MARKET POWER, PRODUCTIVITY AND THE EU SINGLE MARKET PROGRAM. AN EX-POST ASSESSMENT ON ITALIAN FIRM LEVEL DATA

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Abstract

This paper provides empirical evidence on the impact the EU Single Market Program has exerted on market power and total factor productivity in a large sample of Italian firms. By splitting the full sample on the basis of the ex-ante likelihood of being affected by the removal of non-tariff barriers within EU boundaries, we are able to control for other economic shocks, provided they affect all firms randomly. Both market power and total factor productivity are estimated by applying several extensions of the methodology developed by Hall. Main findings can be summarized as follows. Firstly, for the sample of "most sensitive" firms market power decreases by 50% in the SMP implementation period compared to previous years, whereas no clear pattern emerges for the other sub-samples of firms. Secondly, only for the sub-sample of "most sensitive" firms a positive transitory shock to productivity growth rates is observed immediately after the announcement of the reform project. Overall, these results are consistent with the long standing view that economic integration reduces firms' market power and increases productivity via the removal of non-tariff barriers.

JEL classification: L1, O3, F1.

Key words: Market Power, Productivity, Integration, Europe.

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1. Introduction

In 1985 the Commission of the European Union (EU) published the *White Paper on Completing the Internal Market* which set up a program and a time table with the ambitious objective of unifying European markets. In short, it proposed that Member States abolish by the end of 1992 all remaining non-tariff barriers to the free circulation of goods, services, persons and capital. As explicitly mentioned in the ex-ante evaluation of the benefits of the so-called Single Market Program (SMP), popularly known as the Cecchini Report (1988), the release of these constraints was expected to trigger a supply shock to the EU as a whole. Productivity gains and increased competition were perceived to be the driving forces, whose beneficial effects should have rippled out into the economy as a whole by sustaining inflation-free growth and creating opportunities for new jobs.

In spite of the fact that many positive effects of the SMP were supposed to result from lower costs passed on to consumers in the form of lower prices, the available empirical evidence on the impact of European integration on firms' productivity and market power is scant[1]. The purpose of this paper is to start filling this gap by providing fresh econometric evidence on both issues. Joint estimates of productivity growth rates and mark-ups are provided by applying different extensions of the methodology pioneered by Hall (1986, 1988) and Domowitz et al. (1988) to a large unbalanced panel of Italian firms over the period 1982-1993. Furthermore, the availability of detailed information on those industries which were considered ex-ante as likely to be particularly sensitive to the SMP, because intra-EU trade was particularly hampered by non-tariff barriers (see Buigues et al., 1990), should allow us to discriminate rather precisely whether observed patterns are a consequence of the specific program we are interested in or depend, more generally, on other economic factors, including the world-wide globalisation of markets.

[1] The most relevant exception is the ex-post evaluation of the SMP directly conducted by the Commission (European Economy, 1996). However, rather surprisingly, this study does not provide direct estimates of the impact of the SMP on productivity. Also, the analysis of the behaviour of market power over time is based on accounting price-cost margins, whose validity has been seriously questioned in recent years (see Bresnahan, 1989). Within the context of European integration see also Sleuwaegen and Yamawaki (1988) and Jacquemin and Sapir (1991).

More generally, this paper contributes to the growing empirical literature assessing the impact of policy measures aimed at reducing barriers to trade or foreign direct investment on competition and/or efficiency[2]. Compared to most previous literature, however, where examined reforms usually imply a rather narrow and clear-cut shift in the policy regime in one particular country[3], the SMP can be considered as a far more ambitious program consisting in a complex rolling sequence of incremental measures, which occurred simultaneously in several countries throughout the "core" implementation period 1988-93 and even afterwards. The price one has to pay for dealing with such a comprehensive program is that observed patterns cannot be directly related to specific measures, since information are not publicly available on the time each of the about 300 hundred measures became effective and on industries it affected.

The remaining of this paper is organised as follows. Section 2 briefly summarises the theoretical rationales underpinning the empirical exercise presented in this paper. Also, it provides some background information on the degree of implementation of the legislative measures introduced by the EU Commission in the 1988-93 period as a consequence of the White Paper. Section 3 presents the empirical model and discusses how the impact of the SMP on productivity and market power can be tested in the context of the framework developed by Hall. Section 4 introduces the panel of firms used in the econometric section and comments upon the relevant descriptive statistics. Section 5 is the core of the paper, where the results of econometric estimates are presented and discussed. Section 6 concludes. Finally, a data appendix provides more detailed information on the structure and the characteristics of the data set.

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[2] Recent examples include Tybout et al. (1991) on the effect of trade reforms on scale and technical efficiency in Chile, Levinsohn (1993) on the impact of trade liberalisation on competition in Turkey, Harrison (1994) on the impact of trade reforms in Cote d'Ivoire on productivity and market power and MacDonald (1994) on the role played by import shocks on labour productivity growth in the US. For a critical review of the literature see Tybout (1992).

[3] Needless to say, even in the case of relatively simple reforms, economic agents may not adjust immediately to a new policy regime. This may not occur, for instance, because of the existence of adjustment costs or imperfect information problems.

2. The EU Single Market Program

2.1 Theoretical Rationales

For the purpose of this paper, the direct effect of the abolition of non-tariff barriers within EU boundaries can be usefully seen both as an enlargement of the relevant market for firms operating in previously protected industries and as an increase in the number of competing firms. According to common wisdom, market integration should have triggered a supply-shock to these industries and possibly to the European Union as a whole. As a consequence, productivity was expected to raise and costs, prices and mark-ups were expected to fall (Cecchini, 1988)[4].

Leaving aside the obvious direct cost savings reason, several other explanations grounded on more or less convincing economic principles have been put forward in recent years to justify these expectations. For expositional brevity, we classify them in two broad categories, the first focusing on the role played by changes in volume and location of production, the second more directly relating the Single Market Program to possible shifts in the competitive regime in previously protected industries.

