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The Impact of Product Market Reforms on Firm Productivity in Italy

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The Impact of Product Market Reforms on Firm Productivity in Italy

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Abstract

This paper examines the role of removing obstacles to competition in product markets in raising growth and productivity. Using firm-level data from Italy during 2003–13 and OECD measures of product market regulation, we estimate the effect of deregulation in network sectors on value added and productivity of firms in these sectors, as well as firms using these intermediates in their production processes. We find evidence of a significant positive impact. These effects are more pronounced in Italian provinces with more efficient public administration, underscoring the complementarities of advancing public administration and product market reforms simultaneously.

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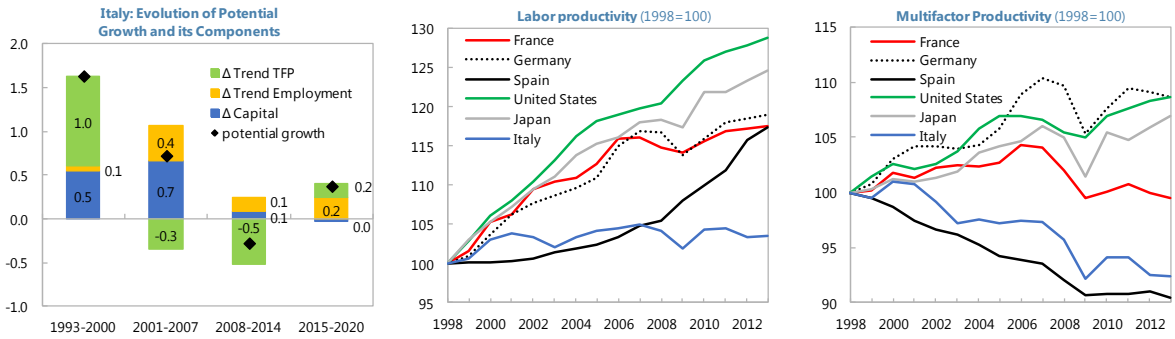
Contents Page

I. INTRODUCTION

Italy's potential growth has declined markedly over the past two decades. The Global Financial Crisis has been an important factor. However, the decline in potential growth preceded the crisis, reflecting a sharp drop in productivity. TFP fell a cumulative 7.5 percent since Italy adopted the euro in 1998, while labor productivity defined as real GDP per hour worked increased a meager 3.5 percent over the same time period (Figure 1).

Figure 1. Italy: Potential Growth and Productivity



Sources: 2015 Italy Article IV Report; Total Economy Database (TED). Labor productivity is measured as GDP per hour worked.

Various factors might have contributed to Italy's poor performance. Academic studies have emphasized structural deficiencies related to the sectoral specialization of Italian manufacturing (Ciriaci and Palma, 2008), a business model, which relies predominantly on micro and small firms, institutional factors, such as labor regulations (Daveri and Parisi, 2010), judicial inefficiency (Giacomelli and Menon, 2013; and Esposito and others, 2013), public sector inefficiency (Giordano and others, 2015), and lack of key factors of production, such as managerial knowhow (Bandiera and others, 2008; Brasili and Federico, 2008; and Bloom and others, 2008).[2] Both OECD (2015) and IMF (2015) have emphasized the importance of greater product market competition and better regulation to boost productivity.

