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# DOMESTIC AND FOREIGN SALES: COMPLEMENTS OR SUBSTITUTES?

by Matteo Bugamelli\*, Eugenio Gaiotti\* and Eliana Viviano\*

## Abstract

How are the dynamics of foreign and domestic sales correlated at the firm level? The question is relevant in that the sign of the correlation shapes the international transmission of shocks and the effects of policy measures. From a theoretical perspective, the correlation could be either zero, as assumed by standard international trade models, or negative if firms are capacity constrained, or positive if liquidity constraints dominate. The empirical evidence, however, is rather mixed. Using a sample of Italian manufacturing firms in the period 2001-12, we show that: i) the sign of the correlation changes over the business cycle, being negative in the first part of the past decade and positive after the 2008 crisis; ii) all the channels suggested by the literature are involved and they may explain the time-varying correlation; iii) the drop in domestic sales by Italian firms in 2012, contributed negatively to firms' exports, and together with liquidity constraints, the fall reduced the growth rate of exports by an average of 0.6 percentage points.

**JEL Classification:** F10, F12, F14, L11.

**Keywords:** domestic sales, export, credit, liquidity and capacity constraints.

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## 1. Introduction

Do the dynamics of a firm's sales in foreign and domestic markets affect each other? The question is relevant for various reasons. It has obvious, direct, bearings for the international transmission of shocks. Moreover, the response of a country's GDP to a given shock turns out to be amplified when foreign and domestic sales are complements, but it is attenuated when they are substitutes. A non-zero correlation implies also that any policy measure affecting domestic sales has an impact on exports, and vice versa. Finally, the existence of such a link could help partly explain the well-known difficulty of price competitiveness indicators to track export performance.

The issue could be even more relevant in the context of the European sovereign debt crisis. For a country like Italy, the standard interpretation is that the 2012-2013 recession has been the result of the collapse in domestic demand that followed significant credit and fiscal restrictions, while exports has sustained growth thanks to international competitiveness gains. An alternative view, that relies on the widespread presence of liquidity constrained firms and/or a reduction in production potential, is that the fall in domestic demand may have also hurt the exporting capacity of firms<sup>1</sup>.

From a theoretical perspective, when the level of demand changes in one market, the size and the sign of the correlation between sales in such a market and sales in other markets depend on the interplay of various factors: on the slope of the marginal cost curve around the initial equilibrium output (for example, if firms face constant marginal costs, profit maximization implies no link between the two markets), on the elasticity of demand in different markets, on the presence of financial constraints that may limit the firm's capacity to adjust the production scale or to pay for fixed exporting costs, on the degree of economies of scale in production.

For all these reasons, the study of this correlation is largely an empirical matter. Focusing on the interaction between domestic and foreign sales, several papers find a *negative* relationship and explain it in terms of capacity constraints. As pointed out by Soares Esteves and Rua (2013), who look at Portuguese time-series data, when domestic demand is high, firms working at full capacity are not able to allocate resources to satisfy increasing foreign demand in the short run. Instead, when domestic demand is weak, firms put more effort into exporting activity to compensate for the decline in domestic sales. Using data on Thai firms, Soderbery (2011) shows that the negative correlation mainly depends on firms that are constrained in terms of both physical capacity and financial means; when domestic demand increases, liquidity-constrained firms cannot expand their production capacity and therefore are forced to cut their exports. Ahn and McQuoid (2012) and Blum, Claro and Horstmann (2013) confirm this result for Chilean and Indonesian firms. Vannoorenberghe (2012) builds and successfully tests on French firms a model where a convex cost function explains both the negative relationship and the volatility of domestic and foreign sales.

Liquidity or credit constraints may also generate a *positive* correlation<sup>2</sup>. For example, a collapse of domestic sales may indeed aggravate a firm's liquidity shortages or credit constraints and thus

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<sup>1</sup> De Nardis (2014) recalls that in Italy manufacturing exporters, which are 20 per cent of all manufacturing firms, make on average 63 per cent of their total sales on the domestic market. This is to say that for most of them a collapse of domestic demand represents a significant shock to their revenues.

<sup>2</sup> This is also true in the case of economies of scale in production where a positive (negative) demand shock in one market increases (decreases) the production scale and decreases (increases) average cost, promoting (hindering) sales in the other market.

limit its ability to bear the costs for selling abroad. On a sample of French firms analyzed over the period 1995-2001, Berman et al. (2011) show the opposite link. They find that a 10 per cent exogenous increase of exports generates a short run increase of domestic sales in the order of 1.5-3 per cent <sup>3</sup>. Their evidence is in favor of the liquidity channel. In particular, they find that firms belonging to sectors in which the need for short-term liquidity is higher – due to higher working capital requirement - have a higher positive correlation between domestic and foreign sales.

The liquidity/credit constraints story suggests that a non-zero correlation between foreign and domestic sales can also affect the composition of the pool of exporters. If for instance small firms – which are typically more dependent on domestic sales – are also more frequently credit/liquidity constrained, a fall in domestic sales will affect them more than larger exporters. An analogous composition effect may occur to the disadvantage of firms or sectors which have higher working capital requirements for technological or life-cycle reasons (e.g., newly born firms).

In this paper we estimate the correlation between the dynamics of domestic and foreign sales using a sample of Italian manufacturing firms over the period 2001-12. We deem our contribution be particularly interesting for a number of reasons.

To the best of our knowledge, ours is the first exercise based on a particularly rich firm-level database. Indeed, the Bank of Italy yearly survey on industrial and non-financial service firms (Invind, hereinafter) provides us with measures of both (a) credit constraints (as measured by firms' intentions to ask for credit to banks) and (b) capacity utilization (as a percentage of maximum physical output). Contrary to previous works, these two measures allow us to test, with some precision and at the firm level, the capacity constraints and the credit constraints hypotheses at the same time. Merging Invind with balance sheet data we can also derive firm-level indicators of liquidity.

The focus on the recent Italian experience is interesting in many respects. First, the period under analysis (2001-12) comprises a “business-as-usual” period (2001-2007) along with two phases where foreign and domestic sales recorded very large (negative) fluctuations: the 2008-09 “sudden stop” in world trade after the Lehman collapse and the significant contraction of domestic demand that followed the sovereign debt crisis exploded in the summer of 2011. The latter recession saw also a credit crunch and widespread liquidity shortages (Bonaccorsi di Patti and Sette, 2012; Gaiotti, 2013; Cingano et al., 2013), implying that we have all the ingredients – *inter alia* on a magnified scale – needed to estimate the importance of the liquidity and credit hypotheses. Second, the recent developments of the Italian economy have been characterized by a high and growing firm heterogeneity. Analyses conducted at the Bank of Italy have shown how differently firms were hit and reacted to similar shocks: this happened both before and during the Great Recession and produced a large variance in terms of sales growth (both domestic and foreign), capacity utilization, liquidity and credit constraints. We can therefore exploit significant cross-sectional and time series heterogeneity at the same time.

