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PRODUCTIVITY AND STRUCTURAL REFORMS: EVIDENCE ON THE ITALIAN ECONOMY

by
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1. *Introduction*

Productivity is a notion widely used in economics to address relevant analytical and policy issues in both the short and the long run. In the former case productivity has a prominent role in explaining business cycle fluctuations; in the latter case productivity is a key factor in identifying the sources of economic growth. For this last reason, productivity – and in particular total factor productivity – is often taken as a measure of economic performance.

Because productivity is a measure of how well an economic entity is doing or progressing, its accurate measurement is an important issue. This is especially true because we are typically interested in comparisons – both across space and across time – of productivity growth rates. In this paper we compute the rate of growth of Total Factor Productivity (henceforth, TFP) for the private sector of the Italian economy over the period 1970-2000. We adopt the commonly accepted methodology and make use of the official available data. This we do in the first part of the paper, where we document

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that, overall, the trend of TFP change in Italy has exhibited a declining pattern over the three examined decades.

Once the measure of the trend of TFP change is obtained, we empirically investigate for the Italian economy the relationship between total factor productivity and structural reforms (see, e.g., Nicoletti, 2002, and Scarpetta, 2002). The latter are policy interventions that alter the institutional settings of a nation and its economic structure. Indeed, over the last years a large stream of literature has addressed the issue of how TFP changes over time and across space are influenced by the institutional arrangements and regulatory frameworks in the various markets.[1] The idea underlying the existence of a productivity-structural reforms nexus is that policy interventions on the institutional economic settings largely influence the environment where agents' decisions are taken, altering the way they respond to incentives when active on the markets for goods and factor services. In particular, a view which is widely held is that the degree of rigidity and strict regulation in these markets is negatively related to economic performance and, thereby, to potential growth.[2] Thus, structural reforms aimed at increasing flexibility and competitiveness in markets are expected, in general, to foster productivity.

In the second part of the paper we first review the crop of papers that have tackled the issue of productivity-reforms nexus. We then take the evolution of trend TFP growth over time in Italy and relate it in a simple, intuitive and non-rigorous way to various indicators of structural reforms. These include: the degree of competitiveness of the goods market; the degree of flexibility of the labor market; the availability of funds in the credit market; the role of public infrastructures and the intensity of innovation activities.

The results are at best suggestive, for we look at simple, instantaneous correlations. Our evidence, however, points to a positive impact on productivity growth of reforms designed to increase the competitiveness and flexibility of markets.

2. *Measuring Total Factor Productivity*

2.1. *The standard Solow residual*. - Understanding the source of economic

[1] Hall and Jones (1999) show that differences in productivity across countries are driven by differences in what they call social capital, i.e. institutions and government policies. Among the empirical contributions, see for example Calderon (2001), Nicoletti and Scarpetta (2003), Salgado (2002), Scarpetta and Tressel (2002) and Scarpetta et al. (2000).

[2] The OECD launched a large research project aimed at measuring and analysing the extent of product and labor market regulations in different countries (see, e.g., Nicoletti et al., 1999, and Goglio, 2001).

growth is one of the major tasks in economic analysis. In a nutshell, one can argue that the neoclassical theories of growth point to favorable productivity changes induced by improvements in technology and in the organization of production as the main driving force behind growth. On the other hand, the endogenous growth models assign a prominent role in explaining growth to the changes in human capital, knowledge and fixed capital formation (see Hulten, 2001).

The concept of total factor productivity (TFP) is rather straightforward as the latter can be defined as output volumes per unit of inputs. Yet, its actual measurement has stirred an intense debate in both the theoretical and empirical literature. Clearly, a seminal contribution in this area is the one by Solow (1957), who derived a measure of TFP by adopting a production function approach and assuming both perfect competition and constant return to scale.

Solow considered the following production function:

$$Y_t = A_t F(K_t, L_t) \tag{1}$$

where Y_t is real output and K_t and L_t denote capital and labor services, respectively. A_t is the Hicksian shift parameter, which reflects both technical innovation and variation in the organization of production. Intermediate inputs are not included as arguments of the production function: consistently with this, the measure of production used in (1) is real value added.[3]

Total differentiation of (1) and a few substitutions leave us with the classical growth accounting decomposition:

$$\frac{dA_t}{A_t} = \frac{dY_t}{Y_t} - s_l \frac{dL_t}{L_t} - (1 - s_l)\frac{dK_t}{K_t} \tag{2}$$

where s_l denotes the labor income share. The entity (dA_t/ A_t) represents the rate of productivity growth and is also called 'Solow residual', as it is obtained by netting out from the rate of output growth the components attributable to growth in inputs.

In analyzing productivity dynamics at the cyclical frequencies, one may identify a number of drawbacks in measuring TFP growth through the crude Solow residual. An high degree of procyclicality can be generated by departures from constant return to scale and perfect competition (as pointed out by Hall, 1988) and/or failure to measure factors' utilization correctly (see

[3] For an insightful discussion of this issue, see Basu and Fernald (1995).

e.g., Fay and Medoff, 1985, and Basu and Kimball, 1997). These lines of research have stirred an intense remeasurement activity in order to overcome the mentioned shortcomings (see e.g., Basu and Fernald, 2001 and Marchetti and Nucci, 2003). However, in this paper we adopt the standard Solowian approach. The reason is that we are only concerned with long-run relationship, as the one between structural reforms and productivity. Since in our context we do not look at cyclical frequencies, the fact that we ignore the refinements in TFP calculations mentioned above should not lead to any significant cost.

In the following sub-section, we elucidate how the standard Solow residual of equation (2) is derived for the Italian economy.

2.2. *The data.* In computing TFP changes over the time period 1970-2000, we apply equation (2) to data of the Italian market sector. These data are drawn from official statistics released by the National Statistical Institute (henceforth, ISTAT) and when we need to construct a new variable in order to capture important economic features not taken into account in the official data, we provide details of the hypothesis adopted and of the calculations made. The output variable is value added at factor costs referring to the market sector only and expressed at constant 1995 prices. In our baseline measure of TFP growth, the labor input variable is given by total employment (both employees and self-employed) in the market sector. This series is drawn from Italian National Accounts and it refers to standardized units of labor. The labor income share is also computed in a standard fashion. The numerator of it is given by the product of total employment in the market sector and nominal gross labor compensation per employee (inclusive of social security contributions); the implicit assumption is that self-employed per capita compensation equals the one for the employed workers.[4] The

4 Data on labor compensation for the self-employed are – in few cases - available in National accounts releases. However, the routinely adopted assumption is to assign to each self-employed a labor compensation that is equal to the average one of the employees. In addition to obvious comparability reasons, this decision is justified by the difficulty to net out the capital income component from self-employed proceeds. In fact, we also computed another measure of labor share that, in principle, is more closely in line with the true measure. In particular, it is generally known that the social security contribution rate is different whether the worker is employee or self-employed. Hence, we computed an alternative labor share by using as numerator the following term: $WTM*EMPM+ WM*(1 + rtwself)*SELF$, where *WTM* is labor compensation per employee in the market sector, *EMPM* is the number of employees, *WM* is wage per employee, *rtwself* is the social security contribution rate for the self-employed (computed as an implicit, effective rate) and *SELF* is the number of self-employed. Although this measure is admittedly more precise, it faces a serious empirical problem. Time series data

denominator is simply nominal value added for the market sector. In constructing the baseline measure of TFP variations, we do not use time-varying factor shares. On the contrary, we simply take their sample mean over time and treat these shares as constant.[5]

