With the information available in the fiscal files, it is impossible to affect the exports of a trade-platform to the affiliates which actually produced the goods. A more detailed analysis would require custom data at the flow level, which detailed information about products which could be matched (statistically) with the most probable producer (industry affiliation).

The main take-away of this complementary analysis is that standalones and affiliates that were exporting in the pre-crisis period tended to experience a similar shock in terms of magnitude, be it measured in terms of value added or in terms of sales. This shock appeared to be much larger than the shock experienced by purely domestic business units. Among group affiliates, the exporting units experienced a larger drop in profit margins, while “all other things equal”, standalone exporting firms decreased their employment by more than their domestic counterparts.

Lastly, figure 16 also shows that group subsidiaries based abroad tended to reduce their employment by more than their “domestic” counterparts. This latter pattern is not fully explained by their greater participation to international trade, since group affiliates contrasted according to their exporting status did not experience different evolutions in terms of employment. This result suggests that internationalised groups tended to withdraw partially from the French market, either to help offset increased difficulties on markets that were even more exposed to the 2008/2009 downturn, or to reposition their activity on more dynamic foreign markets.

Figure 16
The 2008/2009 shock (as compared to the 2004/2007 period),
for sub-populations of firms that are differentially exposed to the contraction of international demand

	Standalone firms			Affiliates of corporate groups			Affiliates of corporate groups		
	Exporting (A)	Non-Exporting (B)	Difference (A) - (B)	Exporting (C)	Non-Exporting (D)	Difference (C) - (D)	Foreign affiliates (E)	Domestic only (F)	Difference (E) - (F)
Value added	-10.3(***) (0.2)	-8.0(***) (0.1)	-2.2(***) (0.2)	-11.8(***) (0.8)	-9.6(***) (0.4)	-2.1(***) (0.5)	-11.4(***) (0.8)	-11.0(***) (0.9)	-0.4 (0.6)
Sales	-7.5(***) (0.2)	-5.1(***) (0.1)	-2.4(***) (0.2)	-6.3(***) (0.7)	-4.4(***) (0.8)	-1.9(***) (0.5)	-6.0(***) (0.7)	-5.5(***) (0.8)	-0.4 (0.6)
Increase in inventories (yes / no)	0.7(***) (0.1)	0.2(***) (0.1)	0.5(***) (0.1)	5.0(***) (0.6)	2.9(***) (0.7)	2.1(***) (0.4)	4.7(***) (0.6)	3.8(***) (0.7)	0.9(*) (0.5)
Outstanding debt	-7.0(***) (0.7)	-11.0(***) (0.4)	4.0(***) (0.7)	-13.2(***) (2.6)	-13.4(***) (2.9)	0.2 (1.7)	-15.4(***) (2.7)	-3.6(***) (2.9)	-11.8(***) (2.3)
Probability to draw on credit lines	9.9(***) (0.2)	9.2(***) (0.1)	0.7(***) (0.2)	0.3(***) (0.8)	4.9(***) (0.9)	-5.3(***) (0.5)	0.1 (0.8)	5.1(***) (0.9)	-5.2(***) (0.6)
Cash held	-4.1(***) (0.7)	-6.4(***) (0.4)	1.3(***) (0.7)	-19.1(***) (2.9)	-19.6(***) (3.1)	-0.6 (1.8)	-21.9(***) (2.9)	-6.1(*) (3.2)	-15.7(***) (2.4)
Operating profit margin (operating profit / VA)	-11.1(***) (0.5)	-11.0(***) (0.3)	-0.1 (0.5)	-15.0(***) (1.6)	-12.4(***) (1.7)	-2.6(***) (1.0)	-14.3(***) (1.6)	-14.9(***) (1.9)	0.6 (1.3)
Savings rate (net profits / VA)	-6.0(***) (0.7)	-6.6(***) (0.5)	0.6 (0.7)	-8.9(***) (2.2)	-9.0(***) (2.5)	0.1 (1.5)	-8.7(***) (2.2)	-9.8(***) (2.6)	1.1 (1.8)
Employment	-5.3(***) (0.1)	-4.6(***) (0.1)	-0.8(***) (0.1)	-6.7(***) (0.5)	-6.4(***) (0.6)	-0.3 (0.3)	-6.8(***) (0.5)	-5.8(***) (0.6)	-1.0(***) (0.4)
Investment	-9.1(***) (0.8)	-11.2(***) (0.5)	2.1(**) (0.9)	-14.7(***) (2.5)	-15.1(***) (2.9)	0.4 (1.7)	-15.0(***) (2.5)	-13.3(***) (3.1)	-1.7 (1.9)

Coverage: French economy, firms reporting to the “BRN” (Bénéfice Réel Normal) tax scheme and active in the trade (NAF G), manufacturing (NAF C) and business services (NAF M) industries.

