

# THE EFFECTS OF SERVICE DEREGULATION ON INDUSTRY GROWTH

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## **Abstract**

This study analyses the impact of service deregulation on industry growth, to observe if industries that use less regulated services more intensively experience faster value added growth rates. Considering a sample of 18 OECD countries between two periods of time. The analysis focuses on the regulation of telecommunications, energy, transports and professional services. Results indicate that deregulating services increases industry growth in downstream manufacturing industries. Moreover, I have identified threshold effects, after some level of deregulation the regulations seem not to matter. Preliminary results indicate that foreign service dependence is the most important. Estimates are robust to accounting for different measures of financial development.

**Keywords:** Service regulation, financial development, industry growth, telecommunications, energy, transports, professional services, domestic, foreign.

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# 1 Introduction

Policy makers tend to think that countries with less regulated services perform better economically than countries with highly regulated services. This view is supported by a large range of literature examining the effects of entry barriers on economic growth, (Klapper et al. (2006), Jerbashian and Kochanova (2016)). An inadequate service infrastructure, such as poor telecommunications, transport networks, energy or a weak financial system are perceived as critical bottlenecks on sustainable development.

Regulation which creates entry barriers and vertical integration is known to hamper growth in services, which are an important part of the economy and comprise a large share in intermediate inputs and value added, Bena et al. (2011) show that in 1970 services accounted for 26% of intermediate production and 39% of value added, whereas in 2007 they represented 36% and 50% respectively. Since the implementation of the European Single Market Program, services can move freely across intra-EU borders, among OECD countries, the service sector has become one of the most important providers of both output and jobs, and the adequate provision of services is highly recognised as one of the preconditions for development. Because of that, it might have non-negligible effects over industry growth, specifically in those industries that use regulated services more intensively.

I analyse the effects of services deregulation on economic growth, testing whether countries which have more liberalized services, experience higher growth in downstream manufacturing industries. I specifically test the effects of services regulation, by using data from 18 OECD countries and examining if countries with less regulation appear to have better economic performance in downstream manufacturing industries that use less regulated services more intensively, between 1999 and 2007.

This paper is directly related with the paper of Barone and Cingano (2011), it borrows their methodology, extending their sample and analysis. In particular I use OECD and WIOD (World Input-Output Database) databases to construct a similar dataset but extended to cover the period 1999-2007, and adding three more OECD countries. This allows me to observe if there are threshold effects in the light of a lot of service deregulation. Moreover, I also consider foreign services dependence and regulations. I start with replicating the results of Barone and Cingano (2011) by replicating their data from different databases in order to check for the robustness of their results, with the purpose of extending the study. Their main finding is that service

regulation has a negative and significant impact on industry growth, exports and productivity on industries that are more service dependent than less. I extend the analysis of Barone and Cingano (2011) by considering a longer period of time, between 1996 and 2007, in order to observe how changes in regulation affect industry growth. Because of the increased international trade in services, I use alternative measures of service dependence which consider the service dependence each country has from other countries. In order to measure service dependence across industries, I use input-output matrices, whereas service regulation comprises OECD indicators designed to capture regulatory settings for the energy sector, the telecommunication and the transportation sectors and for professional services.

I find that results for 1996-2002 are in line with Barone and Cingano (2011), lower service regulation increases value added in downstream service intensive industries. Although when I extend the sample, I found that results for 1999-2007 are different, after dropping countries and industries it seems that there is a service deregulation threshold. Finally I use WIOD database which allows to consider foreign service dependence and regulation <sup>1</sup>, although it is a preliminary result, it appears to be the most important.

The paper is organized as follows. Section 2 reviews some of the related literature. A description of the variables used in the paper can be found in Section 3. Section 4 presents the methodology used in this study regarding the construction of a measure calculating the level of service dependence. Results and regressions are shown in Section 5. Finally, section 6 presents the conclusions.

## 2 Previous literature

The analysis of the effects of service deregulation on economic growth have been largely studied. Kremers and Koedijk (1996) reviewed the deregulation trails in continental Europe focusing on the political preconditions for successful deregulation. Authors found a negative relationship among the level of regulation and the economic performance. It characterized European countries by the degree of regulation of labor and product markets, and find that the latter seems to be more important for economic performance.

One of the main robustness checks in the paper consists in accounting for the link between finance and industry growth, countries with better developed financial markets and less financial

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<sup>1</sup>Foreign regulation is a research in progress which I together with my supervisor, Prof. Vahagn Jerbashian will develop in the future.

dependent industries experience higher growth rates than industries which are high financially dependent. Because of that, growth effects of service regulation can be comparable to those of finance development. Rajan and Zingales (1998) studied weather industrial sectors that were relatively more in need of external finance, developed disproportionately faster in countries with more developed financial markets. Their findings highlight the relevance of financial development as one relevant model for international specialization.

A restrictive product market regulation environment diminishes the process of adjustment through which positive productivity shocks diffuse across borders and new technologies are incorporated into the production process. Conway et al. (2006) show that in some of the most restrictive OECD countries the loss of adaptability that occurs as a result of sharp levels of regulation can be very high. Conway and Nicoletti (2007) studied the particular case of one non OECD country, Canada, and found that if there are remaining regulatory barriers to competition in a few key non-manufacturing sectors, this may have prevented the economy from highly benefiting from high productivity growth rates. Indicators of service regulation used in the study account for entry barriers in energy, telecommunications, transport and professional services, among others. Klapper et al. (2006) show that entry barriers hamper entry and entrepreneurship, especially in industries that naturally should have high entry. Investments in information and communication technologies (ICT) significantly contribute to economic growth and development, according to recent empirical evidence, Jerbashian and Kochanova (2016) show that investments in ICT are lower, in industries that depend more on ICT, in countries where greater regulations are required for starting a business and for registering property.

Service liberalization has been recently analyzed in the context of productivity as it further affects within-firm productivity growth. Bena et al. (2011) show that as a response to the removal of regulatory barriers hampering entry and reducing state ownership, network services firms accomplished on average 5.5% productivity gains over a period of four years. Boylaud and Nicoletti (2000) use an international database on regulation, market structure and performance in the telecommunication industry to analyze how liberalization affected productivity, price and quality of the service. Authors found that potential competition leads to productivity and quality improvements as well as a reduction of the telecommunication prices. Using panel data, and controlling for differences in economic structure and technology developments.

Fonseca and Utero (2005) account for alternative forms of regulation, authors demonstrate that the strictness of product and labor market regulations have effects on firm growth, specif-

ically, the stricter the rules the more detrimental is the influence on growth in sectorial value added. Foster et al. (2005) investigate the role of labor market regulations in influencing labor reallocation and the capacity of adaptability of firms to technological shocks. Furthermore, regulatory reforms that have decreased the level of economic rents appear to be associated with lower levels of labor and total factor productivity growth.

Using a more detailed data sample has proved to be more efficient for the empirical analysis on the influence that policy regulation exerts over growth, because of that Inklaar et al. (2008) use industry-level measures of output, inputs, and multifactor productivity (MFP) from the EU KLEMS database, finding evidence that service liberalization has been beneficial for productivity growth in telecommunications. Bourlès et al. (2013) also use a model of multifactor productivity (MFP) growth and panel data from fifteen OECD countries, to check the influence of upstream competition on productivity outcomes in downstream industries and find that anticompetitive upstream regulations have significantly constrained MFP growth over the past fifteen years. They show that the effects are stronger for those observations that are close to their productivity frontier. In the same line, Nicoletti and Scarpetta (2003) work with a large new dataset on product market regulation containing industry-level data, in order to test whether industries closer to their technological frontier grow faster in more liberalized markets.

A growing body of research indicates that despite the existence of certain convergence in policy conditions, there are still major disparities in the business environment in the OECD countries, which continue affecting incentives to innovate and adopt new technologies. Nicoletti et al. (2008) reviewed productivity growth patterns across OECD countries over the past fifteen years with the use of sectorial and firm-level data. Authors found that solid regulation of services, especially in continental EU countries, has reduced growth in ICT-using sectors, which used intermediate service inputs intensively. Accounting for the difficulties of the allocation of resources towards the most efficient and dynamic firms, as one of the main channels through which regulation affected productivity.

