BANCA D'ITALIA

EUROSISTEMA

Questioni di Economia e Finanza

(Occasional Papers)

Investment dynamics in Italy: financing constraints, demand and uncertainty

by Steve Bond, Giacomo Rodano and Nicolas Serrano-Velarde

July 2015

Number 283

BANCA D'ITALIA
EUROSISTEMA

Questioni di Economia e Finanza

(Occasional papers)

Investment dynamics in Italy: financing constraints, demand and uncertainty

by Steve Bond, Giacomo Rodano and Nicolas Serrano-Velarde

Number 283 – July 2015

The series Occasional Papers *presents studies and documents on issues pertaining to the institutional tasks of the Bank of Italy and the Eurosystem. The* Occasional Papers *appear alongside the* Working Papers *series which are specifically aimed at providing original contributions to economic research.*

The Occasional Papers *include studies conducted within the Bank of Italy, sometimes in cooperation with the Eurosystem or other institutions. The views expressed in the studies are those of the authors and do not involve the responsibility of the institutions to which they belong.*

The series is available online at www.bancaditalia.it .

ISSN 1972-6627 (print)
ISSN 1972-6643 (online)

Printed by the Printing and Publishing Division of the Bank of Italy

INVESTMENT DYNAMICS IN ITALY: FINANCING CONSTRAINTS, DEMAND AND UNCERTAINTY

by Steve Bond*, Giacomo Rodano# and Nicolas Serrano-Velarde°

Abstract

In this paper we describe the investment behaviour of manufacturing firms in Italy between 1995 and 2013 and we investigate the most important factors leading to the decline in investment since 2008. We estimate an error correction model for investment using information on firms' demand expectations, uncertainty, and credit constraints, based on the Bank of Italy's Survey of Industrial and Service Firms. Our results suggest that the fall in the expected growth rate of real sales played an important role in quantitative terms, and that the 2008 demand shock may explain a long period of weak investment. We also find that credit constraints have a significant impact at the firm level, but less so in aggregate terms. Finally higher uncertainty does not seem to have played a significant role in explaining investment dynamics during the crisis.

JEL Classification: C23, E22, D8.
Keywords: Investment, expected demand, credit constraints, demand uncertainty.

Contents

* University of Oxford.

Bank of Italy, Directorate General for Economics, Statistics and Research.

° Bocconi University and IGIER.

1 Introduction[1]

According to data from the Italian National Statistical Office (ISTAT), since 2008, total investment has fallen by 27%, to levels witnessed in the mid-Nineties, while during the recession of the early Nineties the decline was significantly lower (about 16%). At the same time, since 2007, the ratio of investment to GDP has dropped by about five percentage points, to about 18.5%. In the same period, in the manufacturing sector, total investment has fallen by 20%, while the ratio of investment to value-added has dropped by almost two percentage points to about 23%.

This weakness in investment has adverse consequences both in the short and medium term. In the short term, a contraction in investment has a negative effect on aggregate demand, while in the medium term it can hamper growth prospects. Lower investment implies slower growth of the capital stock that, other things being equal, has a negative impact on productivity and therefore on wages and living standards.

The disappointing performance of investment is likely due to the concurrence of several factors: higher uncertainty about the economic outlook, a downward revision to expectations of future demand, more difficult access to credit and, particularly in manufacturing where the use of capital is more intense, a widening of the margins of spare productive capacity.

The purpose of this note is to investigate what are the most relevant factors behind the recent fall in investment, using data on investment of manufacturing firms in Italy in the period 1995-2013. Based on the existing literature (see, for example, Bloom, et al. (2007), Bontempi, et al. (2010) and Gaiotti (2011)), we estimate an error correction (ECM) model of investment, augmented to include proxies for demand expectations, uncertainty, and credit constraints, obtained from the INVIND survey.

2 Data and aggregate trends

The empirical analysis is based on data from the INVIND survey on manufacturing firms from the Bank of Italy, merged with the CADS archives, from Cerved Group, for the period 1995-2013. The survey is conducted in March of each year, and the balance sheet data refer to calendar years. From the INVIND survey, we retrieve the following variables: i) investment expenditures for the two previous years and the forecast for the current year; ii) employment; iii) the subjective information on access to credit; iv) the expected growth rate of real sales over the next year, and the subjective range (maximum and minimum) of this expected growth rate (our measure of uncertainty) and v) the productive capacity utilization.

[1]This paper presents some preliminary results from an ongoing project on "Cash Flow and Investment: Financing Constraints or Expected Demand?", by S. Bond, G. Rodano and N. Serrano-Velarde. We thank Matteo Bugamelli, Francesca Lotti, Paolo Sestito and Ignazio Visco for helpful suggestions and comments, and Francesco Manaresi and Enrico Sette for fruitful discussions about data related issues. All remaning errors are ours.

As the survey does not have information on capital stock, cash flow, or financial assets and liabilities, the survey data are matched with firms' balance sheets and profit-and-loss accounts from the CADS archives (*Centrale dei Bilanci*) collected by the Cerved Group. From CADS we use balance-sheet information on i) fixed assets, ii) cash flow, iii) investment expenditure, and iv) the *Score*, a nine categories credit rating that Italian banks use to assess the credit risk of Italian firms. Before turning to the econometric analysis, it is worth exploring the aggregate trends of the main variables related to investment decisions.