With regard to the stock of capital, we face two problems: first, we have to construct data for the period 1970-1979 as the official series from ISTAT begins in 1980; second, we need to correct for the fact that aggregate capital stock of the market sector includes residential constructions, which have to be netted out as they do not enter the production function. To tackle these issues, we consider first the accumulation equation for capital stock of the market sector (inclusive of residential constructions):

$$K_{t+1} = (1-\delta) * K_t + I_t \tag{3}$$

where I_t is investment at 1995 prices; we implicitly define a value for the depreciation rate, δ, by running a regression of K_{t+1} on K_t and I_t over the period 1980-2000. Later, we use the available data on investments and the estimated value for δ to derive estimates for the capital stock before 1980. We also consider an estimate of the capital stock in residential constructions and, similarly to what we did for the whole capital stock of the market sector, we use this information in conjunction with data on investments in residential constructions so as to estimate an implicit depreciation rate for this type of capital. Once we have the depreciation rate, we use data on residential investments over the period 1970-1979 in order to construct values for capital stock in residential construction for the period before 1980. The series we use for capital stock of the market sector net of residential construction is therefore the difference between these two series that we have constructed for the entire sample period.

With these data at hands, the TFP change series can be constructed. As a comparison exercise, we also compute a series of TFP change using data from OECD data archives and in particular the database used for the

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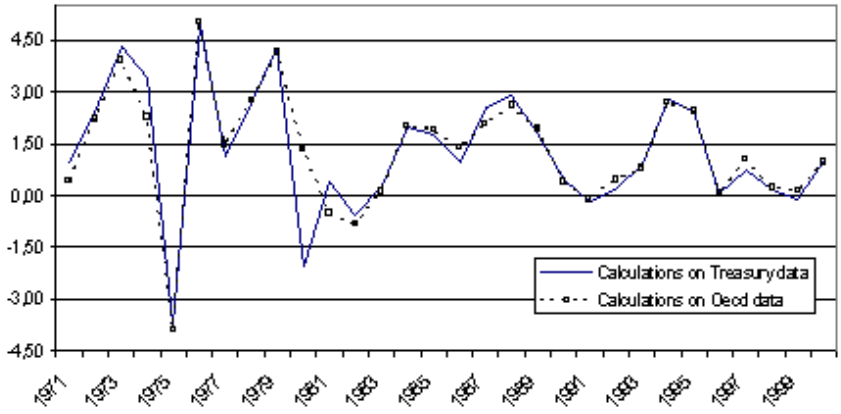
on *rtwself* are available from 1980 only and not from 1970. In principle, because we take the time average of the labor share, this may be an irrelevant issue. However, the labor share in the Italian economy, no matter how it is computed, exhibits a clear downward pattern over time. Hence, if we take the average over the period 1980-2000 of the labor share computed in this alternative way, we obtain a measure of the labor share that is under-estimated with respect to the sample mean that we would obtain if we consider our entire sample period, namely 1970-2000. For this reason, we use the standard measure of labor share and dismiss this alternative approach.

[5] Basu and Fernald (2001) convincingly explain the reasons as to why this approach has more advantages.

Economic Outlook for Italy (OECD, 2001). Of course, as the statistical source is the same (ISTAT), differences between our TFP series and the one constructed using OECD data are of modest size only. In particular, the main source of differences comes from the capital stock series, as the OECD data on capital stock of the business sector, although very similar to our own measure, do not match it exactly. For the labor share, we use the value of .693, which is the one reported for the Italian economy in the Economic Outlook (OECD, 2001).

In the following sub-section, we document how in the Italian economy total factor productivity has evolved over time.

2.3. *The evidence for Italy*. - In the entire period 1971-2000, the rate of change of Italian TFP was, on average, of 1.3 per cent. Behind this value, however, there is a significant variability over time.

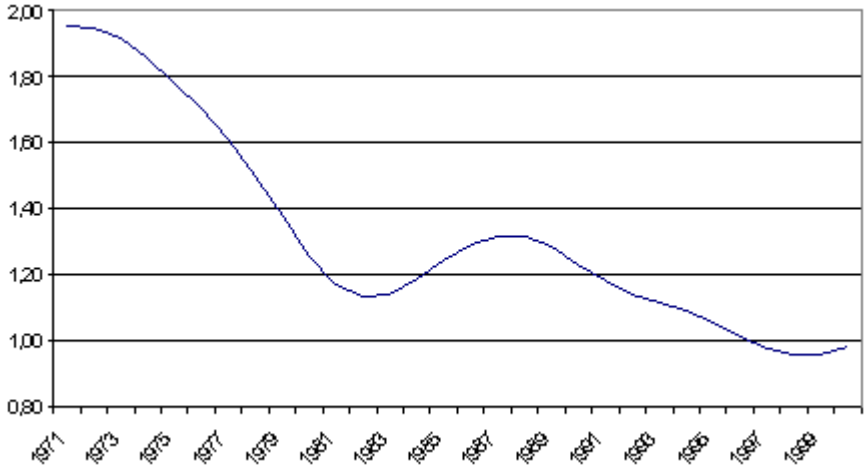


Source: In all the databases used, the original statistical source is ISTAT.

Fugure 1. Total factor productivity in Italy: percentages growth rates (actual data; sample period: 1971-2001)

In Fig. 1 the time change of actual TFP is reported. Two series are considered: the one constructed using our own dataset and the one derived using information drawn from the OECD database. Not surprisingly, the two series exhibit a high degree of conformity. The large variability over time of the two series suggests that a sizeable cyclical component characterizes the TFP series. Hence, because our emphasis is on long-run behavior, we decide to adopt a filter using the Hodrick-Prescott (henceforth, HP) method. The

latter is largely used by macroeconomists to obtain a smooth estimate of the long-term trend component of a series. The TFP filter is linear and two-sided; it extracts the smoothed series, call it *yt*, by minimizing the variance of the original series around *yt*, subject to a penalty that constrains the second difference of *yt*. Since we use annual data, we use 100 as value of the penalty parameter (the λ of standard HP notation).



Source: Authors' calculations on Istat data

Fugure 2. Total factor productivity in Italy: percentages rates of growth (trend values; sample period: 1971-2001)

Fig. 2 documents how the time path of the resulting trend series looks like. Once the cyclical component is netted out, the long-run profile of the series is more evident. Overall, a declining pattern characterizes the TFP growth in the Italian economy over the period 1970-2000. In particular, TFP has decelerated over the seventies with a declining pattern of TFP growth observed until 1982. Subsequently, the latter rises until 1987. From that year onwards, the declining pattern of TFP changes has characterized the Italian economy, with the exception of the last years of the sample, when productivity growth is stable at the value of about 1 per cent and a small acceleration of TFP is observed in the year 2000.[6] Compared to the values

[6] It is well known that the HP methodology presents some problems in estimating trend values in the final years of the sample. To tackle this issue, before applying the HP filter, we

experienced at the beginning of the seventies, in the latest years productivity growth is smaller of about one percentage point (from about 2 to 1 per cent).[7]

Over short periods of five years, we also calculate simple time averages of our trend measure of TFP growth. In Table 1 we report how TFP in Italy has evolved over time by using these time averages.

