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Offshoring, Extent of the Shadow Economy and Firm Performance. Evidence from Italy

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by

Vito Amendolagine**, Rosa Capolupo* and Giovanni Ferri*

Abstract

Being the G-7 country with the largest shadow-economy share, we posit that Italy's manufacturing firms – to counter emerging economies' competition – could alternatively offshore or enter the shadow economy. Within this context, we investigate, in a sample of Italian firms, whether internationalised firms outperform purely domestic firms in terms of efficiency, innovativeness and skill composition. Using propensity-score-matching and difference-in-difference techniques we find evidence that: (i) offshoring impacts TFP negligibly but, (ii) labour cost relocation robustly causes offshoring; (iii) offshoring firms are more likely innovative and R&D-oriented; (iv) firms in high- shadow -economy provinces less likely offshore. It is also evidenced that the latter firms show lower TFP and R&D expenditure.

Keywords: trade integration, offshoring, empirics of global sourcing, shadow economy
JEL Classification: F13, F21, O19, E26

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1. Introduction

Over the last 25 years, globalisation brought about not only opportunities but also challenges for industrialised countries. International trade grew by 5.5% a year between 1960 and 2006 – 2.4% more than world GDP – and the growing role of emerging economies is testified by the fact that their export/GDP ratio increased from 20 to 35% between 1984 and 2004. As emerging economies' producers were growingly included in the circuit of international trade, they stiffly competed away companies from industrialised countries. Thus, advanced economies' enterprises were forced to respond. The response is linked to firms' ability to shift to higher value added activities and/or to cut their production costs. As to the former, the objective is raising the output's innovation/technology content. Regarding the latter response – cutting production costs – firms may choose among two different strategies. The first one consists of internationally fragmenting their own production processes – i.e. venture into offshoring – taking advantage of the drastic reduction in communication and transportation costs.[1] The second strategy is to reduce costs at home, possibly by shifting (some parts of) production to the shadow economy. This will allow a reduction in costs but will hardly deliver well-rooted competitive gains. We can expect that entering the shadow economy is alternative to offshoring. We should consider this possibility, since the extent of the shadow economy in Italy is the largest among the G-7 countries.

Italy's economy was largely affected by emerging economies' competition for two main reasons. Firstly, compared to the other industrialised countries, the Italian economy kept relying to

[1] The increasing extent of offshoring is proved by the fact that FDI flows from rich countries to emerging (and transition) economies – i.e. those implying a vertical frahmentation of production – rapidly expanded more tenfold from 22 billion USD in the early 1990s to beyond 300 billion in recent years (UNCTAD, 2006).

an unusually large extent on manufacturing – with a slow expansion in the service sector – and specialising in manufacturing traditional goods (the segments typical of the *made in Italy*: e.g., textiles & clothing, leather & shoes, furnishing, etc.) with a low content of innovation/technology. Secondly, in spite of its high export propensity, Italy counted very few multinational enterprises, the type of companies, which are normally more prompt to exploit the opportunities offered by offshoring. Accordingly, among industrialised countries, Italy coupled, perhaps, the largest need with the smallest ability to offshore. Not surprisingly, then, the process of offshoring gained momentum at Italian firms particularly after the introduction of the euro precluded for the future competitive devaluations of the exchange rate.

Given this background, this paper starts by investigating the determinants and the effects of production offshoring. In particular, using a database built on the two latest waves of the Capitalia survey and fitting a matching and difference-in-difference approach, we test whether firms that offshore for the first time show higher performance in terms of post-offshoring TFP and/or skill composition of their labour force. At the same time, we try to assess also whether offshoring is substitute or complement with the innovation propensity of the firm. Finally, we test whether the extent of offshoring is negatively related to the size of the shadow economy.

All of the variables are calculated on data based on the Capitalia survey, included the innovation intensity of the firm, which is proxied either by the share of sales due to innovative products or by R&D expenditures. The only dimension of our analysis we could not measure in the Capitalia survey refers to the shadow economy. Here, we used three alternative province-level proxies: a) the share of undocumented workers in 2003 (source: ISTAT, 2006); b) the share of illegal migrants regularized with the 2002 amnesty (source: ISTAT, 2005); c) the share of IRAP[2] tax evasion (source: Pisani and Polito, 2006). In other words, been it impossible to measure the recourse to the shadow economy at the firm level, we posit that such recourse is more likely the higher the extent of the shadow economy in the province where the firm belongs.

[2] IRAP stands for Imposta sui Redditi delle Attività Produttive, i.e. it is levied on the value added of production.

The remainder of this paper is organised as follows. Section 2 draws a concise survey of the literature in terms of the causes and consequences of offshoring, while discussing also the possible interlinkages with the extent of the shadow economy. Section 3 provides some background information on the distribution of firm characteristics oriented towards offshoring, innovation and the shadow economy. Section 4 presents our empirical methodology and Section 5 discusses the main results. Section 6 recaps our findings and discusses policy implications.

1. Offshoring, Firm Performance and the Shadow Economy

2.1 Offshoring and Firm Performance: Surveying the Literature

The profound transformations in the world economy triggered theoretical and empirical researches aimed at assessing the effects of foreign investment and reorganization of production across national borders. Even though some responses lie within the framework of the orthodox theory, the need of new approaches has become undisputable. Indeed, the standard Hecksher-Ohlin neoclassical trade theory – carrying restrictive assumptions on the immobility of production factors and identical production functions across countries – cannot explain internationalisation and offshoring decisions. Similarly, Ricardian-type comparative advantages need to be amended since trade is not "wine for cloth anymore", as claimed by Grossman and Rossi-Hansberg (2006). The data reveal that, while the majority of trade continues to be horizontal, vertical-specialization-based trade is expanding significantly. International outsourcing and foreign direct investment (FDI) have been growing steadily and the external orientation of firms has extended to a range of separable activities going from product design, the assembly of different intermediate products to a wide range of heterogeneous services. In the current phase of the internationalisation of production, firms try to exploit location advantages such as proximity to markets and reduction of labour costs.

From a firm-theoretic viewpoint, models, allowing us to tackle several of these issues, are Melitz (2003) and Helpman, Melitz and Yeaple (2004). These models, focusing on individual firm

behaviour and participation in international markets, offer an explanation to the puzzle of international fragmentation of production. Among the motives for choosing different foreign strategies, the degree of heterogeneity within industries emerges as a result of productivity differences across firms. What comes out is that a firm gives up concentration of production to reduce its variable unit costs even though this strategy brings about higher fixed costs. The main findings are embodied in the following marked sequences of outward orientation by firms: (i) the most productive firms serve foreign markets via subsidiary sales, (ii) intermediate productivity firms cover foreign markets through exports and (iii) lowest productivity firms serve only the domestic market (see Helpman [2006]). This latter strategy, highlighted by the theoretical literature, predicts that the least productive firms perform all their activities at home. Trade raises the profits of high productivity firms and, since domestic firms that do not engage in international activities arehit by competition, the least productive are destined to leave the business unless they find alternative cost reduction modes.