2.1 Investment and productive capacity

Figures (1) and (2) show the behaviour of the investment rate - the ratio between current investment and the stock of capital at the end of the previous year. Whether we measure the investment rate using balance sheet or survey data on investment, we find a sharp fall in 2009 in both the mean and the median investment rate in our sample of firms. From an average of 0.222 for the period 2003-2007, the investment rate, measured from the balance sheets of the firms in our sample, has fallen to 0.178 in the period 2009-2013 (and to 0.162 in the subperiod 2012-2013). Figure (2) shows that the bulk of the fall in investment comes from those firms located at the top end of the investment distribution, so that the cross-section distribution of investment rates is more compressed in the later period.

An investment recovery is unlikely to happen as long as capacity utilization remains low. As shown in Figure (3), capacity utilization fell sharply at the start of the financial crisis and has remained low since: falling from about 80% on average for the period 2003-2007 to about 75% during the recession 2009-2013.

2.2 Liquidity, expected demand, uncertainty, and credit constraints

Among the possible determinants of investment, the literature identifies liquidity, demand, uncertainty and access to credit. Over recent years, cash flow expressed as a fraction of the capital stock has decreased, as shown in Figure (4): from a median of 29% for the period 2003-2007 to 25% in the most recent years.

Expected demand in a given year is defined as the growth rate of sales, net of the growth rate of prices, that the firm expected at the beginning of next year for the next year. That is, expected demand measured in 2008 is what the firm expected at the beginning of 2009 for 2009. As shown in Figure (5) the expected growth of real sales fell sharply in 2008 (that is the growth forecast for year 2009, made at the beginning of 2009). From an average of 2.9% for the period 2003-2007, it fell to -6.7% in 2008. Even after bouncing back in the following year, expected growth did not fully recover to its pre-crisis level: over the period 2009-2013, it was on average 1.8%. These figures for expected *growth rates* suggest that there was a permanent drop in the *level* of expected demand at the start of the financial crisis, in particular for those firms at the bottom 25% of the demand distribution.

In the survey data, we also measure the subjective uncertainty of the firm about expected demand, as the absolute value of the difference between the self-reported maximum and minimum of expected demand.[2] Figure (6) shows the trend in our uncertainty measure over the sample period. We observe a substantial increase in uncertainty in 2008, that is uncertainty about the growth rate of real sales expected at the beginning of 2009 for the year 2009.[3] The measure of uncertainty increases from an average of 0.079 (7.9 percentage points) for the period 2003-2007 (excluding 2005) to 0.106 in 2008, and falls back to 0.082 on average in the period 2009-2013. The increase in uncertainty seems to be stronger for firms located at the higher end of the uncertainty distribution.

Finally, we consider two measures of self-reported credit constraints: whether the firm reported that it would be willing to get more debt at the current conditions ("wanted more credit") and whether the firm reported that it asked for more credit and was turned down ("credit was rejected").[4] Figure (7) reports the proportion of firms which answered 'yes' to each of these questions in each year. Both measures show a sharp increase from 2008 on: in particular, the share of firms that reported being willing to get more credit at the same conditions increased from an average of 9.4% for the period 2003-2007 to 26.7% for the period 2008-2013, while the share of firms that reported having been turned down increased from 2.7% to 9.3% over the same periods.

Overall, looking at the aggregate trends of those variables we believe to affect investment decisions, we observe a substantial change in the 2008-2013 period for most of them, usually with a worsening in the most recent years. For several of the variables, the observed pattern is mostly attributed to those firms at the top of the underlying distribution. We now consider an econometric analysis in order to shed some light on the relative importance of these variables in explaining investment outcomes.

3 The econometric results

Following an approach widely used in recent empirical studies of company investment, we estimate a dynamic error correction specification (see for example Bloom et al. (2007)). This approach is based on a long run target for the stock of capital which is proportional to the level of real sales. Adjustment costs or frictions prevent the actual stock of capital from adjusting fully and immediately to this target level, and rationalise a process of more gradual or delayed adjustment.

The short run dynamics of the error correction specification capture two features of optimal adjustment paths under most forms of adjustment costs or fric-

[2]The same time convention applies as for expected demand. Uncertainty for a given firm in 2008 is the absolute difference between the maximum expected growth in real sales for 2009, and the minimum expected growth rate in real sales for 2009, reported in the March 2009 survey.

[3]The drop in 2005 is due to a one-off change in the question used to derive our measure of uncertainty.

[4]The question for 2008 was asked in March 2009 about the 2008 period.

tions: i) the actual capital stock displays inertia, or state dependence, with lagged levels helping to explain the current level; ii) the investment decision is forward-looking, with current expectations of future conditions a relevant factor in explaining how much the firm should invest now to close the gap between actual and target capital stock levels. However our approach does not impose any particular form for this adjustment process but rather estimates the relevant investment dynamics from the data.

