# MANAGER'S VOCATIONAL TRAINING AND FIRM LEVEL EFFECTS: AN EMPIRICAL INVESTIGATION IN THE ITALIAN MANUFACTURING SECTOR

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**ABSTRACT**

Middle Managers (MM) are key figures for firm ability to gain and sustaining competitive advantage (CIT). Their training activity can be seen as an important tool for improving and upgrading managerial practices to sustain firm strategy that is strictly related with its competitive advantage. The present research aims at deepening the analysis undertaken within the literature branch concerned with the effects of training of middle managers on direct measures of firm performance as measured by profitability indices and productivity. In particular, the study focuses on middle management continuing vocational training in the Italian manufacturing sector in the time window 2006-2011. The study is based on a novel database containing balance sheet data together with exhaustive information about the training undertaken by managers working in the sample of companies available – provided by Fondirigenti. The study extends and deepens the existing literature based on two key aspects: (a) the possibility to disaggregate the training activity along two dimensions: the methodology used and the field in which the training is done; (b) the opportunity to use different more precise measures of training, namely the cost in euros and the time devoted to the activity. We empirically test, using regression models based on GMM estimation, a set of research hypotheses and we find support for the five following hypotheses: (H1) Middle management continuing vocational training has an effect on performance indicators namely ROI, ROE and TFP, Moreover the first two show a TMGT effect; MM training is more effective for: larger firms, older firms (H2 and H3); external resources are important in making MM training effective (H3); different methodologies of training have heterogeneous effects on performance: experiential methods are more effective than relational and front lesson methods (H5). We discuss the results and derive some policy conclusions.

**Keywords**: Managerial Training, firm performance, IV-GMM, TMGT

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## 1. INTRODUCTION

It is largely documented that human capital investments are essential for firms to maintain high levels of competitiveness, to face efficiently the continuing technological changes and to reap their benefits. Recently, this is also noticed by the effort that institutions and countries are doing in order to improve and promote human capital investments giving priority to training activities[1].

Training[2], among the human capital strategies, represents one major activity to improve skills and abilities which in turn increase one's human capital accumulation. Becker's influential study on human capital (1962) has shown that the human capital stock of the firm accumulated through training activities is one of the main factors of production.

Returns to training investments have also been analyzed empirically but, to our knowledge, the vast majority of the studies until the '90s examine such effects only at individual level. Afterwards, the literature debate in the past two decades has increasingly opened to the study of firms' potential return to training investments, thus extending the academic interest from individual to organizational level.

Although it is difficult to assess and isolate the impact of training on firm performance, a number of empirical results demonstrate that it has a positive and significant effect (e.g., Bartel 1994; Dearden et al. 2006) and suggest that it directly enhances firm performance by raising the general level of skills.

This study is part of a small literature concerned with the effects of training on direct measures of firm's productivity and it focuses on middle management continuing vocational training in the Italian manufacturing sector.

The uniqueness of the research lies in the distinctive feature of its target which is the middle manager. This choice is dictated by the importance that this professional role is having in explaining productivity gaps among firms[3]. Contemporary theory argues that organizational performance is heavily influenced by what happens in the middle of the organization, rather than at the top, and thus that middle managers are positioned as key strategic actors (Currie and Procter 2005). Given an adequate support, middle managers can enact substantial change of strategic renewal in very mature manufacturing firms (Jones 2005), they can regularly attempt to influence strategy and they often provide the impetus for new initiatives (Floyd and Wooldridge 1992). As observed by Floyd and Wooldridge (1997), a substantial amount of theory and research underlines the key role of middle managers on firm's strategy. First of all, one key strategic role of middle level managers is to implement the top management's strategy (Nutt 1987; Schendel and Hofer 1979), and empirical research has confirmed middle management's upward influence on strategic decisions and has shown a positive relationship between middle management involvement in strategy and organizational performance (Floyd and Wooldridge 1992). Indeed, middle managers are the link between the overall direction provided the top managers with the day-to-day reality of lower-level managers: they perform a coordinating role where they mediate, negotiate, and interpret

[1] The Lisbon European Council in 2000 settled a strategy to transform Europe into the most competitive knowledge-based economy in the world, delivering sustainable growth and generating more and better jobs. Some ambitious goals have been established: not only making Europe the most dynamic knowledge-based economy in the world, but also making education and training a world quality reference. Consequently, both countries and firms are strongly called to prioritize investments in vocational education and training. However, although some European countries are doing an effort in initiating measures to promote lifelong learning, coherent structures are generally lacking (Tessaring and Wannan 2004). Furthermore, very recently, the Council of European Union 'adopted conclusions on education and training in Europe 2020, outlining the contribution of education and training to economic recovery, growth and jobs. During the discussion on the issue, EU Education Ministers pointed out that investing in education at a time of crisis through smart and innovative actions will have a positive long term effect and therefore the EU must commit to a better Europe and a better future for citizens.' (Council conclusions on education and training in Europe 2020 - the contribution of education and training to economic recovery, growth and jobs, November 2012)

[2] Training is defined as "a planned initiative taken by the organization to impart the job knowledge and skills and also to modify the attitudes and behaviours of employees in ways consistent with the goal of the organization" (Noe 2002).

[3] Recent cross sectional studies argue and demonstrate that the way a firm is managed has a strong effect on its performance (Bloom and Van Reenen 2007). Furthermore, several contributions suggest that improving management skills is an effective way for firms to outperform their competitors (Bailey et al. 1992).

connections between the organization's institutional (strategic) and technical (operational) levels. Middle managers mediate between the organization, its customers and its suppliers. As administrators, middle managers direct the organization's overall technical task. Floyd and Wooldridge (1992) observe that middle managers' upward influence activities have the potential to alter the firm's strategic course by providing top management with unique interpretations of emerging issues and by proposing new initiatives. Indeed, championing the alternatives, defined as the persistent and persuasive communication of strategic options to upper management, appears to be an important middle management function in strategy. Middle managers also supply information to top management concerning internal and external events. Synthesizing information defined as the interpretation and evaluation of information, affects top management perceptions and is a second way middle managers influence the formation of strategy. On the other side, with downward influence, middle managers become change of agents, fostering adaptability and implementing deliberate strategy and they can make organizations more flexible and stimulate behaviors that diverges from official expectation.

In addition to the target of the analysis, this study has several other features that make it unique compared to the other contributions in the same field. (1) The dataset we use is unusually rich since it contains information on the duration of training, direct costs of training to the firm as well as productivity data. (2) It is statistically representative of firms in the Italian manufacturing regarding dimension, sectors, geographic location, and legal form. It consists of more than 3,000 companies and covers six recent years. (3) The dataset is also representative of every manager within the firm, meaning that we can track training activity of each manager along six years. (4) The dataset, as opposed to all of the others studies in the same field, is not collected from a survey. This means that our analysis is based on extremely reliable data. (5) The analysis is concerned with Italy, a country which deserves particular attention for at least two reasons. First, Italy is one of the countries with the lowest incidence of on-the-job training in Europe (ISFOL 2012)4. Second, at the moment we can identify only two studies concerned with this country (Conti 2005; Colombo and Stanca 2008).

Finally, taking advantage from the detailed dataset, we disaggregate the training activity along an original dimension: (6) the methodology used.

The reminder of this article is structured as follows. Section 2, respectively, offers a discussion on the theoretical and empirical literature related to the effects of vocational training investments. Section 3, Section 4, and Section 5 introduce the data, the research hypothesis. A discussion on the main findings is provided in Section 6. Concluding remarks follow in Section 7.

## 2. LITERATURE BACKGROUND

The literature concerned with the estimation of the returns to training is extensive. Our approach is to use a firm-level dataset in a regression framework to estimate the impact of training on firm performance. As such, we restrict the review of the literature to studies of this type.

The study by Bartel (1994) deserves particular attention because it represents the benchmark for several authors (e.g., Dearden et al. 2006). Using the 1986 Columbia Business School Survey with data of 155 American manufacturing firms, Bartel estimates the effect of training programmes on net sales (in logarithm). by a simple cross-section production function with 1986 labor productivity as dependent variable and the training index variable (i.e. the percentage of the actual number of groups in the firm receiving formal training) among the independent ones. No effect of formal training on productivity in the same year is found and this result is not affected by the

[4] According to the Continuing Vocational Training Survey 2005 still about the 70% of Italian corporations do not invest in training (Dent and Wiseman 2005). This trend has not changed in the following years (ISFOL 2012). As for the share of firms which provide training for their workers, Italy is ranked third from last place, after Greece and Turkey (ISFOL 2012).

inclusion of the variables measuring other human resource policies.