Table 1. Total Factor Productivity in Italy: five-years averages of percentage growth rates (trend values)

Periods of five years	Calculations on Treasury data	Calculations on OECD data
1971-1975	1.89	1.78
1976-1980	1.49	1.63
1981-1985	1.17	1.31
1986-1990	1.29	1.30
1991-1995	1.12	1.14
1996-2000	0.98	1.05
Whole sample: 1971-2000	1.32	1.37

Source: In all the databases used, the original statistical source is ISTAT.

The overall picture points to a declining pattern of productivity in the Italian private sector. This empirical fact refers to the nineties as well. This is in sharp contrast with other economies, in particular the US, where the surge in TFP has been remarkable over the last decade.[8]

estimate a simple autoregressive model (AR4) on the actual series and use the estimated parameters to predict changes of TFP over the period 2001-2004 (4 years). Subsequently, we apply the HP methodology on the TFP series over the artificially prolonged new sample period (1971-2004).

[7] A sizeable productivity drop occurs in 1975 and the HP filter may find it difficult to cope with this anomalous observation. We tackle this issue by first restricting the sample to the period 1976-2000. In this case, the trend series exhibits a flatter profile in the second part of the 70's compared to the one displayed in Fig. 2. On the other hand, however, when we simply interpolate the 1975 observation with the average of the 1974's and 1976's values, the resulting trend pattern is qualitatively similar to the one of Fig. 2, with the TFP trend variation being slightly higher than the actual trend in the first half of the 70's and slightly lower in the second part.

[8] As a sensitivity inspection, we also compute two alternative measures of TFP growth, using, in one case, standard time-varying labor shares and, in the other, Törnqvist indices for them. Although differences between the two series and the one with constant labor shares exist, the pattern is qualitatively very similar.

3. *A Few Extensions in the Computation of* TFP

The Solow residual that we derived was built by relying on the standard growth accounting framework and using the available National account data. In this section, we compute additional series making use of information not provided by the National Statistical Institute. The new series should represent finer measures of productivity, that control for some important economic features. Our scope is to compare them with the original series and, more in general, to verify if they convey a different message regarding the evolution of Total Factor Productivity in Italy over the period that we consider.

3.1. *Allowing for variable intensity of labor Use: the number of hours.* - As illustrated before, we use standard units of labor drawn from the National accounts to measure the labor input. Indeed, the true measure of labor input services, N_t, would be the following:

$$N_t = L_t H_t E_t \tag{4}$$

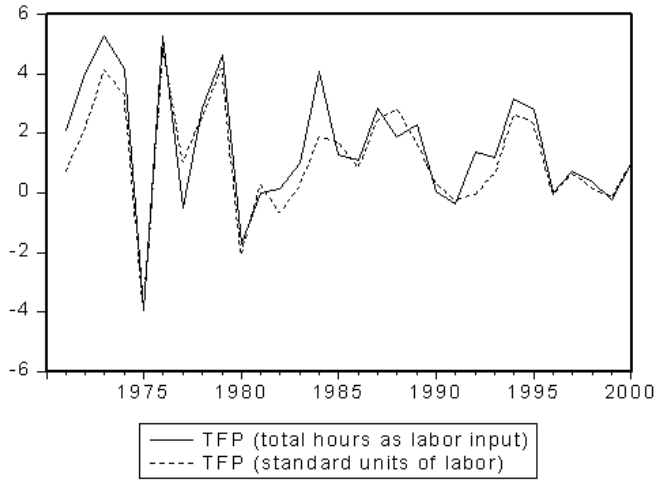
where L_t is the number of employees, H_t the number of hours per worker and E_t is the unobservable hourly effort spent by each worker at time t. The task of approximating the unobservable effort, E_t, is a challenging one and several approaches have been proposed in the literature (see, e.g., Basu and Kimball, 1997, and Marchetti and Nucci, 2001). A similar argument would hold for hours per capita. Indeed, while the latter tend to exhibit a stationary profile in the long run, by looking at the cyclical frequencies they are likely to increase sharply during a boom and decline during a recession. At the theoretical level, the presence of non negligible hiring and firing costs justifies a form of labor hoarding, with the implication that hours per worker fluctuate extensively along the business cycle. If the labor input measure that is used in calculating TFP does not take into account this cyclical pattern of hours, then one may observe a procyclical behavior of productivity that is a figment of measurement errors.[9] Although our focus is on long-run tendencies, however, as a robustness inspection, we also derive a measure of TFP where total hours are used as a measure of labor input. Our a priori, as pointed out in the final part of sub-section 2.1, is that the trend behavior of the Solow residual should

[9] During a boom, if labor hoarding prevents firms from hiring extensively, hours per capita tend to rise in order to satisfy the increasing demand. Output therefore increases, but, because labor statistics focus on employment only, an increase in measured TFP would be observed. A similar argument would hold, *mutatis mutandis*, in the case of a recession.

end up being substantially unchanged.

Official Italian economic statistics do not include any information on actual man-hours. The only information available is a time series on the statutory number of hours. However, this variable is not adequate to measure the behavior of hours over time, as the effective number of hours worked is likely to differ sharply from the number of hours resulting from labor contracts. Notwithstanding this lack in official statistics, OECD releases a time series on Italian worked hours and uses this information in their analyses of Italian economy. This piece of information refers to the average number of hours per worker in the market sector. The original source is the *European Labour Force Survey* (*EULFS*), where a country-specific adjustment has been introduced by OECD researchers on most national series. To derive the series for total hours, we multiply the OECD series by the number of employees (source: ISTAT). Once this measure of labor input services is obtained, we calculate TFP changes using constant factor shares. On a priori grounds, we would expect that the degree of procyclicality of this TFP growth series is lower than the one exhibited by the standard TFP growth series described in the previous section. Indeed, if we calculate the simple sample correlation between a typical cyclical indicator like changes in aggregate output, as measured by real value added of the market sector, and TFP changes, the value of it is larger when the standard TFP variation is used. In particular, the covariance is .92 in the latter case while it is .83 when TFP growth with total hours as labor input is used. This implies that the degree of spurious procyclicality of total factor productivity is partially reduced when a potentially more refined measure of labor input is used. Somewhat surprisingly, however, in the sample period considered, the latter series of TFP variation is slightly more volatile than the standard TFP growth series (see Fig. 3). Explaining this evidence presents some challenges and, in general, the fact that data on Italian worked hours are not released by official statistical offices induces stronger caveats on the use and interpretation of estimates made available by other institutions.[10]

[10] Arguably, a tentative explanation is that, during booms, Italian workers tend to increase their hours worked but not only in the firms they are employed in; rather, by also taking a second job with a part-time involvement. While this phenomenon would be well captured when labor is measured in standard units, it may be less so when information on hours worked is collected through surveys on a sample of individual firms.



Source: Authors' calculations on Istat and OECD data

Figure 3. TFP actual growth in the Italian market sector using alternative labor input measures: Period 1970-2000

3.2. *Human capital and the qualitative composition of labor.* - As it is well known, increasing importance has been attributed in economic analysis to the role of human capital accumulation as a driving force for growth. On the empirical side, much effort has been spent in the attempt to measure the quality of the workforce and identify, along this line, a number of characteristics that approximate how workers contribute differently to output formation. In this section, we attempt to explore how total factor productivity looks like when the measure of labor input controls for the growing quality of the workforce.