Formally we estimate the following dynamic error correction specification for rates of investment

$$\begin{aligned}\left(\frac{I_{it}}{K_{i,t-1}}\right) &= c + \alpha_1 \left(\frac{I_{i,t-1}}{K_{i,t-2}}\right) + \alpha_2 \Delta y_{it} + \alpha_3 \Delta y_{i,t-1} \\ &\quad -\phi(k_{i,t-2} - y_{i,t-2}) + d_t + \eta_i + v_{it}\end{aligned}$$

where I_{it} is investment expenditure by firm i in year t, $K_{i,t-1}$ is the stock of capital at the end of year $t-1$, k_{it} is the logarithm of the stock of capital, and y_{it} is the logarithm of real sales; d_t and η_i denote year dummies and firm-specific fixed effects respectively. Our baseline specification takes this form, with the appropriate lag lengths to be guided by the data. Inertia, or state dependence, in the level of the capital stock is captured through the speed of adjustment parameter ϕ being less than one in the error correction representation.

To analyse the main determinants of investment we include several additional explanatory variables in the above specification: the credit score variable, which may capture variation in the required rate of return component of the user cost of capital or in the availability of credit; the current (or lagged) cash flow variables, which reflect the availability of internal finance and are commonly found to be useful in explaining firm-level investment behaviour; expected demand and uncertainty about future demand and finally the measure of credit constraints as taken from the INVIND survey.

The estimation of these dynamic error correction specifications from panel data which covers a large number of firms observed for a small number of time periods poses several challenges. To obtain consistent estimates of these dynamic models, we use both a one-step generalized method of moments (GMM) first-differenced estimator (Arellano & Bond, 1991) and a variant of the 'system GMM' estimator developed by Arellano & Bover (1995) and Blundell & Bond (1998).[5]

The main results of the empirical analysis are reported Tables (I) and (II). Table (I) reports estimates of our baseline error correction model for our sample of 1734 Italian manufacturing firms, obtained using the pooled OLS, Fixed Effects, first-differenced GMM and system GMM estimators. All specifications include a full set of year dummies, and reported standard errors are robust to both het-

[5]The instruments used for the first-differenced equations are the second, third and fourth lags of the investment rate (I/K), real sales growth (Δy) and error correction $(k-y)$ terms; the additional instruments used for the equations in levels for the system GMM estimator are the first lags of the first-differences of these variables.

eroskedasticity and autocorrelation. The results reported here use the measure of investment reported in the balance sheet data obtained from the CADS database, but very similar results were obtained using the measure of investment reported by firms in the INVIND survey.

As expected, the pooled OLS estimates of the coefficients on the lagged investment rate and the error correction term (which are expected to be biased upwards) are considerably higher than the Fixed Effects estimates of the same coefficients (which are expected to be biased downwards). The first-differenced GMM estimates of these coefficients are in between the OLS and Fixed Effects estimates of the same coefficients.[6] The system GMM estimates are broadly similar to the first-differenced GMM results.[7]

The GMM estimates reported in Table (I) suggest a statistically significant positive relationship between investment rates and current and/or lagged real sales growth. The statistically significant negative coefficients on the error correction term further suggest that investment rates are influenced by a desire to adjust capital stock levels towards a long run target which is proportional to the level of real sales.[8] This adjustment process seems to be well approximated by the short run dynamics included in our error correction model, leaving a residual error component (v_{it}) that is serially uncorrelated.

The first column of Table (II) reports our system GMM estimates[9] of an extended error correction specification in which the ratio of cash flow during year t divided by the stock of capital at the end of year $t-1$ ($CF_{it}/K_{i,t-1}$) is introduced as an additional explanatory variable.[10] The estimated coefficient on this cash flow

[6]The serial correlation tests detect significant, negative first-order serial correlation in the first-differenced residuals but no second-order serial correlation, both of which are consistent with our maintained assumption that the time-varying component of the error term (v_{it}) in the untransformed equations is serially uncorrelated: we report the Arellano & Bond (1991) test statistics for the absence of first (second) order serial correlation in the first-differenced residuals, which have a standard normal distribution under the null hypothesis being tested. Also consistent with this assumption, the Hansen test of over-identifying restrictions does not reject the validity of the instruments used for the first-differenced equations, all of which are lagged two or more periods.

[7]The validity of the additional instruments used for the untransformed equations is not rejected by the Hansen-Difference test.

[8]The estimated coefficient for the Error Correction Term is in the range -0.12 to -0.08 in most specifications, indicating that about 10% of any gap between actual and desired capital stock levels is closed annually. The size of this coefficient is related to the half-life of the capital stock adjustment process following a permanent change in the level of demand, and hence to the period during which our model would predict weak investment rates following the negative demand shock at the onset of the crisis. We investigated whether there was any significant change in this speed of adjustment parameter across sub-periods before and after 2008, but found no evidence of instability.

[9]Similar results are obtained using first-differenced GMM, see Table (III).