Secondly, Bartel addresses the endogeneity problem implementing a model of the determinants of 1983 labor productivity and calculating the residual. For those businesses that do not have any training programs as of 1983, a Logit model is estimated the dependent variable is the probability of implementing a training program after 1983 and the independent one is the value of the residual from the 1983 labor productivity equation. A faster productivity growth for firms that carry out training programmes is discovered. Furthermore, businesses that are operating below their expected labor productivity levels in 1983 are more likely to implement a formal training program and experience larger increases in labor productivity growth in the three following years (i.e. an 6% annual increase in productivity between 1983 and 1986 compared with businesses that do not). Only new training programmes, but not formal training, exert a positive effect on firm sales.

Black and Lynch (1996) use a large sample of American firms for the year 1994. They estimate a standard Cobb-Douglas production function including training intensity, three specific types of training activities and several controls for other workplace practices. Production functions are estimated for the manufacturing and non-manufacturing sectors in which dimensions of training are included along with capital and labor. Results of estimating Cobb-Douglas production functions for manufacturing and non-manufacturing sectors indicate that training (defined as the number of workers trained in 1990 and 1993) has no effect; the proportion of time spent in formal off-the-job training, i.e. outside working hours, has a positive effect in manufacturing and computer training has a positive impact in non-manufacturing. However their cross-sectional study is prone to unobserved heterogeneity bias, and furthermore the authors take training as an exogenous variable in their regression as opposed to endogenous. Endogeneity problem is not treated.

In a follow-up paper, Black and Lynch (2001) address the endogeneity problem by restricting the analysis to the manufacturing sector and matching the establishments to the census Bureau's Longitudinal Research Database. They estimate a first-difference production function for the time period 1988-1993 and use coefficients from this equation to estimate an establishment specific residual that is then regressed on variables measuring the establishment's human resource management practices obtained from telephone surveys. None of the training variables are significant in the second stage. Once the endogeneity issue is properly addressed, the positive relationship between training and productivity observed in the cross-sectional analysis disappears.

Among studies on developing countries we can mention Ng and Siu (2004) who focus their attention on Chinese manufacturing firms. The production function estimation shows that there is a positive relationship between training expenditures, particularly managerial training, and enterprise productivity. Regarding the training provision by enterprise, both state-owned enterprises (SOEs) and non-SOEs obtained a positive return from devoting resources to managerial training. A 1% increase in managerial training induced a 0.32% (0.13%) increase in sales for SOEs (non-SOEs). These estimates fall within the range of estimates found by Tan and Batra (1995) in their investigation of enterprises in five developing countries. The authors suggest that enterprises may find it useful to allocate resources continuously to managerial training.

In the same direction, Turcotte and Rennison (2004) try to understand if the content of training could have an impact on the productivity of Canadian firms. Their results show that an increase of 10 percentage points in the proportion of employees who received technological training is linked with an increase of 4.5% in productivity.

Some studies analyse the effect on productivity of the interaction between training and innovation. In particular, analysing French and Swedish firms, Ballot et al. (2001) shows that training and R&D are complementary and have positive and significant effects on productivity. Results suggest a possible exchange between training and physical capital investment because the iteration between the two variables holds to negative effects on productivity.

On the same branch of studies, the analysis by Ballot et al. (2006) allows to investigate the effects of training, R&D practices and physical capital investments. It shows that the return of

training investment can be shared between the firm and its employees but it remains higher for the firm itself. They find that training returns of investments are higher for firms than for their employees and that employees share with their employer returns of physical capital investments, R&D and training.

Using a more aggregated dataset, Dearden et al. (2006) present a study on the productivity impact of training intensity on the industry level in U.K. They use a long panel dataset of 94 British industries between 1983 and 1996 that entails information on training in every year. They estimate a Cobb-Douglas production function and show that an increase of 10% in the proportion of trained employees leads to an increase in the wages of 3.0% and an increase in the value added per worker of 6.0%. Furthermore, they show that firms which are more incline to make use of knowledge based competences, seem to be more incline to provide training for their workers. They address unobserved heterogeneity as well as selectivity of training simultaneously by using a system GMM estimation including levels, first differences and lags of capital, labor as well as training intensity (Blundell and Bond 1999). In addition, they calculate the impact and the sign of the biases incurred when training is taken as exogenous in the estimation. The positive and significant effect of training intensity on productivity increases significantly when endogeneity of training is addressed.

Conti (2005) replicates the British study on Italian data but does not find statistically significant effects when the GMM method is used for estimation.

Barrett and O'Connell (2001) study the impact of training on productivity of 215 Irish firms since 1993 to 1995 (firms belong to all sectors, including manufacturing and services) and find that general training has a positive impact on productivity growth while specific training has no effect.

In Portugal, the research by Almeida and Carneiro (2009) on a sample of 1,500 firms in the manufacturing sector of more than 100 employees between 1995 and 1999, confirms the relation between training and productivity. The authors observe that an increase of 10 hours of training per employee implies an increase of hourly productivity from 0.6% to 1.3%. This study suggests that training within firms is a good investment for many firms and that it probably implies a higher return with respect to physical capital investment. The authors also document the empirical importance of adequately accounting for the costs of training when computing the return to firm investments in human capital.

In sum, the vast majority of the empirical literature, both cross-sectional and longitudinal, demonstrates the existence of a positive and significant relation between training activity and firm performance. Nonetheless, results are not always coherent in the estimation of the magnitude of that link (i.e., Ballot et al. 2006; Barrett and O'Connell 2001; Colombo and Stanca 2008; Zwick 2006).

One possible explanation could be that the empirical studies show a large heterogeneity in the use of methods, models and data sources. This diversity seems to lie in differences among countries, labor market institutions and data generation on the one hand, and between the underlying estimation techniques on the other hand (Bartel 2000).

The measurement of training variable fairly differs among the reviewed studies because it is strictly constrained by the availability of data. In some cases, several research studies have to deal with weak and questionable indicators such as training index based on a 7 points-Likert scale (Delery and Doty 1996) and training evaluation (García 2005). Firm's training provision is measured both in absolute value (the number of hours/weeks of training) and in percentage value (calculated with respect to the total number of worked hours). The preferred and reliable training measures seem to be the length of training (number of training hours and number of days/weeks), the training intensity (% of hours and % of participants), and the training expenditure.

One of the most critical aspects underlined by the vast majority of the authors concerns the lack of information on training costs which is recognized to be a reliable measure of training investments. Indeed, only Ng and Siu (2004) have the chance to use expenditures as a proxy of the firm's propensity to provide training for their workers.

In the vast majority of the previous literature on this topic, firm's performance is most frequently measured by objective firm and individual productivity indicators such as net sales, value

added and labor efficiency which are often taken in log. They are estimated using a Cobb-Douglas production function which represents the most common empirical framework.

Furthermore, we observe that in all the reviewed studies training information is drawn from surveys: interviewees are asked to provide information about training activities implemented several years before the survey itself leaving room to measurement errors (Bartel 1994).

We also remind that this kind of studies are plagued by estimation problems. One of these concerns the endogeneity of training, which occurs when one independent variable is correlated with the dependent variable, and which studies such as Bartel (1994), Barret and O'Connell (2001) have failed to control for. In this regard, estimations made by Zwick (2002; 2006) with instrumental variable method on a sample of 2,090 observations from 1998 to 2001 show that, after controlling for different source of bias, an increase of 1% in the proportion of trained employees in 1997 imply an increase of 0.76% points on average on the productivity between 1998 and 2001.

More recently, studies by Colombo and Stanca (2008), Dearden et al. (2006), and Zwick (2006) suggest that if firms heterogeneity is not taken into account, the impact of training on productivity will be overestimated while if the endogeneity problem is not taken into account, the impact of training on productivity will be underestimated. In this regard, Colombo and Stanca (2008) show that failing to account for the potential endogeneity of training leads to underestimate the effect of training on productivity (point estimates are 0.9%, 0.5% and 2.2% for OLS, fixed effects and system GMM, respectively). They address the endogeneity problem by using lagged variable of training investment as instrumental variables. Furthermore, focusing on the system GMM (which is the authors' preferred estimates), the coefficient for effective training (average number of days of training per trained employee) is larger (2.2%) than that of training intensity (number of employees undertaking some form of training) (1.9%), although the difference is quite small. This indicates that using a measure of training intensity that does not account for training duration may lead to underestimate the effects of training on productivity. Also Zwick (2002) concludes that endogeneity and unobserved heterogeneity both have a significant impact on the measurement of the productivity impact. Controlling for endogeneity by adding a selection correction term increases the measured productivity impact of training intensity. Finally, significant omitted variable bias is detected. When a broad variety of firm, employee and personnel management characteristics are not taken into account, the estimated productivity impact is much too high.

Then, we can state that there seems to be no consensus or empirical preferences in the choice of the technique to use in case of estimation biases, leaving room for the treatment of these measurement errors. By the way, it is unanimously recognized that only the use of longitudinal dataset allows to deal properly with the two mentioned estimation problems.

In this regards, the reliability and richness of the dataset can make the difference. We have the chance to address the endogeneity problem by using an innovative and unusual variable which is demonstrated to be a valid and reliable instrument (See Section 5.2 for further details).