These models capture various characteristics of the new international division of labour but, as some scholars argue, we still lack a simple analytical framework for investigating costs and benefits of increased offshoring in home country and/or in the participating countries. Along lines that do not focus on fixed costs lie the works by Grossman and Rossi-Hansberg (2006), and Melitz and Ottaviano (2005). Particularly important, given the links with our empirical findings, is the impact on wages induced by offshoring. Grossman and Rossi-Hansberg (2006) split the impact on wages into three different components: a *labour supply effect*, a *relative price effect* and *a productivity effect*. The authors claim that, if the productivity effect dominates over the others, then the offshoring of low skilled jobs will raise the wages of domestic workers performing these tasks. The opposite holds true when the productivity effect is dominated by the others.

A second factor stressed by the literature relates to the different internationalisation strategies faced by firms depending on contractual incompleteness. The determinants of the level

of offshoring and of selecting offshoring vs. outsourcing[3] will depend on the relative control that producers of final goods and suppliers of parts of production exert on the different stages of the production process. The quality of contracting institutions affects firms' decision to either outsource (purchasing intermediate goods and services domestically or internationally) or offshore (operating via foreign affiliates). In these new forms of contracting and sub-contracting, agency problems are likely to occur since factors of production are not under the direct control of the final good producer. It can be shown that, without cooperation with the supplier, the level of output – and hence revenues – may decrease. In these models the choice among different modes of production will depend on the share of revenues under the different production strategies (Grossman and Helpman [2002, 2005], Antràs [2003], Feenstra and Spencer [2005], Feenstra and Hanson [2005]).

Parallel to the sizeable theoretical studies an increasing empirical literature, facilitated by the availability of micro-level datasets, deals with the domestic effects of offshoring. From the "gains from trade" perspective, there are many related issues that can be tackled. Can we expect from this process a win-win game in which all players will benefit? Or is it more appropriate to envisage a zero sum game depleting employment and worsening performance at home? Can we apply the mutual benefits of comparative advantages to these forms of internationalisation? The current lively debate on the issue symbolises the doubts on the effects of an integration process with rather different features from the past, since giant countries like China and India are going to play the game with labour and capital trade-offs of a magnitude greater than earlier competitors (see Farrel 2005).

The impact of offshoring on the domestic activities and performance of the firms investing abroad is one of the most addressed empirical issues even though the extent of offshoring is still

[3] As it is standard in the literature, the term offshoring is used to indicate the relocation of activities abroad in their own affiliates (FDI and multinationals) whereas outsourcing is used to mean the relocation of one or more stages of a good's production process formerly carried out entirely in the home country. Therefore, outsourcing means the acquisition of an input or service from an unaffiliated company. Ambiguities remain in these definitions (see, for instance Baghwati 2004)

limited in advanced economies. The latest World Economic Outlook reports that in 2003 the offshoring of manufacturing and services inputs averaged about 5% of gross output (IMF, 2007; p.166) but downward pressures on wages, changes in skill composition as well as a decrease in labour share are largely expected. Workers in advanced economies could be better off only if the positive effects from enhanced trade and productivity are larger than the negative effect on the share of income accruing to labour. In the empirical literature, in fact, the main issue deals with the consequences of the globalization of labour on wages and employment in advanced economies. Some works find that the labour intensity of home country-production, can be lowered when the employment in affiliates in developing economies is large (see, e.g., Mariotti, Mutinelli and Piscitello [2003] for the Italian case, and Lorentowicz et al. [2005] for Austria and Poland). However, the work by Amiti and Wei (2005) finds no evidence that offshoring led to job losses in the U.K. during the period 1995-2001, in either manufacturing or the service sectors. More in general, jobs depleted by service outsourcing are likely to be offset by new jobs created in the same sector.

Other studies that focus on the "jobs creation *vs.* depletion" issue include Brainard and Riker (1997), Braconier and Eckolm (2002), Hanson *et al.* (2001), Konings and Murphy (2006), Marin (2004), Mariotti *et al.* (2003). While some papers find some substitution effect between home parent employment and their affiliates, other studies find that employment in foreign affiliates in developing countries can be complementary to home employment. Finally, case-study papers using Irish firm-level data, such as Görg, Hanley and Strobl (2004), Girma and Görg (2004), Girma, Greenaway and Kneller (2004) find that the effect of outsourcing is positive particularly for large firms and for those based on international exports.[4] However, more recently Gorg and Hanley (2005) using plant-level data for the Irish electronics sector – which has witnessed

[4] Linked to employment recent literature stresses the effect on real income. One view states that all income gains go to the offshoring country. The income distribution in the host country twists in favour of shareholders. However, more work is needed to assess this important effect.

significant offshoring activities – find significant reductions in labour demand due to the outsourcing of materials used in production.

Indeed, most concerns about offshoring regard its effects on the labour market. It seems that jobs will be lost in some sectors at home without corresponding job gains in other sectors, thus resulting in net job losses for the country. Alternatively, some argue that shifting jobs overseas enables workers to be employed into higher productivity tasks and that proper accounting of this phenomenon should consider cross-industry effects (Kierkowski [2005]).

While the majority of the studies reviewed fail to assess *the causality effect* of offshoring on firm performance, more recent studies confirm the positive effects of internationalisation focusing on the construction of a proper counterfactual to which the performance of the firms after the strategy has been accomplished is compared. We recall the works by Barba Navaretti and Castellani (2005, 2004a and 2004b, Barba Navaretti *et al* 2006). On the basis of samples of Italian firms these authors construct counterfactuals focussing on the firms that invest abroad for the first time and carry out a difference-in-difference estimate to assess the issue (see also Egger and Pfaffermayr, 2003, for a similar analysis on Austrian firms, and Barba Navaretti, Castellani and Disdier 2005 for the case of France). Thus, they show that the net effects of outward investment on the home business are positive both in terms of higher TFP and output growth. Moreover, the better performance of firms shifting from national to multinational with respect to the "never shifting" ones does not deplete employment.

Our work builds on these studies by contributing at further exploring the phenomenon of offshoring for Italian firms. Our results partly depart from the existing evidence especially concerning the labour market impact, which appears to be more complex in Italy than in other European countries. This complexity is explained by the degree of underground activities characterising the Italian goods and labour markets. In fact, the size of the shadow economy if, on one hand, exerts a negative fiscal externality on the aggregate level, on the other hand, it may create, at a micro level, margins of flexibility and competitiveness by allowing firms to avoid

labour market restrictions and institutional inefficiencies (high tax rates and social security contributions which increase labour costs). These arguments start to emerge also in the theoretical literature by arguing that the incentive to go underground may outweigh the benefits of remaining official (see Davidson, Martin and Wilson [2003] Kanniainen, Paakkonen and Schneider [2004], Grossman [2002]). These studies suggest that the worse the profitability and the competitiveness of the firm caused by high shares of direct and indirect taxation, the higher the shadow economy. Therefore, it seems plausible to think that firms confronting with higher integration competitiveness with a group of neighbouring countries may choose to enter the shadow economy.