In particular, we focus on the level of education attainments as the key characteristic that reflects labor quality. Therefore, we measure labor input variation as a weighted average of the employment changes associated to different groups of workers disaggregated according to education levels. The weights used are the relative wages, on the grounds that differences in wages across groups are tightly linked to differences in labor productivity.[11] We identify three groups of workers on the basis of the level of education

[11] In Barro and Lee (1993) a similar approach is employed; see also Scarpetta, Bassanini, Pilat, and Schreyer (2000) and Brandolini and Cipollone (2001).

attainment: low-education workers are those whose education attainment is not superior to the attendance of the first part of secondary school ("scuola media"). This group, of course, includes also those who have attended primary school only and those who had no schooling whatsoever. The group of middle-education workers includes those who attended secondary school, while the group of high-education workers refers to those with a University degree. For each of these groups, we used information drawn from the archive of the Bank of Italy's surveys of household income and wealth (see Brandolini and Cannari, 1994 for a description of these data). In particular, we compute relative wages for each education group as the ratio of labor compensations paid to the workers in a group to the labor compensations paid to all the workers. More specifically, we compute the time-varying shares as

$$(5) \qquad weight_{it} = \frac{w_{it} L_{it}}{\sum_{i=1}^{3} w_{it} L_{it}} \qquad i = 1,2,3$$

where w_{it} is the average nominal wage bill for workers with level of education attainments i and L_{it} is the number of workers (both employees and self-employed) in the same education category. The index t, of course, refers to time. Once the weights are calculated for each group, they are multiplied to the corresponding changes in the number of employees of the same group. The latter information is drawn from ISTAT data on employment by education attainment that are partly unpublished.

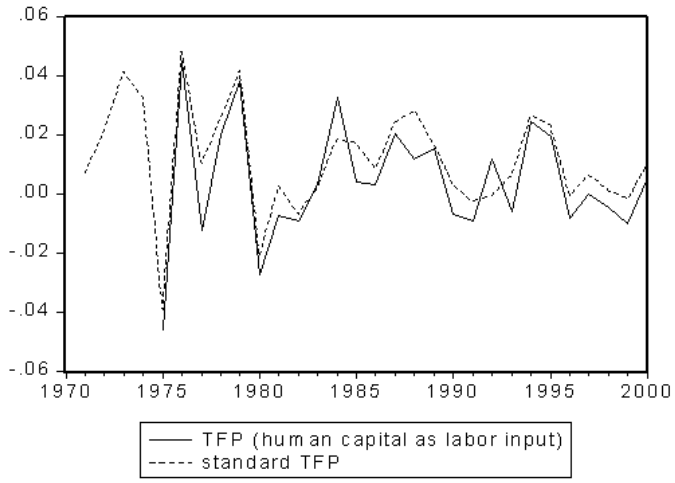
Not surprisingly, the quality of the Italian workforce has sharply increased over the sample period 1970-2000. In particular, the share of low-education workers over total workers has declined, while the shares of workers in the other two categories have increased. The measure of human capital is constructed as follows:

$$(6) \qquad d\log(HC)_t = \sum_{i=1}^{3} weight_{it} * d\log(L_{it}) \qquad i=1,2,3$$

where HC_t is human capital.

The last step is to compute TFP variation using change in human capital as labor input. Fig. 4 compares the behavior of the standard TFP growth series with the one derived in this section, that controls for changes in labor quality. The TFP series that considers human capital accumulation starts in 1975. The main evidence is that the two series do not exhibit remarkably different

patterns. We also considered an alternative labor input measure where, in the computation of human capital, changes in total hours of the different groups rather than in employment are taken into account;[12] in the latter case the overall pattern is qualitatively unchanged.



Source: Authors' calculations on ISTAT and Bank of Italy data.

Figure 4. TFP actual growth in the Italian market sector using human capital as labor input: Period 1970-2000

4. *Structural Reforms and TFP Dynamics*

The relationship between a country's economic performance and its institutional setup, as well as the reforms changing that setup, is a topic that has attracted increased interest by researchers and policy-makers alike. The basic idea is that institutions and government policies affect the agents' economic environment. In particular, they can alter the incentives of firms in the accumulation of capital and in the production of goods and of individuals in the investment in human capital and in the supply of qualified labor services.

[12] Since hours per capita disaggregated by education groups are obviously not available, the implicit assumption is that changes in hours per capita are the same across education categories.

4.1. *A cursory review of the literature.* - Given that TFP is an accepted measure of a country (or firm or industry) economic performance, the question is what are the key factors that affect its growth over time. This aspect has spurred a lot of research, especially empirical studies. The interest has focused in particular upon comparisons of TFP growth rates over time and across space. In the first case the goal is to try to understand if and why a country's TFP growth has gone through different regimes. This could be the case of Italy, if we look at the average growth rates reported in Table 1. In the second case the aim is to understand if and why productivity growth differs across countries. Here we would expect TFP rates to converge to a common value insofar as the countries involved are at a similar stage of development, are highly integrated, and by and large share the same technology. Much recent research has focused on explaining TFP differentials (see for example Calderón, 2001).

Empirical surveys, such as Fagerberg (1994) and Temple (1999), classify the determinants of productivity growth into three groups: a catching-up term serving as a proxy for productivity and/or technology gap; a set of proxies for the efforts to close that productivity gap; a set of policy-related variables meant to capture institutional factors and how these change over time by means of structural reforms. In particular, the second group of variables falls within the realm of endogenous growth theory, so that investment in human capital or in physical capital (e.g. infrastructure), resources devoted to innovation activities (e.g. R&D and patents), or more generally differences in technology (Coe and Helpman, 1995) are the variables most often entertained. As for the second group of factors reference is often made to differences in economic policy such as trade policy (Edwards, 1998) or government spending (Hansson and Henreksson, 1994), or more generally differences in institutions. Indeed, Hall and Jones (1999) argue that differences in productivity are fundamentally related to differences in social infrastructure across countries, i.e. differences in institutions and government policies that determine the economic environment within which individuals accumulate skills and firms accumulate capital. Prescott (1998) claims that differences in productivity rates are driven by the resistance to adopt new technologies and efficiently use the current technologies, with resistance dependent upon the policy arrangement a country employs. The author concludes that understanding productivity differences requires a theory of how institutions affect TFP and why a society chooses those institutions.

The implications of institutions and of the policies changing those institutions for TFP growth has been the subject of various recent empirical papers by independent researchers and by the economists of major

international organizations, IMF and OECD in particular. The goal is to provide empirical support to the claim that – *ceteris paribus* – the degree of rigidity and of regulation of the markets where exchanges of goods and services take place is negatively correlated with performance, and therefore with a country economic growth. It follows that reforms aiming at increasing the flexibility of those regimes are beneficial and ought therefore to be encouraged.