Finally, we add a consideration regarding the specific target of our analysis. Our study focuses entirely on middle managers. In the last years, this professional figure has received particular attention by several authors which argue and state that managers play an important role in explaining productivity gaps among firms. We can identify recent and influential cross sectional studies which demonstrate that the way a firm is managed has a strong effect on its performance: firms across countries that apply accepted management practices perform significantly better than those that do not (Bloom and Van Reenen 2007). This issue has been demonstrated firstly by analyzing four countries (Bloom and Van Reenen 2007) and subsequently by extending the sample to seventeen countries around the world (Bloom and Van Reenen 2010). The managerial dimension has also been incorporated in theoretical models aimed at understanding performance heterogeneity across firms (Hambrick and Mason 1984). Differences in managerial abilities may result, for example, in differences in technology usage and in the quality of workers (Bartelsman and Doms 2000). All of these contributions suggest that improving management skills is an effective way for firms to

outperform their competitors (Baily et al. 1992).

In a recent lecture[5] held at Bocconi University ("Boss-onomics: does management matter?", 10th October 2011) John Van Reenen[6] identifies a few key factors in driving better management and productivity, and their implications for business people and policy makers trying to boost performance in Italy and overseas. He argues that not only technological progress but also managerial quality is an important determinant of a firm's performance. He also states that investments in human capital devoted to managers is one of the six key structural reforms which allow to improve management and productivity in the long run[7].

The above comments demonstrate the importance of middle managers in driving business performance through their practices. On the other hand, as pointed out by Thang et al. (2010), there are almost no empirical studies that consider the impact of training (and, in particular, of managerial training) in HR outcomes and practices, which in turn affect the firm performance level[8]: although it is clear that managerial training and development produces improvements in management, mixed results are available and theoretical analyses suggest to deepen this topic (Mabey 2002; Mabey 2004a; Mabey 2004b). We can identify some specific analyses about this link which have been performed addressing firms in developing countries (Bloom et al. 2013; McKenzie and Woodruff 2012; Sonobe et al. 2010; Sonobe and Otsuka 2012) or belonging to some specific sectors (Newkirn-Moore and Bracker 1998) or with a specific size (Wong et al. 1997) or concerning some specific managerial practices (Clegg et al. 2010; Nielsen et al. 2010).

The relevance of this target in the context of human capital practices is then clear. Our analysis provides an original and unique evidence on this topic[9].

## 3. THE DATA

### *3.1. Sample and data sources*

The data we use in this study refer to the time window 2006-2011 and are drawn from two different sources[10]: the dataset from Fondirigenti concerning all the information about middle managers training; the Italian section of Bureau van Dick (BvD) from which we collected all the accounting data of firms for the corresponding years. The construction of this novel database is motivated from the fact that to our knowledge it was not available a dataset containing both the information on training and measures of corporate performance about Italian firms, which is required for the analysis we would like to implement.

The first dataset, collected from Fondirigenti[11], contains detailed information about middle management training activity of Italian firms in the industrial sector. It is an individual-level dataset which includes the number of managers in training, the number of days spent on training, the

[5] Available on *https://www.youtube.com/watch?v=LQeH1FNP-Dc*

[6] John Van Reenen is a full professor of Economics at the London School of Economics, and Director of the Centre for Economic Performance (CEP). For the past decade, John Van Reenen has been leading an international research team of leading academics and business people focusing how to measure and explain management practices in over 20 countries including the US, Italy, China, India and Japan.

[7] See *https://www.youtube.com/watch?v=LQeH1FNP-Dc (1:00:19).*

[8] 'By directly linking training with firm performance, however, studies have ignored the potential mediating role of these HR outcomes on the relationship. Thus, an important question is whether training unequivocally affects HR outcomes, which in turn impacts on firm performance level. This consideration provides a point of departure for future research, namely, to test the mediating effects of HR outcomes, which could be useful in unravelling the relationship between training and firm performance' (Thang et al. 2010)

[9] The whole set of studies mentioned in the literature review refers to workers in general. We can indentify only two contributions which also provide the estimation of the returns to training on business performance focusing specifically on managers. Ng and Siu (2004) estimate the impact of 'total technical training expenditures' as well as of 'total managerial training expenditures'. This last estimation is positive and statistically significant. Before them, Ballot et al. (2001) find similar results.

[10] Data are updated to December 31st, 2011.

[11] Fondirigenti is an Italian Interprofessional Fund, founded in 2004, inter-promoted by Confindustria and Federmanager. Its main objective is to fund middle managers' vocational training of the joined Italian firms in the industrial sector.

overall number of hours and the overall amount of money spent on training, as well as the information disaggregated for different methodologies of training programs and the amount of money that each year is at disposal of firms to finance manager training, which as we will clarify below has a crucial role in our identification strategy. The second dataset allow us to build a series of firm-level indicators and variables such as the standard industrial classification (SIC) sector of activity, sales, value added, stock value of fixed capital, number of employees, average number of hours worked per employee, and other variables regarding balance sheets, firm demographics and employment.

As a result of the matching, we obtain a firm-level panel data set containing firms' economic characteristics and training practices over the time period going from 2006 until 2011.

The study is limited to the businesses in the manufacturing sector, a limitation that is actually beneficial in that it minimizes the problem of comparing labor productivity across businesses in diverse sectors of the economy, i.e. it allows us to abstract from between-industry differences.

The final dataset consists of 3,504 companies in manufacturing sectors, which provide training activities for managers at least once in the time window from 2006 to 2011. The sample size is remarkable in the light of that of previous studies, which often count only few hundred observations. Furthermore, analysis indicates that, with respect to industry, occupation and establishment size[12], the sample is representative of the population of Italian manufacturing firms (see Section 6).

As pointed out in the Introduction, training information extremely reliable since they are not collected from a survey and the dataset is fully representative of the managers in the firm. This allows to track the whole training activity provided to each manager along the six years.

### *3.2. Measures*

**Dependent variables.**

We examine a set of indicators as proxies of different dimensions along with it is possible to evaluate firm's performance. The first group of them are concerned with the concept of productivity:

1. Value added (LogVA) measured as gross revenues minus expenses on materials. This measure of firm's productivity is widely used in similar studies because it provides a single index that can be used to compare firms' productivity. It is also adopted here to enhance comparability with prior works (i.e., Conti 2005, Maliranta and Asplund 2007, Colombo and Stanca 2008, Konings and Vanormelingen 2009).
2. labor productivity, as measured by the VA divided by the total number of employees,
3. the annual growth rate of value added, given by $Log(VA_t)$-$Log(VA_{t-1})$,
4. the growth of value added over three years by $Log(VA_t)$-$Log(VA_{t-3})$,and
5. total factor productivity (LogTFP) estimated via the method of Levisohn and Petrin (2003).

The impact of training is also tested on firm's financial indicators:

1. Turnover growth 1 year, as measured by $Log(Turnover_t)$-$Log(Turnover_{t-1})$,
2. Turnover growth 3 year, as measured by $Log(Turnover_t)$-$Log(Turnover_{t-3})$,
3. Return On Sales (ROS), and
4. Return On Equity (ROE).

[12] The dataset includes even micro companies with more than one employee.

### Independent variables.

Among the independent variables we include capital (as measured by an permanent inventory method based on fixed assets) (K) both lagged one ($K_{t-1}$) and three years ($K_{t-3}$), the number of employees (meaning the total number of employees at the end of the period) (L) both lagged one ($L_{t-1}$) and three years ($L_{t-3}$), and age of business. Training (T) is included into the model both as total number of hours of training provided by the firm ($T_{Hours}$) and expenditure ($T_{Expenditure}$).

We include the age of the firm in years (calculated as 2012 minus the founding year) to capture any maturation effects. This variable is included because of theoretical and empirical evidence on the relationship between the age of the business and the level of labor productivity (see Bartel (1994), note 7 [13]).

In order to control for other organizational and environmental forces that are related to both training and organizational performance, our regressions include some control variables.

A vector of 20 dummy variables representing 21 two-digit SIC codes in manufacturing is added to the equations in order to control for systematic differences in the measurement of both productivity and financial indicators across diverse businesses in the manufacturing sector (see Bartel (1994), note 10[14]). In addition, we included three dummy variables representing four geographic locations (North-East, North-West, Centre and South of Italy).

In the end, we also include one additional piece of information concerning training. We control for the methodology used. Methodology is measured by the number of hours in each of the following categories: e-learning, practice, lecture, experiential methods, relational methods, and seminar/workshop, simulation. The seven methodologies has been aggregated into three main categories namely front lesson (which includes e-learning and lecture), experiential training (which includes experiential methods, relational methods, and simulations), and on field training (which includes seminar/workshop and practice). Summary statistics for the dependent, independent and control variables are given in the Appendix A.