### 3 Methodology

I use Barone and Cingano (2011) index of exposure of downstream industries to service regulation,  $BCSERVREG_{i,c}$ , which is the main explanatory variable of their study. In order to test each industry dependence on each service regulation, for all countries between 1996 and 2002.

The index is measured combining country-level information on service regulation and industry-level data on service dependence. Barone and Cingano (2011) index of service regulation is calculated as follows:

$$BCSERVREG_{i,c(1996-2002)} = \sum_s (w_{i,s} X_{c,s})$$

Where  $X_{c,s}$  is an index of service regulation for country  $c$  and sector  $s$ , on a scale from 0 to 6, where 6 represent the stricter conditions. I have obtained the data from OECD PMR (Product Market Regulation) database. Moreover,  $w_{i,s}$  is a measure of industry  $i$  dependence on regulated services  $s$ , calculated as the share of expenditures on services out of the value of industry output. I have obtained the data from input-output accounts. The first part of the study consists in analysing the effects of anti-competitive service regulation over industry growth, replicating the data from the different databases and performing Barone and Cingano (2011) exercise.

For the purpose of replication, in this first part  $w_{i,s}$  is calculated using US input-output matrix which are assumed to reflect technological differences rather than country specific determinants. For this reason, I use 1997 US input-output matrix (excluding United States from the sample) and data on service regulation from OECD PMR database in 1996 for energy, transport and telecommunication and 1998 for professional services. (Data on professional services only available for 1998, 2003, 2008 and 2013).

In the second part of the study I conduct a robustness check that consists in changing the time period, between 1999 and 2007, to observe if the effects of service regulation have changed over time in the face of strong services deregulation. Working with the average US input-output matrix between 1999 and 2007 with the purpose of obtaining a most accurate measure of industry dependence on services. Moreover, policy regulation data is obtained from OECD PMR database in 1999 for energy, telecommunication and transport and 2003 for professional services.

$$BCSERVREG_{i,c(1999-2007)} = \sum_s (w_{i,s} X_{c,s})$$

Furthermore, the last part of the study, consists in changing the industry dependence on service regulation between 1996 and 2002, but leaving constant all the other variables from this period. Instead of using input-output service dependence from a benchmark country (US) I use each country specific service dependence. I have obtained the data from the World Input-Output database (WIOD) and data on each country specific service regulation is obtained form

the OECD PMR database. Service dependence is calculated as the share of expenditures on services out of the value of industry output using the average input-output accounts between 1996-2002. Data on policy variables is obtained from OECD PRM, from 1996 except from professional services which is from 1998. Own or domestic service regulation index is calculated as follows:

$$WSERVREG_{i,c(1996-2002)} = \sum_s (g_{i,s} X_{c,s})$$

Where  $X_{c,s}$  is an index of service regulation for country  $c$  and sector  $s$ , on a scale from 0 to 6, where 6 represent the stricter conditions. Moreover,  $g_{i,s}$  is a measure of industry  $i$  dependence on regulated services  $s$ .

Because of the increased international trade in manufacturing and offshoring of services, the regulation of foreign services might also be important for the growth of domestic manufacturing industries. The purpose of the last part of the study, is to test if external service dependence has effects on internal value added growth of downstream manufacturing industries, by taking into account service interrelationships among countries. Data on industry dependence on services is obtained from the World Input-Output database (WIOD). The period of interest is as in Barone and Cingano (2011), 1996-2002. Service dependence is computed using the average between the seven years of world input-output matrices. Finally, policy variables are from 1996 except from professional services which is from 1998 (obtained from OECD PMR). Foreign service regulation index is calculated as follows:

$$FSERVREG_{i,c,sc'(1996-2002)} = \sum_c \sum_{sc'} (w_{i,c,sc'} X_{c,sc'})$$

Where  $w_{i,c,sc'}$  corresponds to the dependence on industry  $i$  in country  $c$  on services-in-country  $c'$  (e.g Austria uses service from its own country and from other countries such as Belgium). Finally,  $X_{c,sc'}$  corresponds to service regulation in country  $c$  and service regulation in country  $c'$ .

At last but not least, important robustness checks for the analysis consists in taking into account the relationship between finance and industry growth as financially dependent industries experience faster value added growth than industries which depend less, in countries with better developed financial markets, Rajan and Zingales (1998). I adopt two different measures of industry financial development; private credit by deposit money banks over GDP and ac-

counting standards. Moreover, another robustness check consists in introducing the average  $SERVREG_{i,c}$  between the sample period. Furthermore, the study also accounts for the differences in regulation between 1996 and 2002, for the first and last part of the study, and between 1999-2007 for the second part, in order to give robustness to the results.

## 4 Data Sample

The major part of the data is obtained from the OECD database, specifically from the Structural Analysis Dataset (STAN), which provides a comprehensive tool for analyzing industrial performance at a relatively detailed level of activity across countries. It includes annual measures of output, labor input, investment, and international trade. It is primarily based on member countries' annual national accounts complementing them from other sources, such as national industry surveys/census. The data is classified according to International Standard Industrial Classification Revision 3 (ISIC Rev. 3) of all economic activities (including services).

In order to measure the level of dependence of manufacturing industries on service regulation the combination of both country-level information on service regulation and industry-level data on service dependence is needed. The OECD's Product Market Regulation (PMR), (Conway and Nicoletti (2006)) indicators provide a broad coverage of product market regulation indexes at the economy-wide level in the following broad regulatory domains: state control, barriers to entrepreneurship, and barriers to international trade and investment. The study focuses on four upstream main types of services; energy, telecommunications, professional services and transport.

Furthermore, I obtain data on input-output tables from two different databases OECD (OECD input-output database) and WIOD (World Input-Output database) in order to have two different measures of industry dependence on services. As explained in the methodology, on one hand I use US input-output matrix, whereas on the other hand I use each country input-output matrix. Finally I analyse two different periods of time for the whole sample, the first period comprises from 1996 to 2002 (following Barone and Cingano (2011)), while the second period ranges from 1999 to 2007. The main variables used in the empirical part are summarized in Table 1 and 2, which presents the characteristics of the main variables used. (number of observations, mean, standard deviation, minimum and maximum). A more detailed description of variables and sources can be found in the Appendix A.1 and A.2.



Table 1: Summary statistics of the main variables, 1996-2002

	Obs.	Mean	SD	Min.	Max.
<b>Country-industry level</b>					
Real value added growth 1996-2002 [GROWTH <sub>i,c</sub> ]	342	0.018	0.051	-0.304	0.241
Nominal value added growth 1996-2002 [NGROWTH <sub>i,c</sub> ]	390	0.036	0.051	-0.283	0.198
Implicit deflator growth 1996-2002 [DEFGROWTH <sub>i,c</sub> ]	342	0.166	0.044	-0.304	0.214
Value added share in 1996 [SHARE <sub>i,c</sub> ]	392	0.739	0.541	0.000	0.461
Service regulation in 1996 [SERVREG <sub>i,c</sub> ]	308	0.275	0.006	0.078	0.600
Change in service regulation 1996-2002 [DSERVREG <sub>i,c</sub> ]	308	0.068	0.394	-0.010	0.187
<b>Industry level</b>					
Dependence on energy 1996-2002 [Wenergy <sub>i,s</sub> ]	420	0.010	0.004	0.004	0.190
Dependence on telecommunications 1996-2002 [Wtelecommunications <sub>i,s</sub> ]	420	0.004	0.002	0.001	0.010
Dependence on transports 1996-2002 [Wtransport <sub>i,s</sub> ]	420	0.239	0.010	0.117	0.431
Dependence on professional services 1996-2002 [Wprof.serv. <sub>i,s</sub> ]	420	0.485	0.188	0.009	0.893
External finance dependence 1996 [ED <sub>i,s</sub> ]	420	0.735	1.588	-0.45	6.200
<b>Country level</b>					
Regulation of energy in 1996 [Energy <sub>c,s</sub> ]	392	5.057	1.013	2.489	6.000
Regulation of telecommunications in 1996 [Telecommunications <sub>c,s</sub> ]	392	3.500	1.622	0.000	6.000
Regulation of transport in 1996 [Transport <sub>c,s</sub> ]	392	3.941	0.989	1.125	6.000
Regulation of professional services in 1996 [Professional servies <sub>c,s</sub> ]	322	2.437	1.133	0.494	4.354
Financial development in 1996 [FD <sub>c</sub> ]	406	0.672	0.357	0.165	1.724

*Notes:* Summary statistics of the most important variables used int the paper.