Note: These results are from regressions which include a wider set of controls: firm age, lagged employment growth, capital intensity, productivity, firm level fixed effects, relevant proxies for exposure to financial constraints (see main text: collateral rich vs. collateral poor firms in the sub-sample of independent firms; affiliates of cash-rich vs. cash-poor groups in the sub-sample of affiliates of corporate groups). All regressions also include the logarithm of the total value added produced in the industry where the firm is operating. Standard errors are reported in parentheses, *** denotes significance at the 1% level, ** denotes significance at the 5% level, and * denotes significance at the 10% level.

Source: Insee, BRN and Esane Information systems; LIFI survey.

B.4 Comparative statics in the Stiglitz and Weiss (1981) framework

In this appendix, we propose a short summary of the comparative statics in the Stiglitz and Weiss (1981) framework which underlies the identifying assumption for the difference-in-differences strategy implemented in figure 11.

In a very simplified version of Stiglitz and Weiss (1981), all loans are of the same amount, and therefore all projects to be financed have the same size. The expected returns associated with each project are the same, but projects are heterogeneous in terms of riskiness.

Default is defined as:

$$\underbrace{C}_{\text{colateral}} + \underbrace{R}_{\text{return}} \leq \underbrace{B}_{\text{loan}} \cdot \left(1 + \underbrace{r}_{\text{interest rate}} \right)$$

Due to limited liability, realized profits for the entrepreneur (borrower) can be expressed as:

$$\pi(R, r) = \max\{R - (1 + r) \cdot B; -C\}$$

Therefore, as interest rates increase, only the riskiest projects remain profitable in expectation, which induces a selection effect: the demand for funds decreases as interest rates increase, but the corresponding projects also become riskier.

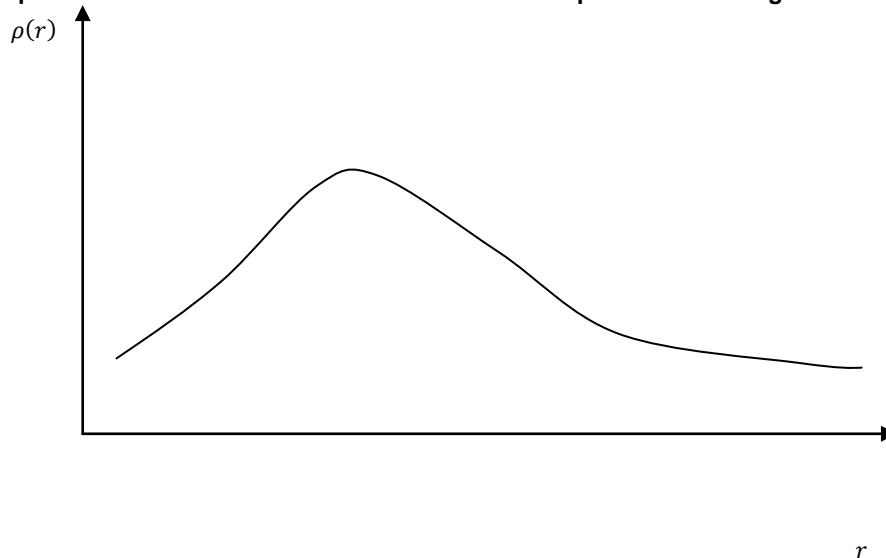
Realized returns for banks (lenders) can be written as:

$$\rho(R, r) = \min\{R + C, B \cdot (1 + r)\}$$

Therefore, if the selection effect described above is sufficiently strong (depending on the distribution of risk across projects), then the expected return function $\rho(r)$ can be non-monotonic. Stiglitz and Weiss consider the case where it is first increasing in terms of the interest rate (weak selection effect), and then decreasing (strong selection effect), as depicted in figure 17.