## 4. THE RESEARCH HYPOTHESIS

### Overall effect of training

Investments in human capital, like education and training, are crucial to the growth and the performance of economies, organizations and individuals. Several currents of thought suggest and demonstrate the role of human resource practices in determining and influencing business results (Becker and Gerhart 1996; Pfeffer 1994; Wright and McMahan 1992). Among them, the Resource-Based View (RBV) of the firm (Penrose 1975; Rumelt 1984; Diericx and Cool 1989; Barney 1991 and 1995) highlights the importance of the firm's internal and specific factors in order to generate a competitive advantage. According to the RBV, durable and sustained competitive advantages lie on the development of the bundle of valuable resources[15] at the firm's disposal which must be neither perfectly imitable nor substitutable without great effort (Barney 1991; Conner 1991; Wernerfelt 1984).

[13] "According to the product life-cycle theory, the age of the business will be correlated with the level of labor productivity. Young businesses have low level of labor productivity because their technology has not yet been well defined and their employees devote a significant amount of their time to designing and redesigning an appropriate production technology" (Bartel 1994).

[14] "This helps to deal with the fact that the data do not include information on inventory accumulation. To the extent that some industries were experiencing decreases in product demand during the period under study, using net sales per worker (even corrected for material costs) may not be an accurate measure of labor productivity. Adding the vector of two-digit SIC categories to the labor productivity regression increases our confidence in the use of net sales measure as the dependent variable" (Bartel 1994)

[15] "*Firm resources* include all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness" (Barney 1991).

A number of empirical studies addressed the issue focusing mainly on the effects on performance of firm of training of all the employees. Conversely, our analysis is entirely focused on middle managers.

The importance of working on this specific target instead of a broad one is dictated by the two following considerations. One is concerned with the relevance of the target itself. Middle managers represent a key professional figure for firms for several reasons. They are typically the decision makers with regard to knowledge diffusion and seizing opportunities afforded by information and communication technologies. They are able to exploit opportunities and neutralize treats, could be rare in terms of firm-specific knowledge and constitute an imperfectly imitable, non-substitutable resource for the firm (Mahoney 1995). Furthermore, organizational capability at a management level is essential to improve international competitiveness (Castanias and Helfat 1991). Finally, managers are particularly instrumental in creating organizational ethos of learning for all groups of employees (Martin et al. 1998).

The second is concerned with the fact that middle managers have been demonstrated to play a key role in explaining the heterogeneity of business results among firms. More specifically, several studies demonstrate that training devoted to managers has a positive impact on their practices (Mabey 2004a) which in turn have a positive and significant impact on firm performance (Bloom and Van Reenen 2007). The magnitude of the impact of training on firm's performance is expected to be positive, significant and reliable because of its direct effect on manager's practices. All these considerations clarify the importance of managers within firms and consequently the importance to implement HR practices (i.e., on-the-job training) that empower them.

On the basis of the above discussion we put forward the first hypothesis of our paper:

*Hypothesis 1 (H1). Middle managers training enables firms to upgrade its managerial practices and hence has a positive and significant impact on firm's performance as measured by profits indicators and productivity.*

Recent contributions in the managerial literature recognize in non-linearity of effect a key role (Wales et al. 2012). In particular, a major concern in estimating the effect of an independent variable on an objective variable is the fact that after a critical threshold below which the impact is estimated to be positive the returns from increasing by a percentage point the independent variable can be zero or even negative. This effect is also known as too-much-of a good thing effect (TMGT). In our case we do not know ex ante if and when the positive impact hypothesized (H1) becomes close to zero or even negative. We know that there exist a series of tradeoffs in providing training to middle managers. First there exist a direct cost of training, then we have to take into account also the indirect cost given by the lost production due to the fact that middle manager is taken away by her/his typical activity. The point is if and how these costs are offset by the additional returns due to the upgraded managerial competences that translate into new and more productive managerial practices.

As a result we can propose the following competing hypothesis:

Hypothesis H1.a) the impact of MM training on firm performance presents the TMGT effect.

Hypothesis H1.b) the impact of MM training on firm performance does not present the TMGT effect.

In addition to the one discussed above, there are four other hypotheses that aim to refine the analysis (see FIGURE 1). The hypothesis development has the aim of disentangling first the direct effect of training on performance and then evaluate a set of "moderating" factors, namely organizational complexity, managerial skill upgrading, external resources and finally to evaluate if and how different methodologies have an heterogeneous impact on firm performance.

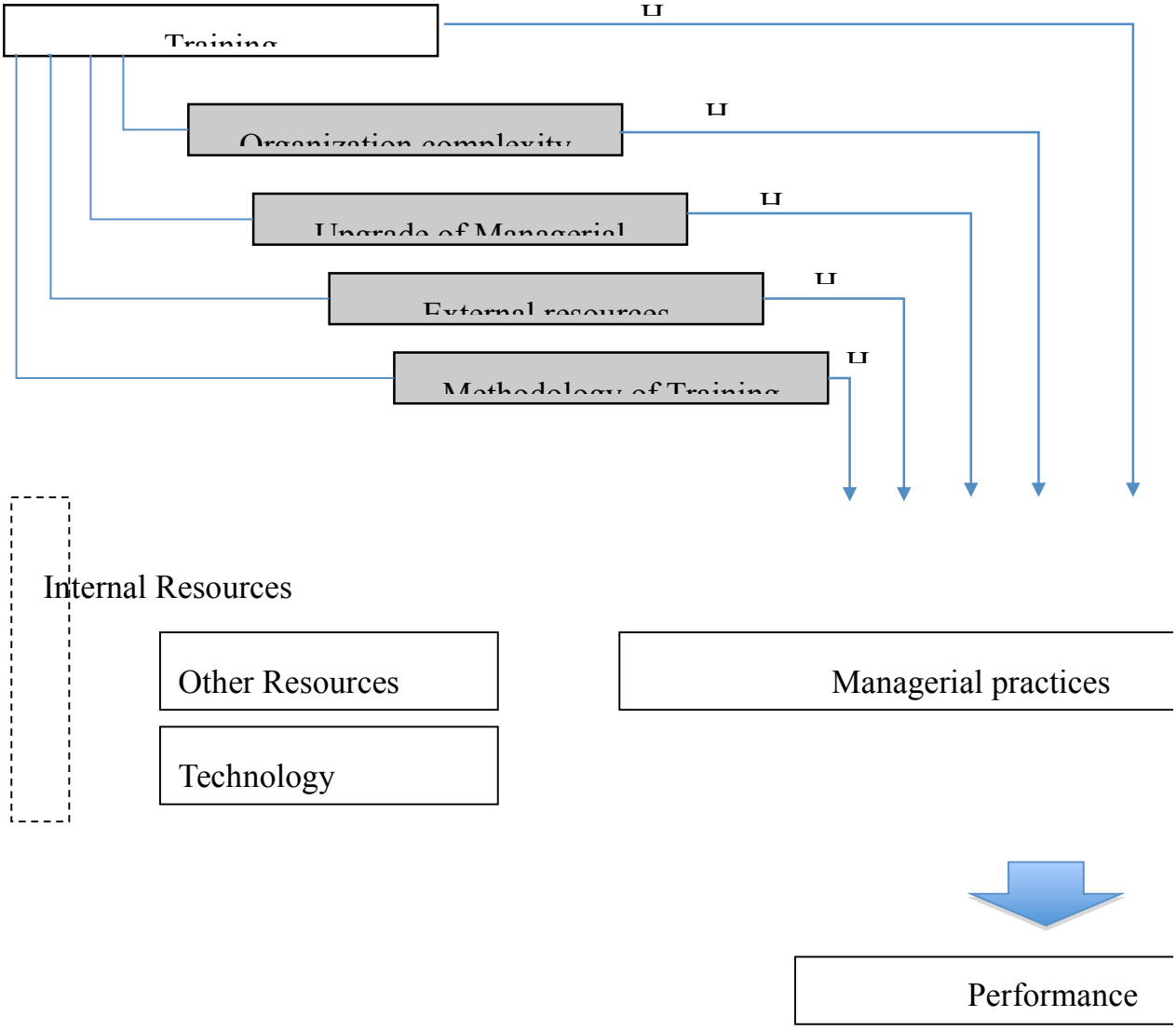


FIGURE 1 THE DIRECT AND MEDIATED EFFECTS OF TRAINING ON FIRM PERFORMANCE

**Organizational structure**

The magnitude of training effects seems to be linked to firms' characteristics (e.g., structure, dimension, etc.), even though results are not always significant (e.g. Colombo and Stanca 2008; Dearden et al. 2006; Turcotte and Rennison 2004) and coherent. In particular, firms' size directly influences the production process and results in more formalized organizations, since larger firms use average more capital-intensive production processes and have more specialized positions, with higher qualified personnel and a higher knowledge elasticity of training (de Kok 1999). Furthermore, small firms have a much lower training propensity than large firms, and provide often informal and on-the-job training (Cosh et al. 2003). Then, it is interesting to add fresh light on this topic. We expect to find out that large firms benefit from training, small firms do not. Hence, we state the following:

*Hypothesis 2 (H2): Firms characterized by a more complex organizational structure benefit more from middle managers training.*

**Upgrade of managerial competences**

The age of business is included because of theoretical and empirical evidence on the relationship between the age of the business and the level of labor productivity, and, as a consequence, the age of business is often used as a control variable in the analyses of the impact of training on productivity (Black and Lynch 2001; Colombo and Stanca 2008; Delery and Doty 1996). For example, young businesses may be relatively informal organizations and will have low sales per employee while they are developing new products. As the business and product lines mature and go to market, sales per employee grow and the business growth requires the implementation of formal personnel policies such as training. However, the relationship between firm age and growth as well as between firm age and training propensity does not seem always linear (Arvanitis 2008; Goedhuys 2007). We would expect to find out that the higher is the age of business the higher is the return from managers' training. Consequently, we test the following:

*Hypothesis 3 (H3): Firms benefit from middle managers' training because it provides them a way to upgrade their organizational capabilities.*

**External resources**

This hypothesis is based on the belief that the impact of managers' training relies on the context in which the firm is placed. Indeed, if we consider the location variable, we include institutional factors that may affect productivity of firms such as the regulatory environment, provision of business infrastructure and corruption that may differ across states or regions (Goedhuys 2007). To set an example, Colombo and Stanca (2008) found that "across Italian regions, the effect of training is large and significant in North and Central regions, while small and not significant for firms located in the South". With our analysis we would expect to confirm these results.

*Hypothesis 4 (H4): The infrastructure and economic environment of the area in which the business firm is active is a key factor in activating the positive effects of training of middle managers on firm performances.*

**Type of training methodology**

Taking advantage from the detailed dataset available, we argue that some training methodologies, above all the applied ones, are more suitable and effective for managers than others. Previous literature does not analyze this aspect but Zwick (2002) that considers the impact of the training methodology on productivity. He distinguishes training methodologies as formal external courses, formal internal courses, training on the job, seminars and talks, job rotation, self-induced learning, and quality circles. Furthermore, at a theoretical level, the use of applied methodologies is encouraged by Read and Kleiner (1996), although no single training method can be considered superior to all others. Hence, the final hypothesis can be formalized as follow:

*Hypothesis 5: Middle managers' training activities performed using applied methodologies (workshop, business simulations and case study discussions) have a higher impact on performances than those based on relational methods and frontal lessons.*

## 5. METHODOLOGY

### *5.1. Regression model and method.*

The test of the hypothesis is tackled through the estimation of a series of regression models in which the performance of firm is regressed against a set of control variables and the training variables object of the study. The models vary according to the different performance indicator used and the different set of covariates introduced as controls.

In general, we estimate the following:

$$perf_{i,t} = \alpha_i + \beta \cdot training_{i,t} + \delta_1' X_{i,t}^1 + \delta_2' X_{i,t}^2 + \gamma' Z_{i,t} + \tau_t + \varepsilon_{i,t} \quad , \qquad [1]$$

where the subscript *i* refers to firm and *t* to year. $perf_{i,t}$ represents the performance of firm i in year t. $training_{i,t}$ is the logarithm of intensity of training activity (in turn: the number of hours or the expenditure per year); $X^1$ is a vector of time variant control variables given by the number of employees and a proxy for the capital assets of firm, $X^2$ is the age of business; Z is a vector of additional controls, namely, the sector of activity (SIC 2-digit level) and the geographical area of activity at NUTS 1 level. $\boldsymbol{\tau_i}$ Is a time dummy to control for business cycle confounding effect. In addition, to test assumption H1.a *vs* H1.b we introduced also the quadratic term $training^2_{i,t}$.

All estimations are done using GMM-IV technique that allows to cope with the problem of endogeneity of training variable. Moreover, in order to get rid of heteroskedasticity we estimated the robust standard errors.

The performance indicators used are: Return on Sales (ROS), the Return on Equity (ROE) and the log of Total Factor Productivity (TFP).

The estimation of TFP is done using the Levinsohn and Petrin (2003) methodology which has the advantage of tackling a key issue in the estimation of production function: the correlation between unobservable productivity shocks and input levels. Indeed, firms respond to positive productivity shocks by expanding output, which requires additional inputs. Conversely, negative shocks lead firms to contract output, decreasing their input usage. Levisohn and Petrin suggest to use the intermediate input as a proxy of investments so to solve the problem of simultaneity of shocks and input level.[16]

### *5.2. The choice of the instruments*

A key aspect of the present work is the availability of an instrument that seems to mimic the characteristic of the theoretical instrument, as we will try to show below. In the context of our study the endogeneity issue arises from the fact we would like to single out the impact of training activity of middle managers on the firm performance. Nonetheless, we cannot exclude ex ante that the past performance has an effect on the level of training activity of firm. Under this condition "standard" regression coefficient are biased (Wooldridge, 2002). A first way to solve the problem is suggested by the GMM-Sys technique that makes use of longitudinal structure of the data to partially solve the problem. An ideal solution would be to individuate a variable that is related with the training activity but not with the performance of firm. In our context we can rely on lagged values of the variable under scrutiny and on a variable that possesses the desired features to qualify as an instrument: the yearly amount of money that INPS reserve for each firm.

This sum of money is generated by the administrative legislation related to the membership to Fondirigenti. In particular, Fondirigenti saves a percentage of the annual fee due from the firms in a reserved fund that is accessible from firms themselves only to "buy" training for middle managers. After three years the fund "expires" meaning that firm cannot use it anymore and Fondirigenti recollect the money for other purposes.

This variable appears to be significantly correlated (See TABLE A 6) with the number of hours yearly spent in training (0.461; 0.000) and with the amount of money spent in training each year (0.293; 0.000). At the same time the correlations with the performance indicators used are not significant and close to zero.

Hence, the number of hours and the amount of money spent in training are instrumented by the budget available each year for training for each firm, that *ex ante* is correlated with hours of training but not with the performances of firm. A Hansen J statistics testing overidentifying

[16] See Levisohn and Petrin (2003) and Olley and Pakes (1996) for a discussion about the issues arising in estimating a production function and the related econometric solutions.

restrictions was calculated for every model and the results show that equations are correctly specified[17].

## 6. THE RESULTS

### *6.1. Descriptive results*

The final dataset consists of 3,504 firms, which have provided training activity for their managers at least once between 2006 and 2011.

The sample is primarily composed of small and medium firms (i.e. with less than 250 employees), with about thirty seven percent of firms being large (more than 250 employees). The composition of our sample reflects the actual composition of firms in the Italian manufacturing sector (http://www.istat.it). The vast majority of firms in the sample is located in the North of Italy (about 77%) and has more than 14 years old in the business (about 72%). TABLE A 1 reports the descriptive statistics concerning size, geographic area and age of business.

As already mentioned, the dataset contains also information on the methodology used. A breakdown by methodology of on-the job training activity is provided in

TABLE A 8 and TABLE A 9. Data show that standard lectures are chosen as a methodology to learn by the 40% of managers, with an average of more than 40 hours per year. Practical activities are chosen by the 22% of managers while simulations and seminar/workshop are preferred in the 17% of cases.

The sum of the seven training methodologies provides a direct measure of the total amount of on-the-job training received by managers. On average a manager spends over 31 hours in on-the-job training per year. As this variable is skewed to the right, the mean level of training may be somewhat deceiving (the median level of training is 16 hours per year). This is one of the two measure of total training used to estimate the effects of on-the-job training on productivity and business performance.

Training expenditure is the second measure of training intensity used in the equation model. On average, firms in the sample spend over 33,000 euros in on-the-job training per year. The relationship between firm size and training seems to be exponential (see TABLE A 5). The largest is the firm the greatest is the amount of time they spend in training. Same conclusions can be drawn if we look at the relationship between firm size and the hourly cost of training. The largest is the firm the higher is the quality of training (proxied by the hourly cost of training) they provide to their managers.

### *6.2. Econometric results*

All the estimations provided in Table 1, Table 2, and Table 3 are implemented by using the IV-GMM technique (see Section 5 for further details) to control for the endogeneity of the training variable[18]. Some other estimation techniques are tested in the present work but results are not shown because of their inconsistency. Indeed, the endogeneity of the training variable invalidates the

[17] See below for the details about estimation of each regression model, that can include as instruments also lagged value of the training variable included in the model.

[18] Indeed, temporary shocks could increase productivity and bring changes in training activity (and of course in the other inputs, labor and capital). Some studies demonstrate that firms facing a downturn in demand tend to reallocate idle labor to training activities (Black and Lynch 2001; Bartel 1994).

estimations and needs to be addressed using a set of instrumental variables correlated with training but not with the productivity shock[19].