The basic starting point is that "increased competition can lead to one-time and on-going gains in multi-factor productivity, i.e. the combined productivity of labor and capital" (OECD, 2001/2). One-off efficiency improvements – "static" gains – arise from better resource allocation and from less slackness in the use of inputs in response to greater pressure to perform. On-going gains – "dynamic" gains – are generated by increased efforts to innovate and faster diffusion of innovation. The positive association between measures of product market competition and productivity has been documented by various authors, including Nickell (1996), Nickell, Nicolitsas, and Dryden (1997), Salgado (2002). This analysis has received great impetus within the OECD research program on growth (Scarpetta, Bassanini, Pilat, and Schreyer, 2000). In particular, productivity differentials have been related to measures of product market regulation constructed specifically for the purpose (Nicoletti, Scarpetta, and Boylaud, 1999). In addition, the role of the employment protection legislation as a measure of the flexibility of labor markets has been considered (Nicoletti, Scarpetta, and Boylaud, 1999). The authors find that the stringency of product market regulations is negatively associated with productivity performance, with the effect being stronger the farther away a country is from the technological frontier (Scarpetta and Tressel, 2002). In addition, there is evidence of a negative impact on productivity of tight employment protection legislation when wages or internal training do not offset the higher adjustment costs. Indicators of flexibility in the labor market as well as in the product market are also considered by Salgado (2002). Closely related to these are the studies considering more generally the role of human capital which directly increases productivity by raising the productive potential of employees. The evidence seems to suggest that firms with highly skilled employees and experienced managers invest more in human capital and are better at introducing new technologies and innovative work practices (see H.M. Treasury, 2000). These conclusions are in line with the predictions of endogenous growth models.

Other aspects related with current modes of business operations are considered from the viewpoint of their influence on TFP growth. As for innovation and technical progress, firm-level studies show that R&D and

investment in human and physical capital have strong positive impacts on the rate at which new technologies and best-practice techniques are adopted. As a consequence, a strong positive correlation between R&D intensity and productivity is found (see, e.g., Coe and Helpman, 1995, and Wakelin, 2001). Other studies are more cautious, arguing that the effect of R&D on TFP growth depends on market structure and technological characteristics, with a stronger impact for technological leaders in high-tech industries (Scarpetta and Tressel, 2002, but also Atella and Quintieri, 2001). Within the context of innovation, there is the recent large crop of papers dealing with the impact of Information and Communication Technology (ICT) on rates of growth of productivity (Gordon, 2003, just to mention one of the latest contributions). Here the debate gets interwined with measurement issues and we can safely say that it has not yet reached firm, widely accepted conclusions.

There remain two institutional facets of the economy whose reforms are likely to significantly impact its productivity performance. The first one is represented by financial markets. Here the underlying idea is that financial pressure may motivate improvements in organizational efficiency and growth (see e.g. Aghion, Dewatripont, and Rey, 1999). When debt service payments are high, managers have an incentive to provide higher levels of effort in order to avoid the consequences of bankruptcy. Viewed from a different perspective, King and Levine (1993) argue that financial markets enhance growth by offering better screening of investment projects, thereby reducing the cost of capital. In a related vein, the degree of shareholder control is thought to play a role, in that a significant major shareholder is believed to put pressure upon the managers to perform. Nickell, Nicolitsas, and Dryden (1997) find evidence of a significant association between these factors and productivity growth. Nicoletti and Scarpetta (2003) look at changes in the ownership structure and in particular at the impact of privatizations of companies previously controlled by the State. They indeed find an increase in productivity as a result of privatizations, but the gain may depend upon whether or not the State maintains large stakes in the equity capital of the newly privatized companies.

The State is important from another perspective. The role of fiscal policy for growth and performance has been investigated both at the theoretical and empirical level. Government spending that is “productive” (expenditures aimed at correcting distortions due to the existence of collective goods, externalities, and natural monopolies) is seen as generating productivity gains. However, tax policy can also be detrimental for growth. Indeed, Hansson and Henreksson (1994) find that the level of government consumption, transfers, and total spending (relative to GDP) have a strong

negative effect on private sector TFP growth. Spending in education is instead beneficial. This is also the case of a much investigated case, the role of public capital or public infrastructure (see Aschauer, 1989; Munnell, 1992; Sthephan, 1997).

4.2. *The existing evidence for Italy*. - Which is the case for Italy? The literature on the reforms-productivity nexus concerning our country is relatively scant and the emphasis is placed more on the determinants of TFP growth rather than on the impact of structural reforms.

A few variables related to the structure of labor market – composition of labor demand and hours of work lost due to strikes – are considered by Chiarini and Piselli (2000) in a vector autoregression exercise which include TFP and real wages. It is found that a shock in labor conflicts produces a negative change in the Solow residual for at least four years. Atella and Quintieri (2001) argue that the relationship between TFP and R&D expenditures is far from being established, when data on Italian industries are considered. That link is significantly affected by the way productivity is measured and by the hypotheses maintained when computing the Solow residual. More investigated has been the role of public capital/public infrastructure. Picci (1999), using regionally disaggregated data, finds that the evidence is mixed. Public capital is significant in explaining output in most cases. However, when attention is placed on the long run properties of the data or when contemporaneous short run effects are ruled out, the results are either non significant or significant but of negligible importance. The author concludes that the influence of public capital is probably due to short run demand effects. Bonaglia, La Ferrara and Marcellino (2000) employ three different methodologies to assess the impact of public infrastructure on TFP. Using regional data they find that the overall effect is positive and significant in all the approaches. They however obtain mixed results when disaggregating by geographical areas, period, and type of public investment. Using a panel approach across time and regions, Paci and Saddi (2002) (see also Vassallo, 2002) find a positive and significant elasticity of output to public capital for the country as a whole and for all macroregions, with the exception of the Centre of Italy. In addition, the authors find that the functional disaggregation of public capital reveals the important role played by the infrastructures directly related to building transportation networks, telecommunications, airports. Finally, the impact on industrial sectors of ICT is investigated by Gambardella and Torrisi (2001). Atzeni and Carboni (2001) investigate the differences in ICT investment between the North and the South of Italy. The authors use a standard growth accounting approach to

calculate TFP growth and consider the impact of ICT adoption on it. The findings support the idea that the use of ICT helps firms located in less developed areas to fill the gap, provided that they are able to invest in all sets of ICT complements.

As previously said, the above papers generally focus on individual determinants of the TFP growth of the Italian economy. The OECD research program on growth has conducted several studies on cross-national comparison basis, but attention has been devoted also and specifically to Italy. Here the emphasis has been placed on structural reforms promoting flexibility and deregulation with the help of suitably constructed indicators of reforms. Specific mention is to be made of Goglio (2001), Nicoletti (2002) and Scarpetta (2002). The upshot of this research, as far as our country is concerned, is summarized in OECD (2002). What are the likely reasons of the slowdown in Italian TFP growth in the last decade?

Among the reasons that may also explain the decline in international competitiveness are:

- an insufficient degree of product market competition;
- labor market rigidity in the form of employment protection legislation, as Italy is one of the OECD countries with the highest level of employment protection;
- Italy displays the highest level of red tape, whereas research shows that countries with the lowest administrative barriers to entrepreneurship have registered the largest increase in TFP growth;
- business R&D spending has been stagnant in our country and government R&D is only half the EU average; nevertheless, empirical research shows a positive effect of R&D on productivity;
- a positive association has been established between TFP growth and increased use of ICT: Italy tends to lag behind the other OECD countries.