Firstly, especially in industries where increasing returns to scale prevail, market integration reduces the number of firms in equilibrium, each surviving firm producing a higher level of output along a downward sloping marginal cost curve. In a world where firms are asymmetric, less efficient firms will leave the industry. It follows that industry-level productivity is expected to increase due both to exit of less efficient firms and to higher productivity of incumbents[5]. This effect is reinforced if there are significant differences in factor endowments among EU Member States. In fact, this is the case where the existence of asymmetries seems more plausible since firms in each country have the incentive to enter (exit) industries where a comparative advantage (disadvantage) exists.

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[4] These are only some of the commonly mentioned positive micro-effects of EU integration. Others include an increase of product variety in differentiated industries and speedier innovation.

[5] There is now a growing body of empirical papers which look at relative importance of the two effects on productivity growth. See for instance Griliches and Regev (1995).

Secondly, market integration is expected to induce a reduction in firms' market power. This may simply occur because the number of competing firms has increased[6]. In addition to this, integration may also toughen the stance of price competition, for instance because integration introduces heterogeneity in business culture and the more competitive naturally dominates or because a long story of domestic inter-firm relations is disrupted or, more simply, because of greater geographical distance among competing firms (Lyons and Matraves, 1996).

Competitive pressure is also generally thought to have a positive impact on productivity in at least three different ways. Firstly, since more competition is associated with a reduction in equilibrium prices, market integration exerts a further negative effect on the number of firms in equilibrium. As already explained, this is expected to raise industry productivity levels due both to the exit of less efficient firms and to higher productivity of surviving firms. Secondly, as long as competition stimulates speedier process innovation, it shifts upward the production function. Finally, if we allow firms to operate inside the efficient production frontier, competition might affect the incentives for firms to improve their efficiency by reducing the misuse of technical and human resources and managerial slack. Even if this explanation is not particularly appealing on theoretical ground, casual observations of the behaviour of monopolistic firms following the introduction of some form of competition seems to suggest that this effect is likely to be important, at least in some industries[7].

2.2 Implementation Policies

The purpose of this section is to provide a brief description of the degree of implementation of the core legislative measures underlying the notion of unified European markets, coupled with more qualitative evidence gathered from official EU sources on the perceived effective completion of EU economic integration.

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[6] Most oligopoly models predict a negative relation between the number of firms in the market and the degree of market power each firm enjoys.

[7] Also, a number of recent papers provides alternative theoretical justifications for the positive relation between the state of competition and efficiency. See among others Hay and Liu (1997), Nickell (1996), Vickers (1995) and Willig (1987).

In strict terms the SMP is represented by the set of legislative proposals put forward in the 1985 *White Paper on Completing the Internal Market* and the legislative measures actually implemented in the years 1988-93 as a direct consequence of the White Paper[8]. The general objective can be stated very simply: EU Member States had to eliminate all remaining non-tariff barriers to the free circulation of goods, services, persons and capital by the end of 1992. These barriers fall into three broad categories: physical barriers, including intra-EU border stoppages, customs control and associated paperwork; technical barriers, like protected public procurement markets and divergent national product standards, technical regulations and business laws; fiscal barriers, mainly different VAT rates and excise duties.

In the White Paper the EU Commission proposed 282 specific measures to remove non-tariff barriers. After some minor revisions which have occurred over the years, 275 measures had entered into force at the EU level by mid-September 1996. Of those, 219 require national implementation laws. As a consequence, a first rough indicator of the degree of implementation of the overall program is given by the share of measures actually transposed into national legal systems. By mid-September 1996, Member States had transposed on average 92.9% of these measures[9], whereas at the end of 1992 the same figure was about 75%. Also, 55.6% of those 219 had been implemented by all 15 Member States, and this percentage goes up to 81.7% for measures transposed by 14 Member States.

Obviously, the fact that the SMP legislation had to a large extent been transposed into domestic legislation by the end of 1992 is a necessary but not a sufficient condition for the single market actually to work. In fact, more qualitative evidence seems to suggest that SMP main objectives have been only partially fulfilled. In particular, according to a recent business survey carried out by EUROSTAT, areas such as fiscal and technical barriers and especially public procurement markets still seem to be suffering from the same old problems. More generally, leaving aside the issue of the non-adoption of single market measures, three unsolved problems have been identified. Firstly, in some cases there might be inadequacies in

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[8] See European Economy (1996), pag. 16.

[9] As far as Italy is concerned the situation is as follows: 196 correctly transposed measures, 14 not yet transposed, 7 not correctly transposed and 2 not applicable.

the legislation itself, for instance because it is unclear or its scope is too limited. Secondly, it is widely perceived that EU legislation is unevenly enforced across countries, this in turn giving firms operating in less rigorous countries an unfair competitive advantage. Thirdly, possibly as consequence of the abolition of most obvious non-tariff barriers, new and more subtle measures are appearing at the national level. Often these new obstacles are associated with public policy objectives and include environmental regulations or more sophisticated technical requirements (European Economy, 1996).

Finally, preferences for national products, lack of information, language barriers and, more generally, long standing habits and traditions may still act as a deterrent to the free circulation of goods, services or factors of production. Needless to say these cultural or psychological factors cannot be removed through a stronger enforcement of SMP legislation.

Summarising, whereas the speed of adoption of SMP measures at the national level seems satisfactory there is qualitative evidence casting some doubts on the effectiveness of the program. However, what is still missing is a quantitative assessment on whether these inadequacies have prevented the SMP from keeping, at least partly, its initial promises of higher productivity and lower market power. This is the task we address in the remaining of this paper.