In brackets, the name of the variables used in the database.

All variables and data sources are defined in detail in the Appendix A.1 and A.2.

Table 2: Summary statistics of the main variables, 1999-2007

	Obs.	Mean	SD	Min.	Max.
<b>Country-industry level</b>					
Real value added growth 1999-2007 [GRWOTH <sub>i,c</sub> ]	344	0.024	0.463	-0.178	0.206
Nominal value added growth 1999-2007 [NGROWTH <sub>i,c</sub> ]	395	0.471	0.807	-0.970	0.724
Implicit deflator growth 1999-2007 [DEFGROWTH <sub>i,c</sub> ]	344	0.125	0.369	-0.131	0.162
Value added share in 1999 [SHARE <sub>i,c</sub> ]	381	0.734	0.561	0.002	0.144
Service regulation in 1999 [SERVREG <sub>i,c</sub> ]	336	0.290	0.127	0.559	0.602
Change in service regulation 1999-2007 [DSERVREG <sub>i,c</sub> ]	336	0.611	0.443	-0.002	0.218
<b>Industry level</b>					
Dependence on energy 1999-2007 [Wenergy <sub>i,s</sub> ]	420	0.132	0.007	0.004	0.030
Dependence on telecommunications 1999-2007 [Wtelecom. <sub>i,s</sub> ]	420	0.005	0.002	0.001	0.011
Dependence on transports 1999-2007 [Wtransport <sub>i,s</sub> ]	420	0.249	0.009	0.012	0.042
Dependence on professional services 1999-2007 [Wprof.services <sub>i,s</sub> ]	420	0.061	0.025	0.006	0.107
<b>Country level</b>					
Regulation of energy in 1999 [Energy <sub>c,s</sub> ]	392	3.486	0.851	1.937	5.750
Regulation of telecommunications in 1999 [Telecommunications <sub>c,s</sub> ]	406	1.021	0.720	0.000	3.125
Regulation of transports in 1999 [Transport <sub>c,s</sub> ]	392	3.035	0.966	1.250	5.125
Regulation of professional services in 1999 [Professional servies <sub>c,s</sub> ]	420	0.132	0.007	0.004	0.030
Financial development in 1999 [FD <sub>c</sub> ]	336	0.716	0.408	0.193	1.924
Financial disclosure [ACCSTAN <sub>c</sub> ]	252	0.658	0.125	0.42	0.900

*Notes:* Summary statistics of the most important variables used int the paper.

In brackets, the name of the variables used in the database.

All variables and data sources are defined in detail in the Appendix A.1 and A.2.

## 5 Results

I first compare the original and the new databases in order to check if the data of both datasets does not differ substantially by testing for the robustness of the results. Both databases comprise the same variables for the same period, 1996-2002. Table 3 presents the summary statistics (number of observations, mean, standard deviation, minimum and maximum) and the correlations between both data samples. The table is divided in three parts; country-industry level, country level and industry level.

For the first part (country-industry level data), all the variables are highly correlated and the standard deviations are quite similar between both databases. Moreover, the mean the minimum and the maximum are also aligned. For the second part (country level variables), all variables are highly correlated and the lowest correlation is for energy regulation, summary statistics are very similar although the mean for the new dataset is a little bit larger because the maximum is higher. In these two parts, the number of observations is higher in the new database. Finally in the last part (industry-level), the number of observations is the same for both samples, summary statistics are comparable and variables are highly correlated. With this analysis I provide evidence that data of both databases is similar.

Table 3: Summary statistics of the main variables

	Obs.	Mean	SD	Min.	Max.	Corr.
<b>Country-Industry level</b>						
Real value added growth 1996-2002 [GROWTH <sub>i,c</sub> ]	342	0.018	0.051	-0.304	0.241	0.8094***
Real value added growth 1996-2002 [GROWTH <sub>i,c</sub> ]*	307	0.024	0.060	-0.284	0.523	
Nominal value added growth 1996-2002 [NGROWTH <sub>i,c</sub> ]	390	0.036	0.051	-0.283	0.198	0.6614***
Nominal value added growth 1996-2002 [NGROWTH <sub>i,c</sub> ]*	323	0.034	0.051	-0.199	0.439	
Implicit deflator growth 1996-2002 [DEFGROWTH <sub>i,c</sub> ]	342	0.166	0.044	-0.304	0.214	0.6298***
Implicit deflator growth 1996-2002 [DEFGROWTH <sub>i,c</sub> ]*	300	0.009	0.044	-0.335	0.189	
Value added share in 1996 [SHARE <sub>i,c</sub> ]	392	0.739	0.541	0.000	0.461	0.9605***
Value added share in 1996 [SHARE <sub>i,c</sub> ]*	375	0.722	0.052	0.001	0.454	
Financial development [FD <sub>c</sub> ]	406	0.672	0.357	0.165	1.724	0.9373***
Financial development [FD <sub>c</sub> ]*	420	0.679	0.331	0.168	1.633	
External finance dependence 1996 [ED <sub>c</sub> ]	420	0.735	1.588	-0.450	6.200	0.9996***
External finance dependence 1996 [ED <sub>c</sub> ]*	420	0.733	1.590	-0.450	6.200	
Financial disclosure[ACCSTAN <sub>c</sub> ]	252	0.658	0.125	0.420	0.900	1.0000***
Financial disclosure[ACCSTAN <sub>c</sub> ]*	252	0.658	0.125	0.420	0.900	
Service regulation in 1996 [SERVREG <sub>i,c</sub> ]	308	0.275	0.006	0.078	0.600	0.7836***
Service regulation in 1996 [SERVREG <sub>i,c</sub> ]*	308	0.240	0.103	0.069	0.627	
Average service regulation 1996-2002 [AVGSERVREG <sub>i,c</sub> ]	378	0.242	0.085	0.081	0.524	0.7855***
Average service regulation 1996-2002 [AVGSERVREG <sub>i,c</sub> ]*	308	0.203	0.089	0.654	0.580	
Change in service regulation 1996-2002 [DSERVREG <sub>i,c</sub> ]	308	0.068	0.394	-0.010	0.187	0.6848***
Change in service regulation 1996-2002 [DSERVREG <sub>i,c</sub> ]*	308	0.078	0.049	0.001	0.290	
<b>Country level</b>						
Regulation in energy in 1996 [Energy <sub>c,s</sub> ]	392	5.057	1.013	2.489	6.000	0.7323***
Regulation in energy in 1996* [Energy <sub>c,s</sub> ]	308	4.300	1.295	1.808	6.000	
Regulation in telecommunications in 1996 [Telecommunications <sub>c,s</sub> ]	392	3.500	1.622	0.000	6.000	0.8973***
Regulation in telecommunications in 1996* [Telecommunications <sub>c,s</sub> ]	308	2.899	1.534	0.100	5.679	
Regulation in transports in 1996 [Transport <sub>c,s</sub> ]	392	3.941	0.989	1.125	6.000	0.8859***
Regulation in transports in 1996* [Transport <sub>c,s</sub> ]	308	2.861	0.927	1.529	5.133	
Regulation in professional services in 1996 [Professional Services <sub>c,s</sub> ]	322	2.437	1.133	0.494	4.354	0.9286***
Regulation in professional services in 1996* [Professional Services <sub>c,s</sub> ]	336	2.458	1.041	0.829	4.178	
<b>Industry level</b>						
Dependence on energy 1996-2002 [Wenergy <sub>i,s</sub> ]	420	0.010	0.004	0.004	0.190	0.8449***
Dependence on energy 1996-2002* [Wenergy <sub>i,s</sub> ]	420	0.017	0.009	0.006	0.038	
Dependence on telecommunications 1996-2002 [Wtelecommunications <sub>i,s</sub> ]	420	0.004	0.002	0.001	0.010	0.7882***
Dependence on telecommunications 1996-2002* [Wtelecommunications <sub>i,s</sub> ]	420	0.004	0.001	0.001	0.006	
Dependence on transports 1996-2002 [Wtransport <sub>i,s</sub> ]	420	0.239	0.010	0.117	0.431	0.7791***
Dependence on transports 1996-2002* [Wtransport <sub>i,s</sub> ]	420	0.030	0.136	0.011	0.063	
Dependence on professional services 1996-2002 [Wprof.serv. <sub>i,s</sub> ]	420	0.485	0.188	0.009	0.893	0.5886***
Dependence on professional services 1996-2002* [Wprof.serv. <sub>i,s</sub> ]	420	0.267	0.010	0.013	0.054	

Notes: \* Variables from Barone and Cingano (2011).