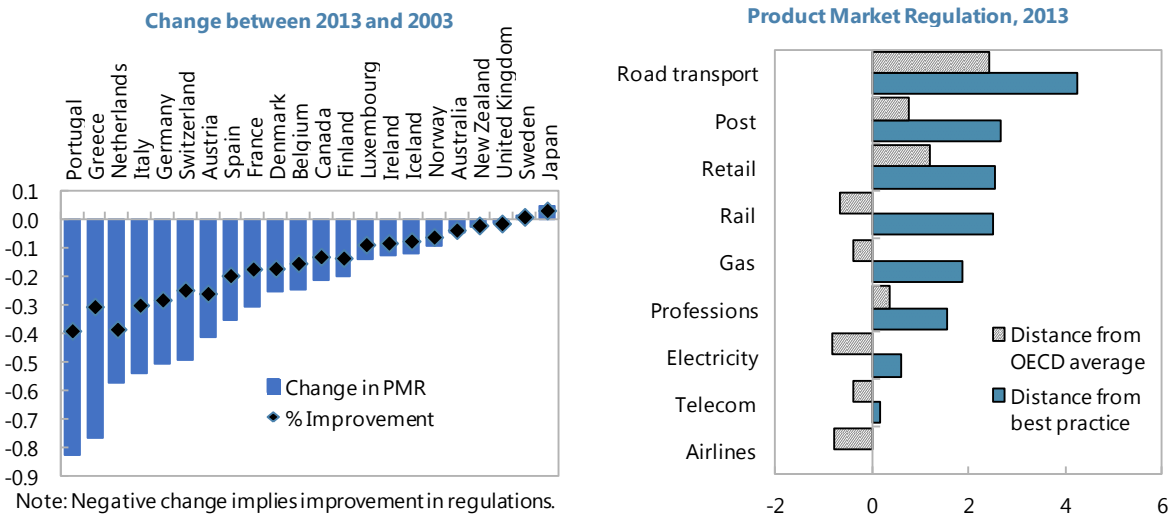
The government's comprehensive reform agenda tries to tackle many of the structural rigidities. The National Reform Program (NRP) aims to raise labor productivity through wide-ranging reforms of the labor market and education system, improve the business environment through an overhaul of the public administration and civil justice, facilitate reallocation of resources and enhance firm productivity through further liberalization of product and services markets, and boost investment through financial sector reforms.

This paper examines empirically the potential role of removing obstacles to competition in product markets in boosting growth and productivity. In particular, we study Italy's own experience with deregulation of key network and services industries over the 2003–13

[2] Pellegrino and Zingales (2015) examine systematically the various possible explanations of Italy's productivity slowdown, conclude that the main cause of Italy's "disease" is the inability of small firms to adjust to the global change of the 2000s, namely the rise of China and the ICT revolution.

period. According to the OECD Product Market Regulation (PMR) indicators, Italy is one of the biggest de jure reformers between 2003 and 2013 among OECD countries. In some areas such as telecommunications and airlines, Italy is currently at or close to OECD best practice. In other areas, however, such as road transportation and retail, it remains heavily regulated (Figure 2).

Figure 2. Italy: Product Market Regulation



Sources: OECD; and World Economic Forum.

We assess the impact of liberalization by exploiting the variation in the timing and degree of deregulation across sectors. In particular, we are able to address three questions: (1) did the performance of previously regulated sector improve as barriers to competition were removed? (2) What was the impact on downstream industries, which use the output of regulated network industries as inputs in their production function? And (3) how is the response to liberalization shaped by government efficiency? We answer these questions using annual firm-level data from Italy over the 2003–13 period from the Orbis database by Bureau van Dijk, OECD de jure measures of regulation, and Italy's input-output matrix.

We find evidence of a positive association between deregulation in network sectors and value added and productivity of firms in these sectors. For instance, a one-standard deviation improvement in the PMR is associated with 9 percent larger firms. Firms using outputs from network sectors as production inputs also benefit. Upon deregulation of network sectors, those firms that use regulated inputs more intensely increase their size and productivity relatively more. We also find that in provinces with more efficiently provided public services, the positive association between deregulation and firm performance in previously regulated sectors is significantly stronger. This finding suggests that there may be important complementarities between public services provision and deregulation. Alternatively, if government efficiency proxies the quality of implementation of legislated

deregulation, it suggests that the quality of implementation shapes the effectiveness of deregulation. While our analysis is unable to pinpoint the exact mechanism behind this empirical finding, it underscores the complementarities of advancing public administration and product market reforms simultaneously.

This paper relates to a large and growing literature on the effects of product market reforms on economic performance.[3] The question has been approached from many angles. A number of studies rely on industry-level data across a panel of OECD economies (such as Bourles and others (2013) and Barone and Cingano (2011)) to identify the impact of intermediate goods market imperfections on productivity and growth downstream. A handful of country studies follow a similar econometric approach. Using sectoral data for Italy, Allegra and others (2004), find that antitrust problems in intermediate goods markets affect the export and growth performance of sectors that depend more on intermediate goods. Our study is one of the few that focus on the downstream effects of regulation using firm-level data. Arnold and others (2011, 2015) study the downstream impact of regulation using firm-level data for the Czech Republic and India, while Forlani (2012) does the same for France. In a recent study, Gal and Hijzen (2016) analyze the indirect effects of product market reforms using firm-level data from 15 countries.