3. Methodology

3.1 Empirical Model

Consider the following production function:

$$Q_{it} = \Theta_{it} F(K_{it}, L_{it}, M_{it})$$

where Q_{it}, K_{it}, L_{it}, M_{it} are production, capital, labour and materials for firm i at time t, Θ_{it} is a productivity factor which is allowed to be different across firms and over time, and F is homogeneous of degree Γ in all input factors. Letting q_{it}, k_{it}, l_{it}, m_{it} and θ_{it} be the logarithms of Q_{it}, K_{it}, L_{it}, M_{it} and Θ_{it}, we can write the logarithmic differentiation of the production function:

$$\Delta q_{it} = \Delta\theta_{it} + \varepsilon_{QL}\Delta l_{it} + \varepsilon_{QK}\Delta k_{it} + \varepsilon_{QM}\Delta m_{it} \quad (1)$$

where $\varepsilon_{QL} = \frac{\delta q_{it}}{\delta l_{it}}$, $\varepsilon_{QK} = \frac{\delta q_{it}}{\delta k_{it}}$, and $\varepsilon_{QM} = \frac{\delta q_{it}}{\delta m_{it}}$ denote respectively the elasticity of output to labour, capital and materials. By initially assuming perfect competition in both product and factor markets and constant returns to scale, the elasticities can be replaced with factor shares as follows:

$$\varepsilon_{QL} = s_{it}^{L} \qquad \varepsilon_{QM} = s_{it}^{M} \qquad \varepsilon_{QK} = 1 - s_{it}^{M} - s_{it}^{L} \quad (2)$$

Solow (1957) solved (1) for the rate of technical change, $\Delta\theta_{it}$. Hall's insight in Solow's approach is to relax the assumptions of perfect competition in the product market and of constant returns to scale. As a result, equation (1) becomes:

$$\Delta \underline{q}_{it} = \Delta\theta_{it} + \mu_{it}(s_{it}^{M}\Delta \underline{m}_{it} + s_{it}^{L}\Delta \underline{l}_{it}) + \gamma_{it}\Delta k_{it} \quad (3)$$

where, $\underline{q}_{it}$, $\underline{l}_{it}$ and $\underline{m}_{it}$ are the logarithms of gross output, labour and materials divided by the net capital stock, s_{it}^{M} and s_{it}^{L} are the share of materials and labour in total revenue, μ_{it} is price over marginal cost and γ_{it} is the local scale elasticity measure minus 1.

Since μ_{it} and γ_{it} are unobservable it is necessary to model Θ_{it}, in order to recover estimates of the two parameters from (3), Let us assume that Θ_{it} can be conveniently represented as:

$$\Theta_{it} = Ae^{a_i + a_t + v_{it}} \quad (4)$$

where a_i is a firm-specific time-invariant component (possibly correlated with the other right hand-side variables) measuring among others the level in managerial efficiency, a_t represents productivity shocks common to all firms in a given year and v_{it} is a random component with mean 0[10]. After differencing (4) and replacing it in (3), our basic empirical specification is obtained:

$$\Delta \underline{q}_{it} = \beta_{it} (s^{M}_{it} \Delta \underline{m}_{it} + s^{L}_{it} \Delta \underline{l}_{it}) + \gamma_{it} \Delta k_{it} + \Delta a_{t} + \Delta v_{it} \qquad (5)$$

Under the maintained hypothesis of smooth substitution between capital and the other factors of production, (5) is still a valid representation of (1) if capital is the only quasi-fixed factor (Hulten, 1986)[11]. This can easily be understood since computing capital share as in (2) amounts to imputing the true marginal cost of capital, that is its shadow price. Things become more complicated if we allow labour to be a quasi-fixed factor as well. If this is the case, equation (5) has to be rewritten as:

$$\Delta \underline{q}_{it} = \mu_{it} s^{M}_{it} \Delta \underline{m}_{it} + \nu_{it} s^{L}_{it} \Delta \underline{l}_{it} + \gamma_{it} \Delta k_{it} + \Delta a_{t} + \Delta v_{it} \qquad (6)$$

where ν_{it} is equal to $\mu_{it} \frac{z^{L}_{it}}{p^{L}_{it}}$ and z^{L}_{it} and p^{L}_{it} are the shadow price of labor and the competitive market wage respectively. As pointed out in Sembenelli (1996), $\frac{z^{L}_{it}}{p^{L}_{it}}$ can then be interpreted as a measure of the degree of utilization of labor, being equal to 1 with full economic utilization

[10] Note that transitory productivity shocks, v_{it} affect the level of inputs as long as they become part of firm's information set before the input levels are chosen. This in turn determines a correlation between the error term and changes in inputs. For this reason we will make use of instrumental variable techniques in the econometric section. For more detailed information on the choice of instruments see section 5.

[11] As a consequence the standard practice of correcting capital by a measure of capacity utilization can be reconciled with standard neoclassical production functions only under very restrictive assumptions. See section 5.

(i.e. marginal revenue product equals market wage), smaller than 1 in the case of under-utilization and greater than 1 in the case of over-utilization of labor[12].

3.2 Testable Propositions

As already mentioned in the introduction, the purpose of this paper is to test for two specific propositions:

i) the SMP has a direct and negative effect on firms' market power;

ii) the SMP has a direct and positive effect on firms' productivity.

Most empirical work trying to assess the impact of policy reforms on productivity or market power has been conducted by comparing the pre- with the post-reform performances of the economic variables of interest. In this spirit testing for i) and ii) would amount to the testing of the following two inequalities, possibly for a selected sample of firms likely to be affected by the policy measure under study[13]:

$$\mu_{PRE} > \mu_{POST} \quad \text{and} \quad \Theta_{POST} > \Theta_{PRE} \tag{7}$$

μ_{PRE} and μ_{POST} can be estimated by imposing the appropriate restrictions on the variability of the coefficient μ_{it} over time and across firms in equations (5) or (6). For this purpose, in the empirical section we make use of two dummy variables: PRE and POST, which are respectively equal to 1 in the pre- and in the post-reform years and zero otherwise. On the contrary, Θ_{POST} and Θ_{PRE} are neither observable nor can be estimated since only changes in productivity levels, Δa_t can be recovered from equations (5) or (6). If the policy reform under study is expected to generate a permanent shock to the level of productivity, what should then be observed is a transitory shock to Δa_t, the exact timing depending on both the

[12] Note, however, that this interpretation holds only under the maintained hypothesis of a perfectly competitive labor market. On this issue see Abbott et al. (1989).