In brackets, the name of the variables used in the database.

All variables and data sources are defined in detail in the Appendix A.1 and A.2.

## 5.1 Service Regulation, Growth and Price effects between 1996-2002

Following Barone and Cingano (2011), the value added growth regression between 1996 and 2002 is the following:

$$GROWTH_{i,c} = \alpha + \beta SERVREG_{i,c} + \delta SHARE_{i,c} + \mu_i + \gamma_c + \epsilon_{i,c}$$

Where  $GROWTH_{i,c}$  represents the real value added growth in each country  $c$  and industry  $i$  between 1996-2002,  $SHARE_{i,c}$  is the sample initial period value added industry share in industry  $i$  and country  $c$  in 1996, in order to control for more specialized industries. Service regulation,  $SERVREG_{i,c}$ , captures the level of exposure of downstream manufacturing industries to service regulation between 1996 and 2002. Moreover,  $\mu_i$  and  $\gamma_c$  are country and industry specific effects respectively, to deal with reverse causation or omitted variables. Finally,  $\beta$  measures the effects of service regulation on industry growth, there is a negative link between regulation and growth if  $\beta$  is negative.

### 5.1.1 Regulation and Output growth

Coefficient reported in Table 4, column 1, presents industry dependence on service sector regulation as baseline direct weights that represent technical coefficients of dependence between service sector  $s$  and manufacturing industry  $i$  computed on the US input-output matrix. It shows the negative relationship between service regulation and industry growth, the more regulated the lower growth rate. Column 2 and 3 are means of robustness accounting for the relationship between finance development and industry growth, as financial development facilitates economic growth; high financially dependent industries experience faster value added growth rates than less dependent industries, Rajan and Zingales (1998). Financial development is calculated as private credit by deposit money banks over GDP in 1996 in column 2 and as accounting standards in column 3, with US industry external finance dependence as the interaction term. Both measures are positive and significant, neither of the calculations affects the negative link between service regulation and economic growth. This findings leads to the same conclusions as Barone and Cingano (2011) results, decreasing beginning of period anti-competitive regulation in the provision of services has a significant and positive effect on industry growth.

Column 4 presents the average service regulation between 1996 and 2002, using service regulation from 1996, the results are in line with Barone and Cingano (2011), where an increase

in service regulation leads to a decrease in industry growth. Finally the last column accounts for the deregulation between 1996 and 2002, to observe how changes in service regulation affects economic growth (e.g. countries with high levels of service regulation in the beginning of the period, which experimented process of deregulation that effects value added), the results show the strongest effects in this case.

Table 4: Services Regulation and Growth, 1996-2002

	(1)	(2)	(3)	(4)	(5)
	Baseline direct weights	Financial development (credit)	Financial development (acc. stand)	Average 1996-2002 regulation	Deregulation 1996-2002
Service regulation [ $SERVREG_{i,c}$ ]	-0.195** (0.097)	-0.193** (0.095)	-0.181* (0.099)	-0.159** (0.080)	-0.219** (0.099)
Financial dev. x external dep. [ $FD_c \times ED_c$ ]		0.004* (0.002)	0.004 (0.003)	0.005 * (0.003)	0.004 * (0.002)
Accounting stand. x external dep [ $ACCSTAN_c \times ED_c$ ]			0.014** (0.006)		
Change in service regulation [ $DSEVRREG_{i,c}$ ]					0.212 * (0.116)
Initial industry share [ $SHARE_{i,c}$ ]	0.073 (0.052)	0.058 (0.049)	0.073 (0.053)	0.054 (0.050)	0.059 (0.049)
Constant	0.046 (0.032)	0.048 (0.031)	0.016 (0.022)	0.073 (0.030)	0.051 (0.031)
Observations	240	240	214	240	240
$R^2$	0.66	0.67	0.66	0.66	0.67

Notes: Standard deviations in parentheses. \*\*\* Significant at 1%, \*\* significant at 5%, \* significant at 10%.

Dependent variable is the annual compounded growth rate of real value added at country-industry level [ $GROWTH_{i,c}$ ]. Financial development is calculated as private credit by deposit money banks over GDP in 1996 [ $FD_c$ ] in column 3 and as accounting standards in 1983 [ $ACCSTAN_c$ ] in column 4. Service regulation is measured in 1996 except for column 5 that is the average value.  $DSEVRREG_{i,c}$  measures exposure to service deregulation, the change in regulation between 1996 and 2002.

For getting a sense of the size of this effect, percentiles take into account the annual growth differential between and industry with overall service dependence at the 75<sup>th</sup> percentile (other non-metallic mineral products) in comparison with an industry at the 25<sup>th</sup> percentile (wood and products of wood and cork). Industries at the highest and lowest percentile are different from the ones reported by Barone and Cingano (2011), in their data the industry with overall service dependence at the 75<sup>th</sup> percentile is pulp, paper and printing, whereas at the 25<sup>th</sup> is fabricated metal products.

The coefficient estimated in column 1 implies this differential would rise by approximately 0.70 percentage points if regulation were to be consistently lowered in the four services (energy, telecommunication, transports and professional services) by an amount equal to the difference in average between a country at the 75<sup>th</sup> and a country at the 25<sup>th</sup>. The coefficient estimated in column 3, implies the growth differential between an industry at the 75<sup>th</sup> percentile and one at the 25<sup>th</sup> percentile of external finance dependence (plastic products and pulp and paper,

respectively) would increase by approximately 0.4 percentage points moving from a country with private credit at the 25<sup>th</sup> percentile to a country close to the 75<sup>th</sup> percentile of financial development.

### 5.1.2 Financial Development, Prices and Nominal Growth

In this section I investigate, in the same way as Barone and Cingano (2011), the relationship between output and prices. As shown in the previous section, lower regulation appears to increase output in industries which are service intensive, by decreasing the service component of the cost of production. Because of that, there are two different effects over nominal value added. On one hand, a positive effect as a consequence of higher output, and on the other hand a negative effect due to lower prices.

$$DEFGROWTH_{i,c} = \alpha + \beta SERVREG_{i,c} + \delta SHARE_{i,c} + \mu_i + \gamma_c + \epsilon_{i,c}$$

$$NGROWTH_{i,c} = \alpha + \beta SERVREG_{i,c} + \delta SHARE_{i,c} + \mu_i + \gamma_c + \epsilon_{i,c}$$

Where  $DEFGROWTH_{i,c}$  is the annual compounded growth rate of value added implicit deflator for industry  $i$  and country  $c$ , whereas  $NGROWTH_{i,c}$  is the annual compounded growth rate of nominal value added growth for industry  $i$  and country  $c$ . Table 4 reports the results for this relationship, from columns 1-2 the dependent variable is the annual compounded growth rate of value added implicit deflator (DEFGROWTH) between 1996-2002, whereas in columns 3-5 the dependent variable is the annual compounded growth rate of nominal value added (NGROWTH) for the 1996-2002 period.

Table 5 estimates the effects of regulation on industry prices; higher deregulation and higher financial development translates into lower prices in manufacturing industries which are service intensive, which can be observed in columns 1-2. Columns 3-5 replicates the same regression as in Table 4 using nominal value added growth rate as dependent variable, the effect of service regulation becomes largely insignificant, as the nominal growth is an interaction between real value added growth and prices, the negative effects of service regulation over real value added growth rates compensates with the positive relationship between higher service regulation and prices. This results agree with the theoretical background of Barone and Cingano (2011) who showed that nominal growth would react less than real growth, because lower regulation increases

output in service-intensive industries lowering the service component of the cost of production, as a result there are two opposite effects on nominal value added: a positive effect due to higher output and a negative effect due to lower prices. The combination of both effects might tend to weaken the relation between service and industry output when this is measured in nominal terms.