In sum, on the basis of the empirical evidence that suggests the importance of structural reforms for enhancing countries' growth potential, the OECD economists list a number of specific policy actions that could and should be taken to strengthen the reform process. Among these are the acceleration of the privatization process, the need to deepen our capital markets and a continued human capital development.

4.3. *Structural reforms and productivity: a simple investigation of the nexus*. - The evidence from which the above recipes are drawn does not come from investigations conducted exclusively on our country. Those OECD results stem from economic models purporting to explain productivity differentials

using cross-sectional data for the various countries. Within that context researchers have made an effort to obtain measures of product market and labor market competition and regulation that are not the routinely used indicators, such as mark-ups, industry concentration indexes, unemployment replacement rates, and the like.

Resorting to this type of indicators is however inevitable when the goal is the study of the evolution of TFP growth over a long span of time. This is the case here. Moreover, one has to do with the available data so that the choice of indicators of structural reforms in practice rarely corresponds to the conceptually correct counterpart. These considerations motivate our choice of a simple and intuitive investigation of the association between productivity growth and proxies for the state and evolution of the country's market institutions. These proxies suffer from several theoretical and empirical shortcomings, though they are widely employed (see e.g. Salgado, 2002). Because product and factor markets are the primary candidate whose institutions to look at, we first consider the markup of prices over average costs to capture the competitive conditions of the goods market and indirectly the degree of existing regulation. Other things equal, deregulation policies ought to generate a reduction in markups and, through reduced distortions and increased efficiency, an improvement in the rate of change of total factor productivity. This presumption is borne out by the evidence in Fig. 5 showing a negative association between the changes in trend TFP and in the trend

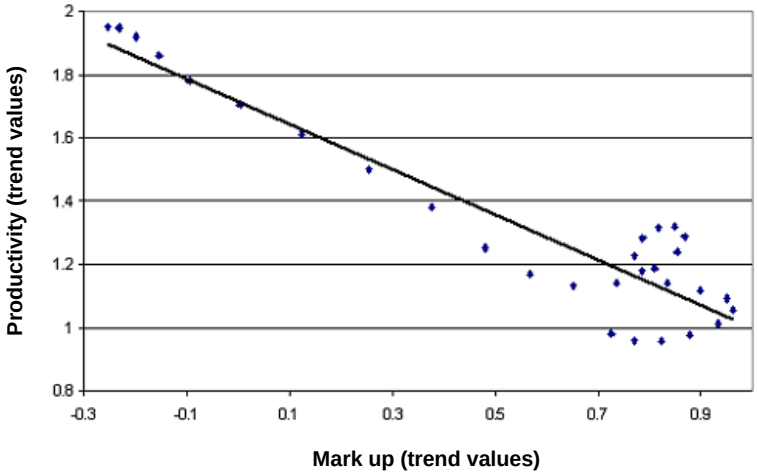


Figure 5. Private sector *TFP* and mark-up (percentage growth rate - period 1971-2000

value of the markup for the private sector of the economy. As to the efficient functioning of the labor market, we select as a proxy the NAIRU, the Non Accelerating Inflation Rate of Unemployment. Policy interventions aiming at a reduction of the distortion in the structure of employment due to a given institutional setup ought to decrease the NAIRU and this could have beneficial effects on the private sector productivity. Fig. 6 appears to confirm this prediction: high NAIRU values indicate low flexibility and efficiency of the labor market. Policy decisions that reduce that unemployment rate should produce an improvement in economic performance. Next is the capital market. The ratio between bank credit granted to the private sector and GDP is our proxy for market frictions and liquidity constraints. TFP growth would benefit from policies designed to improve the efficiency of capital markets, to remove the distortions permitting a better selection of valuable entrepreneurial project and adoption of new technologies.

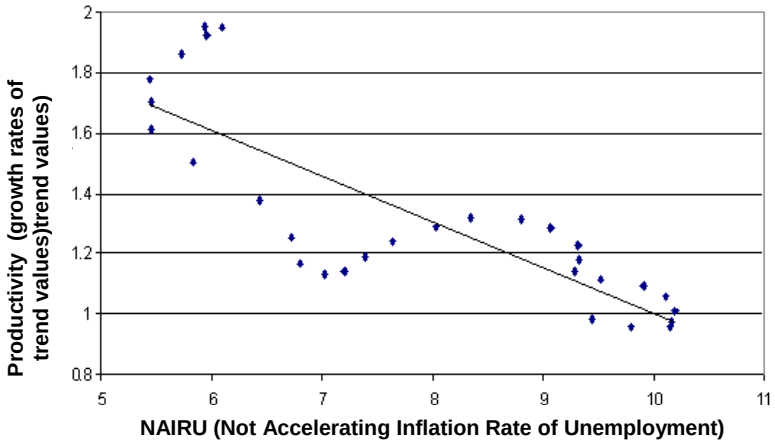


Figure 6. Private sector TFP and NAIRU (period 1971-2000)

This is borne out in Fig. 7. We also examine whether policy actions purporting to increase the endowment of public infrastructure of the nation are actually capable of increasing private sector productivity. Fig. 8 seems to support this conjecture: indeed, were the notion of public capital limited to transport and telecommunications networks the positive slope of the interpolating line would be probably even more pronounced. Finally, in Fig. 9 we examine whether the expansion of innovation activities - as measured by the growth rate of the R&D expenditure-GDP ratio - is associated with an acceleration of TFP. Although the evidence is less strong than in previous

cases, we have some indications that innovation activities are beneficial to the overall productivity.

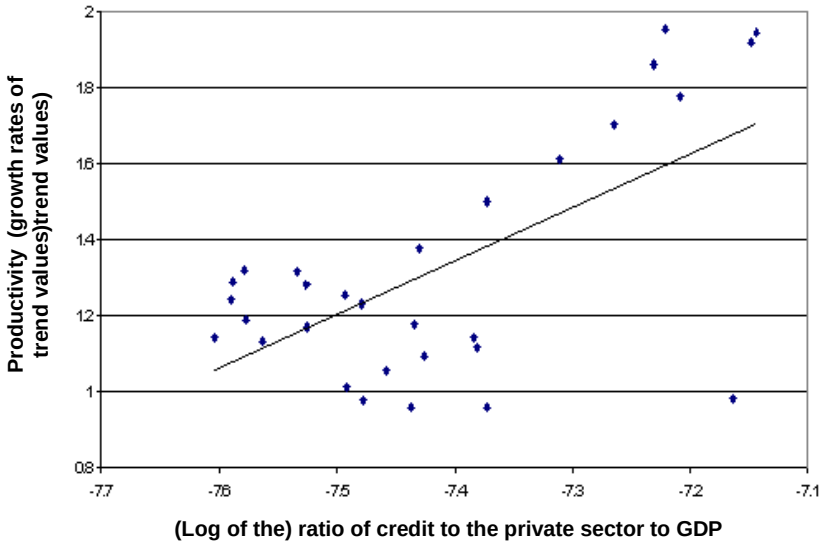


Figure 7. Private sector TFP and fina*n*cial development (period 1971-2000)