In the first part of our sample period (2001-07), neither foreign nor domestic sales were subject to exceptional fluctuations at the macro level; this period could help us to identify the role of capacity constraints using the cross-sectional variance of the data. The Lehman default in

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<sup>3</sup> They use a variety of instruments for French foreign sales: from product-destination specific imports to tariffs, from financial crises to civil wars. Their results are valid in cases where the dynamics of foreign demand is either positive or negative, even if the effect is slightly larger in the latter case.



September 2008 endows us with an abrupt global trade collapse that first triggered some financial pain for industrial firms. Since the summer of 2011, the collapse of domestic demand caused by the sovereign debt crisis and the subsequent credit crunch worsened firms' conditions; very likely, the relevance of capacity constraints decreased significantly for most firms, while that of credit and liquidity constraints grew. As a result, and differently from the previous literature, we can test whether the sign of the correlation between foreign and domestic sales changes over time: all the channels described above can be at play at different intensity in different periods.

Our empirical analysis focuses on simple correlations with no attempt at causal interpretation. This is indeed the main goal of the paper, that is unveiling the existence of a non-zero correlation and identifying different sources of heterogeneity. Nonetheless, in order to isolate the channels listed above we also control for other factors that could affect the correlation between the dynamics of domestic and foreign sales. In particular, we include year dummies to control for worldwide shocks like the one that hit world trade in 2008-09, sector- (and also sector&year-) dummies to account for sector-specific shocks and firm-fixed effects to exclude that firm-level unobservable characteristics affect a firm's ability to compete in any market. Importantly, the correlation we estimate for 2011-12 can be seen as the result of a shock to domestic demand that, being due to the fiscal contraction and the credit crunch following Italy's sovereign debt crisis, is very likely exogenous to the single firm and, in particular, to its exports.

Our findings are the following. First, during the whole period (2001-2012) the correlation between foreign and domestic sales is not significantly different from zero. However, a negative correlation until 2007 is followed by a large and positive correlation in both 2008-2010 (Great Recession) and 2011-12 (sovereign debt crisis). Based on the estimated correlations, in 2012 the drop in domestic sales may have reduced the growth of foreign sales by 0.6 percentage points (as a reference, export grew 4.7 per cent in our sample). Such a contribution is not exceedingly large, but still economically significant. The impact is even more relevant, in the order of 1.5 pp, if one considers the subset of firms that do export, but still largely rely on domestic demand. Second, all channels suggested by the literature are at play. This may explain the time-varying correlation between domestic and foreign sales. While capacity constraints give rise to a negative correlation, credit and liquidity constraints lead to a positive one. According to our results, the positive correlation in 2011-12 can be attributed to the aggravation and diffusion of liquidity problems and to the attenuation of capacity constraints due to increased slack at the firm level. These results on the channels can be seen as a further piece of evidence that the correlation between the dynamics of domestic and foreign sales we find is not spuriously driven by some misspecification (e.g., omitted variables).

The paper is organized as follows. In the next section we summarize the main features of the dataset. Section 3 provides some descriptive evidence while a more systematic empirical analysis is described in section 4. The last section concludes.

## 2. Data

Our firm-level data come from two sources. The first is Invind, the Bank of Italy survey on industrial and non-financial service firms with at least 20 employees<sup>4</sup>. This survey, which is stratified according to firms' branch of activity, size class and geographical areas, is conducted since 1984 on a yearly basis and collects data on many relevant variables like governance structure, domestic and foreign sales, investments, output prices, employment (level and composition). Importantly for our purposes, firms are asked to provide an estimate of the degree of capacity utilization, which is defined, as in other business surveys, as a percentage of the maximum physical output they can produce, and to give an indication on whether they have been credit constrained. For the latter, we classify firms as credit rationed if they answer positively to the following questions: (1) the firm would have liked to receive more credit at current conditions; and (2) the firm approached to an intermediary but the credit was denied (see also Gaiotti, 2013 for a similar use of this variable).

Invind is merged with the Company Accounts Data Service (CADS) that provides balance sheet information on a large sample of Italian firms, with a very good coverage of large firms. We use CADS data to get balance-sheet a proxy for liquidity, equal to the ratio between total short term assets and total short term debts (the so-called current ratio).

Since we focus on firms' exports and want to work with a larger sample comprising also smaller firms – those that are more likely to be credit or liquidity constrained and more reliant on domestic demand –, we restrict the Invind sample to manufacturing firms and to the period from 2001.

## 3. Preliminary evidence

In Figure 1 we plot the distribution of yearly changes of foreign sales (panel a) and domestic sales (panel b) during the period 2001-12. Both measures declined considerably in 2009, but their trends diverged after 2011, when the sovereign debt crisis affected only domestic sales. The figure allows to appreciate the rich cross-sectional variance in our data: in 2011-12 the distribution of firm-level growth rates of domestic sales ranged from -50 to 50 per cent.

A first look at the time-varying correlation between the growth rate of foreign and domestic sales is provided in Figure 2 which plots the value of the time-varying coefficient  $\beta_t$ , computed from the following regression:

$$\Delta f_{it} = \beta_t \Delta d_{i,t} + \gamma_t + \gamma_s + \gamma_{t,s} + u_{it} \quad [1]$$

where  $\Delta f_{it}$  and  $\Delta d_{it}$  are the annual percentage changes of, respectively, exports and domestic sales,  $\gamma_t$  are year-fixed effects,  $\gamma_s$  are sector-fixed effects,  $\gamma_{t,s}$  are joint time- and sector-fixed effects. Being time-varying the coefficient  $\beta_t$  is a measure of the year-by-year correlation once common and sector-time trends are accounted for. The dashed green lines delimit the 90 per cent confidence intervals. As clear from panel (a) of Figure 2, the correlation is not statistically different from zero at the beginning of the period but it becomes positive during the Global Recession. In panel (b),

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<sup>4</sup> Over the years, the Invind's sample has been subject to various changes, the most relevant one in 2001 when the reference population, originally composed of firms with at least 50 employees, was enlarged to include also firms with 20-49 employees.

where we also control for firm-fixed effects, the increase in the correlation after the Lehman default is even larger, suggesting that the positive correlation found in panel (a) is not due to omitted firm-specific characteristics.

The changes in the correlation over the cycle can be better appreciated by estimating  $\beta$  over three separate sub-periods: a business-as-usual period (2001-07), the 2008-09 sudden stop in world trade after the Lehman collapse and the last phase (2011-2012) dominated by the sovereign debt crisis. We therefore estimate a different version of equation [1], namely:

$$\Delta f_{it} = \theta f_{i,t-1} + \beta_p \Delta d_{it} + \delta_p \Delta d_{it} * Y_i + \gamma_i + \gamma_s + \gamma_t + \gamma_{t,s} + u_{it} \quad [2]$$

where, in addition to variables already defined in equation 1,  $\gamma_i$  are firm-fixed effects,  $f_{it-1}$  denotes the level of foreign sales  $f$  at time  $t - 1$ ,  $Y_i$  is a set of firm-specific characteristics that we interact with  $\Delta d_{it}$ . The coefficients  $\beta_p$  and  $\delta_p$  are allowed to vary over the three sub-periods (p=1,2,3).