Figure 17

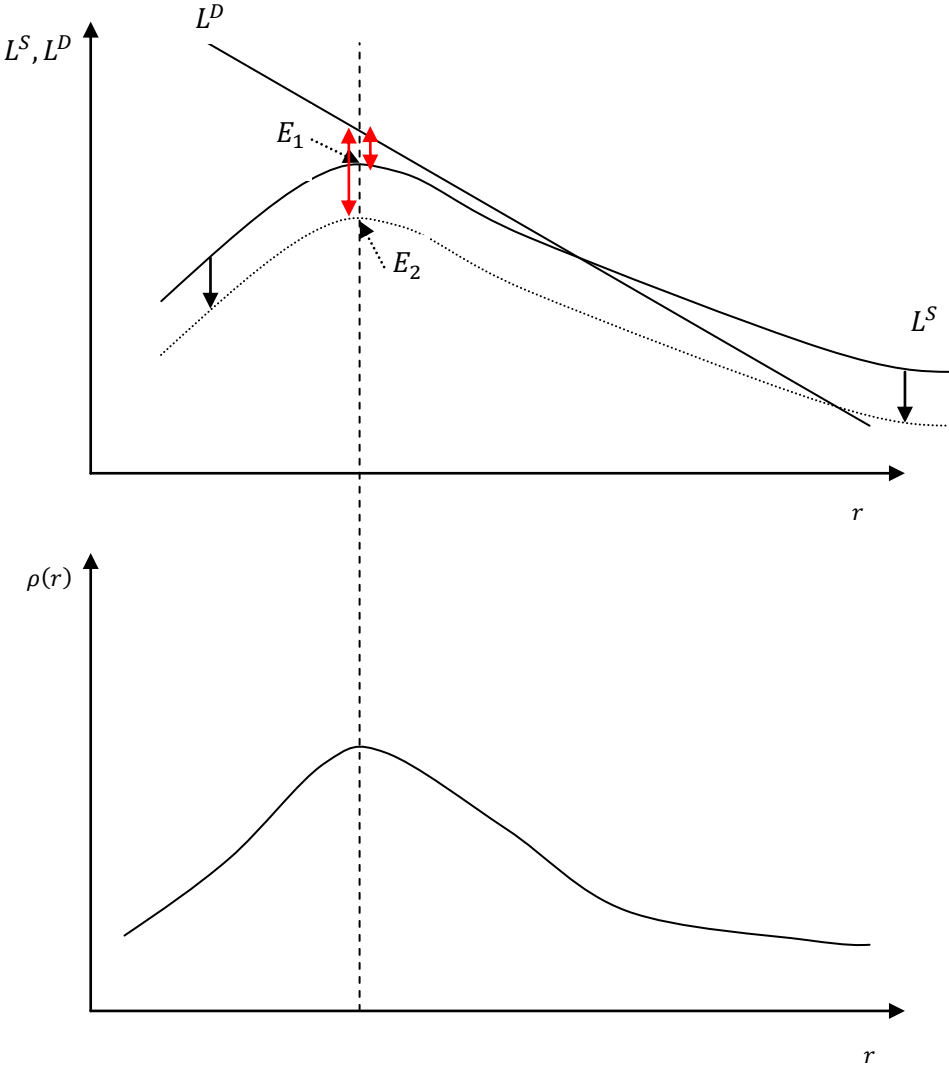
Banks' expected return as a function of the interest rate in presence of a large selection effect



In this situation, the supply of funds L^S remains an increasing function of expected returns ρ (as is standard for the supply side), but since $\rho(r)$ is non monotonic, then the supply of funds is a non-monotonic function of interest rates r . At equilibrium, banks offer the interest rate that maximizes their expected returns (ρ).

In this setting, a negative shock on the supply of funds L^S , defined as a downward translation of L^S in the “supply of funds / expected returns” space, generates a downward shift of the L^S curve in the “supply of funds / interest rates” space as shown in figure 18.

Figure 18
Comparative statics in the Stiglitz and Weiss (1981) setting: supply shock



Interpretation: The lower panel is a replication of figure 17. The upper panel describes demand and supply as functions of the interest rate (not expected returns). The supply curve is computed by a variable change from the relation described in the lower panel, since credit supply is a strictly increasing function of expected returns ρ . Banks offer the amount of credit which maximizes their expected returns, therefore equilibrium is reached at E_1 or E_2 depending of the case considered (initial supply of credit or supply hit by a negative shock).

Let us define the share of credit rationed firms as the fraction of firms which do not obtain credit (materialized by the red double arrows on the picture) over total demand for the corresponding interest rate. If the demand for funds remains unchanged (or experiences a small shock relative to the shock experienced by the supply curve), then the share of credit rationed firms increases, ie. credit rationing is amplified by negative supply shocks.

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