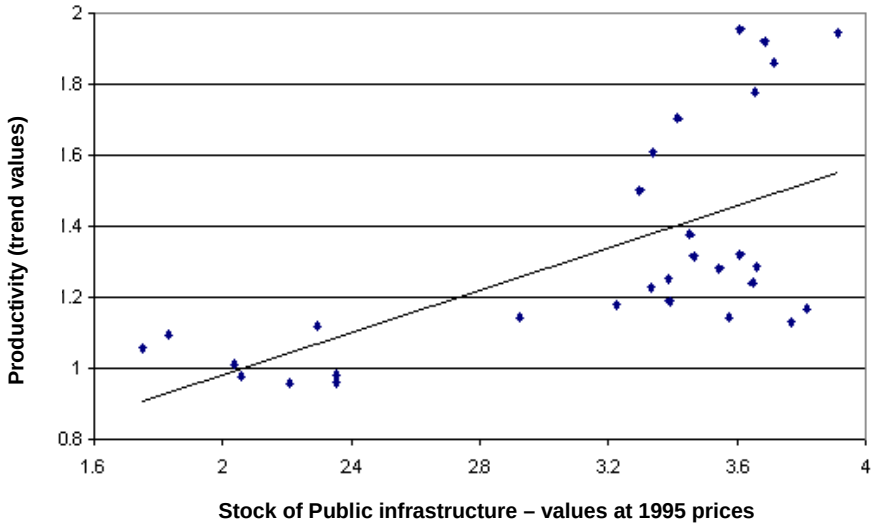


Figure 8. Private sector TFP and public infrastructure (period 1971-2000)

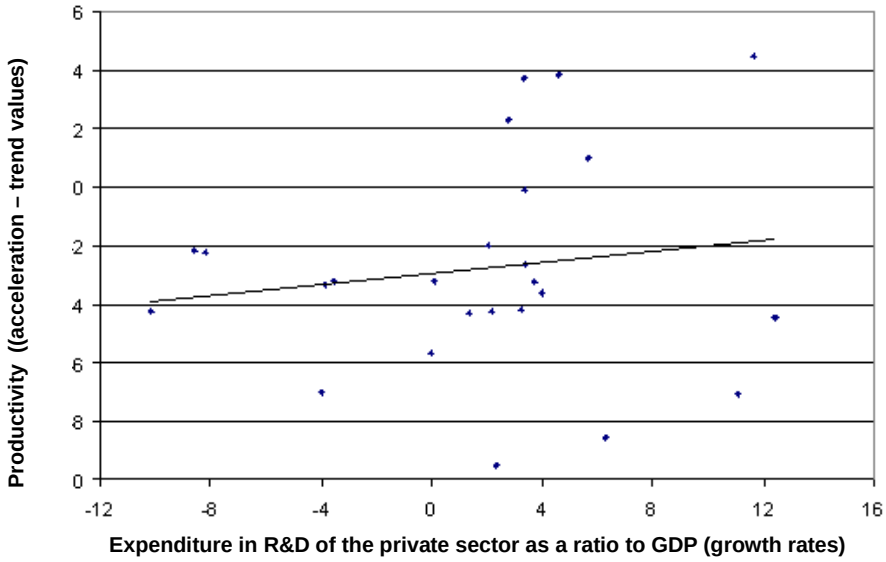


Figure 9. Private sector TFP and private sector R&D (period 1974-2000)

In order to have a joint assessment of how our indicators of structural reforms affect total factor productivity, we also estimate a simple reduced form equation, where the dependent variable is the growth rate of trend TFP. In Table 2 we report the estimation results. In order to tackle the issue of possible endogeneity of the explanatory variables, the latter are inserted in the regression with one lag (three for change in public infrastructures). Although our econometric specification is very simple and so is the methodology (standard OLS), the evidence in Table 2 confirms the overall picture that our proxies for the modifications of the institutional settings and the economic structure in Italy have non negligible explanatory power for the evolution of productivity.[13]

[13] Given our focus on trend behaviour, in the empirical equation most variables have been detrended using the HP smoothing approach. The HP filter, however, presents a number of potential weakness and an important one, for example, is that it introduces spurious cycles into the series (Harvey and Jaeger, 1993). For this reason, caution is necessary in interpreting the results obtained with this method of detrending. As a sensitivity inspection we also tried alternative specifications in which non filtered variables were used and lags of TFP growth were included. The estimated effects are qualitatively similar in the case of NAIRU and financial development and not significant for public infrastructures, the mark-up as well as lagged TFP. Not surprisingly, higher order lags are required for the explanatory variables to be

Table 2. TFP and structural reforms: a simple regression exercise

Dependent variable: Growth rate of TFP (trend values)		
Variables	Coefficient	Std. Error
Constant	0.026	0.005
Growth rate of mark–up (trend values) ($t-1$)	–0.320	0.095
NAIRU ($t-1$)	–0.002	0.001
Growth rate of the credit to *GDP* ratio (trend values ($t-1$))	0.110	0.027
Growth rate of public infrastructure ($t-3$))	0.071	0.038
R–squared	0.934	
Adjusted R–squared	0.922	

The sample is 1974-2000. The estimation method is OLS. (t - 1) indicates that the explanatory variable is lagged once.

The marginal effect of each variable has the expected sign and is statistically significant, although, of course, one can think of other explanatory factors that are potentially relevant but are not considered in the specification here. In order to explain the downward trend in TFP's growth, important insights can be obtained by examining the time profile of the selected explanatory variables. The proxy for the liquidity and efficiency of the financial sector has exhibited a declining pattern until mid 80's and, in general, positive variation since then, with an acceleration in the second half of the 90's. Hence, although the marginal effect of the growth rate of credit to GDP ratio is estimated to be positive (0.11 with a standard error of 0.027), this variable does not share the same declining trend of TFP growth. On the other hand, both the proxy for rigidities in the labor market (the NAIRU) and the one for the degree of market power (the mark-up) have, in general, an upward pattern. With regard to public infrastructures, the sustained growth of this variable until the second half of the 80's turned into a sharp deceleration since then.

5. *Conclusions*

It is well known that Total Factor Productivity is a key element of a country long-term economic growth. Its accurate measurement is therefore critical when the goal is to assess and explain the evolution over time of such index.

This paper has employed the available official data to compute time series measures of TFP growth for the private sector of the Italian economy over the

significant.

last thirty years. A growing literature has recently investigated productivity changes over time and differentials across nations with an eye to the role of a nation's institutions and its structural reforms. These are policy interventions altering the way agents respond to incentives when active on the markets for goods and factor services.

In this context this paper has taken the evolution of Italian trend TFP growth over time and related it in a simple way to various indicators of structural reforms. These included: the degree of competitiveness of the goods market; the degree of flexibility of the labor market; the availability of funds in the credit market; the role of public infrastructures.

The attempt made here was clearly rather crude and the results are therefore to be taken with caution. Albeit simplistic, the analysis documented the existence of a positive relationship between structural reforms in various markets and the overall tendency of total factor productivity in the private sector. The conclusion that emerges – in line with those of other studies – is the usefulness of proceeding with determination along the path of reforms introducing greater flexibility in the country's economic institutions. This process is already under way in our country but needs an acceleration that carry with it larger productivity gains and therefore positive consequences on the rate of economic growth.