[13] Obviously, this empirical strategy is consistent with the idea that policy reforms generate a permanent positive (negative) shock on productivity (mark-up) level.

year the policy has come effectively into force and firms' speed of adjustment to the new regime.

A major drawback of the overall approach described so far is that significant changes in market power or in productivity growth rates may depend on other macro- or micro-economic conditions which have nothing to do with policy reforms and are difficult to control for[14]. To perform more appropriate tests it is then necessary to make the assumption, possibly grounded on good a-priori information, that the policy measure under study has an asymmetric impact on firms or industries and that this difference in the degree of sensitivity can be adequately captured by some appropriate industry or firm level observable variables. Supposing, for instance, that by using a dichotomous variable firms can be ranked in two groups: high sensitive (HS) and low sensitive (LS) firms. Accordingly, estimates of equations (5) or (6) can be obtained separately for each sub-sample of firms and the following more satisfactory test can then be performed :

$$\mu_{HS,PRE} - \mu_{HS,POST} > \mu_{LS,PRE} - \mu_{LS,POST} \qquad (8)$$

In words, what is required in (8) is that the difference in market power between the pre-reform years is greater for HS firms compared to LS ones. If this is the case, this better performance can be reasonably attributed to the specific program, under the condition that our dichotomous variable does not capture significant differences across firms in the impact of other macro or micro economic variables[15]. As it is described in details in next section this approach is made possible in the case of the SMP by the availability of detailed industry level information on the ex-ante likelihood of being affected by the removal of non-tariff barriers within EU boundaries.

[14] For instance, the two periods may occur in different stages of the business cycle. There is a large body of both theoretical and empirical literature which suggests that both productivity and market power are likely to vary over the cycle.

[15] Obviously the same argument applies to productivity growth rates.

4. Data and Descriptive Statistics

The data set used in the econometric analysis is based on an unbalanced panel constructed by CERIS-CNR by merging balance sheet data collected by Mediobanca, a large investment bank, with industry level data provided by ISTAT, the Italian Central Statistical Office.[16] For our empirical analysis we have extracted observations relative to privately-owned manufacturing firms with no less than seven consecutive observations over the 1977-1993 period, thus obtaining a sample of 7,581 firm-year observations relative to 745 companies.

Estimates have been conducted over the 1982-1993 period in order to have two comparable sub-samples, related respectively to the pre-Single Market Program period (1982-1987) and to its implementation period (1988-1993). Moreover, since we use Instrumental Variable estimation techniques, this choice improves the efficiency of our estimates. This holds especially for estimates conducted over the pre-single market program sample since at the first year of estimation we have four cross sections still available for taking lagged variables as instruments, while one cross section is lost in constructing first differences.[17]

As discussed in the previous section, in order to analyse the effects of the SMP on firms' productivity and market power, we need to identify those groups of firms which are more likely to be affected by the program. For this purpose we have followed the criteria suggested by the European Commission in the preparatory work on the ex-ante analysis of the SMP effects.[18] In that study industries most directly affected by the program were identified by experts using as main criteria the level of non-tariff barriers, complemented by other indicators including the price dispersal for identical products between Member States, the level of intra-EU trade and the potential for economies of scale. Forty out of 120 NACE 3-

[16] More detailed information on the data base can be found in the enclosed appendix and in Margon et al. (1995).

[17] Moreover, our choice of the estimation period is supported by the fact that in 1982 a fixed plants revaluation law has been introduced in Italy for fiscal reasons. Given the lack of detailed firm level information on revaluation procedures, this makes it difficult to apply the perpetual inventory technique over the data available prior to 1982.

[18] See Buigues et al. (1990).

digit manufacturing industries were selected. These "sensitive" industries were further classified in two sub-groups depending on whether the impact of the abolition of non-tariff barriers was expected to be "high" (14 industries) or "moderate" (26 industries)[19]. In the first sub-group two types of industries were included: those in which the main purchaser is the public sector and those where different national standards hamper intra-EU trade considerably. The second sub-group covers a variety of manufacturing industries where principal obstacles are administrative and technical controls or differences in standard, which however are not perceived to have a major negative impact on intra-EU trade.

Applying these definitions to our sample, we have identified 184 "highly sensitive" firms, 199 "moderately sensitive" firms and 362 "non sensitive" firms. In the Data Appendix Table A.1 describes the unbalanced structure of the panels. and Table A.2 provides a description of the three samples.[20]

In Table 1 we provide some descriptive statistics on the variables used in the econometric estimates over the two sub-periods (pre-SMP sample and SMP sample) and for the three samples of firms ("Highly sensitive", "Moderately sensitive", "Non sensitive").

Variables Δq, Δm, Δl and Δk are expressed as logarithmic differences, where q is firms' output deflated using the three-digit production price index, m represents materials, computed as the deflated difference between sales and value added, l is the number of employees and k is the net capital stock, computed following the standard perpetual inventory technique. The share of labour on total revenue is denoted by S^L and the share of materials is S^M.

During the two sub-periods the average GDP rate of growth has been positive (2.07% and 1.58% respectively), as well as the average rate of growth of industrial production (0.97% and 0.95% respectively). This pattern is confirmed by the average rate of growth of output

[19] This classification was carried out at the Union level. At a second stage the pertinence of this list was checked with respect to each Member State, taking into account national industrial structures and country specific non-tariff barriers. On this issue see also the enclosed Data Appendix.

