

Trade-off between labor productivity and capital accumulation in Italian energy sector

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Abstract

This work provides an explanation for the puzzling trade-off between labor productivity and capital accumulation, occurred in Italian energy sector from the late 1980s onwards. By using a vector autoregressive model, we decompose labor productivity into technological and non technological shocks. We find that: (1) labor productivity responds positively to technological shocks, leading to a transition from one equilibrium to another; (2) capital accumulation shows a persistent decline in response to a positive technological shock, revealing that, in energy sector, technology and capital stock are substitutes. From our analysis we get some policy lessons. The obtained results point out the importance of a comprehensive strategy aimed at increasing technological progress through research, innovation and human capital investment in energy sector. Conversely, our findings state that institutional reforms and changes in regulation can only have a transitory effect on labor productivity in energy sector, without permanent gains in the future.

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1. Introduction

This work provides an explanation for the puzzling trade-off between labor productivity and capital accumulation, occurred in Italian energy sector from the late 1980s onwards. Our aim is

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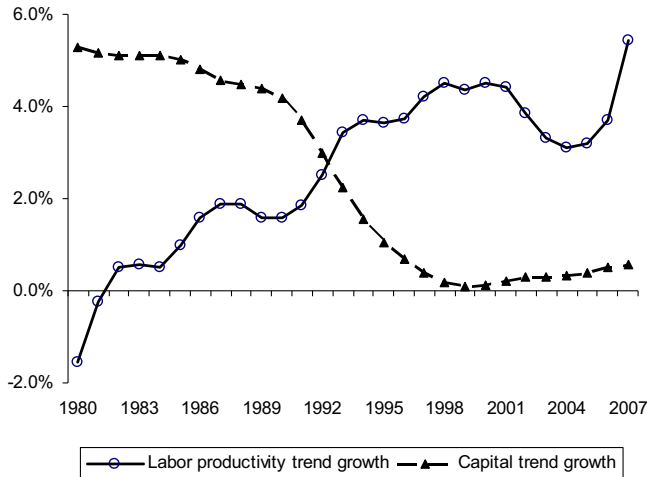


Fig. 1. Labor productivity and capital accumulation. 1980–2007 (growth rates).

Istat 2010. Productivity database, Italian energy sector. Trends computed using the Hodrick–Prescott filter

to give a rationale of this stylized fact providing some new evidences to measure the impact of technological and non technological shocks on the growth rate of labor productivity and capital accumulation. The obtained results show that, over the last decades, the rising of labor productivity in Italian energy sector is mainly due to technical progress rather than capital accumulation. Hence, energy markets need policies aimed at strengthening technical advances to increase both productivity and profitability in the long run.

Readily available aggregate national accounts data are frequently used to describe relative movements in labor productivity and capital accumulation. In Italy, they show that the long-run pattern of rising labor productivity in energy sector has an opposite image in declining trend rates of real capital growth. Fig. 1 indicates the existence of this conflicting pattern since the mid of 1980s. Since then, trend value added per worker in Italian energy sector has been rising; but, the recovery in labor productivity was accompanied by a correspondingly negative trend in capital accumulation. The opposite movements of these variables suggest that higher productivity growth in Italy could be related to some further sources. Our aim is to improve our understanding of the ultimate causes of the trade-off, identifying technological and non technological shocks at the origin of the phenomenon.

From a methodological point of view, decomposing labor productivity in its sources requires an appropriate proxy of technological progress. We extract such a series by controlling for non technological effects in labor productivity: varying capital accumulation, crude oil price, interest rates and unemployment.

An extensive literature on productivity and technological progress in energy sector, however, exists. Prior to the 1990s, especially in US, a large number of contributions have been made to investigate how regulation and technological advances affected the generation of electricity and the associated level of productivity. For a good review of the literature, on methodologies and applications, see Abbott (2005).

Traditionally, the standard procedure is to compute index number of partial or total factor productivity (TFP). Kendrick (1961) was the first to assess productivity change measurements in the electricity industry, using labor hours and capital stock. He estimated, over the period

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