2.2 Incentives to Offshore in Italy's Dualistic System: Shadow vs. Regular Economy

Relating to the 2002-03 average, Schneider (2005) estimates that the share of shadow economy is 25.7% in Italy, making the country a clear outlier not only with respect to the other G-7 countries – ranging from the lowest value of 8.4% for the USA to the largest 16.8% for Germany – but also vis-à-vis the overall OECD average (16.3%).

Various possible explanations have been put forward to account for this phenomenon (see Schneider and Enste [2000], Lucifora, 2003). Among the top ranked explanations we may list four. First, corporate tax rates and regulatory restrictions in the labour market are very high in Italy, thus encouraging firms to seek ways to evade or elude taxation and restrictions. Second, the little effectiveness of the tax enforcing bodies, due to the low efficiency of the public sector or to the fact that some of the past governments introduced repeated tax amnesties by raising expectations for further ones. Third, we annotate the high reliance on small and medium-sized enterprises (SMEs) in the productive system. SMEs are notoriously less structured and more opaque than larger enterprises, which makes it easier for them to operate in the hidden economy. Fourth, the specialization of Italy's economy in traditional manufacturing generates a very large

share of low skilled jobs, whereby the role for the informal segment of the labour market is amplified and so is the scope for (parts of) the firms doing business in the shadow.

Holding the first three factors constant, the competitive challenge posed by globalisation could hit Italy along the fourth dimension and lead it into a vicious cycle in which – according to the arguments raised in the previous Section – many low productivity firms might choose to turn to – or increase their reliance on – the shadow economy.

Some cross-section evidence seems to support this view. For instance, the level of the intensity of the IRAP tax evasion over the period 1998-2002 was larger in the less developed Southern Italy – 19 of the 22 provinces ranked as highest tax evasion were located in the South as against only 1 of the 21 provinces ranked as lowest tax evasion. Yet there were 9 Southern provinces among the 22 for which IRAP tax evasion showed a high growth between 1998 and 2002 (Pisani and Polito, 2006). However, we will also use another proxy of the extent of the shadow economy – the share of irregular employment – which is highly positively correlated with the tax evasion variable. It is worth observing that the large and increasing reliance of Southern firms on the shadow economy came about hand in hand with a worsening in performance which was more severe for them than for Centre-Northern firms. According to the Capitalia data on manufacturing, between the 1998-2000 and the 2001-2003 waves, the ROA was rather stable for Centre-Northern firms – decreasing only slightly from 8.0 to 7.9% – while it dropped from 8.3 to 7.8% for Southern firms. Thus, it is possible that, while global competition intensified, Southern firms were experiencing lower productivity and, at the same time, intensifying their recourse to the underground economy.

On this issue, Rossi (2006) convinncingly argues that it is worth considering at least four different strategies: (i) firms holding a non-trivial technology advantage vis-à-vis competitors from emerging economies; (ii) intermediate firms able to face competition by upgrading their technology level; (iii) low-tech firms trying to fence competition by promoting their trade marks; (iv) low-tech firms making a solely defensive move into international outsourcing production to

low labour cost countries. The author concludes that type (iv) companies are paving their way to exit the market as soon as they will exhaust the temporary benefit from lower production costs. Rossi does not even consider the prospect for those firms entering the shadow economy. We may add this possibility as a fifth available response to competition.

Quite obviously, we would expect that firms moving (part of) their production abroad might further increase their innovation content for firms of the types (i) and (ii) above. In addition, it is easy to conjecture that the added fifth category of firms – those moving to the shadow economy – will hardly fragment their production abroad.

3. The empirical approach: propensity score matching and difference in difference estimator

Our interest lies in estimating the effect of offshoring on firm performance using score–matching techniques and the difference in difference methodology. These approaches have been developed as means to approximate the counterfactual situation, which is unobservable in nature.. In particular, we wish to infer, for the Italian firms, which offshored their production abroad, what would have been the performance implications if they had not offshored.

Let $D_{it} \in \{0,1\}$ be an indicator of whether firm i chooses to offshore at time period *t.* Let us denote with y^{1}_{it+s} the outcome y obtained at time $t+s$, with $s \geq 0$, by firms which have chosen to invest abroad and with y^{0}_{it+s} the hypothetical value of y they would have gained if they had not offshored.

As it is well known from the literature, the effect of offshoring would be captured by:

$$y^{1}_{t+s} - y^{0}_{it+s} \qquad (1)$$

By using a microeconometric evaluation methodology (Blundell and Costa Dias [2002]; Heckman *et al.* [1997] the average treatment effect on the treated (ATT) offshoring firms may be written as:

$$\hat{\delta} = E\left[y^1_{it+s} - y^0_{it+s} \;\middle|D_{it} = 1\right] = E\left[y^1_{it+s} \;\middle|D_{it} = 1\right] - E\left[y^0_{it+s} \;\middle|D_{it} = 1\right] \quad (2)$$

where $\hat{\delta}$ captures the difference between the average outcome for firms that have offshored and the average effect for the same group under the hypothesis that they did not offshore. A missing data problem arises, because we cannot observe both the outcomes, y^1_{it+s} and y^0_{it+s}, for the same unit. Hence, we approximate the treated firms' behaviour in a non-observed condition (non-offshoring) with the average performance of the non-offshoring firms:

$$E\left[\, y^0_{it+s} \;\middle|D_{it} = 0\,\right]$$

Working on non-experimental data yields, however, a potential self-selection bias, because the choice between offshoring and non-offshoring is not random but endogenous. The value of D_{it} depends, in fact, on observed characteristics and on the economic environment in which firms operate.

To overcome this kind of bias, Rosenbaum and Rubin (1983) introduced the ignorability treatment assumption (ITA), which states that, conditionally on observed covariates X, the choice of taking part in the treatment and the potential outcomes (y^1_{it+s} and y^0_{it+s}) are independent. A weaker assumption implied by the previous one is the conditional mean independence assumption, which suffices for our purpose to calculate the average effect of internationalising. Under the independence assumption, the average treatment effect (ATE) and the ATT (defined above) are the same:

$$\hat{\delta} = E\left[y^1_{it+s} - y^0_{it+s} \;\middle|D_{it} = 1\right] = E\left[y^1_{it+s} - y^0_{it+s}\right] \quad (3)$$

It follows that the right hand-side may be estimated as difference in sample means, without taking into account the endogenous treatment choice. To satisfy the independence assumption, we use the propensity score matching method. In practice, we match the treated group with the firms in the control group, i.e. those firms which happen to be the nearest neighbours in terms of the propensity score. The latter is obtained from a logit estimation of the treatment choice on some observed lagged variables.