The rest of the paper is structured as follows: Section II outlines the empirical strategy used to estimate the effect of liberalization both for regulated industries and downstream firms. Section III presents the main findings and their robustness. The heterogeneous implementation of product market reforms across Italian regions is the focus of Section IV; while Section V concludes.

II. Empirical Strategy, Data and Measurement

Reforms that raise competition in product and services market can affect the economy in two ways. First, deregulation is expected to affect firms in the regulated sectors themselves, through the usual effects of competition on growth. Greater competitive pressures could lead to reallocation of output across heterogeneous firms, as inefficient firms exit, and/or induce firms to innovate and adopt new technologies, thereby raising sectoral productivity. This effect by itself could be important as regulated industries account for close to 30 percent of Italy's GDP. Second, higher competition—which may lead to lower mark-ups, greater availability of services, and higher quality products and services—could benefit firms that use the output of regulated industries as inputs. These are the so-called downstream effects. This is another quantitatively important channel as regulated sectors

[3] See, for example, Adhikari and others (2016), Bouis and others (2016), Gal and Hijzen (2016), Daveri and others (2015), Dimelis and Papaioannou (2015), Bassanini (2015), Forlani (2015), Bouis and others (2012), Bouis and Duval (2011), Cacciatore and others (2012), Eggertsson and others (2014), Andrews and Cingano (2014), Schindler and others (2014), and Fiori and others (2007).

account for about 30 percent of total inputs in the Italian economy, according to Italy's input-output matrix. In this paper, we attempt to shed some light on both channels.

A. Regulated Sectors: Empirical Strategy

We study the association between product market regulation and performance of firms in regulated sectors in the following empirical framework:

$$Y_{ipt} = \delta * PMR_{pt} + \gamma X_{ipt} + \alpha_{rt} + \alpha_p + \varepsilon_{ipt} \qquad (1)$$

where Y_{ipt} is a performance indicator for firm *i* operating in regulated sector *p* at time *t*, PMR_{pt} is the state of regulation in sector *p* at time *t* (lower values mean a more competitive environment), X_{ipt} is a vector of firm-specific controls, α_{rt} is a set of region-year fixed effects (20 NUTS2 regions), and α_p is a set of sector fixed effects (2-digit NACE Revision 2 classification).[4] ε_{ipt} is an error term, corrected for heteroskedasticity, and clustered at the industry-year level in the estimation, as our variable of interest varies only at the industry-year level. This equation is estimated on annual firm level data across nine regulated sectors.

In this specification, the coefficient δ captures the extent to which liberalization is associated with better firm outcomes in regulated sectors. The region-year fixed effects control for all time-varying factors that affect the performance of all regulated industries in a region equally (for instance, regional demand or productivity shocks). The sector fixed effects capture all time-invariant sectoral characteristics that may affect the outcomes of firm in a sector. X_{ipt} includes firm-size dummies when our outcome of interest, $Y_{ipt,}$ is a output, gross value added or productivity proxy and lagged firm size to control for convergence effects when Y_{ipt} is a measure of firm growth.[5]

It is important to emphasize that an interpretation of δ as the causal effect of deregulation on the productivity of regulated sectors is difficult. There are nine sectors for which we have measures of product market regulation, and it is hard to argue that the variation in terms of the timing and degree of deregulation is exogenous to firm performance in these sectors. For example, liberalization might have been initiated in response to the poor performance of incumbents or alternatively incumbents in certain sectors might have been more powerful in lobbying for entry barriers. The inclusion of a variety of fixed effects alleviates to some extent these concerns, but the results of this exercise should be interpreted as illustrative, given these caveats.

[4] The specification includes industry fixed effects at the 2-digit level since indicators of product market regulation are available at broadly that level of industry aggregation.

[5] A large literature has documented that large firms are more productive (e.g., Idson and Oi, 1999). Size is defined as average firm employment over 2003–13 to avoid endogeneity issues. Firms are classified in five size buckets (less than 10 employees, 10–19, 20–49, 50–249, and more than 250 employees).