[10]The additional instruments used in the first-differenced equations are $CF_{i,t-2}/K_{i,t-3}, CF_{i,t-3}/K_{i,t-4}$ and $CF_{i,t-4}/K_{i,t-5}$, and the additional instrument used in the untransformed equations is $\Delta CF_{i,t-1}/K_{i,t-2}$. The same timing is used for each of the additional variables included in the later columns of Table II.

term is positive and significantly different from zero.[11]

The first column of Table II provides a benchmark specification from which to explore whether there is useful additional information to explain the investment behaviour of Italian manufacturing firms in the survey measures of expected future real sales growth, self-reported credit constraint status and subjective uncertainty, and in the credit score measure. The second column of Table (II) adds the survey measure of the expected growth rate in real sales; the timing here is that the survey data obtained in March of year t is used to explain the investment rate measured for year t (i.e. $I_{it}/K_{i,t-1}$). The coefficient on this expected demand growth measure is found to be highly significant and also robust to the inclusion of additional explanatory variables.[12] The estimated coefficient on the actual growth rate of real sales during year t becomes negative when we include this forward-looking measure of the firm's expectation at the start of the year, although the estimated coefficient on lagged sales growth remains positive and significant.[13]

The third column of Table (II) adds the credit score measure (measured from year $t-1$ balance sheets) to the specification from the second column. We find no significant additional information in the credit score measure which is useful in explaining investment rates.[14] This is also the case for the subjective uncertainty measure constructed from the upper and lower bounds for the growth rate of real sales reported in the survey (column IV). We do estimate a statistically significant negative coefficient on the indicator for whether the firm reports that

[11]The interpretation of a significant, positive coefficient on the cash flow term is controversial: one possibility is that it reflects the presence of financing constraints as an important determinant of investment expenditure for at least some of the observations included in the sample (see, for example, Fazzari, et al. (1988), and Bond & van Reenen (2007)); another possibility is that current or lagged cash flow terms provide additional information about current expectations of future demand or future profitability, beyond that contained in current and lagged values of output growth. Some research using samples of large, publicly traded UK and US firms, for which information on analysts' forecasts of future profitability is available and can be used as a proxy for firms' expectations, suggests that the main role of significant cash flow terms in those samples has been to proxy for expectations of future profitability, rather than to indicate the presence of financing constraints - that is, the coefficients on cash flow terms become insignificant when more direct measures of expected future profitability are introduced into the empirical specifications (see, for example, Bond, et al. (2004), for the UK, and Cummins, et al. (2006), for the US). More generally, it is difficult to distinguish between these two explanations for the presence of significant cash flow terms in empirical investment models, in the absence of data on firms' expectations of future demand or future profitability.

[12]Using the first-differenced GMM estimator, the coefficient on expected real sales growth is estimated to be 0.145, with a standard error of 0.070.

[13]Interestingly, the estimated coefficient on our cash flow term also remains positive and significant when we include this measure of expected demand growth. This contrasts with findings for publicly traded UK and US firms reported in Bond et al. (2004) and in Cummins, Hassett and Oliner (2006) respectively, although it should be noted that those papers use measures of expected future profitability over longer time horizons than the survey measure of expected sales growth for the current year which we are using here.

[14]In simpler specifications which omit the cash flow term, we do estimate a significant, negative coefficient on the credit score measure. This is suggestive that the cash flow term in our model controls for similar information to that contained in the credit score measure, related to the cost or the availability of credit.

an application for credit was turned down (column V). Column VI confirms that the results from our preferred specification in column V are largely unchanged by the addition of the credit score and uncertainty measures to the set of explanatory variables.

These results suggest that a fall in the expected growth rate of real sales from 0.02 (i.e. 2%) to -0.05 (-5%), as occurred for the median firm when comparing March 2009 and March 2008 (see Figure 5), would reduce investment rates in the same year by about 0.012 (i.e. by 1.2 percentage points), holding all other explanatory variables constant. In the longer term, a permanent fall in the level of real sales of 7% would reduce target capital stock levels by the same amount. Our model suggests that only about 8% of the gap between actual and target capital stocks is closed each year, indicating that this permanent demand shock may explain a long period of weak investment.

The difference in investment rates between a firm which reports being credit constrained and one which does not is estimated to be 0.033 (i.e. 3.3 percentage points). The proportion of firms which reported being credit constrained increased from about 2%-5% before 2008 to around 7%-10% after 2008. Even taking the increase to be from 2% to 10%, our results indicate only a very small impact on the average investment rate for manufacturing firms.[15]

4 Conclusions

The econometric analysis suggests that not all of the conventional determinants of investment may have played an important role in driving the recent slowdown in manufacturing investment. For instance, higher uncertainty does not seem to have played a significant role, at least as measured by our subjective proxy for uncertainty about the future growth of real sales. Conversely, the large, one-off fall in the expected growth rate of real sales seems to be the main factor responsible for the fall in investment, both in the short term and in the longer term.

We emphasise one implication of our model which may play an important role in accounting for the persistent weakness of manufacturing investment following the initial onset of the financial crisis in 2008 (as seen in Figure 3, for example). Figure 5 shows that there was a very large but temporary fall in the *rate of growth* of real sales expected by Italian manufacturing firms, as indicated by responses to the survey conducted in March 2009. One year after, the median expected growth rate was back in positive territory and remained there in the following years. However, there is no suggestion that the typical firm expected the sharp fall in the *level* of real sales, which indeed occured in 2009, to be reversed - that would require a period of unusually high growth after the initial crisis, allowing the level of real sales to return to its previous path. If anything, expected growth

[15]That is, the investment rate falls by 3.3 percentage points for 8% of firms, with no change for the remaining 92% of firms, giving a fall in the average investment rate of about 0.26 percentage points.

rates in the period from March 2010 onwards were lower than those reported over the preceding decade.