From the data each firm is assigned a probability of falling in the treatment group conditional on a set of covariates X measured at time *t-s:*

$$P(D_{it} = 1 \mid X_{t-s}) \tag{4}$$

The purpose is to calculate the *ex ante* probability of offshoring, in order to select those firms which had not offshored, but that had similar possibilities to do it with respect to the treated firms.

Thus, these conditional probabilities referred as to the individual's propensity scores allow us to construct a control group in which every treated unit is matched to an untreated unit that has similar characteristics at the time before the treatment. After the matching process, we are able to estimate the average impact of internationalising by using two different estimators: the standard matching estimator (SM) and the difference in difference estimator (DID).

The SM estimator allows us to compare the post-offshoring average performances of both the treated and the untreated firms and may be written as:

$$\hat{\delta}_{SM} = \bar{y}^{1}_{it+s} - \bar{y}^{0}_{it+s} \tag{5}$$

The DID estimator allows us to compare the mean change difference in the performances before and after the treatment for both the offshoring and the non-offshoring units.

$$\hat{\delta}_{DID} = \left[\bar{y}^{1}_{it+s} - \bar{y}^{1}_{it-s}\right] - \left[\bar{y}^{0}_{it+s} - \bar{y}^{0}_{it-s}\right] \tag{6}$$

Following the method put forth by Meyer (1995), we may estimate the DID through the following regression:

$$y^{j}_{it} = a + \beta_1 d_t + \beta_2 d^{j} + \alpha_{DID} d^{j}_{t} + X'_{it}\beta_4 + \varepsilon^{j}_{it} \tag{7}$$

where j = 0,1 indicates whether firm has offshored or not, while t = 0,1 indicates, respectively, the pre- and the post-offshoring period. The vector of covariates X allows us to control for other sources of heterogeneity in the dependent variable. The dummies *d* are constructed as follows:

d_t = 1 if t = 1 and 0 otherwise;

d^{j} = 1 if j = 1 and 0 otherwise;

d^{j}_{t} = 1 if j = 1 and t = 1 and 0 otherwise.

Estimating α_{DID} by OLS yields the DID estimator of the offshoring effect on Italian firms. If we only consider the post-offshoring period (that is t = 1), we obtain the simpler expression:

$$y^{j}_{i} = a + \alpha_{SM} d^{j} + x^{j'}_{i} + v^{j}_{i} \tag{8}$$

This allows us to calculate the standard score matching estimator α_{SM}. However, an important advantage of the DID estimator is its robustness since it eliminates temporally invariant sources of bias.

4. Data set and basic patterns on firm performance

The empirical analysis carried out in this work relies on data drawn from the latest two waves of the three-year survey on manufacturing firms administered by Capitalia, conducted in 2000 and 2004 over the previous 3 years, which allow us to totally cover a six-year period (1998-2003). These surveys report, through stratified samples on geographical areas, industries, and sectors,[5] several aspects of selected units, such as balance sheet values (for all the years 1998, 1999, 2000, 2001, 2002, 2003) as well as indicators capturing size, economic performance, investment in physical capital and in R&D, different type of internationalisation choices, company organization, etc...

For our purpose, we select from the entire sample of 4,289 Italian manufacturing firms those answering both survey waves, obtaining a balanced panel of 2,102 units. Firms offshoring in both the surveys and those never offshoring are dropped from our data set. This captures the "switching effect" of offshoring in the second period (2001-2003). In addition, we exclude observations reporting missing values for the variables used to calculate total factor productivity (TFP) as well as observations, which reveal a missing or negative value added for more than two years over each three-year wave. Finally, we drop firms whose materials amount or the number of employees at the beginning of at least one of the two waves fell within either the first or the last percentiles. Each firm has an identification number that permit us to follow the firm over time.

[5] Firms are distributed geographically as follows: North-West 35.7%, North-East 30.33%, Centre 17.6%, South 13.1% and Islands 3.1%. According to size, firms with employees in the 11-22 range represent 22.2% of the sample, those in the range 22-50 count for 29.6%, those in the 51-250 range represent 36.9%, those in the 251-499 range are 5.3% and those with 500 employees or more represent 6.1% of the sample. By Pavitt classification, the distribution run as follows: traditional 52.0%; scale sector, 16.8%; specialized sector, 26.7%; high tech, 4.6%.

The panel used in this paper draws also from ISTAT for province-level data that proxy for the shadow economy. We use three different proxies of the extent of the shadow economy: the rate of irregular employment over the total employment; the number of irregular immigrants and the degree of IRAP tax evasion. The first is taken from an ISTAT survey (2002), which provides the average value of the hidden economy[6] at province level. The second is the result of the latest amnesty (2002) that allowed 650,000 irregular immigrants[7] to legalise their permanence in the country. The third information is drawn from Pisani and Polito (2006).

The offshoring or international outsourcing variables used in the Capitalia data set is constructed by taking into account what the firm declares in the offshore-outsourcing and international insourcing sections of the questionnaire[8]. In particular, offshore-outsourcing includes the relocation of processes to external internationally located providers as well as FDI associated with offshoring in the form of international insourcing. The unification of both forms of internationalisation follows the idea to represent the official OECD definition of offshoring.[9]

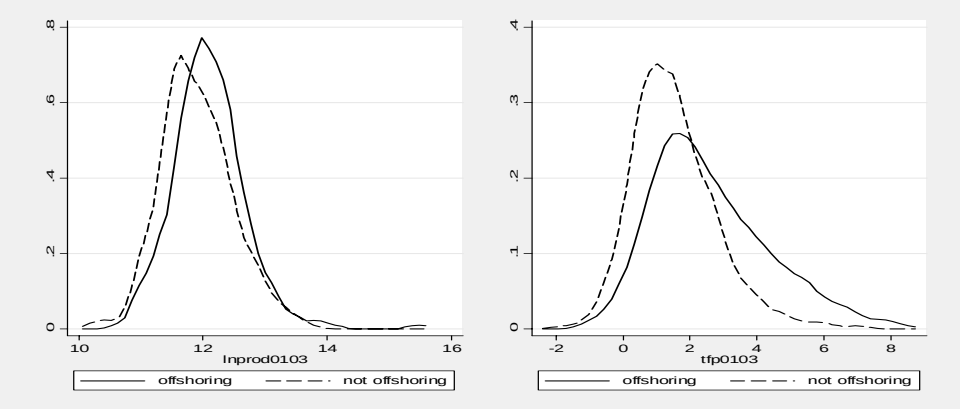
Trying to exploit this rich data base, in this section we present some basic evidence on performances and heterogeneities of firms engaged in international activities vs. the other firms. This preliminary analysis implements the unmatched sample counting 1,479 firms composed by 252 newly offshoring and 1,227 never-offshoring firms. In the wave of 2003 the number of firms with internationalised production is about 5% of the sample, while in the previous wave the percentage was only 3%. If we consider the whole sample of firms those belonging to the traditional sector show the highest propensity to offshore (6% of all the firms) followed by firms in the specialised sector (4.7%) and lastly by services. These firms are geographically located in