B. Downstream: Empirical Strategy

To identify the impact of upstream liberalization on downstream firm performance, we exploit the differential linkages across industries. Similar to Bourles and others (2013), Barone and Cingano (2011), and Arnold and others (2015), the key identifying assumption is that deregulation of a particular product market will benefit relatively more industries that use this product as an input more intensely. For instance, an improvement in the PMR for the energy sector will benefit the heavy industry, whose production technology is relatively more reliant on energy, more than financial services. Thus, for each sector, *s*, in the economy, we can construct a measure of *indirect regulatory burden* (or Upstream PMR)

$$UpstreamPMR_{st} = \sum_{p=1}^{P} PMR_{pt} * Intensity_{sp}$$

where PMR_{pt} is the state of regulation in sector *p* at time *t*, and $Intensity_{sp}$ measures how intensely downstream industry *s* uses input *p*. The upstream PMR thus aggregates the sector specific indices of regulation (the standard OECD PMRs) into a single index of upstream regulation, with sector-specific weights reflecting input intensities.

We then estimate the following specification using firm level data:

$$Y_{ist} = \beta * UpstreamPMR_{st} + \gamma X_{ist} + \alpha_{rt} + \alpha_s + \varepsilon_{ist} \qquad (2)$$

where Y_{ist} is a performance indicator for firm *i* in sector *s* at time *t;* $UpstreamPMR_{st}$ is the indicator of the indirect regulatory burden sector *s* is subject to at time *t* (lower values mean less regulatory burden), X_{ist} is a set of firm-specific controls, α_{rt} is region-year fixed effects, α_s is a set of sector fixed effects (768 sectors, 4-digit NACE Revision 2 classification); and ε_{ist} is the error term. In contrast to equation (1), we estimate equation (2) for all sectors in the economy. We expect β to be negative and significant if upstream liberalization has positive effects on downstream firm performance. Similar to equation (1), we cluster standard errors at the industry-year level since our variable of interest, *UpstreamPMR*, only varies at this level.[6]

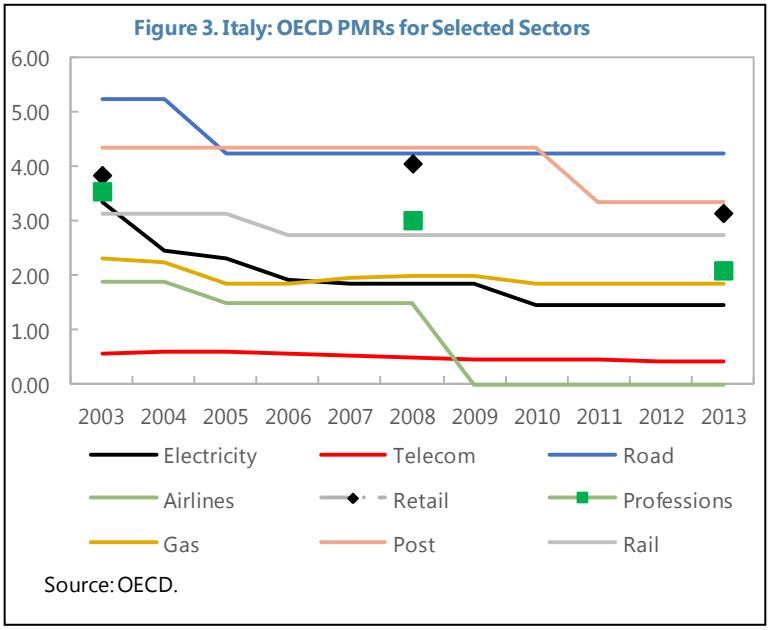
C. Measuring Regulation

We rely on the OECD PMR indicators to systematically measure regulatory provisions in nine sectors over 2003–13: telecom, electricity, gas, post, rail, air passenger transport, road transport, retail, and professions.[7] The indicators are based on *de jure* policy settings

[6] Gal and Hijzen (2016) perform a similar exercise for 15 countries using a more sophisticated identification strategy that relies on the variation in total intermediate input use within industries combined with the industry-level variation we use.

[7] The computation of the sector-specific PMRs, described in detail by Koske and others (2014), follows a bottom up approach, aggregating data on entry regulation, public ownership, vertical integration, market structure, and price controls.