The results are shown in Table 1. In column (1), where the coefficient  $\beta$  is not time-varying, the correlation between the dynamics of domestic and foreign sales is not significantly different from zero. When we allow for different  $\beta_p$ , the estimated correlation is always significantly different from zero: it is negative until 2007 and positive in the two subsequent periods (2008-10 and 2011-12; column 2). These results are fully confirmed when we control for sector-year dummies (column 3) or for type of product (investment, intermediate or consumption good)year dummies (column 4), i.e., for sector or product-specific business cycles.

In the last two columns we take care of the possibility that the positive correlation estimated after 2008 is spuriously due to omitted firm-specific variables (e.g., good firms may perform well in both markets, while less efficient ones record a negative performance everywhere). In column 5, we interact the change of domestic sales with firm-level average labor productivity (proxied by sales per worker) as computed over the period 2001-2007 – thus before the period of interest – and also allow the estimated coefficient of this interaction term to differ across the three sub-periods. We find that the interaction term has indeed a positive and significant coefficient (which is also identical in the three sub-periods), but the main results are unchanged.

Finally, one may argue that our results come from international business cycle correlation: in this case the estimated  $\delta_p$  should be (spuriously) larger for firms exporting in the EU countries, whose business cycles are more likely synchronized with the Italian one. This is not the case, as shown in column 6 where the share of exports towards EU (measured as of 2006) is interacted with the yearly change of domestic sales. The estimated coefficient on this variable is not statistically significant from zero and the other results do not change.

As a further check, we modify equation [2] to let the coefficients  $\delta_p$  differ between firms that are almost “pure exporters” and firms that export but also sell a substantial portion of their production on the domestic market. We expect a larger positive correlation between the evolution of domestic demand and the ability to export for those firms that are more domestic-oriented. To this aim, we split the sample into two groups depending on the share of exports being above or below average<sup>5</sup>. The results, reported in Table 2, show that in 2011-12 the correlation is positive for

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<sup>5</sup> For each firm the average share is computed over the period 2001-2007. For the 2012 sample, about 60 (40) per cent of firms have a higher (lower) than average export share. Firms entering Invind after 2007 are excluded from these estimates.

both groups of firms but, as expected, much higher among those that are relatively more dependent on domestic demand.

To get an assessment of the economic relevance of the estimated correlation, we use the results shown in column (1) of Table 1 and calculate the following:

$$\widehat{\Delta f}_t = \widehat{\theta} \widehat{f}_{t-1} + \widehat{\beta}_p \widehat{\Delta d}_t + \gamma$$

where the symbol “ $\widehat{\phantom{x}}$ ” denotes estimated values and the bar denotes the sample average of the variable in year  $t$ ;  $\gamma$  captures the average of the estimated firm- and year-fixed effects. The term  $\widehat{\beta}_p \widehat{\Delta d}_t$  measures the change in total foreign sales growth associated to the observed change in domestic sales.

Figure 3 reports  $\widehat{\Delta f}_t$  and  $\widehat{\beta}_p \widehat{\Delta d}_t$  from 2001 to 2012. Before 2008 the contribution of  $\widehat{\beta}_p \widehat{\Delta d}_t$  to the dynamics of exports is negative and negligible. Afterwards, when the correlation between sales growth across markets becomes positive, we find a significant contribution of  $\widehat{\beta}_p \widehat{\Delta d}_t$  to export growth. In 2009 the drop of domestic sales occurred immediately after the Lehman default was associated to a 2 percentage points drop in foreign sales (out of a total 14 percent drop). In 2012 the collapse of domestic sales, amounting on average to 5 per cent, reduced export growth by 0.6 percentage points (out of a total drop equal to 4.7 per cent).

Using the estimates from Table 2, Figure 4 reproduces Figure 3 for two different sets of firms. Quite clearly, in 2012 the contribution of  $\widehat{\beta}_p \widehat{\Delta d}_t$  to the dynamics of exports has been negative and particularly strong for those firms with an export share lower than average: we estimate an impact equal to -1.5 percentage points, out of a positive growth of 4.2 per cent.

#### 4. Searching for mechanisms

How can we explain a non-zero correlation between sales in domestic and foreign markets? Why may such a correlation change sign over the cycle? To answer these questions, we need to focus on the different supply-side factors that the theory has proposed as possible mechanisms generating a co-movement of sales across markets. To this purpose, we exploit the high firm-level heterogeneity we have in our data in terms of liquidity, credit and capacity constraints. The underlying idea is that the average correlation changes over time with the changing proportion of firms that are either liquidity/credit or capacity constrained. The huge and “exogenous” shocks that hit the Italian economy since 2008 offer an ideal environment in that both liquidity and credit difficulties and productive slackness increased significantly.

Empirically, we estimate the following equation :

$$\Delta f_{it} = \theta f_{i,t-1} + \beta_1 \Delta^+ d_{it} + \beta_2 \Delta^- d_{it} + \delta_1 \Delta^+ d_{it} * X_{i,t-1} + \delta_2 \Delta^- d_{it} * X_{i,t-1} + \theta X_{i,t-1} + \gamma_i + \gamma_t + u_{it} \quad [3]$$

where  $\Delta^+$  is a positive change in domestic sales,  $\Delta^-$  is a negative change,  $X_{i,t}$  is the intensity of either liquidity, credit or capacity constraints (as specified below),  $\gamma_i$  are firm-fixed effects and the other variables are defined as in the previous equations.  $X_{t-1}$  are one-period lagged to limit the effects of possible reverse causation.

We start from credit and liquidity constraints. Short-run liquidity and credit constraints may prevent firms from buying intermediate goods and affording the additional per-period costs

associated to export (see the broad literature following Melitz, 2003). Therefore, for highly constrained firms the correlation between the dynamics of domestic and foreign sales should be positive as the liquidity generated by domestic sales might be needed to finance the exporting activity.

Credit constraints and liquidity shortages were particularly severe since 2008, and especially during the sovereign debt crisis. We consider two measures: the share of firms that declare to have been denied credit (Gaiotti, 2013) and the ratio between short term assets and short term debts (known as the current ratio). As shown in Figure 5, the share of credit constrained firms in our sample increased from 6 per cent on average in the period before 2008 to 11 per cent in 2012. Liquidity followed a different pattern: after 2008 the current ratio increased on average and for firms with a relatively high liquidity ratio (75<sup>th</sup> percentile of the distribution of firms according to the level of the current ratio), suggesting an explicit strategy to accumulate liquidity in response to credit restrictions; this accumulation has been weaker and turned into a decline after 2010, particularly for firms with a lower current ratio (25<sup>th</sup> percentile of the distribution; Figure 6).