[6] More in detail the shadow economy is measured by the rate of irregular employment, calculated as the number of irregular labour units in total employment. Given the difficulty to measure this rate at the province level, the incidence of the shadow economy is given by intervals. We take the median values of the intervals and scale them by the number of province citizens.
[7] About 50% of them (330,000) were employed in Italian firms; the other half supplied services to Italian households.
[8] We consider firms that answer positively to questions relative to relocation of production and other activities abroad in both the questionnaire of the 1998-2000 and 2001-2003.
[9] The term "offshoring" is sometimes used synonymously with the term "outsourcing". However, outsourcing means acquiring services from an outside (unaffiliated) company or an offshore supplier. In contrast, a company can source from either an unaffiliated foreign company (OFFSHORE OUTSOURCING) or by investing in a foreign affiliate (OFFSHORE IN-HOUSE SOURCING)". From the Glossary of Statistical Terms of OECD.

the North-West of Italy followed by firms from the North-East and then from the Centre. Southern Firms have the lowest propensity to offshore even though they also exhibit a growing trend. Among the offshoring firms the mode for the share of sales due to foreign production lies in the range 20 to 50%.

To capture the heterogeneity of the firms and the asymmetry of the distribution of some performance indices we use kernel density estimators to show in Figure 1 the density functions for TFP and labour productivity. The visual impact of offshoring on these indices of performances is positive. The figures plotted on data from the second wave 2001-2003 show that the distribution of average log TFP levels is higher for offshoring firms than for non-offshoring ones. In particular, offshoring firms exhibit a higher TFP average and a right skewed distribution compared to the distribution for non-offshoring firms. A similar pattern emerges for labour productivity. Both figures reveal clearly that non-offshoring firms are less productive on average than internationalised firms.[10]

Figure 1. Offshoring firms and productivity

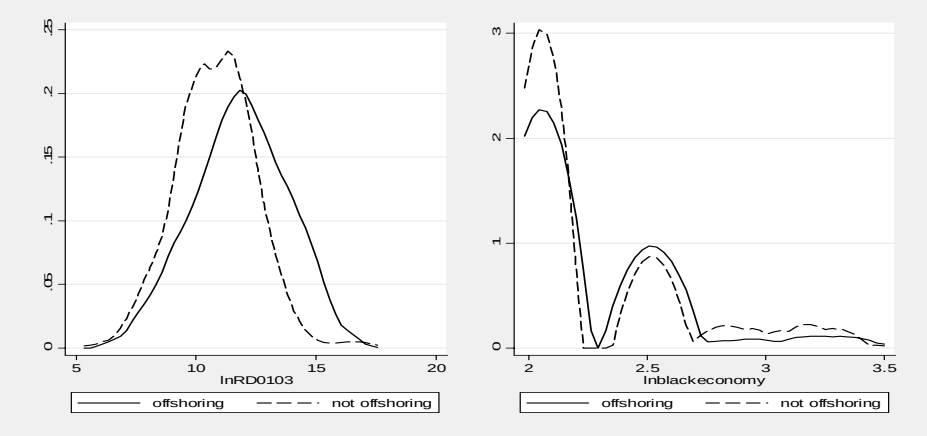


Next, we consider (in Figure2, left panel) the distribution of firms' innovative activities proxied by the balance sheet value of their R&D expenditures. The shape of the distribution is clearly favourable to offshoring firms which show a higher average of R&D expenditures. An

[10] We use Stata default to smooth the distribution of our variables. As a default Stata uses Epanechnikov kernel with optimal bandwidths.

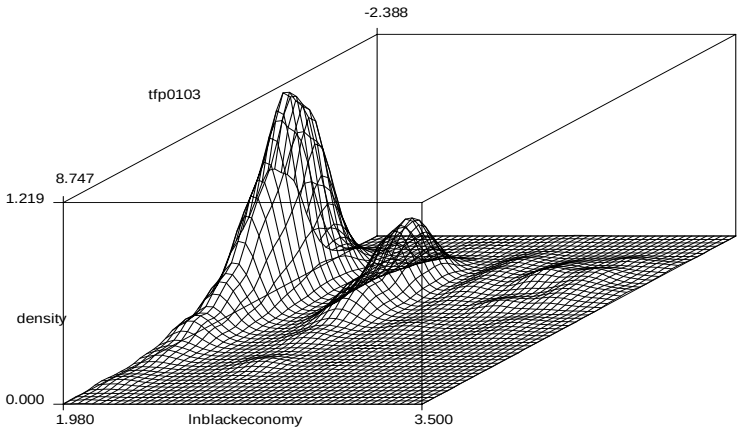
alternative way of showing the diversity of experience and strategies adopted by Italian firms is to plot the distribution of firms that entering the shadow economy (Figure 2, right panel). The figure reveals that non-offshoring dominates in the long right tail of the distribution.

Figure 2. Different strategies by offshoring firms



To complete our descriptive part, we consider both the shadow economy and efficiency features of firms (TFP). The mechanism that underlies the hypothesised link is that firm that enter the hidden economy are more likely to carry out inefficient operations. From figure 3 we detect that higher efficiency firms concentrate in the areas where the intensity of shadow economy is the lowest .

Figure 3. Efficiency vs. shadow economy



The evidence we have illustrated in this paragraph reflect some firm characteristics emerging from the data set. It suggests that firms involved in offshoring activities outperform purely domestic firms. Further support to these hypotheses should be drawn from the econometric analysis.

To sum up the hypotheses that emerge from our discussion and that will be tested in the subsequent econometric analysis are the followings:

H1. Offshoring firms are more innovative. We expect that firms that offshore have some special characteristics such as a higher spending on R&D and/or other variables proxying for the innovative content of their production.

H2. Offshoring firms have better productivity and efficiency performances. This effect is more problematic to detect since firms may choose to offshore also to improve previously unsatisfactory performances by shifting jobs overseas. While for FDI H2 has proven to be a necessary condition, this is not inevitably true for the other modes of internationalisation. However, according to the literature, we expect that firms with higher productivity show a higher probability to invest abroad.

H3. Offshoring firms exhibit a positive skill bias. If H1 and H2 are correctly posed, then we expect that more innovative firms are also more skill intensive, while there is no clear pattern of their capital/labour ratios. It has long been accepted that Italian firms cannot

compete in the mass production of low value added goods and therefore they might redeploy workers into higher-productivity tasks.

H4. Average wages may either decrease (if the foreign workers' competition effect dominates) or increase (if the skill bias prevails) for offshoring firms. As stated above, both effects are consistent with offshoring activities depending on the degree of diversification in firms' production.