(i.e., data on laws and regulations) as opposed to *de facto* assessments of degree of implementation, or effectiveness of regulation. The OECD approach offers systematic coverage at the cost of abstracting from potentially important aspects of regulation. The OECD indicators are in the [0, 6] range, with higher values denoting more regulation. The coverage is continuous for network industries but limited to 2003, 2008, and 2013 for retail and professions (Figure 3). For the study of regulated sectors, we pool sectors for which PMRs are available at an annual frequency and those for which the coverage is limited to three years. Hence, we cover network, retail, and professional sectors in an unbalanced panel. However, when examining downstream effects on the broader economy, we focus on deregulation in the network industries, which allows us to build an annual panel of firms over a 10-year period. In a robustness exercise, we also examine the downstream effect of deregulation in all sectors, including retail and professional services.



To construct a measure of indirect regulatory burden or upstream PMR, we use the Italian input-output matrix. Based on the 2010 input-output matrix at basic prices, we can measure the linkage between any sector in the economy and those network sectors deregulated over the 2003–2013 period, by calculating sector-specific input intensities.[8] $Intensity_{sp}$ is calculated as the units of regulated product *p* needed to produce one unit of final output in sector *s*. One potential shortcoming of using the Italian input-output matrix is that endogeneity issues may arise if input-use decisions by industries are distorted by lack of competition (e.g., companies substituting rail transportation for road transportation if regulation results in expensive and inefficient road transportation services). We address this point in the robustness section where we use the UK input-output matrix to calculate input intensities.[9]

[8] The input-output matrix uses 63 NACE Revision 2 sectors, and reflects the average inter-industry sourcing behavior of firms in a given sector of the economy. For an individual firm, the actual reliance on a given sector may be different; however, even if precise data on input use by the firms were available, it would still be preferable to rely on industry averages in order to minimize potential endogeneity concerns.

[9] Input use decisions could also reflect changes in regulations within Italy, arguing for using the Input-Output matrix from an earlier year. However, patterns of intermediate input usage appear to be very persistent over time: the correlation between the 2001 and 2011 Input-Output matrix for Italy published by the OECD exceeds 0.9.

D. Measuring Firm Performance

Firm data are from the Orbis database by Bureau van Dijk, which offers unique coverage of micro, small and medium Italian firms. It includes all companies required to submit accounts with the Italian Chamber of Commerce. It thus captures a very significant portion of the micro, small, and medium enterprises, which constitute the bulk of economic activity in Italy, but are rarely represented in other commonly-used firm-level datasets. The coverage in the Orbis database is high. In 2007, the firms included in the database account for roughly 70 percent of value added in the economy. The panel of firms is highly unbalanced. Financial information is available for only 100,000 firms in 2003 (as the Orbis database typically provides 10 years of data per company), however the sample increases to 470,000 in 2004 and reaches 715,000 firms in 2011.[10]

We construct indicators of firm size, growth, and productivity to assess firm performance. The firm size variables we use are (log) real gross value added and real output (defined as real operating revenue). The change in log real gross value added is our measure of firm growth. The productivity proxies are real gross value added per employee, real output per employee, and firm-level TFP.[11] TFP is calculated as the residual from OLS regressions of a simple Cobb-Douglas production function, run industry-by-industry (at 2-digit NACE 2). Appendix Table 1 reports summary statistics for the dependent variables we use.

III. RESULTS

A. Regulated Sectors

We find evidence that industry outcomes improve in the aftermath of the removal of barriers to competition in regulated sectors**.** Table 1 reports the coefficients, δ, of estimating equation (1) using 6 alternative measures of firm performance. Across all of these measures, except TFP, we estimate a negative, statistically significant association between PMR and firm's performance. Sectors which experienced greater deregulation (i.e., reduction in the PMR) expanded relatively more compared to sector whose PMR declined by less, as indicated by the implied increase in output, value added and firm growth (columns 1–3). This relative sectoral growth is accompanied by improvements in productivity, both measured as output per worker and gross value added per worker. The economic magnitude of the association is sizable: a one standard deviation reduction in the PMR is associated with

[10] The data used in the analysis was extracted from the Orbis database in the first half of 2015, and does not reflect subsequent database updates. See Kalemli-Özcan and others (2015) for a detailed description of the Orbis database.