Table 3 reports the estimates of equation [3] with  $X_{it-1}$  defined as the current ratio (the higher the value of the current ratio, the higher a firm's liquidity). We find, as expected, that the positive correlation between changes in sales across markets is smaller for firms with higher liquidity, as shown by the negative coefficient on the interaction term  $d_{it}X_{it-1}$  in column (1). When we allow for a separate coefficient on positive and negative changes in domestic sales, we find that the above-mentioned effect applies only when domestic sales contracts (column 2). This is to say that liquidity problems are binding only when cyclical conditions worsen.

In Table 4 we substitute the current ratio with the credit constraints dummy. The results reported in column 2 are similar to those shown in Table 3. Nevertheless, they also suggest that when domestic sales drop, firms that are not subject to credit constraints manage to substitute domestic with foreign sales, while credit constrained firms are forced to cut their exports.

We then address the role of capacity constraints. As mentioned, they could help explain a negative short-run correlation between changes in domestic sales and in exports (e.g. Ahn and McQuoid, 2012, Blum et al. 2013, Berman et al. 2011). When capacity utilization is high, firms should be less able to increase their sales in both markets so that high capacity utilization should induce a negative correlation. To this aim, we use the index of capacity utilization collected by Inwind from 2001 to 2012. As clearly emerges from Figure 7, the recent crisis determined a big drop in capacity utilization on average, much larger, in 2009 and 2012, at the 25<sup>th</sup> percentile of the distribution of capacity utilization, i.e., among firms with a larger productive slackness to start with.

Table 5 shows the estimates of equation [3] when  $X_{it-1}$  is equal to our measure of capacity utilization. As expected, we find that the coefficients of the interaction terms are statistically significant and negative. This occurs both when we do not (column 1) and we do (column 2) distinguish between negative and positive changes of domestic sales.

The evidence shown in Tables 3-5 looks compatible with a world where the liquidity/credit and the capacity channels are at work simultaneously on different sets of firms and in different periods. In Table 6 and 7 we explicitly address this issue. We first focus on liquidity and capacity constraints. Column (2) of Table 6 shows that: *a*) a positive coefficient links changes in domestic and foreign sales, for both increases and decreases of domestic sales; *b*) these positive coefficients are reduced, and can even turn negative, when capacity constraints become binding; *c*) at low levels of liquidity

and in case of domestic demand contractions, the positive correlation increases. The results are fully confirmed when we add sector-time dummies to control for sectoral shock that could be driving the correlation between domestic and foreign sales (column 3).

Similar results apply when replacing the current ratio with the credit constraints dummy (Table 7): a positive correlation after a reduction of domestic demand is fully due to credit constrained firms; capacity constraints induce a negative correlation only after an expansion of domestic demand.

These results imply that the degree of substitutability/complementarity of domestic and foreign sales depends on firms' characteristics in different states of the economy. Figure 8 reports the change in foreign sales ( $\Delta f$ ) associated to the change in domestic sales ( $\Delta d$ ) for different "types" of firms, based on the estimates presented in column 2 of Table 6 and focusing on the 2012 recession<sup>6</sup>. We distinguish four cases, according to whether firms face liquidity constraints and have large margins of spare productive capacity: *a*) low liquidity and low capacity utilization: the current ratio equal to the 25<sup>th</sup> percentile of its distribution in 2012, and capacity utilization equal to the 25<sup>th</sup> percentile; *b*) low liquidity and binding capacity constraints: the current ratio equal to the 25<sup>th</sup> percentile, capacity utilization equal to the 75<sup>th</sup> percentile; *c*) high liquidity and low capacity utilization: the current ratio equal to the 75<sup>th</sup> percentile, capacity utilization equal to the 25<sup>th</sup> percentile; *d*) with high liquidity and binding capacity constraints: the current ratio equal to the 75<sup>th</sup> percentile, capacity utilization equal to the 75<sup>th</sup> percentile.

As shown in Figure 8, the slope of the relation between the growth rate of domestic sales and that of foreign sales is significantly different for the four types of firms. A strongly positive slope, meaning that foreign and domestic demand are complements, applies for illiquid firms with large spare capacity: in this case a 10 per cent fall in domestic sales, combined with a change from the 75<sup>th</sup> to the 25<sup>th</sup> percentile of the distribution of liquidity, is associated to a 2 p.p. fall in foreign sales. This slope decreases as capacity constraints become more binding. It becomes negative when firms face no liquidity constraint and work with a high degree of capacity utilization: in this case domestic and foreign sales are substitutes.

## 5. Concluding remarks

In the debate on the disappointing performance of the Italian economy, the role of a very weak and even contracting domestic demand is commonly seen only from one angle: it is a direct drag on growth. Often this calls for measures to gain international competitiveness and increase exports, as a substitute to domestic demand.

In this paper we have presented evidence that unveils a more complex link. Depending on some supply side features, the dynamics of domestic demand can be directly correlated to that of exports: foreign and domestic demand can be complement. Our results offer a new interesting perspective to interpret a period, like the one Italy entered after the sovereign debt crisis burst in the summer of 2011, where the growth of domestic demand was negative, the availability of credit was sharply reduced and firms' liquidity difficulties became serious and diffuse. In light of these results, economic policy should consider that export growth may be adversely affected by the developments on the domestic market, with an intensity that depends on the severity of the credit crunch and the liquidity shortage and on the existence of unused capacity.

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<sup>6</sup> Thus we set  $f_{t-1}$  equal to the 2011 average.

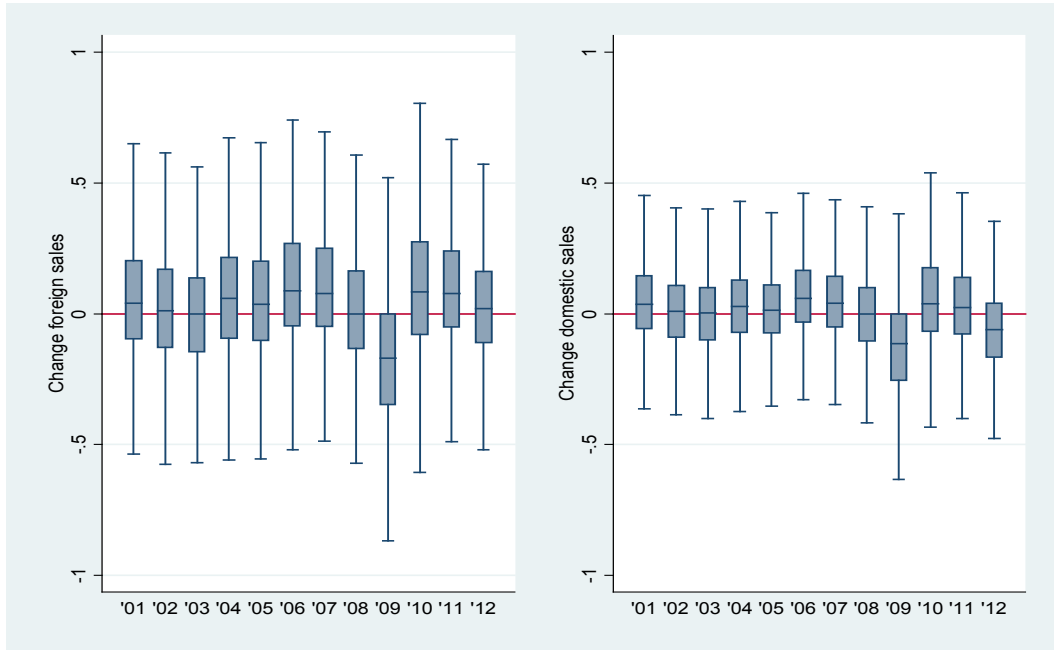
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## Tables and figures