H5. Firms relying on the shadow economy are less likely to offshore and, if they do, we expect them to reap lower gains from this move. The argument is that entering the shadow economy is a short run strategy. Even though gathering some momentary advantage is possible, this move may shorten the horizon considered by the firm, because of the higher risks implied by illegal markets and fears of punishment by the government for illicit economic conduct.

5. Econometric Results

We firstly estimate a logit regression in a binary treatment variable (OFFS) as a function of a number of observable structural firm's characteristics and some environmental variables that according to our hypothesis influence the probability to offshore. Among these characteristics we have chosen the following:

$$P(OFFS_{it} = 1 \mid Net\ Sales_{t-1}, K/L_{t-1}, IRR.IMMIGRANTS_{t-1}, DSEC_t)$$

where Net Sales is a size indicator of the firm (measured by the average value of total net sales over the three-year period 1998-2000), K/L is the average capital labour ratio in the same period, Irregular Immigrants (IRR.IMMIGRANTS) is the index of illegal foreign employees regularized with the 2002 amnesty. We assume that in the previous three-year period these workers were already available on the underground labour market for firms' provisions. DSEC are dummies variables that capture the Pavitt sector of activity to which the firm belongs. The inclusion of these sectors has a twofold meaning. They represent different degrees of specializations and

technological intensity in firms' production functions and they also proxy for labour costs since the data analysis reveals that the more specialised the sector the higher its labour cost. Therefore, DSEC includes the traditional sector (Sector 1), the specialised and the high tech sectors (respectively Sectors 3 and 4 in our notations). We tried to include ATECO sectors in the logit as well as geographical location of firms together with a district dummy, which takes value =1 if the firm is localised in an Italian industrial district, but all these variables proved to be statistically insignificant (not reported).

Table 1. Probability to offshore for Italian Firms (Logit estimates)

Dependent variable Offshoring= 1 if the firm ventured in offshoring between 2000-2003	Coefficient (stand. err. in parentheses)
Ln (K/L) 98-00	-.1323*
	(.0767)
Ln Y 98-00	.7588***
	(.0652)
Ln IRR.IMMIGRANTS	-.2313*
	(.1293)
Sector 1	.4839**
	(.2323)
Sector 3	.5414**
	(.2486)
Sector 4	.8456**
	(.3881)
Pseudo R squared	.1247
No.Obs.	1479

NOTES: *** significant at 1%; ** significant at 5%; * significant at 10%
Standard error are in parenthesis
Sector 1 , 2 and 3 are three dummies that correspond to the Pavitt industry classification. SECTOR 1 is the traditional sector, SECTOR 3 is the specialized sector and SECTOR 4 is the high tech sector.

The logit estimates suggest that the probability of offshoring is positively and significantly related to the level of Sales and to the industry-dummies, where firms belonging to the specialised and high tech sectors have a higher probability to offshore. Firms with higher K/L have a lower probability to offshore and this result is consistent with the hypothesis that the main objective of offshoring firms is to reduce labour costs.[11] Moreover, we find that the greater is the extent of the

[11] It is worth noting that according to the data set even though the number of offshoring firms increases with size, the phenomenon involves also small and medium size enterprises.

shadow economy where the firm does its business (ln IRR.IMMIGRANTS), measured here by the intensity of irregular immigrants at the province level, the lower its probability to invest abroad.

Table 2. Test for the means equality (matched controls and offshoring firms)

	Unmatched Sample			Matched Sample		
Variable	***Control***	***Offshoring***	***Test for equality of means (p-value)***	***Control***	***Offshoring***	***Test for equality of means (p-value)***
TFP	1.5378	2.6470	0.000***	2.6673	2.64	0.9115
Ln (K/L) #	9.9719	10.1131	0.0526*	10.0737	10.0737	0.9986
Ln (Y) #	15.2485	16.2909	0.000***	16.2669	16.2659	0.9938
IRR.IMMIG.#	17032.41	14049.21	0.0800*	21995.7	14002.42	0.0014***
Ln (L)	3.3969	4.2221	0.000***	4.1864	4.1942	0.9479
Ln(FIN)	10.5643	11.0872	0.000***	10.1463	10.3686	0.1673
Ln VA	13.9738	14.9223	0.000***	14.9267	14.9009	0.8511
Ln (Y/L)	11.8526	12.0707	0.000***	12.0810	12.0736	0.8958
LnW	10.1140	10.1930	0.000***	10.1852	10.2031	0.5803
Ln R&D	10.9866	11.8380	0.000***	11.7696	11.8416	0.7438
No.Obs.	1227	251		224	224	

NOTES:
***significant at 1%; ** significant at 5%; * significant at 10%
# indicates the variables used for matching.
The other variables not used in the test are the followings: LnFIN is a financial variable that captures the capacity of indebtness of the firm, Ln VA is value added of the firm, Ln Y/L is the labour productivity, and Ln L is total employment, LnW is the unit cost of labour, Ln R&D is the expenditure on R&D, all variables are defined in natural logarithms

In Table 2 we compare the group of treated firms with the control group to explore through the test for equality of means the average firm characteristics before and after the application of the matching technique[12]. As reported, the mean values are very close in the matched sample for those treated and for the control group, while both groups reveal significant diversity in the mean values in the unmatched sample. The tests performed to verify that the balancing property hold are reported in the same table (means and p values). The tests, performed for a large number of variables, show clearly that the matching satisfies the means equality for almost all the variables used. Recall the null Hypothesis is that the means are significantly different from zero from both sides.

[12] Matching was performed with Stata 9 using the psmatch command by Sianesi (2001).

Table 3. DID and SM regression results

Dep.variables	DID (unc.)	DID (con.)	SM (unc.)	SM (con.)	Shadow economy variable (DID)	Shadow economy variable(SM)
ΔlnTFP	-..0237** (.0120)[13]	-.0190 (.0126)	-.0222 (.0156)	-.0143 (.0170)	-.0093 (.0083)	-.0219** (.0112)
R^2 No.Obs .	.0038 895	.0233 809	.0045 448	.0432 405		
ΔlnR&D	1.5100*** (.4412)	1.1816** (.4574)	.3437 (.5124)	.8334* (.4584)	-2.8081*** [(a)] (.8617)	-2.3445** [(a)] (1.1722)
R^2 No.Obs .	.0521 153	.1620 136	.0065 78	.2084 73		
lnINNOVATION	.2161** (.1116)	.2352** (.1138)	.3422** (.1392)	.3905** (.1466)	-.0089 (.1430)	.0058 (.2042)
R^2 No.Obs.	.0084 432	.0730 400	.0267 216	.0960 200		
ΔlnW	-.0059 (.0045)	-.0062 (.0051)	-.0112** (.0049)	-.0095* (.0056)	.0041 (.0033)	.0051 (.0034)
R^2 No.Obs.	.0021 883	.0107 688	.0111 446	.0500 345		
ΔlnL	-.0093** (.0042)	-.0118** (.0044)	-.0024 (.0044)	-.0056 (.0053)	.0028 (.0027)	.0046 (.0039)
R^2 No.Obs.	.0061 896	.0678 694	.0006 448	.0803 347		
ΔlnSKILL	.0097*** (.0056)	.0168** (.0066)	.0096 (.0070)	.0193 (.0071)	.0041 (.0041)	.0069 (.0053)
R^2 No.Obs.	.0049 562	.0403 449	.0046 435	.0444 340		

NOTES:
***significant at 1%; ** significant at 5%; * significant at 10%
[(a)] Here as a shadow economy proxy we use the rate of irregular employment, while in all the other regressions we use the Tax Evasion index.
Bootstrap standard errors in the parenthesis (500 replications). The constant is included in all regressions. The meaning of each variable included in the table is explained in Appendix B.