Table 5: Financial development, Prices and Nominal Growth 1996-2002

	(1)	(2)	(3)	(4)	(5)
	Prices	Regulation and fin. dev.	Nominal Growth	Financial development	Regulation and fin. dev.
Service regulation [ $SERVREG_{i,c}$ ]	0.358 *** (0.111)	0.353*** (0.053)	-0.022 (0.053)		-0.021 (0.052)
Financial dev. x external dep. [ $FD_c$ x $ED_c$ ]		-0.003 (0.004)		0.002 (0.002)	0.002 (0.002)
Initial industry share [ $SHARE_{i,c}$ ]			0.014 (0.041)	0.011 (0.040)	0.008 (0.041)
Constant	0.010 *** (0.032)	0.011 *** (0.032)	-0.034 ** (0.162)	0.033 *** (0.013)	0.038 ** (0.016)
Observations	237	237	256	256	256
$R^2$	0.61	0.61	0.70	0.71	0.71

*Notes:* Standard deviations in parentheses. \*\*\* Significant at 1%, \*\* significant at 5%, \* significant at 10%. In columns 1-2 the dependent variable is the annual compounded growth rate of value added implicit deflator [ $DEFGROWTH_{i,c}$ ] at industry-country level. In columns 3-5 the dependent variable is the annual compounded growth rate of nominal value added at industry-country [ $NGROWTH_{i,c}$ ]. Columns 1-2 measures prices and columns 4-6 measures nominal value added growth. Financial development is calculated as private credit by deposit money banks over GDP in 1996 [ $FD_c$ ] and as accounting standards in 1983 [ $ACCSTAN_c$ ]. Service regulation is measured in 1996.  $DSERVREG_{i,c}$  measures exposure to service deregulation, the change in regulation between 1996 and 2002.

## 5.2 Service Regulation, Growth and Price Effects for 1999-2007

In this section, I perform the same analysis as in the previous section but between 1999 and 2007, as means of robustness to observe if there are some changes in service regulation that can affect countries economic performance, due to the fact that considering almost ten years there is scope for countries to change their service regulations, moreover in this period there has been a large change in service regulation. Countries having strict regulations in 1999 but lowering them in the course of the years might affect industry growth. The regression is the same as in the previous analysis:

$$GROWTH_{i,c} = \alpha + \beta SERVREG_{i,c} + \delta SHARE_{i,c} + \mu_i + \gamma_j + \epsilon_{i,c}$$

Table 6 reports the results for the previous regression, where the dependent variable is the annual compounded growth rate of real value added at the country-industry level for the

period 1999-2007. Results are quite different from the findings in the first part of the analysis. Coefficient reported in Table 6 column 1, presents technical coefficients of dependence between service sector  $s$  and manufacturing industry  $i$ , computed using the US input-output matrix. It shows that service regulation, although, having the same sign is not significant. The same happens for column 5, which tests the change in service regulation between 1999 and 2007.

Two measures of financial development are reported in columns 3 and 4 (private credit by deposit money bank and accounting standards respectively), to test the relationship between finance dependence and industry growth. Both measures report different results; in column 3 service regulation is negative and significant at 10%, however, in column 4 is negative but is not significant. Column 4 presents the average service regulation between 1999 and 2007 and the results are different to the ones of the first part; service regulation is negative but not significant. Finally, checking the robustness of Barone and Cingano (2011) results, I observe that they do change during this period.

Table 6: Services Regulation and Growth, 1999-2007

	(1)	(2)	(3)	(4)	(5)
	Baseline direct weights	Financial development (credit)	Financial development (acc. stand)	Average 1996-2002 regulation	Deregulation 1996-2002
Service regulation [ $SERVREG_{i,c}$ ]	-0.068 (0.044)	-0.079* (0.045)	-0.010 (0.058)	-0.274 (0.146)	-0.054 (0.084)
Financial dev. x external dep. [ $FD_c \times ED_c$ ]		0.002 (0.004)		0.013 (0.015)	0.002 (0.004)
Accounting stand. x external dep [ $ACCSTAN_c \times ED_c$ ]			0.009 (0.009)		
Change in service regulation [ $DSERVREG_{i,c}$ ]					-0.040 (0.130)
Initial industry share [ $SHARE_{i,c}$ ]	0.265*** (0.074)	0.248*** (0.078)	0.302*** (0.091)		0.248*** (0.079)
Constant	-0.016 (0.022)	-0.037 (0.029)	-0.073** (0.033)	0.069 (0.030)	-0.041 (0.031)
Observations	257	191	206	164	191
$R^2$	0.69	0.73	0.64	0.61	0.73

Notes: Standard deviations in parentheses. \*\*\* Significant at 1%, \*\* significant at 5%, \* significant at 10%.

Dependent variable is the annual compounded growth rate of real value added at country-industry level [ $GROWTH_{i,c}$ ]. Financial development is calculated as private credit by deposit money banks over GDP in 1999 [ $FD_c$ ] in column 3 and as accounting standards in 1983 [ $ACCSTAN_c$ ] in column 4. Service regulation is measured in 1999 except for column 5 that is the average value.  $DSERVREG_{i,c}$  measures exposure to service deregulation, the change in regulation between 1999 and 2007.

One possible explanation for this finding is the existence of a potential threshold in professional services; after some robustness checks constructing  $SERVREG_{i,c}$  in different ways (dropping each service or dropping some countries), I found that without including professional services in the  $SERVREG_{i,c}$  index, it becomes significant at 1%. Because of that professional service regulation has to be analyzed separately, as it has to be a change between 1998



(professional service regulation in Table 4) and 2003 that makes service regulations become insignificant.

In order to test for differences in professional service regulation between 1998 and 2003, Conway and Nicoletti (2006) provide a description of different service regulation indicators (energy, transport, telecommunications and professional services) of non-manufacturing sectors of OECD countries over the past three decades (PMR product market regulation indicators). In their description, differences between 1998 and 2003 are presented for professional services.

Figure 1<sup>2</sup>, presents the list of countries from the most deregulated to the lowest for 1998 and 2003. The most important result is that the most deregulated countries in 1998<sup>3</sup> have stricter regulations than in 2003. In fact, the mean of service regulation in 1998 for the most deregulated countries was, on scale form 0-6, where 6 present the stricter conditions, 1.35 whereas five years later in 2003 it was 1 approximately. Once excluding this ten most deregulated countries the findings coincide with the ones found in the first part of the study. In fact, only dropping the first five most<sup>4</sup> deregulated countries, service regulation becomes negatively related with industry growth, agreeing with Barone and Cingano (2011). This results indicates that it might exist a threshold that after some level of deregulation, regulations do not matter.

Results are reported in Table 7 without including in the sample the most five deregulated countries in 1999, and service regulation becomes significant in all cases. The only difference is that financial development has no effect on industry growth for that period. This results provide evidence that important changes in service regulation might affect the economic performance of a country, if the period of time is large enough to let countries take action and change their regulations it will possible have effects on industry growth, specifically those industries which depend more in the service whose regulation has been changed. Holding beginning-of-period regulation constant, value added growth in service intensive industries benefits form higher deregulation.

The industry with overall service dependence for this period at the 75<sup>th</sup> is manufacturing and recycling, whereas the industry situated at the 25<sup>th</sup> is other non-metallic mineral products, which in the previous period was an industry situated at the 75<sup>th</sup>, which means it has experienced a huge deregulation process between this period. The coefficient estimated in column 1 implies this differential would rise by approximately 0.45 percentage points if regulation were to be

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<sup>2</sup>See Appendix A.3

<sup>3</sup>Denmark, Australia, Sweden, Finland, United Kingdom, Switzerland, Ireland, Mexico and Netherlands.

<sup>4</sup>Denmark, Australia, Sweden, Poland and United Kingdom.

consistently lowered in the four services by an amount equal to the difference in average between a country at the 75<sup>th</sup> and a country at the 25<sup>th</sup>.