Fig.1

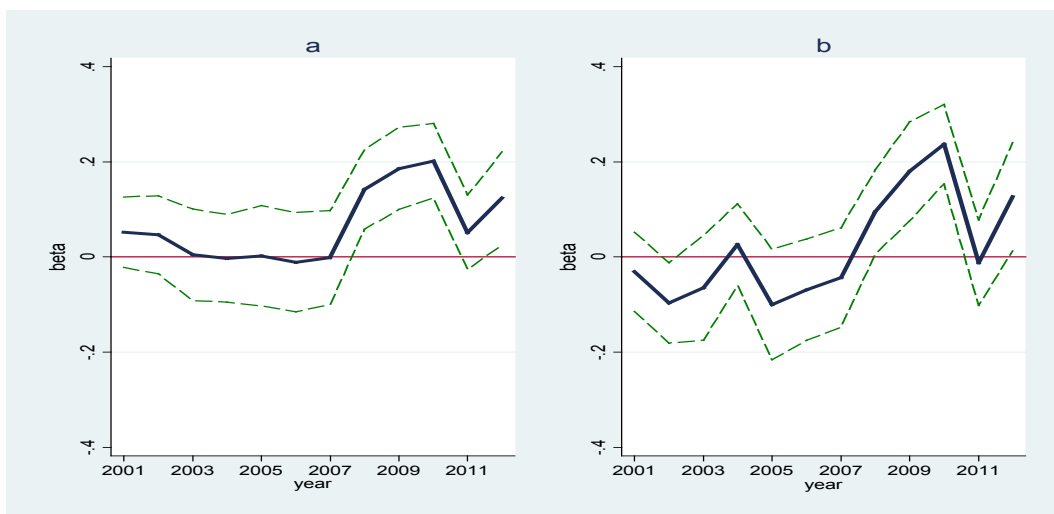
**Box plot of the distribution of annual percentage changes of domestic and foreign sales, 2001-2012**



Notes: Authors' elaborations on Invid data

Fig.2

**Correlation between the growth rate of domestic and foreign sales, 2001-2012**  
(OLS estimates; sector and time dummies in panel a; time dummies and firm FE in panel b)



Notes: Authors' elaborations on Invid data. The figure reports the OLS coefficients (distinct by year) of a regression of the percentage changes in foreign sales and the percentage change in domestic sales. Robust standard errors. OLS coefficients in the solid blue line; confidence intervals at 90% in the dashed green lines.



Tab. 1

**Correlation between the annual growth rate of domestic and foreign sales, by period and type of firm (1)**

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. var.: $\Delta$ exports						
Log export (t-1)	-0.1573*** (0.0086)	-0.1572*** (0.0086)	-0.1579*** (0.0087)	-0.1707*** (0.0108)	-0.1563*** (0.0087)	-0.1766*** (0.0147)
$\Delta$ dom. sales	0.0254 (0.0166)	-0.0562** (0.0230)	-0.0691*** (0.0232)	-0.0853*** (0.0270)	-0.0743*** (0.0241)	-0.1347** (0.0577)
Period 2* $\Delta$ dom. sales		0.2170*** (0.0377)	0.2012*** (0.0383)	0.2157*** (0.0432)	0.1951*** (0.0431)	0.1996** (0.0998)
Period 3* $\Delta$ dom. sales		0.1294*** (0.0481)	0.1411*** (0.0486)	0.1605*** (0.0543)	0.1594*** (0.0578)	0.2751** (0.1379)
$\Delta$ dom. sales*Average prod. (2)					0.0001** (0.0000)	
Period 2* $\Delta$ dom. sales* Av. prod. (2)					0.0001 (0.0001)	
Period 3* $\Delta$ dom. sales* Av. prod. (2)					-0.0001 (0.0001)	
Share exported in EU (3)						0.0007 (0.0009)
Period 2* $\Delta$ dom. sales* Share in EU (3)						0.0009 (0.0015)
Period 3* $\Delta$ dom. sales* Share in EU (3)						-0.0022 (0.0020)
Firm fixed effects	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes	yes
Sector*time dummies	no	no	yes	no	no	no
Type of good*time dummies	no	no	no	yes	no	no
No. of obs.	26,328	26,328	26,328	20,172	24,603	10,645
R-squared	0.31	0.31	0.32	0.33	0.30	0.23

Notes: OLS estimates. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . (1) Period 1 (reference period, excluded)=2001-07; period 2=2008-10; period 3=2011-12. (2) Firms' average of sales per workers from 2001 to 2007. (3) Firms' average share of exports towards EU in total foreign sales before the Global financial crisis.

Tab. 2

**Correlation between the annual growth rate of domestic and foreign sales, by period and export share**

Dep. Var.: $\Delta$ exports	(1)	(2)	(3)
	Low export share	High export share	Total
Log export (t-1)	-0.1647*** (0.0114)	-0.1465*** (0.0127)	-0.1575*** (0.0086)
$\Delta$ dom. sales	-0.0211 (0.0694)	-0.0678*** (0.0184)	
Period 2* $\Delta$ dom. sales	0.2360** (0.0982)	0.1913*** (0.0372)	
Period 3* $\Delta$ dom. sales	0.2723** (0.1339)	0.0849* (0.0508)	
$\Delta$ dom. sales*Low share			-0.0340 (0.0686)
Period 2* $\Delta$ dom. sales *Low share			0.2371** (0.0959)
Period 3* $\Delta$ dom. sales *Low share			0.2617** (0.1301)
$\Delta$ dom. sales*High share			-0.0656*** (0.0187)
Period 2* $\Delta$ dom. sales*High share			0.2095*** (0.0354)
Period 3* $\Delta$ dom. sales*High share			0.0885** (0.0450)
Firm fixed effects	yes	yes	yes
Time dummies	yes	yes	yes
No. of obs.	11,995	12,621	26,333
R-squared	0.30	0.31	0.31

Notes: OLS estimates. Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. (1) Firms with average share of foreign sales in total sales lower than the sample average in the period 2001-07; (2) Firms with average share of foreign sales in total sales higher than the sample average in the period 2001-07.