[20] When estimating a production function there may be a selection problem introduced by firms' entry into and exit from the industry as firms' decisions on whether to exit will depend on their productivity. Using balanced panel data, which pretends the entry and exit dynamics do not exists, will result in biased estimates, while using unbalanced panel data allows in principle to address the selection issue (see Levinsohn and Petrin (1997)). Unfortunately, even if our panel is unbalanced, we do not have appropriate data for modeling entry and exit choices.

for the firms in our sample which is positive and slightly lower during the second period: for the full sample the average rate of growth is 1.94% during the pre-SMP period and is 1.57% during the SMP period.

As discussed in section 3.2, when analysing the effects of market integration by observing realisations of the variables of interest over the pre-reform period and during its implementation, possible different patterns may be influenced by macro-economic conditions not directly related to the reform. In our sample the absence of significant differences in the rate of growth of the economy, no matter how measured, over the two periods let us think that possible differences in the rate of growth of productivity can not be easily attributed to cyclical factors.

With regard to this issue, descriptive statistics also show that highly sensitive firms experienced higher rates of growth with respect to the other two groups of firms in both periods. Since our estimation strategy is based on the assumption that market integration has an asymmetric impact on different groups of firms on the basis of their sensitiveness to the SMP, the interpretation of possible differences in the rate of growth of productivity over the three samples must take into account the observed pattern for the rate of growth of output. We will return to this issue in the next section.

Another interesting characteristic which emerges from the data is that in all samples of firms capital increases over time, while labour follows the opposite pattern. The average rate of growth of capital is 0.056 for highly sensitive firms, 0.039 for moderately sensitive firms and 0.05 for non sensitive firms, while the rate of growth of labour is respectively -0.014, -0.032 and -0.019. This trend is reflected by the behaviour of the labour share on total revenues which is found to decline in all samples.

5. Econometric Results

In order to study the effects of the SMP on firms' productivity and market power we have estimated four different equations for each of the three samples, in order to check the robustness of our results to several deviations from the assumptions of the basic model,

including the effect of the cyclical variation in capacity utilization and the possible quasi-fixed nature of labor.

We started following the methodology pioneered by Hall (1986, 1988) and Domowitz et al. (1988), by estimating equation (5) which assumes variable returns to scale, perfect competition in factor markets, imperfect competition in product markets and capital as the only quasi-fixed factor. In reporting estimates we denote equation (5) as Model A.

The second step of our estimate strategy has been to estimate model A correcting capital with a measure of capacity utilization. This approach, which has been adopted by several authors,[21] can be reconciled with the standard neo-classical theory only by assuming fixed coefficient technologies for installed capacity (see Tybout (1992)). However, from a more factual perspective, fluctuations in capacity utilization over the business cycle are an hardly disputable fact, at least in some industries. As a consequence, we checked the robustness of our findings by interacting capital with a two-digit measure of capacity utilization (Model B).

Since for all samples estimates of Model A and Model B reject the hypothesis of variable returns to scale, we also re-estimated the basic model after imposing constant returns to scale (Model C).

Finally, we modified one of the basic assumptions of the original model by allowing not only capital but also labor to be a quasi-fixed factor, thus obtaining equation (6) which includes a new regressor $\nu_{it} = \mu_{it} \frac{z_{it}^L}{p_{it}^L}$, where the ratio of the shadow price of labor (z_{it}^L) over the competitive market wage (p_{it}^L) can be interpreted as a measure of the degree of utilization of labor (Model D). The hypothesis of variable returns to scale is maintained. This model seems to be particularly appropriate for the Italian context where high costs of hiring and firing workers characterize the labor market.[22]

All models have been estimated with the Generalized Method of Moments (GMM) technique developed by Arellano and Bond (1991). This technique extends to panel data the

[21] See, among others, Harrison (1994).

methodology proposed by Hansen (1982) and generalizes the instrumental variable method suggested by Balestra and Nerlove (1966) and Anderson and Hsiao (1981,1982) by exploiting the orthogonality conditions that exist between disturbances and lagged variables included in the model.

Since all regressors in our models are likely to be correlated with the error term, OLS estimates would be biased and inconsistent, while the GMM provides consistent estimates of parameters by making use of appropriate instruments. In particular, one endogeneity issue derives from the fact that when estimating a production function, transitory productivity shocks (v_{it}) might affect the level of inputs to the extent that the shock becomes part of firms' information set before inputs choices are determined. In that case the error term will be correlated with the right hand side variables. Moreover, output price is endogenous to our models, since product market is imperfectly competitive and output price depends on strategic quantity choices made by firms.

Assuming that the idiosyncratic component of the productivity shock (v_{it}) is white noise, the logarithmic differentiation introduce an error which has a moving average structure of order one. For this reason legitimate instruments are dated (t-2) or earlier and second order autocorrelation must be excluded. Appropriate tests (m_1 and m_2) show that second order autocorrelation is not present in all estimated equations; moreover the Sargan test let us reject the hypothesis of correlation among instruments and error terms, thus legitimating the choice of instruments.

In Tables 2 (highly sensitive), 3 (moderately sensitive) and 4 (non-sensitive) we report estimates of the four models for each sample of firms. The main findings can be summarize as follows.

Focusing on the degree of market power, all estimated models show that for highly sensitive firms price over marginal cost (μ_{it}) is significantly greater than one in both periods, thus supporting the hypothesis of imperfect competition in product markets. Furthermore, overall results in Table 2 show that the ratio of price over marginal cost decreases over time: during the pre-SMP period markup estimates range between 17.7% and 23.4% while during

[22] For empirical evidence on this issue see Jaramillo, Schiantarelli and Sembenelli (1993).

the second period their values decrease and lie in the interval 7.1%-12.0%. On average, the mark-up coefficient is found to be approximately 11 percentage points lower during the program implementation period and a t-test shows that this difference ($\mu_{post} - \mu_{pre}$) is significantly different from zero at conventional statistical levels in all estimated models.

