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Regulations and productivity: Long run effects and nonlinear influences

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ABSTRACT

This study examines the impact of product market regulations on Total Factor Productivity (TFP) and explores whether regulatory reforms exert a nonlinear influence on TFP growth. It also distinguishes between short run and long run effects of regulation. The obtained empirical evidence reveals that lower regulations in the long run exert a significantly positive effect on TFP of OECD countries. Short run effects of regulation are not always statistically significant. The influence of regulatory changes is higher in countries with high levels of regulation. Also, the damaging effects of regulation are more intense in countries with low technology gaps. These results hold across a wide array of econometric specifications and variables that measure regulation and TFP.

1. Introduction

Recent decades have seen a remarkable increase in the number of product market reforms in the OECD area. Such reforms have been carried out in many countries albeit from a different starting point and to a different degree. The main reason for promoting changes in product markets has been the strengthening of competition and further boost of productivity and competitiveness of countries.

The key question that arises is whether and to what extent have such changes been successful in countries. Although it is a common belief that policies favoring competition raise productivity, the empirical literature has not yet reached to a complete understanding on their economic impact. The influence on lower regulation growth is still an open issue which depends on country specific characteristics and might be subject to nonlinearities.

This paper examines whether the level of regulation affects Total Factor Productivity (TFP) growth of OECD countries. It contributes in two novel directions. First, given that economic growth is a long run phenomenon, it examines whether regulation affects TFP growth in the long run and distinguishes for short term effects. Second, as regulation is likely to affect growth in a nonlinear way, it explores whether its influence depends on country specific factors such as the size of the technology gap and the existing level of regulation.

The results of this study are based on cross country data for 23 OECD countries in 1975–2011. They are clearly in favor of a negative long run influence of regulation on TFP growth. In the short run, the growth impact of regulation is not always statistically significant, implying that its effects on productivity can be realized after an initial adjustment period. Importantly, it is shown that existing regulatory conditions is an important element for assessing the productivity impact of regulatory reforms. Specifically, the influence of regulatory changes is higher in countries with already high levels of regulation. Also, the harmful effects of regulation are more intense in countries with low technology gaps. These results are validated across a wide array of econometric specifications and variables that measure regulation and TFP.

The paper proceeds as follows: In Section 2, the findings of the relevant theoretical and empirical literature are briefly discussed. Section 3 presents the data and provides measures of TFP growth. In Section 4 the econometric results are discussed. Finally, Section 5 concludes.

2. Theory and empirical literature

Economic theory suggests that competition in product markets results to higher productivity through reallocation of markets shares to most efficient businesses. This can be accomplished by forcing exit of less productive firms and by allowing more efficient ones to enter the market. Although early Schumpeterian arguments and endogenous growth models argue that innovation is negatively associated with higher competition (Romer, 1990; Aghion and Howitt, 1992), recent neo-Schumpeterian analyzes question this view by arguing that, as competitive pressures increase the incumbent firms engage in more innovation in order to preserve their market shares. Aghion et al. (2005) show the existence of an inverse U relationship between competition and innovation. At a low level of competition, an increase in competition in the market increases innovation, since the escape competition effect dominates the Schumpeterian effect and pushes

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firms in the industry to innovate in order to avoid losing market shares. At higher levels of competition, the Schumpeterian effect is more powerful than the escape competition effect, as the post innovation rents become very low.

Similarly, competition affects more the growth of countries or industries which are close to the world technology frontier, in which the escape competition effect is more likely to dominate. In contrast, in economies being far away from the productivity frontier, the Schumpeterian effect is likely to prevail and discourage innovation activity. Aghion et al. (2006) notice that the post war catch up of European economies relative to the United States (US) has slowed down as the relative technology gap narrowed. They stress the need for policies in favour of higher competition, which would affect positively innovation and growth. In the same spirit, Acemoglu et al. (2006) assume that innovation becomes important for growth when a country reaches the technology frontier. They argue that in more advanced countries where the possibilities for further growth through factor accumulation have been exhausted, innovation becomes the main vehicle for growth. Therefore, to the extent that a higher innovation rate depends on competition, countries should adopt policies towards higher liberalization. Similar arguments in favor of a positive influence of lower regulations on technology adoption have been offered by Parente and Prescott (1994), Aghion and Schankerman (2004) and Alesina et al. (2005).

Most findings of the relevant empirical literature indicate that lower regulations in markets are positively associated with productivity growth. OECD industry level evidence of Nicoletti and Scarpetta (2003) indicates that entry liberalization involves significant productivity gains in all countries, irrespective of their position vis-a-vis the technology frontier. However, when liberalization is interacted with the technology gap, productivity gains are higher in manufacturing industries of countries which are far from the technology frontier. Similarly, Aghion et al. (2004) show that more liberalized entry conditions have led to faster TFP growth of the UK firms and have improved aggregate productivity performance. Inklaar et al. (2008) find that entry liberalization has been beneficial for productivity growth of telecommunication industries, while Aghion et al. (2009) have established that market rigidities are more harmful for growth of countries close to the technological frontier.