Fig. 3

The estimated contribution of the change in domestic sales to the dynamics of exports, average

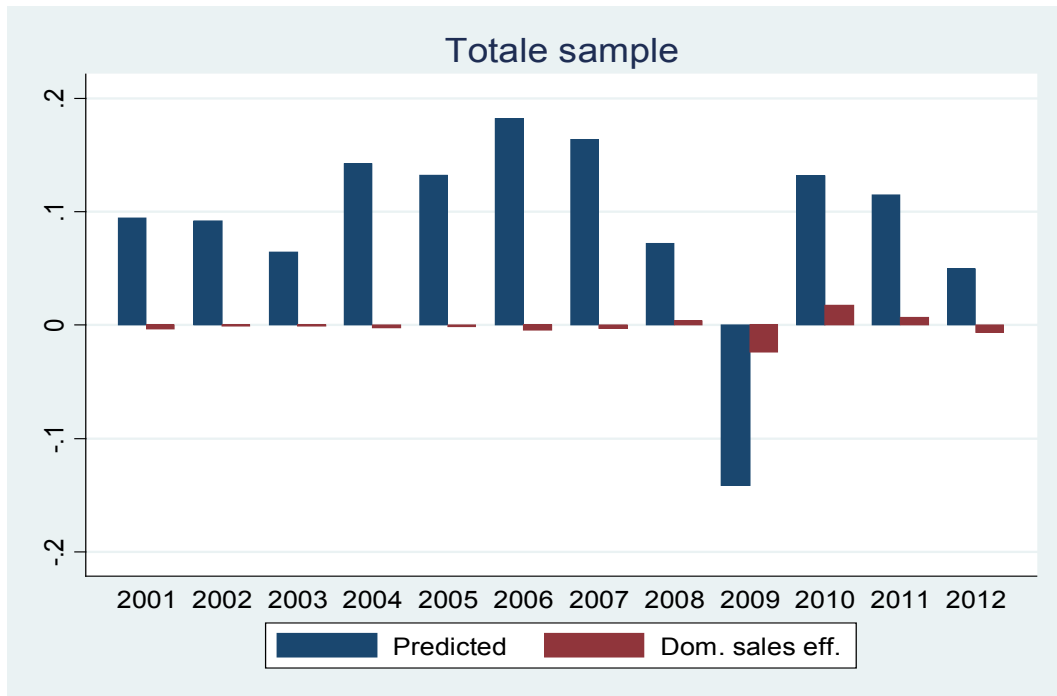


Fig. 4

The estimated contribution of the change in domestic sales to the dynamics of exports, by firms' export share

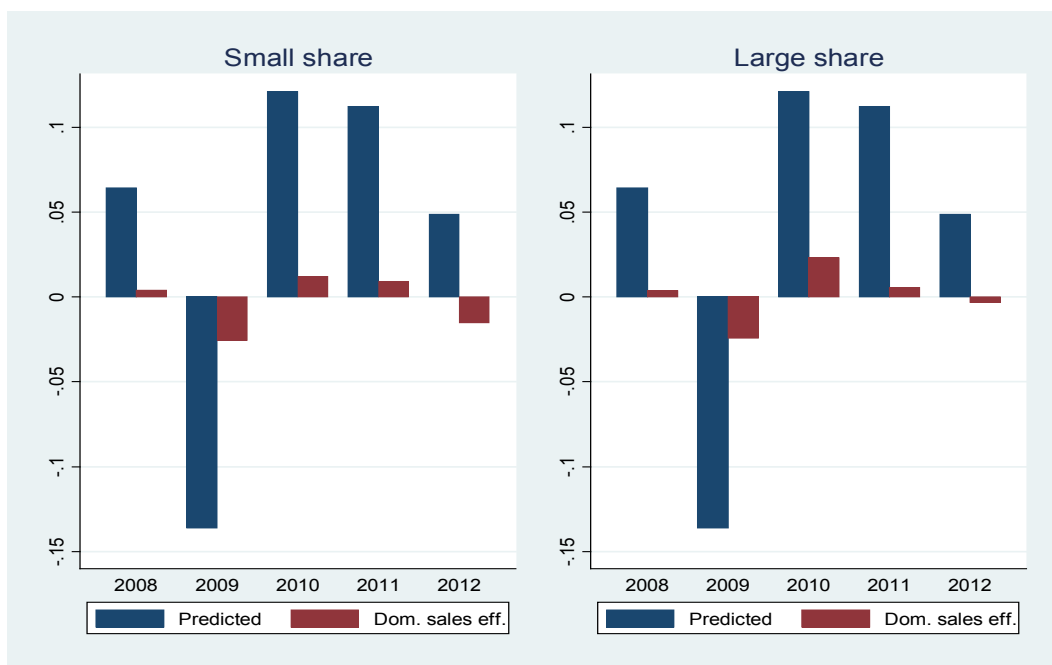
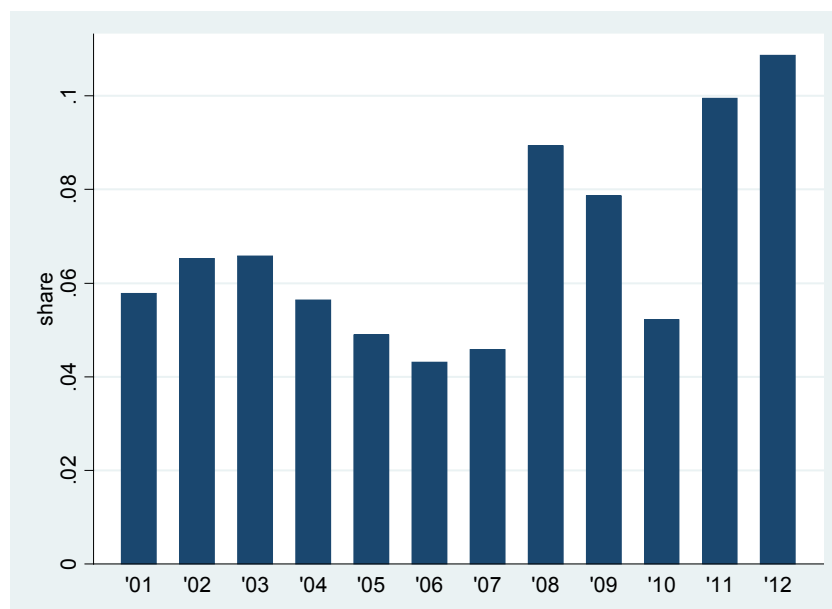