For the other two samples of firms estimates do not evidence a clear pattern of the price to marginal cost ratio. Since the difference between the markup coefficients over the two sub-periods is not significantly different from zero in most of reported equations, we re-estimated all models over the samples of moderately and non sensitive firms after imposing the restriction of constancy of the markup parameter over time ($\mu_{post} = \mu_{pre}$). [23] Estimates show that the ratio of price over marginal cost is found to be significantly higher than one only in Model D[24], thus supporting the idea that considering labor as a fully flexible factor lead to underestimate the markup parameter.[25]

Summarizing, overall results show that, for the sample of highly sensitive firms, market power decreases by 50% in the SMP implementation period with respect to the pre-SMP years. This finding is the main result of this study and it is consistent, at least for firms most directly affected by the SMP, with the prediction that market integration would have increased price competition and consequently reduced firms' market power via the removal of non-tariff barriers.

As far as the nature of returns to scale is concerned, only Model D supports the hypothesis of variable returns to scale. Since the coefficient γ is significantly smaller than zero in all samples, there is evidence in favor of the hypothesis of decreasing returns to scale.[26] Also, estimates of Model D provide evidence of systematic labor under-utilization, since the estimated ratio between the marginal product of labor and the market wage is significantly

[23] We do not report detailed estimates of restricted models for reason of space.

[24] Mark-up is equal to 14.3% for the sample of moderately sensitive firms and to 10.3% for the sample of non-sensitive firms

[25] See Abbott et al. (1989).

[26] This result is counterintuitive and may be due to the existence of correlation between capital and the ratio of labor over capital, both included as regressors.

smaller than one for all samples. Changes over time in the measure of labor utilization are not easily interpretable and would require specific investigation; anyway this issue is not crucial here given the purposes of this study.

We turn now to discuss the impact of market integration on firms' productivity, as implied by our estimates. To this aim we recovered the values assumed by time dummies for each year which represent estimates of yearly rates of growth of productivity. In Figure 1 we report plots of three-years centered moving averages of estimated rates of growth over the three samples of firms.[27]

As discussed in section 3.2, if market integration is expected to induce a permanent positive shock on productivity levels, we should observe a temporary shock on its rate of growth. The timing of this event is unclear and it depends on various factors, including whether firms anticipate or not the expected effects of the Single Market Program and the time needed for policy measures to become effective. This last point may be difficult to define for the nature of the SMP which has not been implemented at once, but consists in several measures which have come into force at different times in each EU Member State.

Despite all above mentioned problems our results are suggestive. In fact, for the sample of highly sensitive firms we observe a sharp increase in the rates of growth of productivity during the 1985-1987 period, that is after the announcement of the signature of the White Paper (1985) till the starting of the implementation of the Single Market Program (1987). The same pattern of productivity growth is not observed for the other two samples of firms.

Obviously, these findings are consistent with highly sensitive firms anticipating the impact of the reform on competition, thus reducing the misuse of technical and human resources and managerial slack. However this interpretation must be compared and contrasted with other possible explanations, including the traditional output led productivity growth. On the one hand, the fact that the productivity jump is observed only in the 1985-87 interval

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[27] We report plots of three-years centered moving averages as they are more easily interpretable than yearly growth rates.

whereas output grows at an even faster pace in the following years (1988-89) gives support to the SMP supply shock hypothesis. On the other hand, as we noted in section 4, highly sensitive firms experimented higher rates of growth with respect to other firms in both periods. Hence our results on the effect of market integration on firms' productivity must be considered as not completely conclusive.

6. Conclusions

The empirical evidence provided in this paper is consistent with the ex-ante expectation that the EU Single Market Program should have increased competition and consequently reduced market power, especially for firms operating in industries where non-tariff barriers were perceived to be high. In fact, what is observed is that mark-ups decline significantly in the SMP implementation period (1988-93) compared to previous years (1982-87) only for firms operating in the so-called "1992 highly sensitive" industries. The evidence on productivity is less conclusive. This mainly depends on the characteristics of the SMP itself whose long implementation period makes it difficult to predict where the shock to productivity level is likely to occur. However, our estimates of corrected Solow residuals show a significant jump in productivity growth rates for highly sensitive firms in the 1985-87 period, that is immediately after the program announcement but before the "core" implementation period (1988-93). Obviously, this results is consistent with the idea of sensitive firms anticipating an expected increase in competitive pressure by reducing inefficiencies. Also, since this positive jump is observed neither in other periods nor for the other samples of firms, other competing explanations, such as a demand driven productivity shock, sound less convincing.

Even if overall findings lend support to the positive role played by the Single Market Program, and more generally by policies aimed at reducing non-tariff barriers, in reducing market power and increasing productivity, more research on this topic is needed. Firstly, to check for the general validity of the results presented in this paper, it would be important to replicate this exercise on samples of firms of other EU countries. Secondly, further, and possibly more conclusive, evidence on the impact of the SMP on productivity can probably

be obtained by applying stochastic frontier techniques to firms operating in carefully selected sensitive industries. Thirdly, our understanding of the competitive mechanisms underlying observed patterns would greatly benefit whether it would be possible to isolate the role played by incumbent firms compared to that played by entrants and exiting firms. All these issues are in our agenda for future research.