Table 7: Service Regulation and Growth 1999-2007

	(1)	(2)	(3)	(4)	(5)
	Baseline direct weights	Financial development (credit)	Financial development (acc. stand)	Average 1996-2002 regulation	Deregulation 1996-2002
Service regulation [ $SERVREG_{i,c}$ ]	-0.085* (0.046)	-0.097** (0.049)	-0.032* (0.077)	-0.496** (0.248)	-0.197* (0.136)
Financial dev. x external dep. [ $FD_c \times ED_c$ ]		0.002 (0.004)		0.010 (0.013)	0.002 (0.004)
Accounting stand. x external dep [ $ACCSTAN_c \times ED_c$ ]			0.013 (0.010)		
Change in service regulation [ $DSERVREG_{i,c}$ ]					0.134 (0.191)
Initial industry share [ $SHARE_{i,c}$ ]	0.272*** (0.074)	0.244*** (0.078)	0.317*** (0.094)		0.247*** (0.084)
Constant	-0.042 (0.028)	-0.032 (0.031)	0.184 (0.034)	0.068 (0.039)	-0.019 (0.035)
Observations	203	138	154	124	138
$R^2$	0.72	0.77	0.67	0.66	0.77

*Notes:* Standard deviations in parentheses. \*\*\* Significant at 1%, \*\* significant at 5%, \* significant at 10%. Results are calculated without including Denmark, Australia, Sweden, Finland and United Kingdom. Dependent variable is the annual compounded growth rate of real value added at country-industry level [ $GROWTH_{i,c}$ ]. Financial development is calculated as private credit by deposit money banks over GDP in 1999 [ $FD_c$ ] in column 3 and as accounting standards in 1983 [ $ACCSTAN_c$ ] in column 4. Service regulation is measured in 1999 except for column 5 that is the average value.  $DSERVREG_{i,c}$  measures exposure to service deregulation, the change in regulation between 1999 and 2007.

If we investigate the relationship between service regulation, industry prices and nominal growth, we find different results for the effects of service regulation on industry prices. Table 8 presents the results for financial development, prices and nominal growth between 1999 and 2007. Unlike the findings in the first part, service regulation has no effects over prices, although, similarly with the first part it has no effects over nominal growth. Nominal growth is an interaction between real value added growth and prices, none of them are significant (including all countries in the sample) for this period, as a result service regulation has no effect over nominal growth. However, if we drop the most five deregulated countries, as before, there is a positive effect over prices but an insignificant effect over industry nominal growth, which are the same results as Barone and Cingano (2011). Because the negative effects of service regulation over real value added growth compensates with the positive relationship between higher service regulation and prices.

Table 8: Financial Development, Prices and Nominal Growth 1999-2007

	(1)	(2)	(3)	(4)	(5)
	Prices	Regulation and fin. dev.	Nominal Growth	Financial development	Regulation and fin. dev.
Service regulation [ $SERVREG_{i,c}$ ]	0.033 (-0.170)	0.037 (0.041)	-0.017 (0.041)		-0.027 (0.041)
Financial dev. x external dep. [ $FD_c \times ED_c$ ]		-0.002 (0.001)		-0.001 (0.066)	-0.001 (0.002)
Initial industry share [ $SHARE_{i,c}$ ]			0.073 (0.059)	0.064 (0.066)	0.060 (0.067)
Constant	0.015 (0.009)	0.160 (0.010)	0.024 (0.020)	0.036*** (0.055)	0.034*** (0.057)
Observations	256	189	261	193	193
$R^2$	0.60	0.62	0.79	0.80	0.80

*Notes:* Standard deviations in parentheses. \*\*\* Significant at 1%, \*\* significant at 5%, \* significant at 10%. In columns 1-2 the dependent variable is the annual compounded growth rate of value added implicit deflator at industry-country level. In columns 3-5 the dependent variable is the annual compounded growth rate of nominal value added at industry-country.

Financial development is calculated as private credit by deposit money banks over GDP in 1996 [ $FD_c$ ] and as accounting standards in 1983 [ $ACCSTAN_c$ ]. Service regulation is measured in 1996.  $DSEVRREG_{i,c}$  measures exposure to service deregulation, the change in regulation between 1999 and 2007.

### 5.3 Domestic and Foreign Service Regulation and Growth

The scope for growth of trade in services is vast, a primarily reason of why international trade in services has been limited is because the need of physical contact between producers and consumers. New technology, in particular, telecommunications provide a medium of exchange that overcomes such an historical limitation; science advances in information and communication technologies are increasingly permitting cross-border trade in labor intensive services, accelerating the growth of services activities. Foreign suppliers are sources of new technologies as well as the competition that is needed in markets. Because of the increasing importance of international trade in manufacturing and offshoring of services, it is important to study how foreign regulations affect domestic industry growth, and to examine whether domestic regulation is more influential than foreign regulation or the other way around.

In the first part of this section, instead of following the same procedure as Barone and Cingano (2011), who assumed US input-output accounts reflect technological differences rather than country-specific determinants, not allowing for the possibility that using input-output weights from a benchmark country, does not allow to correctly measure technological dependence on service inputs because country-specific weights are different. Because of that, in order to construct the domestic  $DSEVRREG_{i,c}$  I use each country particular input-output account with each country specific service regulation policy. The time period studied in this part is the same as in the first part of the analysis, 1996-2002 and all the other variables are also the same

as in Table 4. The regression is the following:

$$GROWTH_{i,c} = \alpha + \beta WSERVREG_{i,c} + \delta SHARE_{i,c} + \mu_i + \gamma_c + \epsilon_{i,c}$$

Where  $WSERVREG_{i,c}$  accounts for industry  $i$  dependence on service regulation in country  $c$ , calculating service dependence using each country input-output matrices and service regulation policies.

Coefficient 1 of Table 9 presents the direct weights obtained from the technical coefficients of each country specific input-output accounts, calculated as the ratio of expenditures on service out of the value of industry output. It can be observed, that an increase in service regulation leads to a decrease in industry growth. The introduction of financial development, private credit by deposit money bank in column 3 and accounting standards in column 4, does not change the effects of service regulation over industry growth, furthermore both measures of financial development are highly significant. Measuring service dependence taking into account each own country input-output accounts and service regulation leads to the same results as Barone and Cingano (2011), using US input-output accounts as benchmark appears to work fine when using domestic service dependence.

Table 9: Service Regulation and Growth 1996-2002

	(1)	(2)	(3)
	Baseline direct weights	Financial development (credit)	Financial development (acc. stand)
Own Service Regulation [ $WSERVREG_{i,c}$ ]	-0.002** (0.001)	-0.002** (.001)	-0.003** (0.001)
Financial dev. x external dev. [ $FD_c$ x $ED_c$ ]		0.004* (0.002)	
Accounting stand. x external dep. [ $ACCSTAN_c$ x $ED_c$ ]			0.021*** (0.006)
Initial industry share [ $SHARE_{i,c}$ ]	0.164*** (0.058)	0.146*** (0.055)	0.161*** (0.058)
Constant	0.010 (0.010)	0.011 (0.028)	-0.034 (0.011)
Observations	187	187	187
$R^2$	0.70	0.70	0.71

Notes: Standard deviations in parentheses. \*\*\* Significant at 1%, \*\* significant at 5%, \* significant at 10%.

Dependent variable is the annual compounded growth rate of real value added at country-industry level [ $GROWTH_{i,c}$ ].

Financial development is calculated as private credit by deposit money banks over GDP in 1996 [ $FD_c$ ] in column 2 and as accounting standards in 1983 [ $ACCSTAN_c$ ] in column 3.

Service regulation is measured in 1996.

For getting a sense of the size of this effect, percentiles take into account the annual growth differential between and industry with overall service dependence at the 75<sup>th</sup> (Pulp, paper, paper products, printing and publishing) in comparison with an industry at the 25<sup>th</sup> (Food products,

beverages and tobacco) percentile. The coefficient estimated in column 1 implies this differential would rise by approximately 0.60 percentage points if regulation were to be uniformly lowered in the four services by an amount equal to the difference in average between a country at the 75<sup>th</sup> (Belgium and Italy) in comparison with a country at the 25<sup>th</sup> (Great Britain).