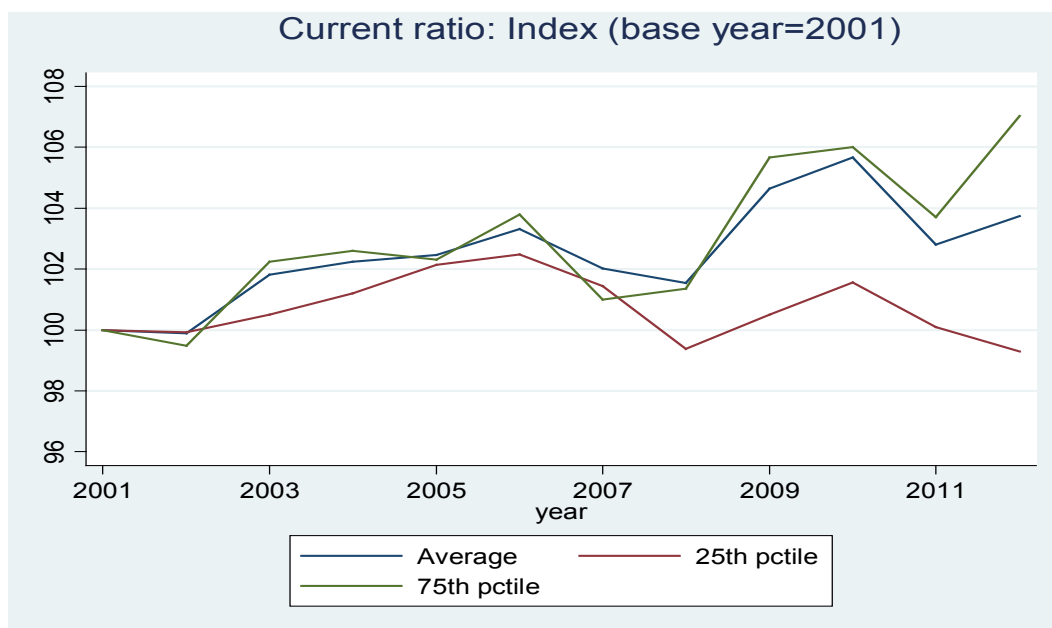
Fig. 5

Share of credit-constrained firms, by year



Notes: Authors' elaborations on Invind data. Credit constrained firms are those stating they would have liked to receive more credit at current conditions, they approached an intermediary but credit was denied. Shares have been calculated excluding missing values.

Fig. 6



Notes: Authors' elaborations on Invind and CADS data The current ratio is equal to the ratio between short-term assets and short-term debts.

Tab. 3

## The effect of liquidity

Dep. Var.: $\Delta$ exports	(1)	(2)
Export (t-1)	-0.1735*** (0.0121)	-0.1736*** (0.0121)
$\Delta$ dom. sales	0.1111** (0.0553)	
$\Delta^-$ dom. sales		0.1342 (0.1175)
$\Delta^+$ dom. sales		0.0984 (0.0865)
Current ratio (t-1)	-0.0326** (0.0129)	-0.0413*** (0.0149)
$\Delta$ dom. Sales*Current ratio (t-1)	-0.0687* (0.0383)	
$\Delta^-$ dom. sales *Current ratio (t-1)		-0.1453* (0.0824)
$\Delta^+$ dom. sales*Current ratio (t-1)		-0.0298 (0.0605)
Firm fixed effects	yes	yes
Time dummies	yes	yes
No. obs.	18,584	18,584
R-squared	0.31	0.31

Notes: OLS estimates Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . The current ratio is equal to the ratio between short-term assets and short-term debts.

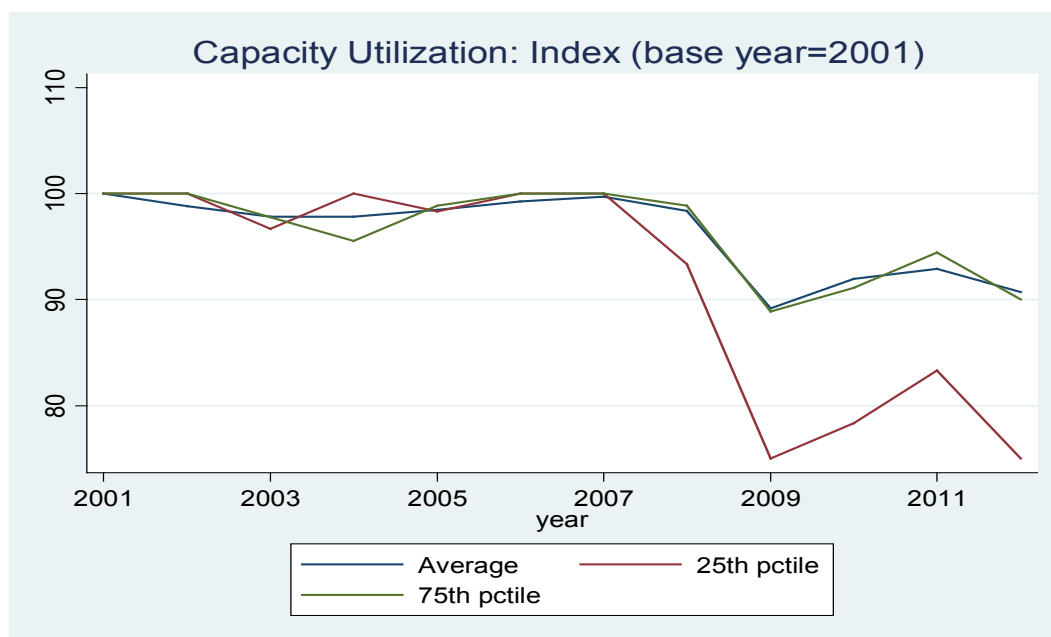
Tab. 4

## The effect of credit constraints

Dep. Var.: $\Delta$ exports	(1)	(2)
Export (t-1)	-0.1765*** (0.0110)	-0.1768*** (0.0110)
$\Delta$ dom. sales	-0.0028 (0.0188)	
$\Delta^-$ dom. sales		-0.0836* (0.0429)
$\Delta^+$ dom. sales		0.0366 (0.0283)
Credit constr. (t-1)	-0.0191 (0.0222)	0.0070 (0.0310)
$\Delta$ dom. sales* Credit constr. (t-1)	0.0925 (0.0755)	
$\Delta^-$ dom. sales*Credit constr. (t-1)		0.2608* (0.1396)
$\Delta^+$ dom. sales*Credit constr. (t-1)		-0.0059 (0.1217)
Firm fixed effects	yes	yes
Time dummies	yes	yes
No. obs.	21763	21763
R-squared	0.31	0.31

Notes: OLS estimates Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Credit constrained firms are firms which state that they would like to receive more credit at current conditions and they approached to an intermediary and credit was denied. Shares calculated excluding missing values.

Fig. 7



Notes: Authors' elaborations on Invind data. The capacity utilization index is based on firms' assessment about the actual use of plant and equipment expressed as a percentage of the firm's full capacity.

Tab. 5

### The effect of capacity constraints

	(1)	(2)
Dep. var.: $\Delta$ exports		
Export (t-1)	-0.1650*** (0.0126)	-0.1651*** (0.0126)
$\Delta$ dom. sales	0.4187*** (0.1128)	
$\Delta^-$ dom. sales		0.3870* (0.2165)
$\Delta^+$ dom. sales		0.4327** (0.1714)
Capacity utiliz. (t-1)	-0.0004 (0.0004)	-0.0004 (0.0005)
$\Delta$ dom. sales * Capacity utiliz. (t-1)	-0.0049*** (0.0014)	
$\Delta^-$ dom. sales * Capacity utiliz. (t-1)		-0.0053** (0.0027)
$\Delta^+$ dom. sales * Capacity utiliz. (t-1)		-0.0047** (0.0021)
Firm fixed effects	yes	yes
Time dummies	yes	yes
No. obs.	15966	15966
R-squared	0.31	0.31

Notes: OLS estimates Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . The capacity utilization index is based on firms' assessment about the actual use of plant and equipment expressed as a percentage of the firm's full capacity.