Table 3 presents a synthesis of our estimates. Detailed results with all the covariates for conditional estimates concerning the impact of offshoring on both the efficiency and labour market variables are presented in Appendix A. The main results may be summarised as follows. First, we find a negative relationship between offshoring activities and firm performance suggesting that individual firms do not benefit in the period of our analysis from newly offshored activities. In fact, TFP declines when offshoring increases. However, while the sign is always negative, its statistical significance is revealed only in the unconditional DID estimator. This outcome may suggest a negative spillover effect from production fragmentation abroad in

domestic own plants or more likely it can represent a *learning curve effect*. TFP does not increase immediately after offshoring has taken place but it needs some adjustment period, especially when imperfectly competitive firms face fixed costs of production to offshore parts of their activity.[14] There are some indications that productivity effects of manufacturing offshoring depend on the degree to which firms are already globally engaged in international activities. The, so called, "industrial organization" approach suggests that efficiency can be gained through experience in the foreign market and firms in our sample are going through their first experience. In theory, it is largely known that foreign activities and investment abroad can reduce productivity of domestically owned firms, particularly in the short run.[15] To be sure, empirical evidence on the productivity effect of offshoring is scant to date (see Olsen [2006]).

Second, despite the negative effect on TFP, all the other effects are robustly positive and may outweigh the short-run negative effect on efficiency. We can enumerate the positive and significant effect on innovative activity measured by the growth rate of R&D or by the percentage of sales due to innovative products. Evidently, firms that offshore their activities have a higher propensity to innovate. This is suggestive of either a technological diffusion through imported intermediate goods or of the need to invest in technology to gain competitiveness abroad. However, descriptive statistics reveal that the majority of activities offshored by the Italian firms deliver production coming back into the home country in the form of final output.

Third, the effects on the labour market are noteworthy and in accordance with theoretical predictions. First of all, Table 3 shows a positive effect on the skill composition, as measured by the ratio of skilled to unskilled workers. As expected, the findings show that the domestic firms offshore less skill intensive stage of production by increasing the demand for labour of high

[14] It is well known from some studies of the McKinsey Institute that German companies save € 0.52 for every euro of corporate spending they offshore to India. These savings are lower than in the USA mostly because of higher additional management costs for coordinating offshoring projects that German companies incur due to differences in language and culture. On similar lines is the study by Marin (2005) on offshoring by German and Austrian firms in the CEECs. The author shows that productivity in these countries is lower than in the home country and cost savings are lower than expected.

[15] See, for example, Aitken and Harrison (1999). In their study on the effect of foreign investment in Venezuela they found negative and robust effects on productivity of domestically owned firms in the same industry.

skilled workers for home production. These effects are statistically significant and robust under both unconditional and conditional DID estimators. Since the main objective of offshoring is decreasing the labour cost, we also find a reduction of unit wages. However, the statistical significance of this coefficient attains only in the SM estimator (both in conditional and unconditional forms). Another effect in our analysis is the reduction in the growth rate of employment after offshoring. However, this result – which contrasts with some other empirical works – should be considered with caution for two reasons. In the first place, it attains in the DID but is not significant in the SM regression. Secondly, our analysis focuses on newly offshoring firms, which could experience a substitution between employment at home and abroad only in the short-term, while the effect might vanish or change sign later on in time.

Fourth, and finally, our results show that proximity to the shadow economy – measured by the share of irregular employment or by the intensity of tax evasion – affects not only the likelihood to offshore but also the benefits that offshoring firms can gather from this move. Specifically, the shadow economy proxy exerts a negative and significant impact on both TFP (only in the SM) and the R&D propensity (in both the SM and DID).

6. Conclusions

The novelty of this paper consisted in considering that the offshoring option comes together with other strategic choices. Some of these choices are possibly complementary while others are alternative to offshoring. In response to the increasing competitive threats posed by emerging economies, firms from industrialised countries may choose to intensify their innovation drive, thus climbing the technology ladder. This move may well be coupled with offshoring, where lower technology output is shifted to low wage countries while home plants focus on new higher-technology products. Firms may also opt for a different home-grown way to cut costs: moving to the shadow economy.. This option cannot be disregarded in Italy, where the extent of the shadow economy is largest among the G-7 countries.

Consistently with our hypotheses, the econometric results of the difference-in-difference and standard-matching estimators have shown that – compared to never-offshoring firms – newly offshoring companies display some interesting features. First, the likelihood of offshoring is higher for larger-sized firms, for companies belonging to the specialised and high tech sectors, and for enterprises with more labour intensive production (lower for enterprises with higher capital/labour ratios) while is lower for those doing business in locations where the extent of the shadow economy is larger. Second, we found that offshoring exerts favourable effects in terms of firms' innovative activity – either measured by the growth rate of R&D or by the percentage of sales due to innovative products – and delivers a positive effect on the skill composition of employees. In spite of this latter effect, at least in the short-term, unit wages decrease as the impact of the competition exerted by low-wage foreign workers prevails over the skill bias. Even though we failed to detect a positive impact of offshoring on TFP – possibly due to the existence of a learning curve – the favourable impact on innovation supports the hypothesis that offshoring and innovation are complementary strategies.

Finally, our findings show that proximity to the shadow economy not only reduces the likelihood to offshore but also curtails the benefits, which offshoring firms can reap out of this move. Specifically, the shadow economy proxy exerts a negative and significant impact on both TFP and the R&D propensity. This result bears relevant policy implications. In particular, vis-à-vis their offshoring companions, firms choosing to enter the shadow economy may be producing negative spillover effects by lowering the propensity to innovate and hence TFP.