In other words, manufacturing firms expected the fall in the level of real sales experienced in 2009 to be more or less permanent. If the desired level of capital is proportional to the level of real sales, this implies a permanent reduction in the desired capital stock. With inertia in capital stock levels and a protracted period of adjustment, this in turn implies a prolonged period of weak investment demand. The permanent nature of the demand shock suggested by the data on expected growth rates of real sales may thus be sufficient to explain persistently low levels of investment in the years following the onset of the crisis.

A Data appendix

Timing The INVIND survey for a a given year (e.g. 2002) is conducted in March of the following year (e.g.2003). For the main variables (e.g investment expenditure) the firm is asked what is the amount in the given year (2002), in the previous one (2001), and the amount expected for the following one (2003). The survey variables for a given year are then matched with balance sheet data for the same year (referring to 2002, reported at 31-12-2002).

Survey variables The main variables from the survey are[16]

- *Investment (survey)*: total fixed investment in tangible assets at current prices undertaken by the firm in the year.
- *Sales*: total sales in the year at current prices.
- *Productive capacity*: is the subjective degree of utilisation (in percentage) of technical productive capacity, as reported by the entrepreneur.
- *Credit constraints*: a dummy variable equal to one if the firm is credit-constrained. Following Guiso and Parigi (1999) it is constructed with the answers from the INVIND survey to two questions on access to credit. Firms are asked whether (i) at the current market interest rate they wish a larger amount of credit; (ii) they have applied for credit but have been turned down. A firm is classified as credit constrained in two different ways: if it wanted more credit at the given conditions - positive answer to the first question; if it asked for more credit and was turned down - positive answer to the second one.
- *Expected demand growth*: expected growth in sales, adjusted for expected own-price inflation (calculated as "expected growth in sales" - "expected growth in price").
- *Uncertainty*: the survey asks a question about the subjective range (maximum and minimum) of expected growth in real sales. Uncertainty is calculated as the absolute value of the difference between the maximum and the minimum.

Balance sheet and income statement variables To complement information from the INVIND survey, we use the CADS database. The main variables are:

- *Cash flow*: cash flow during the year, at current prices.

[16] In addition to the main variables, from the survey we also calculate: *employment* is the number of employees at the end of the year; *productive capacity* is the degree of utilization of technical capacity.

- *Capital*: the stock of capital is the book value of material fixed assets at the end of the year.
- *Investment (balance sheet)*: investment in material fixed assets during the year, at current prices.
- *Score*: a categorical indicator of the likelihood of default within two years that is computed on the basis of multiple discriminant analyses of financial ratios (Altman, 1968). It takes takes integer values ranging from 1 (the safest firms) to 9 (the firms most likely to default).

In 2008, the Italian Government allowed firms to re-value their fixed capital at market values, inducing an increase in balance-sheet stocks of capital and investment for that year only. In order to correct for the distortion in measured investment and capital, we find in the balance sheet the stock of revaluations in a given year. Then we correct the capital stock by subtracting the value of revaluation reserves, and we correct investment by subtracting the change in revaluation reserves.

The variables for the econometric analysis In the econometric analysis these variables are combined to form the following variables:

- *Investment rate*: defined as the ratio of current *investment* to lagged *capital* at the end of previous year. This is the main dependent varible of the econometric analysis and is calculated using both survey and balance sheet measures of investment.
- *Growth of sales*: defined as the difference in the logs of current and lagged *sales*.
- *Capital-sales ratio (log)*: defined as the difference in the logs of current *capital* and current *sales*.
- *Liquidity*: defined as the ratio of *cashflow* and lagged *capital*.

The other variables, like *Score*, *Expected demand growth*, *Uncertainty*, and the two versions of credit constraints are included as defined above.

Sample selection Our sample ranges from 1995 to 2013. We select only manufacturing firms, based on the SIC classification code. The original sample consists of about 43700 firm-year observations. The sub-sample used in the econometric analysis is selected in the following steps:

- we drop observations from those firms which we cannot match to the CADS dataset. The sample is reduced to 33234 observations. On average the matched sample firms are somewhat bigger (both in terms of sales and empoyment) and therefore tend to be located more in the north of the country, while the sectoral distribution is unaffected.

- we drop observations with extreme values of any of the variables used in the econometric analysis. This reduces the number of observations to 19490.
- we keep only firms with at least one spell of 4 consecutive years.

The last two steps also skew our estimation sample in the direction of larger firms. The final dataset is an unbalanced panel of 1734 distinct firms, over 18 years, with a total of 11919 observations. Table (IV) reports summary statistics for some of the variables in the final sample.