We also present the p-values for the following two tests: the Hansen J statistic and the endogeneity test of endogenous regressors. Both of them suggest the validity of the IV approach since instruments are proved to be valid and training can be treated as exogenous. Furthermore, a set of dummy variables for geographic area and sector are included as control variables in all the models estimated.

Table 1 displays the results of estimating the effects of training on firm performance. The analysis delivers mixed results and the variables generally take their expected signs. Nine dependent variables are tested. Both productivity indicators and financial indicators are used to define the dependent variable. Columns 1, 2, 3, 4, and 9 reflect the estimations of the impact of training on firm's productivity which is defined by value added (VA), labor productivity, annual growth rate of value added (growth 1 year (VA)), the growth of value added over three years (growth 3 year (VA)), and total factor productivity (TFP) respectively[20]. Columns 5, 6, 7, and 8 reflect the estimations of the impact of training on firm's financial performance, which is defined by Turnover growth 1 year, Turnover growth 3 year, Return On Sales (ROS), and Return On Equity (ROE)[21]. Among the independent variables, training is measured by the total number of hours of training provided by the firm.

The results recorded in Table 1 show strong support for a positive effect of training on both productivity and financial indicators when they are measured in level. In contrast, when the dependent variable is measured in growth, the significance does not hold anymore. In more details, the estimates imply that raising the training variable by 1% point is associated with an increase in value added of about 0.19% (Column 1) while the effect is halved (0.11%) if we look at labor productivity (Column 2). In contrast, the magnitude of the impact of training is much higher (0.61%) in TFP (Column 9). Our results seem to be in line with those found in the literature, which range from a value of 0.028% (Tan and Batra 1995) to a value of 0.761% (Zwick 2006). A more accurate comparison should be done focusing exclusively on the studies by Colombo and Stanca (2008) and Conti (2005), which are based on a sample of Italian firms. The return to training is equal to 0.074% and to 0.4% respectively. Even in this case the comparison is not straightforward because samples differ from ours in sectors and target[22].

Concerning the financial indicators, results show that an increase of training hours by 1% point is associated with an increase of about 0.42% in ROS (Column 7) and about 1.0% in ROE (Column 8).

Taking advantage from the data available, we test the hypothesis H1 using a different measure of the training variable.

[19] For further details about the IV see Section 5

[20] See Section 3.2 for further details about the definition of productivity indicators.

[21] See Section 3.2 for further details about the definition of financial indicators.

[22] Both these studies analyse a number of industrial sectors and not only the manufacturing one. Furthermore in those studies training is addressed to workers without distinguishing among professional categories.

TABLE 1: THE EFFECT OF TRAINING ON DIFFERENT INDICATORS OF FIRM PERFORMANCES

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| Dependent variables | Value added | Labor productivity | growth_1 year(VA) | growth_3 years(VA) | Turnover growth_1 year | Turnover growth_3 years | ROS | ROE | TFP |
| $T_{Hours}$ | 0.1913*** | 0.1061*** | -0.00741 | -0.00572 | 0.01581 | 0.01812 | 0.4246*** | 1.0378*** | 0.6103*** |
| | (0.013) | (0.007) | (0.008) | (0.017) | (0.022) | (0.035) | (0.094) | (0.269) | (0.067) |
| $K_{t-1}$ | 0.0684*** | 0.0442*** | -0.0105 | | -0.0539** | | 0.0783 | -0.8144*** | |
| | (0.011) | (0.007) | (0.008) | | (0.024) | | (0.051) | (0.173) | |
| $L_{t-1}$ | 0.6632*** | -0.1445*** | -0.0279 | | -0.0749** | | -0.2698** | -0.0598 | -0.1947*** |
| | (0.021) | (0.012) | (0.017) | | (0.033) | | (0.107) | (0.31) | (0.043) |
| $K_{t-3}$ | | | | -0.0280* | | -0.1347*** | | | |
| | | | | (0.015) | | (0.037 | | | |
| $L_{t-3}$ | | | | -0.0457 | | -0.0938 | | | |
| | | | | (0.038) | | (0.058 | | | |
| Age of business | -0.1003*** | -0.0429*** | -0.0512*** | -0.0855*** | -0.1225*** | -0.2060*** | 0.4430*** | 1.2111*** | -0.0848** |
| | (0.016) | (0.012) | (0.011) | (0.024) | (0.027) | (0.05) | (0.151) | (0.448) | |
| Constant | 11.7432*** | 11.0283*** | 0.4020*** | 0.6726*** | 1.5351*** | 2.9815*** | -4.1008* | 2.8008 | 8.5523*** |
| | (0.207) | (0.167) | (0.129) | (0.224) | (0.341) | (0.584) | (2.466) | (4.35) | (0.871) |
| Sector controls | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Geographical area controls | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Observations | 11050 | 10585 | 10950 | 5281 | 11239 | 5460 | 10,875 | 10778 | 1355 |
| F | 456.3 | 29.54 | 13.01 | 10.76 | 4.399 | 5.617 | 11.00 | 10.89 | 133.01 |
| F p-value | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Kleibergen-Paap rk LM statistic[3] | 974 | 890.2 | 1107 | 580.6 | 1134 | 599.5 | 945.3 | 950.1 | 112.1 |
| P-value | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hansen J statistic[4] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0122 |
| P-value | . | . | . | . | . | . | . | . | 0.912 |
| Endogeneity test of endogenous | | | | | | | 24.11 | | |

Table 2 displays the effect of training expenditures on firm performance. The estimates of the impact of training on ROS, ROE and TFP (log of) are significant but their magnitude is lower in comparison to the previous analysis (where training is measured in hours). Raising the training expenditure by 1% point is associated with an increase of about 0.23%, 0.57% and 0.40% in ROS (Column 1), ROE (Column 2), and TFP (Column 3) respectively. Columns 4, 5 and 6 respectively present the results for models in which we introduced the squared term of cost of training for ROS, ROE and TFP (log of). Both profitability indicators show a TMGT effect where the maximum effect of training is around 1.1 thousand euros both for ROS and ROE.

TABLE 2: THE EFFECT OF COST OF TRAINING ON PERFORMANCES

| | | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|---|
| | Dependent variables | ROS | ROE | Log(TFP) | ROS | ROE | Log(TFP) |
| H1 | $Log(T_{Expenditure})$ | 0.2345*** | 0.5722*** | 0.4018*** | 1.9475*** | 4.4366*** | -0.3238*** |
| | | (0.052) | (0.148) | (0.119) | (0.480) | (1.295) | (0.038) |
| | $Log(T_{Expenditure})^2$ | | | | -0.2162*** | -0.4897*** | 0.0405*** |
| | | | | | (0.054) | (0.146) | (0.004) |
| | Log(Kt-1) | 0.0861* | -0.7976*** | | 0.0279 | -0.9465*** | |
| | | (0.051) | (0.173) | | (0.056) | (0.179) | |
| | Log(Lt-1) | -0.2843*** | -0.095 | -0.3186*** | 0.5254*** | 1.7247*** | -0.0730*** |
| | | (0.109) | (0.314) | (0.123) | (0.170) | (0.462) | (0.017) |
| | Log(Age of business) | 0.4565*** | 1.2473*** | -0.0715 | 0.5594*** | 1.5522*** | -0.0556*** |
| | | (0.151) | (0.448) | (0.048) | (0.165) | (0.485) | (0.015) |
| | Constant | -4.7247* | 1.3015 | 11.3379*** | -5.1609** | 0.2332 | 10.5295*** |
| | | (2.428) | (4.333) | (0.696) | (2.511) | (4.564) | (0.209) |
| | Sector controls | Y | Y | Y | Y | Y | Y |
| | Geographical area controls | Y | Y | Y | Y | Y | Y |
| | Observations | 10,875 | 10,778 | 5,666 | 10,875 | 10,778 | 8,443 |
| | F | 11.03 | 10.9 | 2.777 | 9.084 | 9.493 | 22.72 |
| | F P-val | 0 | 0 | 5.15E-06 | 0 | 0 | 0 |
| | Kleibergen-Paap rk LM statistic3 | 1050 | 1056 | 12.51 | 199.6 | 213.8 | 175.5 |
| | P-value | 0 | 0 | 0.00192 | 0 | 0 | 0 |
| | Hansen J statistic4 | 0 | 0 | 1.205 | 0 | 0 | 0.823 |
| | P-value | . | . | 0.272 | . | . | 0.364 |
| | Endogeneity test of endogenous regressors5 | 21.31 | 14.96 | 112 | 20.62 | 14.50 | 85.32 |
| | P-value | 3.90e-06 | 0.00011 | 0 | 5.61e-06 | 0.000140 | 0 |

*Notes:*

*[3]: K-P rk test whether the equation is identified when we drop homoschedasticity. The null is that the equation is underidentified.*

*[4]: Hansen J: the null is that the instruments are valid instruments.*

*[5]: Endogeneity test: the null is that the specified endogenous regressors can actually be treated as exogenous.*

*Robust standard errors in parentheses.*

**** p<0.01, ** p<0.05, * p<0.1.*

To conclude, the results discussed so far are consistent with the hypothesis H1 advanced in Section 4: training has a positive and significant impact on firm's performance as measured by

profits indicators and productivity. This is true independently of the way used to measure training hours vs. expenditure).