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TABLE 1 - DESCRIPTIVE STATISTICS

PRE SINGLE MARKET PROGRAM SAMPLE (1982-1987)

		Highly Sensitive	Moderately Sensitive	Non Sensitive
	Num. Obs.	395	459	742
Δq	Mean	0.037	0.013	0.014
	St. Dev.	0.155	0.181	0.124
	Median	0.047	0.022	0.017
Δm	Mean	0.046	0.024	0.014
	St. Dev.	0.168	0.213	0.150
	Median	0.055	0.024	0.017
Δl	Mean	-0.018	-0.033	-0.024
	St. Dev.	0.103	0.171	0.100
	Median	-0.012	-0.030	-0.018
Δk	Mean	0.046	0.031	0.034
	St. Dev.	0.104	0.107	0.096
	Median	0.029	0.011	0.024
S^M	Mean	0.650	0.640	0.699
	St. Dev.	0.128	0.123	0.132
	Median	0.675	0.643	0.708
S^L	Mean	0.226	0.258	0.193
	St. Dev.	0.095	0.107	0.109
	Median	0.210	0.252	0.176

SINGLE MARKET PROGRAM SAMPLE (1988-1993)

		Highly Sensitive	Moderately Sensitive	Non Sensitive
	Num. Obs.	543	596	1121
Δq	Mean	0.036	0.008	0.010
	St. Dev.	0.149	0.175	0.156
	Median	0.034	0.018	0.018
Δm	Mean	0.044	0.015	0.012
	St. Dev.	0.180	0.202	0.166
	Median	0.043	0.020	0.020
Δl	Mean	-0.011	-0.032	-0.015
	St. Dev.	0.112	0.103	0.120
	Median	-0.008	-0.019	-0.010
Δk	Mean	0.067	0.048	0.067
	St. Dev.	0.106	0.088	0.179
	Median	0.052	0.034	0.046
S^M	Mean	0.686	0.663	0.716
	St. Dev.	0.120	0.123	0.130
	Median	0.697	0.677	0.726
S^L	Mean	0.207	0.241	0.188
	St. Dev.	0.097	0.102	0.107
	Median	0.198	0.225	0.172

TABLE 2 - ECONOMETRIC RESULTS
HIGHLY SENSITIVE FIRMS

	Model A	**Model B**	**Model C**	**Model D**
μ_{pre}	1.195	1.177	1.207	1.234
	(0.049)	(0.05)	(0.047)	(0.058)
μ_{post}	1.071	1.079	1.087	1.120
	(0.038)	(0.042)	(0.036)	(0.039)
ν_{pre}	–	–	–	0.824
				(0.126)
ν_{post}	–	–	–	0.24
				(0.173)
γ	-0.038	-0.026	_	-0.097
	(0.032)	(0.027)		(0.027)
μ_{post}-μ_{pre}	-0.124	-0.098	-0.12	-0.114
	(0.058)	(0.06)	(0.059)	(0.067)
$\mathbf{m_1}$	-0.81	-0.874	-0.939	-0.114
	[184]	[184]	[184]	[184]
$\mathbf{m_2}$	0.537	0.429	0.466	-0.018
	[142]	[142]	[142]	[142]
S	183.997	183.995	183.998	184.002
	[465]	[465]	[466]	[463]

Notes to Table 2:
(1) Dependent variable : Δq. (2) One step estimates with robust test statistics. (3) Sample period: 1982-1993. (4) Number of observations: 938. (5) Number of Firms:184. (6) Asymptotic robust standard errors in round brackets. (7) Degrees of freedom in square brackets.(8) m_1: test for first order autocorrelation, asymptotically distributed as N(0,1).(9) m_2: test for second order autocorrelation, asymptotically distributed as N(0,1). (10) S: two-step estimates Sargan test of correlation among instruments and residuals, asymptotically distributed as χ^2. (11) Instruments used are: sl, sm, k, l, m and two-digit utilized capacity index, all dated (t-2) and earlier. (12) Time dummies are included as regressors and instruments in all equations.

TABLE 3 - ECONOMETRIC RESULTS
MODERATELY SENSITIVE FIRMS

	Model A	**Model B**	**Model C**	**Model D**
μ_{pre}	1.007	1.010	1.028	1.133
	(0.149)	(0,147)	(0.129)	(0.081)
μ_{post}	1.090	1.077	1.103	1.146
	(0.026)	(0.028)	(0.021)	(0.025)
ν_{pre}	–	–	–	0.386
				(0.271)
ν_{post}	–	–	–	0.351
				(0.183)
γ	-0.065	-0.058	–	-0.101
	(0.072)	(0.061)		(0.051)
$\mu_{post}-\mu_{pre}$	0.083	0.067	0.075	0.013
	(0.136)	(0.131)	(0.129)	(0.077)
$\mathbf{m_1}$	-2.373	-2.331	-2.209	-1.804
	[199]	[199]	[199]	[199]
$\mathbf{m_2}$	-1.125	-1.227	-1.114	-0.115
	[161]	[161]	[161]	[161]
S	199	198.999	199.001	199.006
	[465]	[465]	[466]	[463]

Notes to Table 3:
(1) Dependent variable : Δq. (2) One step estimates with robust test statistics. (3) Sample period: 1982-1993. (4) Number of observations: 1055. (5) Number of Firms:199. (6) Asymptotic robust standard errors in round brackets. (7) Degrees of freedom in square brackets.(8) m_1: test for first order autocorrelation, asymptotically distributed as N(0,1).(9) m_2: test for second order autocorrelation, asymptotically distributed as N(0,1). (10) S: two-step estimates Sargan test of correlation among instruments and residuals, asymptotically distributed as χ^2. (11) Instruments used are: sl, sm, k, l, m and two-digit utilized capacity index, all dated (t-2) and earlier. (12) Time dummies are included as regressors and instruments in all equations.