B Figures and Tables

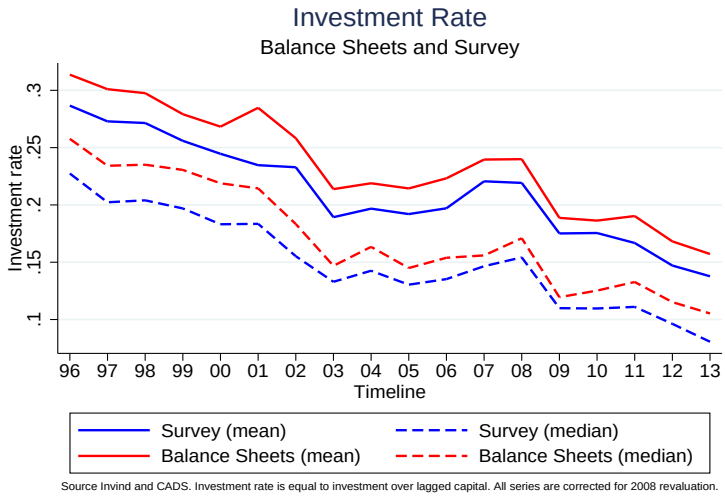

Figure 1: Investment rate: balance sheet and survey data.

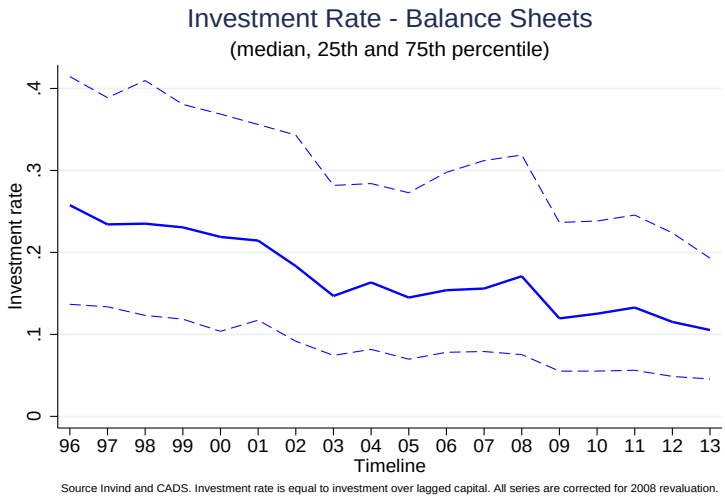

Figure 2: Investment rate: distribution.