Table 3 shows the results concerning H2, H3, H4, and H5 discussed in Section 4. It first presents the link between training and firm's size (i.e. firms with less and more than 50 employees), the age of business (i.e. firms less and more than 14 years old), the geographic location (i.e. firms located in the North, and in the Centre-South of Italy), and the methodology of training (i.e. on field training, front lesson training, and experiential training). The analyses shown in Table 3 are implemented by using the IV-GMM technique. Training is measured in terms of costs for H2, H3, and H4.

A positive effect of training on TFP is observed for medium and large firms (i.e. with more than 50 employees), while results for small firms are positive but not significant. In medium and large firms, an increase of 1% point in training expenditure leads to an increase in TFP of about 0.55%. Our results are coherent with those from previous literature. The link between training and firms' characteristics (e.g., structure, dimension, etc.) is proved to be positive even not significant in Colombo and Stanca (2008) and Dearden et al. (2006). Significant results are those by Turcotte and Rennison (2004), Zwick (2002), and Bishop (1989). Turcotte and Rennison (2004) find that an increase of 1% point in the number of workers trained in class corresponds to an increase of 0.478% in productivity for firms with more than 20 employees (results are not significant for firms with less than 20 employees)[23]. Zwick (2002) finds that the magnitude of the impact of training on productivity growth increases with firm's size (elasticity is equal to 1.130, 2.190, 2.546, and 3.185 for firms of 20-199, 200-499, 500-1,000, and more than 1,000 employees respectively). Analogously, Bishop (1989) shows that the elasticity of productivity with respect to training is 0.092 at establishments with 18.5 employees and about 0.1156 for companies with 200 employees.

To conclude, there is a strong and coherent evidence which supports the hypothesis H2 advanced in Section 4: firms characterized by a more complex organizational structure, namely large firms, benefit more from middle managers training. These results could help to explain why formal training programs are more common at large companies than at small companies (see Appendix A).

Hypothesis H3 is also confirmed empirically: firms benefit from middle managers' training because it provides them a way to upgrade their organizational capabilities. Older firms (with more than 14 years) benefit from training more than younger ones (with less than 15 years). An increase of 1% in the training expenditure leads to an increase of about 0.85 in TFP of older firms. To our knowledge, among the literature analyzed, only Bartel (1994) includes the age of business variable into the model. She finds out that the business age variable does not have the expected positive coefficient in the training implementation equation and the result is not statistically significant.

The infrastructure and economic environment of the area in which the business firm is active is a key factor in activating the positive effects of training of middle managers on firm performances (H4). This hypothesis is empirically proved in our analysis. We find out that an increase of 1% in training expenditure leads to an increase of about 0.76% in TFP for firms located in the North of Italy. The impact is not statistically significant for firms located in the Centre-South of Italy. This result is plausible in the light of the previous findings. Colombo and Stanca (2008) find that across regions, the effect of training is large and significant in North and Central regions (0.08 and 0.12 respectively), while small and not significant for firms located in the South.

The last hypothesis (H5) represents an original contribution since it deals with some characteristics of training that, to our knowledge, have not been analyzed so far in previous literature. Taking advantage from the detailed dataset, we argue that some training methodologies are more suitable and effective for managers than others. Indeed, we find that increasing by 1%

[23] Turcotte and Rennison (2004) find also that an increase of 1% point in the share of workers trained in class with computer training entails an increase of 0.485% in productivity form firms with less than 20 employees, while the estimation is not significant for firms with more than 20 employees.

point training hours for on field training, front lesson training, and experiential training leads to an increase of about 0.87%, 0.26%, and 1.24% in TFP respectively. These results suggest that "applied" methodologies are by far more effective than "standard" ones[24].

TABLE 3: IMPACT OF TRAINING ON TFP ESTIMATED COEFFICIENTS

| Hypothesis tested | Estimated coefficients |
|---|---|
| **H2:** | **(cost of training):** |
| Small firms<br>(less than 50 employees) | 2.1459<br>-2.097 |
| | |
| Medium and large firms<br>(more than 49 employees) | 0.5508***<br>-0.09 |
| **H3:** | |
| Young firms (less than 15 years old) | 0.2845<br>-3.421 |
| Older firms (more than 14 years old) | 0.8495**<br>-0.387 |
| **H4:** | |
| Firms in north of Italy | 0.7642***<br>-0.15 |
| Firms in center-south of Italy | 0.6432<br>-3.304 |
| **H5:** | **(hours of training):** |
| Training (total number of hours) | 0.6103***<br>-0.067 |
| Hours spent in On field training | 0.8726***<br>-0.054 |
| Hours spent in Front lesson training | 0.2589***<br>-0.03 |
| Hours spent in Experiential training | 1.2396***<br>-0.214 |

[24] For further details about methodology see Section 5.

## 7. CONCLUDING REMARKS

This paper has examined for the first time the performance effects of training devoted to middle managers in Italy.

We demonstrate the existence of a positive and significant link between training investments devoted to middle managers and firm's performance (proxied by productivity and financial indicators). Our analysis highlights an exogenous and significant effect of training on firm's performance measured both by productivity (TFP) and financial indicators (ROE). Returns to training investments seem to be much higher for those firms which are large (more than 50 employees), located in the North area of Italy, with more than 14 years of business and which focus on applied methodologies.

In more details, on the basis of a unique dataset, we empirically test a set of research hypotheses and we find support for the five following ones. (H1) Middle management continuing vocational training has an effect on two performance indicators, and the effect is non linear. Raising the training variable by 1% point is associated with an increase of about 0.19% in value added and of about 0.61% in TFP. Our results seem to be in line with those found in the literature, which range from a value of 0.028% (Tan and Batra 1995) to a value of 0.76% (Zwick 2006). Moreover, H1.a has to be preferred to the alternative H1.b for models in which ROS and ROE are used. The TMGT effect is in place: profitability is affected by training but the effect is non linear and after a given threshold training effort the effect starts to be negative.

We also state that MM training is more effective for larger firms (H2) because a positive effect of training on TFP is observed for medium and large firms (i.e. with more than 50 employees), while results for small firms are positive but not significant. In medium and large firms, an increase of 1% point in training expenditure leads to an increase in TFP of about 0.55%.

Hypothesis H3 is also confirmed empirically: firms benefit from middle managers' training because it provides them a way to upgrade their organizational capabilities. Older firms (with more than 14 years) benefit from training more than younger ones (with less than 15 years): an increase of 1% in the training expenditure leads to an increase of about 0.85 in TFP of older firms.

Furthermore, we find some interesting evidence as for geographic location (H4): an increase of 1% in training expenditure leads to an increase of about 0.76% in TFP for firms located in the North of Italy. The impact is not statistically significant for firms located in the Centre-South of Italy.

In the end, we can also state that the methodology of training matters in explaining firm's performance. We find that increasing by 1% point training hours for on field training, front lesson training, and experiential training leads to an increase of about 0.87%, 0.26%, and 1.24% in TFP respectively. These results suggest that "applied" methodologies are by far more effective than "standard" ones.

On the basis of the above results we can conclude that training investments devoted to middle managers are effective. This finding is coherent with what previous literature states. Investments in human capital devoted to middle managers are a key strategy that allows to improve management and firm's productivity in the long run. This is true because of the effects it has on manager's practices that in turn have an impact on firm's performance. In other words, human capital investments (e.g. training investment) have an important role in driving good and accepted managers' practices, which help to explain productivity gaps among firms. Influential previous studies suggest and prove the existence of the second link (namely manager's practices vs. firm's performance) while very few studies address the first one so far (human capital investments vs. manager's practices), leaving room for further researches on this topic. In order to do this, more complete data on manager's practices in organizations need to be collected and an effort by businesses and governments is likely to be necessary in order to generate these data.