TABLE 4 - ECONOMETRIC RESULTS
NON SENSITIVE FIRMS

	Model A	**Model B**	**Model C**	**Model D**
μ_{pre}	1.041	1.040	1.036	1.057
	(0.042)	(0.040)	(0.038)	(0.031)
μ_{post}	1.015	1.005	1.006	1.133
	(0.035)	(0.035)	(0.024)	(0.026)
ν_{pre}	–	–	–	0.673
				(0.203)
ν_{post}	–	–	–	0.223
				(0.118)
γ	0.011	-0.0002	–	-0.059
	(0.025)	(0.024)		(0.023)
μ_{post}-μ_{pre}	-0.026	-0.035	-0.03	0.076
	(0.045)	(0.043)	(0.045)	(0.039)
$\mathbf{m_1}$	-3.365	-3.404	-3.379	-3.2
	[362]	[362]	[362]	[362]
$\mathbf{m_2}$	-1.434	-1.560	-1.438	-1.123
	[301]	[301]	[301]	[301]
S	355.421	355.350	352.983	357.972
	[465]	[465]	[466]	[463]

Notes to Table 4:
(1) Dependent variable : Δq. (2) One step estimates with robust test statistics. (3) Sample period: 1982-1993. (4) Number of observations: 1863. (5) Number of Firms: 362. (6) Asymptotic robust standard errors in round brackets. (7) Degrees of freedom in square brackets.(8) m_1: test for first order autocorrelation, asymptotically distributed as N(0,1).(9) m_2: test for second order autocorrelation, asymptotically distributed as N(0,1). (10) S: two-step estimates Sargan test of correlation among instruments and residuals, asymptotically distributed as χ^2. (11) Instruments used are: sl, sm, k, l, m and two-digit utilized capacity index, all dated (t-2) and earlier. (12) Time dummies are included as regressors and instruments in all equations.

DATA APPENDIX

TABLE A.1 - STRUCTURE OF SAMPLES

HIGHLY SENSITIVE FIRMS

Years of observations	Number of firms
7	42
8	29
9	25
10	15
11	16
12	21
13	7
14	15
15	5
17	9
Total Obs.: 1858	Total Firms: 184

MODERATELY SENSITIVE FIRMS

Years of observations	Number of firms
7	38
8	39
9	28
10	22
11	12
12	11
13	14
14	9
15	6
16	2
17	18
Total Obs.: 2050	Total Firms: 199

NON SENSITIVE FIRMS

Years of observations	Number of firms
7	61
8	84
9	58
10	31
11	34
12	19
13	12
14	18
15	12
16	9
17	24
Total Obs.: 3673	Total Firms: 362

TABLE A.2 - NUMBER OF FIRMS AND OBSERVATIONS BY INDUSTRY

HIGHLY SENSITIVE FIRMS

Nace	Industry	No. Firms	No. Obs.
257	Pharmaceuticals	46	489
315	Boilers & containers	2	19
330	Computers & office mach.	4	48
341	Insulated wires & cables	9	91
342	Electrical machinery	9	88
344	Telecom & measur. equip.	18	179
351	Motor vehicles *	4	38
361	Shipbuilding	1	7
362	Railway stock	3	36
363	Cycles & motor cycles *	6	60
372	Medical instruments	7	72
417	Pasta	6	69
421	Confectionery	7	59
425	Wine & Cider	10	91
427	Beer	5	52
428	Soft drinks	2	26
432	Cotton *	18	181
436	Knitting *	8	70
437	Textile finishing *	2	31
453	Clothing *	17	152
Total		**184**	**1858**

MODERATELY SENSITIVE FIRMS

Nace	Industry	No. Firms	No. Obs.
247	Glass	16	162
248	Ceramics	11	123
256	Ind. & Agric. chemicals	15	153
260	Man-made fibres *	5	50
321	Tractors & Agric. Mach.	7	64
322	Machine tools	6	76
323	Textile machinery	5	58
324	Food & chemical mach.	12	130
325	Mining/construction mach.	11	103
326	Transmission equipment	8	78
327	Paper, wood, etc. mach.	6	65
345	Radio & television	17	157
346	Domestic elec. Appliances	13	115
347	Electric lights	5	46
352	Trailers & Caravans *	6	74
353	Motor vehicle parts *	10	104
364	Aerospace	4	46
431	Wool	9	85
438	Carpets	2	25
451	Footwear	3	44
455	Household textiles	8	80
481	Rubber	13	140
491	Jewelry	3	31
493	Photographic labs.	2	17
495	Miscellaneous manufacturing.	2	24
Total		**199**	**2050**

NON SENSITIVE FIRMS

Nace	Industry	No. Firms	No. Obs.
221	Iron & steel	15	158
222	Steel tubes	4	43
223	Steel forming cold	4	35
224	Non-ferrous metals	9	91
242	Cement	8	93
243	Concrete	5	54
244	Asbestos	1	11
245	Stone products	2	16
246	Abrasives	2	24
251	Basic chemicals	19	191
255	Paint & ink	11	99
258	Soap & detergents	11	120
259	Domestic & office chemicals	3	31
311	Foundries	13	137
312	Forging	3	27
313	Metal treatment	3	29
314	Metal structures	5	53
316	Tools & cans	14	145
319	Mechanical engineering	1	10
328	Other machinery	26	260
343	Electrical equipment	16	154
348	Electrical engineering	5	61
371	Measuring instruments	4	39
373	Optical instruments	2	25
374	Clocks & watches	1	10
411	Oils & fats	6	49
412	Meat products	12	121
413	Dairy products	18	170
414	Fruit & vegetable prod.	6	51
415	Fish products	2	16
416	Grain milling	6	73
418	Starch	1	8
419	Bread & biscuits	7	66
420	Sugar	3	22
422	Animal foods	8	76
423	Other foods	6	57
424	Distilling	7	80
433	Silk	6	63
439	Miscellaneous textiles	5	55
454	Hand made clothing	1	7
461	Wood sawing	1	17
462	Wood boards	2	19
467	Wooden furniture	7	63
471	Paper & pulp	16	166
472	Processed paper	7	73
473/4	Printing & publishing	30	325
482	Rubber	1	7
483	Plastics	16	164
494	Toys & Sports	1	9
Total		**362**	**3673**

(*) denotes industries which have been reclassified on the basis of the revised list of sensitive industries for Italy published in Buigues et al. (1990).

FIG. 1 PRODUCTIVITY GROWTH RATE ESTIMATES

(THREE YEARS CENTERED MOVING AVERAGES)