Once observed that each country specific weights and service regulations have effects over industry growth, I will consider, in this part, services that countries use from other countries, the idea behind this analysis is that there is an increasing trade of service across countries, and each country uses services from other countries which are under the policy regulation of that country. Because of that, it is more appropriate to use the world input-output tables to take into account the service dependence each country has from other countries, as well as their own service dependence. The regression is the following:

$$GROWTH_{i,c,sc'} = \alpha + \beta_0 WSERVREG_{i,c} + \beta_1 FSERVREG_{i,c,sc'} + \delta SHARE_{i,c} + \mu_i + \gamma_c + \epsilon_{i,c}$$

Where  $WSERVREG_{i,c}$  presents service dependence on industry  $i$  in country  $c$  over service regulation, accounts for the domestic industry dependence on service regulation each country has on its own country, computed using each country input-output accounts obtained from the OECD input-output database. While  $FSERVREG_{i,c,sc'}$  corresponds to industry  $i$  dependence on service regulation in country  $c$  and usage of services-in-country  $c'$ , it accounts for the industry dependence on services each country has from other countries, as every country uses services from other countries, it is computed using the input-output accounts and taking into account foreign service regulation policy.

Table 10 presents the strongest results of the paper. Service regulation is highly significant at 1% level in all the cases. The positive coefficient of domestic service regulation contrast with the negative coefficient of foreign service regulation. One possible explanation might be that foreign service regulation has more influence on the economic performance of downstream industries than domestic regulations. Moreover, the results remain the same when controlling for both measures of finance dependence (private credit by deposit money banks and accounting standards for columns 2 and 3 respectively). Finally, correlations between domestic and foreign service regulation are very high.<sup>5</sup>

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<sup>5</sup>See Appendix A.4

Including foreign and domestic regulation implies that assuming US input-output table as a measure of service dependence for every country does not hold anymore. Domestic service regulation has a positive effect over industry growth, whereas increasing foreign service regulation decreases industry growth in downstream manufacturing industries who use regulated services more intensively.

Table 10: Service Regulation and Growth 1996-2002

	(1)	(2)	(3)
	Baseline	Financial	Financial
	direct	development	development
	weights	(credit)	(acc. stand)
Own Service Regulation [ $WSERVREG_{i,c}$ ]	0.039*** (0.009)	-0.039*** (0.009)	-0.036** (0.010)
Foreign Service Regulation [ $FSERVREG_{i,c}$ ]	-0.014*** (0.003)	-0.014*** (0.003)	-0.013** (0.000)
Financial dev. x external dev. [ $FD_c \times ED_c$ ]		0.004* (0.002)	
Accounting stand. x external dep. [ $ACCSTAN_c \times ED_c$ ]			0.021*** (0.006)
Initial industry share [ $SHARE_{i,c}$ ]	0.143** (0.056)	0.126*** (0.053)	0.161*** (0.058)
Constant	0.014 (0.010)	0.015 (0.010)	-0.034 (0.011)
Observations	187	187	187
$R^2$	0.72	0.70	0.73

Notes: Standard deviations in parentheses. \*\*\* Significant at 1%, \*\* significant at 5%, \* significant at 10%.

Dependent variable is the annual compounded growth rate of real value added at country-industry level [ $GROWTH_{i,c}$ ].

Financial development is calculated as private credit by deposit money banks over GDP in 1996 [ $FD_c$ ] in column 2 and as accounting standards in 1983 [ $ACCSTAN_c$ ] in column 3.

Service regulation is measured in 1996.

Nevertheless this finding is a preliminary study, research has to be done in more detail, in order to elaborate a theoretical framework explaining the theoretical background under this result.

## 6 Conclusions

As part of the Single Market Program the European Commission commanded the liberalization and regulatory harmonization of utilities, transport and telecommunication services. In this study I have examined the impact of service deregulation (professional services, telecommunications, transport and energy) on industry growth between 1996 and 2002, finding that service regulation has a negative and significant impact on industry value added growth rate of service dependent industries, which leads to the same conclusions that Barone and Cingano (2011) found. Although service regulation has shown to change between 1999 and 2007, specially due to the high volatility of professional services, which leads to different results for this period of

time.

This study focuses on the effects of product market regulations on one of the key components of the output gap across countries: economic growth, as the process of economic convergence, observed for some decades has stopped and even partially reversed, this study contributes in explaining how this divergence across countries is affected by service regulation policies.

Because of the increasing international trade in services, this study considers service regulation impacts on industry growth, taking into account service usage of other countries services. The preliminary results show that countries are more sensitive to foreign service dependence and regulation than to its own service dependence and regulation, domestic service regulation has a positive and significant impact on industry growth, although foreign service regulation has a negative and significant effect, because of that computing service dependence using a benchmark country appears not to hold anymore. This results are an important finding, however, they leave important questions open for future research, in order to examine deeper how both types of service dependence and regulation (domestic and foreign) behave.

Finally, overall the regulation-growth linkage seems to be robust to different model specifications and sample periods coverage within the OECD countries, although, there is scope for further investigation as more analysis can be done, for example, it might be interesting studying if the effects that service regulation have over growth are the same for non-OECD countries, where the impact of regulation policies on some determinants could be different.

## A Appendix

### A.1 Data Sample

- **Country Sample:** Australia, Austria, Belgium, Canada, Check Republic, Denmark, Finland, France, Germany, Germany (west), Greece, Hungry, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, Norway, New Zealand, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, United Kingdom and United States. Although not all the countries are used in the analysis. <sup>6</sup>
- **Industry Sample:** According to the Isic. Rev 3 classification. "Food products, beverages and tobacco (15-16), "Textiles and textile products" (17-18), "Leather, leather products and footwear" (19), "Wood and products of wood and cork" (20), "Pulp, paper, paper products, printing and publishing" (21-22), "Coke, refined petroleum products and nuclear fuel" (23), "Chemicals and chemical products" (24), "Rubber and plastics products" (25), "Other non-metallic mineral products" (26), "Basic metals" (27), "Fabricated metal products, except machinery and equipment" (28), "Machinery and equipment, (29)", "Electrical and optical equipment" (30-33), "Transport equipment" (34-35) and "Manufacturing N.E.C, recycling" (36-37).
- **Policy Sample:** Policy variables are calculated as indexes on a scale from 0 to 6, where 6 represent the stricter conditions:
  - Energy: Entry barriers and vertical integration in electricity and gas. (The indicator covers production, transmission and supply).
  - Telecommunications: Entry for post and telecommunications. (The indicators cover basic letter, parcel and courier services and trunk and long distance fixed telephony and mobile telephony respectively).
  - Transport: Entry for airlines, entry and vertical integration for rail and entry for road. (The indicators cover passenger service, passenger and freight services and freight services respectively).
  - Professional Services: Entry (licensing, education requirements and quotas and economic needs test) and conduct regulation (prices and fees, advertising form of business

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<sup>6</sup>Check Republic, West Germany, Hungry, Ireland, Iceland, Korea, Mexico, New Zealand, Poland, Slovak Republic and United States are not included in the regressions, either for lack of data or for collinearity problems.



and inter-professional cooperation). The indicator covers engineering, legal, accounting and architectural professions.

- **Input-Output Tables:** In order to pair country-level information on service regulation and industry-level data on service dependence, the sectors we handle according to the Isic. Rev 3, are the following: "Post and telecommunications" (64), "Electricity, gas and water" (40-41), "Transport and storage" (60-63) and "Renting of M&E and other business services" (71-74).

## A.2 Variable Definition

- $NGROWTH_{i,c}$ : Annual compounded growth rate of nominal value added for 1996-2002 and 1999-2007 for industry  $i$  and country  $c$ . (Value added at current prices).
- $GROWTH_{i,c}$ : Annual compounded growth rate of real value added for 1996-2002 and 1999-2007 for industry  $i$  in country  $c$ . (Value added at current prices / value added deflators).
- $DEFGROWTH_{i,c}$ : Annual compounded growth rate of value added implicit deflator for 1996-2007 for industry  $i$  in country  $c$ . (Value added deflators).
- $SHARE_{i,c}$ : Share of industry  $i$  in total value added in manufacturing in country  $c$  for 1996 and 1999. (Value added at current prices in 1996 and 1999 in industry  $i$  / total value added in country  $c$  in 1996 and 1999 respectively).