Barone and Cingano (2011) show that lower regulation in the service sector is important for growth of manufacturing industries that use services more intensively. Bartelsman et al. (2013) use firm level data to show that market distortions result in misallocation of resources and account for a large part of cross country productivity differences. Bourles et al. (2013) establish that anticompetitive regulations in upstream industries have curbed productivity growth of OECD industries and show that these effects are stronger in industries which are close to the productivity frontier. Similarly, Buccirossi et al. (2013) establish a positive effect of friendly competition policies on industry level TFP growth of twelve OECD countries. Finally, Dimelis and Papaioannou (2015) clearly indicate that increases in the degree of entry regulation are negatively associated with industry level TFP growth of south European countries.

3. Data and TFP growth estimates

3.1. Market regulation data

The dataset of this paper includes annual data across 23 OECD countries: namely: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxemburg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the UK and the USA during 1975–2011. Market regulation is measured by the time varying OECD product market regulation index (see Koske et al. 2014). This index includes a wide array of regulatory provisions in seven network service industries which are: telecommunications, electricity, gas, post, rail, air and road transports. This indicator covers the extent of entry limitations, state control, price control as well as the degree of public ownership in these industries and receives values from 0 to 6, with higher values reflecting a higher degree of regulation.

Table 1
Regulation index in energy transports and communications (1975–2011).
Source: Product Market Regulation Database-OECD.

	1975	1980	1985	1990	1995	2000	2005	2011
United Kingdom	4.86	4.86	4.53	3.50	2.31	1.55	1.12	0.80
Germany	5.38	5.38	5.39	5.00	3.95	2.16	1.43	1.28
Australia	4.10	4.10	4.10	4.10	3.53	2.06	1.86	1.52
Netherlands	5.54	5.54	5.54	5.37	4.16	2.43	1.90	1.58
Denmark	5.49	5.49	5.49	4.85	3.95	2.66	1.95	1.60
Spain	5.38	5.36	5.36	5.14	4.36	3.22	1.97	1.63
Austria	5.50	5.50	5.50	4.57	4.21	3.13	2.04	1.65
Canada	4.53	4.53	4.39	3.21	2.74	1.80	1.78	1.73
United States*	3.40	2.88	2.68	2.52	2.07	1.91	1.85	
Japan	5.25	5.25	4.97	4.06	3.59	2.82	2.00	1.83
Belgium	5.36	5.36	5.32	4.93	4.12	3.06	2.53	1.86
Sweden	4.85	4.85	4.80	4.56	3.44	2.75	2.27	1.93
Italy	5.98	5.98	5.92	5.92	5.15	3.93	2.57	2.01
Iceland	5.33	5.34	5.34	5.34	4.75	3.39	2.07	2.01
Ireland	5.67	5.67	5.67	4.92	4.57	3.83	3.17	2.21
Switzerland	4.55	4.55	4.55	4.55	4.40	3.49	2.66	2.31
Portugal	5.97	5.97	5.97	5.47	5.03	3.94	2.82	2.31
Norway	5.39	5.39	4.96	4.65	3.69	3.24	2.38	2.33
France	5.98	5.98	5.98	5.37	5.08	4.05	3.02	2.52
Finland	5.76	5.72	5.58	5.01	3.65	3.11	2.69	2.53
New Zealand	5.73	5.73	5.00	3.86	3.19	2.51	2.60	2.57
Greece	5.76	5.76	5.76	5.76	5.52	4.81	3.80	2.57
Luxembourg	5.53	5.53	5.53	5.53	4.90	3.52	2.90	2.78

Index values range between 0 and 6, from low to high degree of regulation.
Data for the USA end in 2007.

This index can be used as a measure for the economy wide regulatory environment, since it includes sectors in which much anti-competitive regulation is concentrated (Conway et al., 2006). Services produced in these sectors constitute an essential input for most sectors of the rest part of the economy and therefore regulatory provisions in these industries affect the cost of production and aggregate level productivity performance.

Table 1 shows how this indicator has evolved between 1975 and 2011, across the 23 OECD countries of the sample. It is obvious that in 1975 almost all OECD economies were heavily regulated, with the exception of the USA. However, the degree of regulation started to decrease considerably in all OECD countries during the 1990s with different degrees and to a different extent. The most liberal countries in 2011 were the UK, Germany and Australia. On the other hand, the most regulated economies were Luxemburg, New Zealand and Greece.

3.2. TFP growth measures

In this section we present measures of TFP growth. Intuitively, TFP of an economy increases when more output is produced from a given amount of inputs. This may be the result of technological innovations and improvements as well as of more efficient use of existing inputs. TFP growth estimates are derived directly through growth accounting. A Cobb Douglas production function of the following form is assumed:

$$Y_{i,t} = A_{i,t}(K_{i,t})^{\alpha_{i,t}}(L_{i,t})^{(1-a_{i,t})} \quad (1)$$

where $Y_{i,t}$ represents GDP of each country i in period t, K is the physical capital stock of each country and L is the labor input, measured in total hours worked. A is a labor and capital neutral technology parameter, associated with TFP, t is a time index and a is the income share of capital, which varies across countries and time.

The data for growth accounting were taken from the Penn World Table 8.0 Database (see Feenstra et al., 2013). Values for output and