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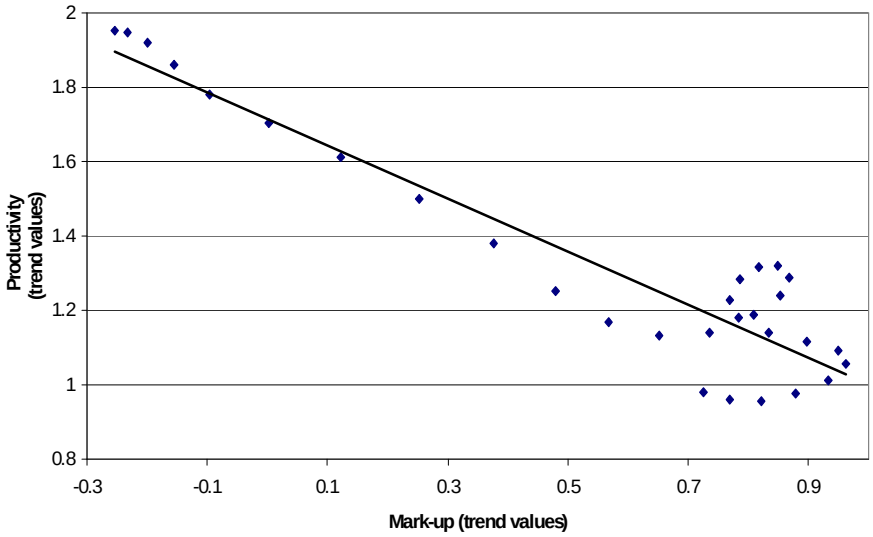
ABSTRACT

Total Factor Productivity (TFP) is a key element for understanding a country's long-term growth potential. Its accurate measurement is therefore critical. A few recent empirical investigations have appeared relating TFP changes over time and across space to a nation's institutions and structural reforms. This paper employs official data to provide time series measures of TFP growth for the private sector of the Italian economy. It then ties the evolution of trend TFP growth over time to various indicators of changes in the institutional settings and the economic structure. The evidence points to a positive impact on productivity growth of reforms designed to increase the competitiveness and flexibility of markets.

JEL classification: *O4*, *O47*, *O52*.
Keywords: *growth, productivity, structural reforms, Italian economy*

Fig. 5: Private sector TFP **and mark-up**
(percentage growth rate - period 1971-2000



Source: Authors' calculations on ISTAT and Bank of Italy data.

Fig. 6: Private sector TFP **and *NAIRU***
(period 1971-2000)

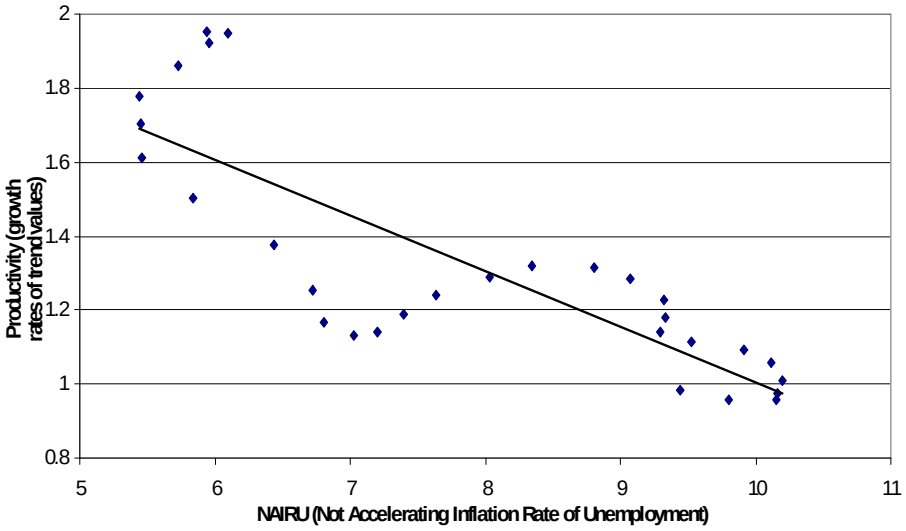


Fig. 7: Private sector TFP **and financial development (period 1971-2000)**

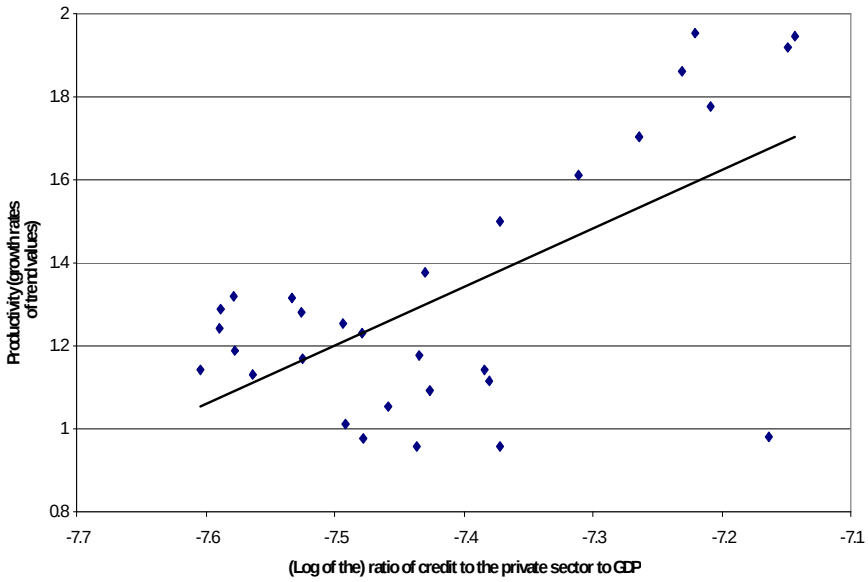


Fig. 8: Private sector TFP **and public infrastructure (period 1971-2000)**

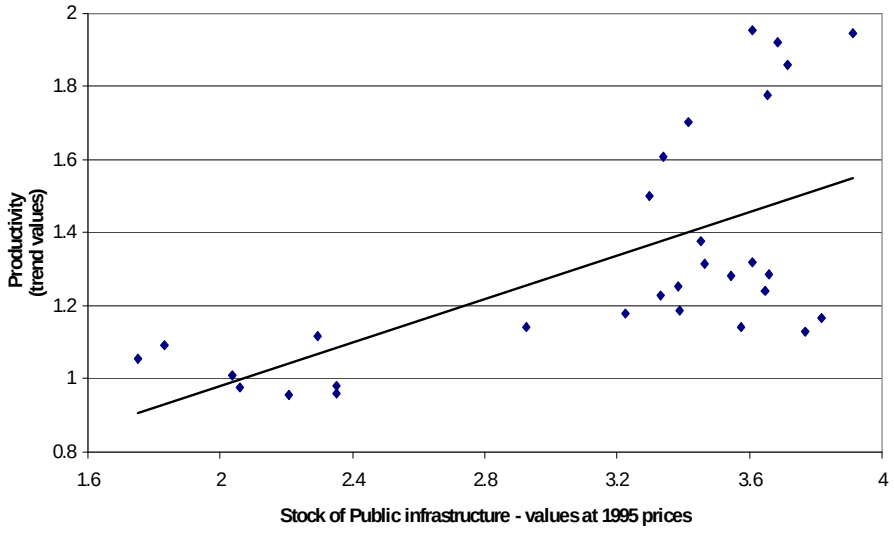


Fig. 9: Private sector TFP **and private sector *R&D* (period 1974-2000)**