Tab. 6

## The joint effect of liquidity and capacity constraints

Dep. var.: $\Delta$ exports	(1)	(2)	(3)
Export (t-1)	-0.1802*** (0.0144)	-0.1802*** (0.0144)	-0.1808*** (0.0147)
$\Delta$ dom. sales	0.5375*** (0.1422)		0.5400*** (0.1416)
$\Delta^-$ dom. sales		0.6487** (0.2648)	
$\Delta^+$ dom. sales		0.4737** (0.2176)	
Current ratio (t-1)	-0.0366*** (0.0137)	-0.0471*** (0.0160)	-0.0330** (0.0138)
$\Delta$ dom. sales*Current ratio (t-1)	-0.0825* (0.0435)		-0.0866** (0.0435)
$\Delta^-$ dom. sales*Current ratio (t-1)		-0.1743* (0.0931)	
$\Delta^+$ dom. sales*Current ratio (t-1)		-0.0341 (0.0710)	
Capacity utiliz. (t-1)	-0.0004 (0.0005)	-0.0005 (0.0006)	-0.0005 (0.0005)
$\Delta$ dom. sales*Capacity utiliz. (t-1)	-0.0051*** (0.0015)		-0.0053*** (0.0015)
$\Delta^-$ dom. sales* Capacity utiliz. (t-1)		-0.0058** (0.0028)	
$\Delta^+$ dom. sales* Capacity utiliz. (t-1)		-0.0047** (0.0022)	
Firm fixed effects	yes	yes	yes
Time dummies	yes	yes	yes
Time*Sector dummies	no	no	yes
No. obs.	14,086	14,086	14,086
R-squared	0.31	0.31	0.33

Notes: OLS estimates. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . The current ratio is equal to the ratio between short-term assets and short-term debts. The capacity utilization index is based on firms' assessment about the actual use of plant and equipment expressed as a percentage of the firm's full capacity.



Tab. 7

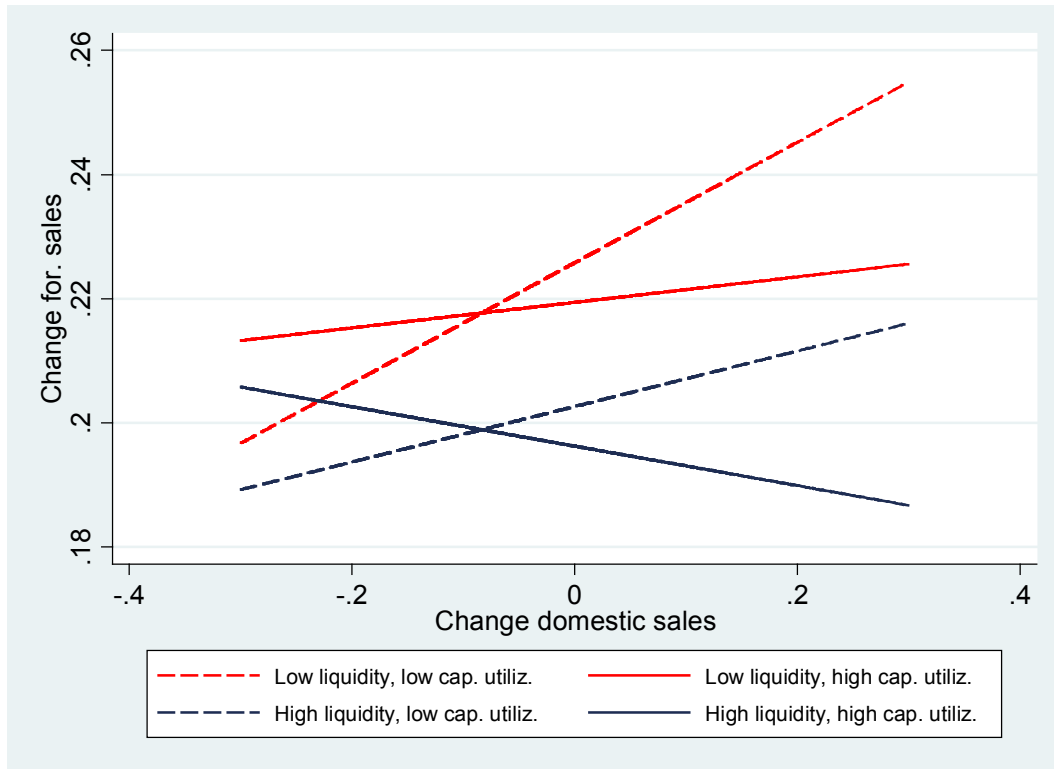
## The joint effect of credit and capacity constraints

VARIABLES	(1)	(2)	(3)
Export (t-1)	-0.1732*** (0.0136)	-0.1734*** (0.0136)	-0.1740*** (0.0139)
$\Delta$ dom. sales	0.3718*** (0.1162)		0.3756*** (0.1160)
$\Delta^-$ dom. sales		0.2567 (0.2239)	
$\Delta^+$ dom. sales		0.4213** (0.1751)	
Credit constr. (t-1)	0.0027 (0.0238)	0.0496 (0.0314)	0.0017 (0.0239)
$\Delta$ dom. Sales* Credit constr. (t-1)	0.1130* (0.0665)		0.1090* (0.0663)
$\Delta^-$ dom. sales* Credit constr. (t-1)		0.4121*** (0.1357)	
$\Delta^+$ dom. sales* Credit constr. (t-1)		-0.0629 (0.1014)	
Capacity utiliz. (t-1)	-0.0004 (0.0005)	-0.0003 (0.0005)	-0.0004 (0.0005)
$\Delta$ dom. sales* Capacity utiliz. (t-1)	-0.0045*** (0.0014)		-0.0048*** (0.0014)
$\Delta^-$ dom. sales* Capacity utiliz. (t-1)		-0.0042 (0.0027)	
$\Delta^+$ dom. sales* Capacity utiliz. (t-1)		-0.0046** (0.0022)	
Firm fixed effects	yes	yes	yes
Time dummies	yes	yes	yes
Time*Sector dummies	no	no	yes
No. obs.	15,162	15,162	15,162
R-squared	0.32	0.32	0.33

Notes: OLS estimates. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Credit constrained firms are firms who state that they would like to receive more credit at current conditions and they approached to an intermediary and credit was denied. Shares calculated excluding missing values. The capacity utilization index is based on firms' assessment about the actual use of plant and equipment expressed as a percentage of the firm's full capacity.

Fig. 8

Complements or substitutes? Correlation between the growth of rate of domestic and foreign sales for different types of firms



Notes: Based on 2012 values. A positive (negative) slope indicates complementarity (substitutability). Low liquidity and low capacity utilization correspond to the 25<sup>th</sup> percentile of the corresponding distributions. Symmetrically, high liquidity and high capacity utilization correspond to the 75<sup>th</sup> percentile of the corresponding distributions.