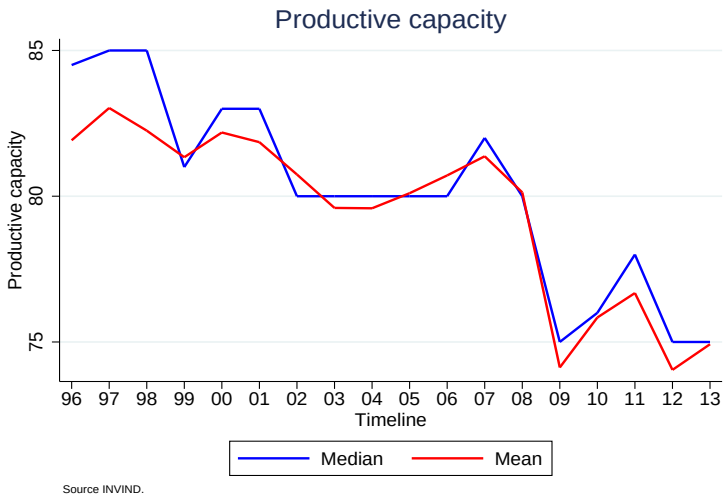

Figure 3: Capacity Utilization

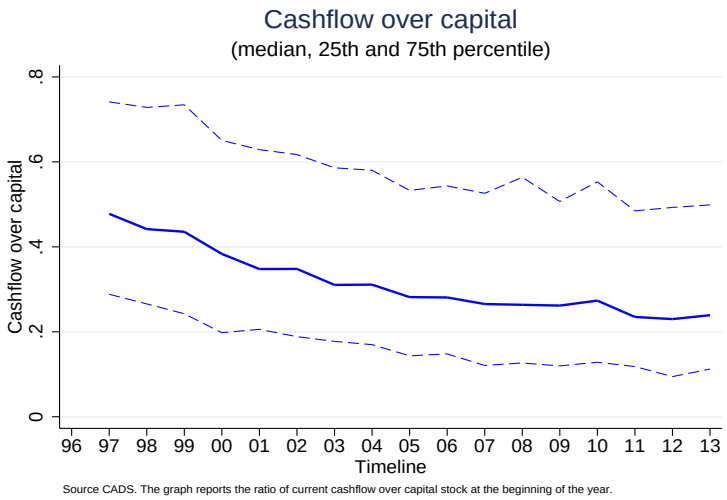

Figure 4: Cashflow

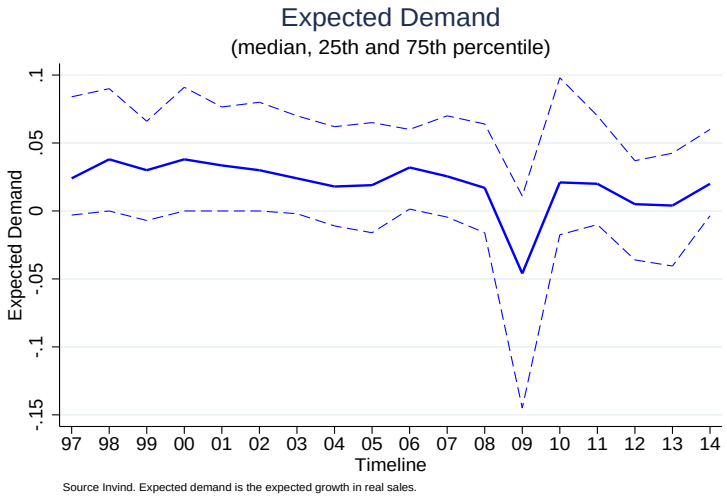

Figure 5: Expected demand

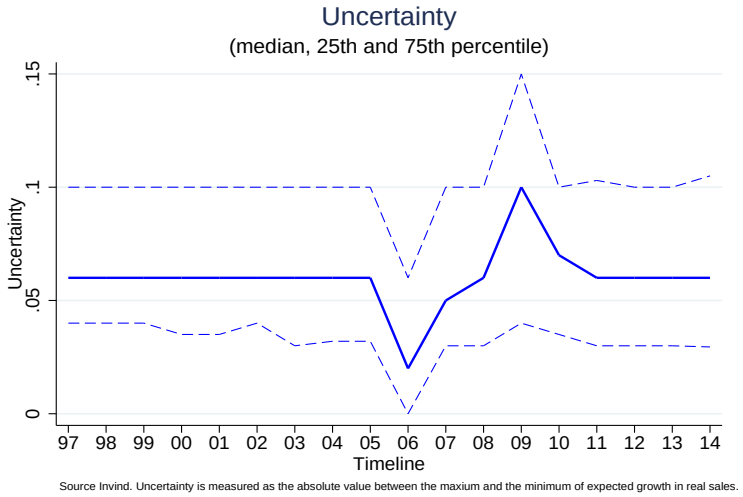

Figure 6: Uncertainty

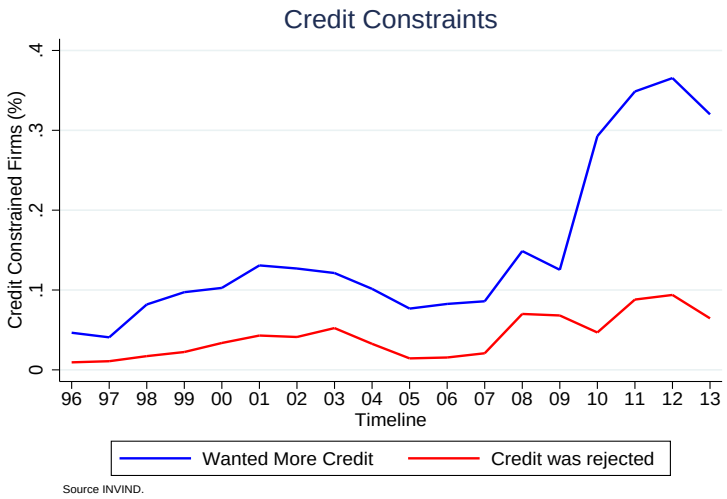

Figure 7: Credit constraints

Table I: Baseline specification

	OLS	FE	GMM	SYSTEM GMM
(lag) Investment rate(balance sheet)	0.255***	-0.231***	0.044	0.015
	(0.018)	(0.020)	(0.037)	(0.022)
Growth of sales	0.136***	0.186***	0.138**	0.088
	(0.015)	(0.018)	(0.070)	(0.061)
(lag) Growth of sales	0.097***	0.243***	0.108***	0.140***
	(0.016)	(0.020)	(0.036)	(0.022)
(lag2) Capital-sales ratio (log)	-0.060***	-0.318***	-0.081**	-0.118***
	(0.003)	(0.018)	(0.034)	(0.018)
Constant	0.103***	-0.329***		-0.026
	(0.014)	(0.031)		(0.028)
R-squared	0.217	0.163		
N	7979	7979	6021	7979
Arellano-Bond test for AR(1)			-12.42	-13.54
Arellano-Bond test for AR(2)			0.70	0.70
Hansen test (P.value)			0.150	0.138
Difference Hansen test (P.value)				0.421

Table II: Main determinants of investment

	I	II	III	IV	V	VI
(lag) Investment rate (balance sheet)	0.046*	0.036	0.035	0.017	0.031	0.015
	(0.025)	(0.031)	(0.030)	(0.032)	(0.030)	(0.030)
Growth of sales	0.077	-0.044	-0.013	-0.001	0.010	0.045
	(0.060)	(0.073)	(0.064)	(0.067)	(0.065)	(0.056)
(lag) Growth of sales	0.095***	0.078***	0.078***	0.062*	0.084***	0.062*
	(0.025)	(0.029)	(0.029)	(0.035)	(0.028)	(0.035)
(lag2) Capital-sales ratio (log)	-0.083***	-0.076***	-0.080***	-0.081***	-0.081***	-0.083***
	(0.021)	(0.021)	(0.021)	(0.022)	(0.019)	(0.019)
Cashflow over capital	0.059**	0.069***	0.069***	0.071***	0.059***	0.072***
	(0.024)	(0.023)	(0.023)	(0.025)	(0.022)	(0.025)
(lag) Expected demand growth		0.212***	0.188***	0.179***	0.171***	0.137**
		(0.065)	(0.058)	(0.069)	(0.060)	(0.062)
(lag) Score			-0.002			0.003
			(0.006)			(0.006)
(lag) Uncertainty				-0.046		-0.038
				(0.075)		(0.073)
(lag) Credit Constraint (was rejected) (%)					-0.033**	-0.032*
					(0.017)	(0.019)
Constant	0.000	-0.018	-0.014	-0.026	-0.016	-0.035
	(0.027)	(0.030)	(0.037)	(0.033)	(0.027)	(0.038)
R-squared						
N	7977	5544	5544	4356	5544	5544
Arellano-Bond test for AR(1)	-13.72	-10.79	-10.88	-8.72	-10.84	-8.81
Arellano-Bond test for AR(2)	0.63	0.71	0.74	0.41	0.75	0.49
Hansen test (P.value)	0.450	0.542	0.487	0.522	0.632	0.557
Difference Hansen test (P.value)	0.833	0.648	0.552	0.623	0.678	0.409