*Source:* OECD STAN database (ISIC Rev. 3, SNA93).

- $Wenergy_{i,s}$ : Industry  $i$  dependence on energy. Matched with 40-41 (electricity, gas and water supply) in input-output accounts.
- $Wtelecommunication_{i,s}$ : Industry  $i$  dependence on telecommunications. Matched with 64 (post and telecommunications) in input-output accounts.
- $Wtransports_{i,s}$ : Industry  $i$  dependence on transport. Matched with 60-63 (transport and storage) in input-output accounts.
- $Wprof. services_{i,s}$ : Industry  $i$  dependence on professional services. Matched with 71-74 (renting of machinery and equipment, computer and related activities, R&D and other business activities).

*Source:* OECD Input-Output accounts for 1997 and average 1999-2007. WIOD Input-Output accounts for the average between 1996-2002.

- Energy regulation<sub>c,s</sub>: Regulation of energy in country *c*, including electricity and gas. Accounting for entry barriers and the degree of vertical integration.
- Telecommunication regulation<sub>c,s</sub>: Regulation of telecommunication in country *c*, including post and telecommunications. Accounting for entry barriers.
- Transport regulation<sub>c,s</sub>: Transport regulation in country *c*, including rail, air and road. Accounting for entry barriers in air, rail and road, and on vertical integration in rail.
- Professional services regulation<sub>c,s</sub>: Professional services regulation in country *c*, including legal, accounting, engineers and architects. Accounting for entry barriers and the regulation of market conduct.

*Source:* OECD Product Market Regulation (PMR) in 1996 and 1999.

- FD<sub>c</sub>: Financial development in each country *c* measured as private credit by deposit money banks over GDP in 1996 and 1999.

*Source:* World Bank's financial development and structure database.

- ED<sub>i</sub>: Industry *i* dependence on external finance, defined as capital expenditure minus internal funds.

*Source:* Thomson Financial Worldscope database.

- BCSERVREG<sub>i,c</sub>: Barone and Cingano (2011) index of exposure of each manufacturing industry in four service sectors (energy, telecommunication, transport and professional services). It is computed as,  $\sum_s (w_{i,s} X_{i,s})$  where  $w_{i,s}$  is the industry *i* dependence on each service and  $X_{i,s}$  is the regulation of each service in each country *c*.
- DSERVREG: Difference between SERVREG in 1996 and SERVREG in 2002. ( $SERVREG_{1996} - SERVREG_{2002}$ ). And difference between SERVREG in 1999 and 2007. ( $SERVREG_{1999} - SERVREG_{2007}$ )
- Average SERVREG: Average SERVREG between 1996 and 2002, and average SERVREG between 1999 and 2007.

*Source:* OECD Product Market Regulation and US 1997 OECD input-output account.

- $WSERVREG_{i,c}$ : Barone and Cingano (2011) index of exposure of each manufacturing industry  $i$  in four service sectors (energy, telecommunication, transport and professional services). It is computed as,  $\sum_s (w_{i,s} X_{i,s})$  where  $w_{i,s}$  is the domestic industry  $i$  dependence on each service and  $X_{i,s}$  is the regulation of each service in each country  $c$ .
- $FSERVREG_{i,c,s'}$ : Index of exposure of each manufacturing industry  $i$  in four service sectors (energy, telecommunication, transport and professional services). It is computed as,  $\sum_s (w_{i,c,s'} X_{c,s'})$  where  $w_{i,c,s'}$  is the industry  $i$  in country  $c$  of using services  $c'$  and  $X_{c,s'}$  is the regulation of service  $s$  in country  $c$  and  $c'$ .

*Source:* OECD Product Market Regulation and World Input Output Database (WIOD).

### A.3 Difference between professional service regulations from Conway and Nicoletti (2006)

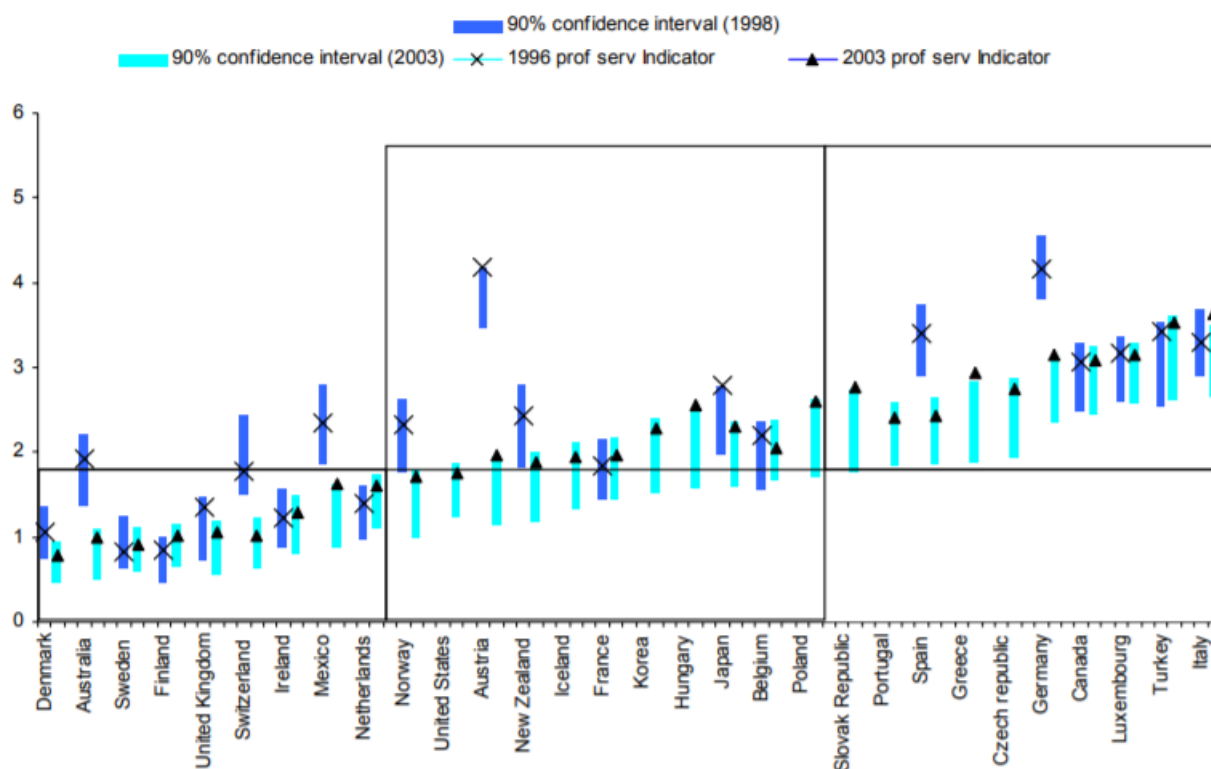


Figure 1: Differences between professional service regulation, computed as 90% confidence intervals, in 1998 and 2003.

### A.4 Domestic and Foreign summary statistics and correlations

Table 11: Summary statistics and correlations

	Obs.	Mean	SD	Min.	Max.	Corr.
Domestic energy	322	1.650	8.940	0	139.763	0.964***
Foreign energy	350	0.049	0.196	0	2.059	
Domestic telecommunications	336	0.231	1.277	0	18.462	0.943***
Foreign telecommunications	350	0.017	0.093	0	1.241	
Domestic transports	336	2.347	16.107	0	267.181	0.995***
Foreign transports	350	0.322	1.690	0	20.132	
Domestic professional services	252	12.152	56.136	0	544.925	0.998***
Foreign professional services	350	0.538	2.587	0	27.265	
Domestic SERVREG	238	8.494	48.422	0	662.321	0.994***
Foreign SERVREG	350	0.927	4.476	0	49.062	

Notes: Summary statistics and correlations of foreign and domestic regulations.

Correlations are calculated as the correlation between the viable and the variable below

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