Appendix A

Tab. 4.1 Effects of offshoring on productivity and innovation (with covariates)

	ΔlnTFP				ΔlnRD				lnnewsales			
DID unc.	-.0237**				1.5100***				.2161**			
	(.0120)				(0.4412)				(.1116)			
DID con.		-.0190				1.1816**				.2352**		
		(.0126)				(.4574)				(.1138)		
SM unc.			-.0222				.3437				.3422**	
			(.0156)				(.5124)				(.1392)	
SM con.				-.0142				.8334*				.3905**
				(.0170)				(.4584)				(.1466)
Tax evas.		-.0093		-.02193**								
		(.0083)		(.0112)								
Shadow						-2.808***		-2.3445**		-.0089		.0058
						(.8617)		(1.1722)		(.1430)		(.2042)
Innovation		-.0093		-.0117		.5832		.2165		.0481		.0635
		(.0131)		(.0195)		(.5859)		(.9005)		(.1587)		(.2466)
Birth		.0002		.0005		.0098		-.0087		.0120*		.0114**
DDistr.		(.0002)		(.0004)		(.0149)		(.0193)		(.0030)		(.0047)
		.0028		-.0050		-.2095		-.8444*		-.0762		-.0685
SEC_4		(.0126)		(.0168)		(.4167)		(.4891)		(.1107)		(.1588)
		-.0502*		-.0479		.5152		-.2503		.4110**		.4230**
DProfit.		(.0288)		(.0442)		(.8602)		(.8868)		(.1448)		(.2158)
		.0082		-.0008		.0350		-.0962)		.0597		.0650
ΔSKILL		(.0060)		(.0076)		(.1839)		(.2290)		(.0477)		(.0687)
		-.2102*		-.3420*		-4.666*		-4.1690		-.3512		-.7000
ΔFIN		(.1187)		(.1863)		(2.6104)		(3.0212)		(.7642)		(1.1293)
Δ(K/L)												
R^2	0.0038	.0233	0.0045	.0432	.0521	.1620	.0065	.2084	.0084	.0540	.0267	.0960
n.obs.	895	809	448	405	153	136	78	73	432	400	216	200

***significant at 1%; ** significant at 5%; * significant at 10%
Bootstrap standard error in parenthesis (500 repetitions).
Constant is included in all regressions.
The meaning of each variable included in the table is explained in Appendix B

Tab. 4.2The impact of offshoring on labour market (with other covariates)

	Δln(W)				Δln(employment)				Δlnskill			
DID unc.	-.0059				-.0093**				.0097***			
	(.0045)				(.0042)				(.0056)			
DID con.		-.0062				-.0118**				.0168**		
		(.0051)				(.0044)				(.0066)		
SM unc.			-.01124**				-.0024				.0096	
			(.0049)				(.0044)				(.0070)	
SM con.				-.0095*				-.0056				.0193**
				(.0056)				(.0053)				(.0071)
Tax evas.		.0041		.0051		.0028		.0046		.0041		.0069
		(.0033)		(.0034)		(.0027)		(.0039)		(.315)		(.0053)
Shadow.												
Innovation		-.0022		.0113		.0048		.0105*		.0107		.0094
		(.0054)		(.0073)		(.0054)		(.0064)		(.0078)		(.0088)
Birth.		.00007		-.00003		0.0003*		.0003**		-.0001		-.00008
		(.0001)		(.0001)		(.0001)		(.0001)		(.0001)		(.0001)
DDistr.		.0032		.0093*		0.0034		-.0017		.0129**		.0127
		(.0042)		(.0055)		(.0037)		(.0056)		(.0063)		(.0079)
SEC_4		.0108		-.0003		-.0091		-.0098		.0055		-.0105
		(.0071)		(.0089)		(.0070)		(.0101)		(.0111)		(.0140)
DProfit.		.0020		.0045*		.0090*		.0102*		-.0058*		-.0051
		(.0020)		(.0025)		(.0018)		(.0027)		(.0034)		(.0038)
ΔSKILL												
ΔFIN		-.0003		.0034**		.0034**		.0032*		-.0027		-.0022
		(.0014)		(.0016)		(.0012)		(.0017)		(.0027)		(.0030)
Δ(K/L)		.0031		.0181		.0060		-.0150		.0022		.0134
		(.0120)		(.0166)		(.0094)		(.0117)		(.0164)		(.0165)
R^2	.0021	.0107	.0111	.0500	.0061	.0555	.0006	.0803	.0049	.0403	.0046	.0444
No.obs.	883	688	446	345	896	694	448	347	562	449	435	340

Appendix B: Variable Definitions [16]

Production (Y) = Net sales of the firm, taken by the related balance sheet deflated by the appropriate National Statistical (ISTAT) industrial production price index.

DProfit = dummy variable that represent the position of the firm into the quartile distribution of firm profitability defined as the ratio of net profit of the firm over the number of employees during the 1998-2000 and 2001-2003 periods.

Birth = the year of firm's constitution as declared in the questionnaire

DDistrict = dummy variable (0,1) that takes value 1 if a firm belongs to an industrial district.

SEC4 = dummy variable (0,1) that takes value 1 if a firm belongs to the high-tech sector.

INNOVATION = dummy variable (0,1), that takes value 1 if the firm incurs process or product innovations during the period covered by the survey and used in this work (1998-2000 and 2001-2003) as declared in the questionnaire (Has your enterprise introduced in the period 2001-2003: 1. any technological new product? 2 Any improved process ? We summed the two answers and constructed a new binary variable that includes both product and process innovations)

W= unit wage cost that is computed as the total wage bill of the firm divided by its total employment.

R&D= the amount of yearly investments to R&D projects as declared by firms in the questionnaire (How is the amount (in €) of R&D investment that your enterprise has done in yearX?)

K= fixed capital sock at the end of the period as the accounting value of net immobilization as reported in the balance sheet

VA = the balance sheet value which stays for the value added of firm

L= total employment given by the sum of blue collars and white collars

Y/L = labour productivity defined as the ratio of value added to the number of employees of the firm. The data set does not report the yearly effective hours of work and this is the only way to measure labour productivity

K/L = firm's ratio of capital stock to employment

SKILL = defined as the ratio between the number of workers that accomplish administrative or other conceptual tasks and the number of the hand workers of the firm.

TFP = approximate TFP is estimated as a regression residual of a Cobb-Douglas production function. The variables used in the TFP calculations are the balance sheet values of output (net sales), capital (the accounting value of net immobilization assets) and total number of workers of the firm. The elasticities of output with respect to capital and labour at firm levels are estimated by a random effect regression with an AR(1) disturbance term. We tried to assess if this figure were appropriate to measure the capital input and we realized that the accounting value reported in the data set coincides with the value of the capital input calculated by the perpetual inventory method.

NEWSALES = the percentage of innovative sales on total sales of the firms as declared in the questionnaire

Shadow = is given by the percentage of irregular employment over the total employment at a province level (source: National Bureau of Statistics: ISTAT)

TAX EVASION = intensity of IRAP tax evasion over the period 1998-2002 at a province level (source: ISTAT)

IRR.IMMIGRANTS = number of immigrants whose permanence in Italy has been legalized after the 2002 amnesty (source: ISTAT).

FIN= financial variable constructed from accounting values and given by net capital + financial debt divided by the number of workers. It captures the ability to catch credit by the individual firm.

[16] All the values from firms' balance sheets are deflated by the Istat production prices for industrial products index.

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