Table III: Main determinants of investment

	I	II	III	IV	V	VI
(lag) Investment rate (balance sheet)	0.042	-0.018	-0.018	-0.133**	-0.043	-0.165***
	(0.036)	(0.047)	(0.045)	(0.053)	(0.046)	(0.049)
Growth of sales	0.124*	0.073	0.076	0.132*	0.121*	0.159***
	(0.067)	(0.079)	(0.071)	(0.074)	(0.071)	(0.062)
(lag) Growth of sales	0.097***	0.128***	0.125***	0.216***	0.148***	0.233***
	(0.037)	(0.047)	(0.046)	(0.059)	(0.047)	(0.055)
(lag2) Capital-sales ratio (log)	-0.081**	-0.125***	-0.124***	-0.251***	-0.148***	-0.278***
	(0.033)	(0.043)	(0.042)	(0.053)	(0.043)	(0.048)
Cashflow over capital	0.092**	0.044	0.064*	0.024	0.019	0.028
	(0.043)	(0.038)	(0.033)	(0.035)	(0.035)	(0.029)
(lag) Expected demand growth		0.145**	0.132**	0.143**	0.119*	0.103*
		(0.070)	(0.064)	(0.069)	(0.065)	(0.062)
(lag) Score			-0.007			0.015
			(0.012)			(0.012)
(lag) Uncertainty				-0.010		-0.002
				(0.080)		(0.078)
(lag) Credit Constraint (was rejected) (%)					-0.030	-0.034
					(0.022)	(0.025)
R-squared						
N	7977	5544	5544	4356	5544	5544
df_m	20	21	22	22	22	23

Table IV: Descriptive statistics

	mean	**median**	**sd**	**N**
Investment (balance sheet)	5388.30	827.00	28803.30	11919
Investment (survey)	5210.16	736.00	32554.43	11919
Capital	27418.15	5665.00	126196.41	11919
Investment rate(balance sheet)	0.22	0.16	0.22	11919
Sales	133663.72	25635.00	685747.54	11919
Cashflow	8672.57	1387.50	43291.37	11916
Growth of sales	0.021	0.025	0.167	11919
Credit Constraint (want more) (%)	0.161	0.000	0.367	11566
Credit Constraint (was rejected) (%)	0.044	0.000	0.205	11919
Expected demand growth	0.025	0.020	0.100	8122
Uncertainty	0.077	0.060	0.068	6424
Score	4.22	4.00	2.27	11919
Employment	399.09	120.00	1541.59	11919
Productive capacity	79.13	80.00	13.27	9791

References

M. Arellano & S. Bond (1991). 'Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations'. *Review of Economic Studies* **58**(2):277–97.

M. Arellano & O. Bover (1995). 'Another look at the instrumental variable estimation of error-components models'. *Journal of Econometrics* **68**(1):29–51.

N. Bloom, et al. (2007). 'Uncertainty and Investment Dynamics'. *Review of Economic Studies* **74**(2):391–415.

R. Blundell & S. Bond (1998). 'Initial conditions and moment restrictions in dynamic panel data models'. *Journal of Econometrics* **87**(1):115–143.

S. Bond, et al. (2004). 'The roles of expected profitability, Tobin's Q and cash flow in econometric models of company investment'. Bank of england working papers, Bank of England.

S. Bond & J. van Reenen (2007). 'Microeconometric Models of Investment and Employment'. In H. J.J. & L. E.E. (eds.), *Handbook of Econometrics*, vol. 6A, chap. 65. Elsevier, 1 edn.

M. E. Bontempi, et al. (2010). 'Why demand uncertainty curbs investment: Evidence from a panel of Italian manufacturing firms'. *Journal of Macroeconomics* **32**(1):218–238.

J. G. Cummins, et al. (2006). 'Investment Behavior, Observable Expectations, and Internal Funds'. *American Economic Review* **96**(3):796–810.

S. M. Fazzari, et al. (1988). 'Financing Constraints and Corporate Investment'. *Brookings Papers on Economic Activity* **19**(1):141–206.

E. Gaiotti (2011). 'Credit availability and investment in Italy: lessons from the Great Recession'. Temi di discussione (Economic working papers) 793, Bank of Italy, Economic Research and International Relations Area.