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## APPENDIX A

TABLE A 2 – VARIABLES USED IN THE ANALYSIS: DESCRIPTIVE STATISTICS

| | Mean | Median | Min | Max | N | Standard deviation |
|---|---|---|---|---|---|---|
| Age of business | 29.15 | 26.00 | 2.00 | 156.00 | 18900 | 19.40 |
| Training expenditure | 33396.97 | .00 | .00 | 2.02E+06 | 21024 | 149725.57 |
| Training hours | 86.20 | 2.00 | .00 | 59696.00 | 21024 | 708.50 |
| Turnover | 2.68E+08 | 4.22E+07 | .00 | 1.08E+11 | 15630 | 2.19E+09 |
| Intermediate input | 1.46E+08 | 1.43E+07 | -1.96E+07 | 5.87E+10 | 15630 | 1.28E+09 |
| # Employees | 626.13 | 163.00 | .00 | 153369.00 | 14845 | 3766.87 |
| Return on Equity (ROE) (%) | 4.44 | 4.95 | -1.50E+02 | 119.77 | 15000 | 26.39 |
| Return on Investment (ROI) (%) | 6.51 | 6.38 | -3.00E+01 | 30.00 | 12597 | 10.53 |
| Value added per employee | 83.21 | 69.00 | -4.80E+01 | 499.00 | 14322 | 57.02 |
| Value added growth (1 year) | .17 | .04 | -5.77E+01 | 83.00 | 2721 | 2.81 |
| Value added growth (2 year) | .04 | -.01 | -2.80E+01 | 21.69 | 2677 | 1.32 |

TABLE A 3 - FIRMS' DEMOGRAPHICS AND ECONOMIC CHARACTERISTICS

| | | |
|---|---|---|
| Age of business (Years) | | 29.15 |
| Age of business | Young | 27.71% |
| | Mature | 72.29% |
| Geographic Area | North-West Area | 45.55% |
| | North-East Area | 31.08% |
| | Centre of Italy | 16.98% |
| | Islands and South Area | 6.39% |
| Size | Micro | 2.20% |
| | Small | 14.30% |
| | Medium | 46.10% |
| | Large | 37.50% |
| | Micro | 2.20% |
| Legal Form | Corporation | 98.17% |
| | Partnership | 0.03% |
| | Cooperative Society | 0.81% |
| | Consortium | 0.93% |
| | Others | 0.06% |
| Sector1 | | 0.29% |
| Sector2 | | 0.17% |
| Sector3 | | 59.82% |
| Sector4 | | 1.63% |
| Sector5 | | 1.51% |
| Sector6 | | 3.40% |
| Sector7 | | 4.94% |
| Sector8 | | 2.57% |
| Sector9 | | 0.26% |
| Sector10 | | 6.76% |
| Sector11 | | 0.97% |
| Sector12 | | 0.68% |
| Sector13 | | 6.34% |
| Sector14 | | 1.28% |
| Sector15 | | 0.00% |
| Sector16 | | 0.49% |
| Sector17 | | 0.20% |
| Sector18 | | 0.17% |
| Sector19 | | 0.23% |
| Sector20 | | 0.00% |
| Sector21 | | 0.00% |

TABLE A 4 - FIRMS' DEMOGRAPHICS AND ECONOMIC CHARACTERISTICS PER YEAR

| | | Year | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **Total** |
| Value added per employee | | 81.15 | 84.77 | 85.37 | 78.78 | 85.03 | 92.35 | 83.21 |
| Return on Equity (ROE) (%) | | 5.91 | 8.01 | 4.6 | 0.03 | 3.68 | 4.09 | 4.44 |
| # Employee | | 619.91 | 624.42 | 653.21 | 624.8 | 616.67 | 536.49 | 626.13 |
| Intangible assets | | 44,795,684.69 | 55,507,106.39 | 55,987,412.96 | 58,737,144.77 | 73,652,284.21 | 15,140,892.44 | 56,962,245.34 |
| Turnover/Employee (Th.) EUR | | 334.62 | 351.38 | 364.16 | 327.71 | 349.71 | 412.11 | 346.86 |
| Dimension | Micro | 2.13% | 2.20% | 2.46% | 2.30% | 1.69% | 1.82% | 2.16% |
| | Small | 15.42% | 15.19% | 13.71% | 13.37% | 13.69% | 13.09% | 14.27% |
| | Medium | 45.92% | 45.66% | 46.05% | 46.54% | 46.75% | 41.45% | 46.09% |
| | Large | 36.53% | 36.95% | 37.78% | 37.79% | 37.86% | 43.64% | 37.49% |

TABLE A 5 – FIRM SIZE BY HOURS AND COST OF TRAINING

| | | Hours of training | Cost of training (per hour) |
|---|---|---|---|
| Firm's size | Micro | 14.11 | 41.35 |
| | Small | 18.07 | 48.49 |
| | Medium | 32.53 | 85.31 |
| | Large | 202.21 | 341.51 |

TABLE A 6 – CORRELATIONS

| | | Training hours | INPS | Training expenditures |
|---|---|---|---|---|
| Training hours | Pearson correlation | 1 | .461** | .277** |
| | P-value | | .000 | .000 |
| | N | 21,024 | 20,939 | 21,024 |
| INPS | Pearson correlation | .461** | 1 | .293** |
| | P-value | .000 | | .000 |
| | N | 20,939 | 20,939 | 20,939 |
| Training expenditures | Pearson correlation | .277** | .293** | 1 |
| | P-value | .000 | .000 | |
| | N | 21,024 | 20,939 | 21,024 |

TABLE A 7 - SUMMARY STATISTICS OF TRAINING ACTIVITY PER YEAR

| | | Year | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **Total** |
| Share of firms active in training | | 28% | 49% | 56% | 74% | 51% | 44% | 50% |
| Number of managers who received training | | 3,094.00 | 9,986.00 | 10,972.00 | 14,925.00 | 9,513.00 | 5,721.00 | 54,211.00 |
| Training costs | mean | 14,341.89 | 37,082.36 | 35,914.63 | 55,392.40 | 29,847.35 | 27,803.21 | 33,396.97 |
| | s.d. | 108,636.23 | 173,470.56 | 151,739.58 | 186,809.35 | 137,440.03 | 122,152.56 | 149,725.57 |
| Training hours | mean | 57.33 | 135.85 | 66.35 | 106.37 | 67.15 | 84.15 | 86.20 |
| | s.d. | 642.86 | 1,458.57 | 260.90 | 515.50 | 269.60 | 246.73 | 708.50 |

TABLE A 8 - TRAINING METHODOLOGY (NUMBER OF HOURS)

| | | Year | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **Total** |
| E-learning (# hours) | mean | 2.49 | 5.59 | 2.97 | 4.32 | 3.88 | 7.23 | 4.41 |
| | s.d. | 56.03 | 119.69 | 21.14 | 26.18 | 51.23 | 71.74 | 66.3 |
| Practice (# hours) | mean | 11.69 | 23.37 | 10.59 | 19.09 | 10.44 | 15.39 | 15.1 |
| | s.d. | 185.5 | 277.21 | 66.22 | 159.58 | 60.18 | 58.61 | 157.19 |
| Lecture (# hours) | mean | 29.12 | 71.76 | 34.19 | 52.74 | 32.83 | 30.13 | 41.8 |
| | s.d. | 497.36 | 1,124.78 | 163.19 | 249.48 | 136.99 | 113.8 | 521.88 |
| Experiential methods (# hours) | mean | 3.57 | 8.36 | 5 | 8.98 | 3.81 | 7.37 | 6.18 |
| | s.d. | 48.71 | 105.01 | 35.81 | 65.44 | 27.06 | 41.47 | 59.78 |
| Relational methods (# hours) | mean | 0.95 | 2.83 | 2.96 | 4.46 | 3.25 | 4.83 | 3.22 |
| | s.d. | 10.62 | 28.29 | 23.08 | 22.01 | 23.11 | 25.16 | 22.75 |
| Seminar/Workshop (# hours) | mean | 8.08 | 20.05 | 7.76 | 10.79 | 9.67 | 14.94 | 11.88 |
| | s.d. | 104.77 | 201.49 | 73.53 | 84.47 | 122.87 | 93.76 | 121.17 |
| Simulation (# hours) | mean | 1.42 | 3.9 | 2.88 | 6 | 3.26 | 4.26 | 3.62 |
| | s.d. | 14.25 | 33.02 | 19.98 | 108.36 | 50.03 | 36.39 | 53.65 |

TABLE A 9 - TRAINING METHODOLOGY (% OF CASES)

| | Year | | | | | | |
|---|---|---|---|---|---|---|---|
| | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **Total** |
| E-learning | 3.22% | 4.94% | 5.91% | 9.16% | 4.14% | 4.71% | 5.35% |
| Practice | 10.76% | 18.72% | 21.20% | 32.42% | 22.03% | 27.57% | 22.12% |
| Lecture | 21.92% | 38.50% | 44.89% | 57.76% | 39.64% | 32.62% | 39.22% |
| Experiential methods | 7.51% | 11.90% | 13.07% | 19.98% | 11.39% | 14.67% | 13.09% |
| Relational methods | 8.33% | 13.47% | 15.84% | 24.29% | 12.07% | 16.32% | 15.05% |
| Seminar/Workshop | 9.05% | 14.67% | 16.70% | 25.74% | 16.81% | 22.26% | 17.54% |
| Simulation | 9.87% | 16.21% | 17.89% | 26.57% | 16.24% | 19.81% | 17.77% |