[11] The original nominal variables from Orbis are deflated using industry-specific (2-digit NACE 2) deflators from Istat for output, gross value added, and inputs. Real capital stock used in the estimation of the production function is constructed using the perpetual investment method, as the sum of previous period real fixed assets less depreciation and real investment (constructed, following Gal (2013), as the difference in fixed assets between t and t-1 less depreciation, deflated by industry-specific investment deflators).

3 percent relatively higher growth, 10 percent relatively larger firms (in terms of output), and 4.7 percent relatively higher value added per worker.

Table 1. Italy: Product Market Regulation and Performance of Firms in Regulated Sectors

	Growth	Size		Productivity		
	Value Added	Value Added	Output	Value Added per worker	Output per worker	TFP
	(1)	(2)	(3)	(4)	(5)	(6)
PMR	-0.027 ***	-0.081 ***	-0.091 ***	-0.042 ***	-0.053 **	-0.012
	[0.006]	[0.021]	[0.027]	[0.016]	[0.023]	[0.010]
r2	0.05	0.54	0.32	0.15	0.14	0.09
N	170581	210589	263825	154845	175956	167196

Note: All regression include region-year and industry fixed effects. Robust standard errors clustered at the industry-year level. Sample period 2003–2013.

These findings likely reflect reallocation of resources across firms operating in the same sector in response to deregulation. As discussed above, greater competitive pressures could lead to improvements in sectoral productivity both as a result of an increase in the average productivity of surviving firms, owing to innovation or adoption of new technologies, or as a result of reallocation of output towards more productive firms and the exit of less efficient ones. Our baseline specification, which controls for fixed effects at the 2-digit NACE industry level, could capture either of these channels. In an alternative specification, we examine whether the observed relative increases in productivity in more deregulated sectors reflect changes in productivity within firms. [12] Our findings suggest that the positive association observed between sectoral output and productivity and PMR is driven primarily by reallocation of production across firms in Italy, i.e. firm entry and exit.[13] In a broader sample of advanced economies, IMF 2016 and Gal and Hijzen (2016) find evidence of improvements in the productivity for surviving firms as well.

B. Downstream Effects

Deregulation in network sectors benefits firms in downstream industries. Table 2 presents the regression results from estimating equation (2) for our six measures of firm performance. We find that the *UpstreamPMR* index has a negative and highly significant coefficient estimate, suggesting a strong role for deregulation in network sectors in enhancing the size and productivity of firms downstream. For example, a one standard deviation drop in the Upstream PMR is associated with a 3 percent higher growth in value added and 6 percent higher productivity. Alternatively, we could estimate what would be the

[12] In particular, we estimate equation (1) including firm rather than sectoral fixed effects. The results of this specification suggest no statistically significant relationship between deregulation and within firm changes in size or productivity.

[13] Since entry and exit are not very well captured in the Orbis database, the results should be interpreted with caution (for more details on measuring firm entry and exit in Orbis, see Gal and Hijzen (2016)).

hypothetical increase in productivity if a particular network sector were to be deregulated. For a firm in a sector with median dependence on road transportation, a one-standard-deviation improvement in the road PMR results in a 3.4 percent increase in output (3.1 percent for value added).

Table 2. Italy: Product Market Regulation Upstream and Performance of Firms Downstream

	Growth	Size		Productivity		
	Value Added	Value Added	Output	Value Added per worker	Output per worker	TFP
	(1)	(2)	(3)	(4)	(5)	(6)
Upstream PMR	-0.248 ***	-1.453 ***	-1.622 ***	-1.115 ***	-1.156 ***	-0.470 ***
	[0.073]	[0.178]	[0.239]	[0.154]	[0.237]	[0.126]
r2	0.05	0.55	0.39	0.21	0.32	0.11
N	3195309	3932165	4966821	2582690	2891712	3292512

Note: All regression include region-year and industry fixed effects. Robust standard errors clustered at the industry-year level. Sample period 2003–2013.

A sizable share of the benefits of deregulation in network sectors on downstream industries stem from the relative improvement in the performance of individual firms. In Table 3 we estimate equation (2) including firm fixed effects, rather than industry indicators. This specification captures the extent to which removal of barriers to competition upstream leads to higher growth and productivity within each firm. Contrary to our findings for regulated sectors, it appears that both reallocation across firms and improvement in the performance within firms explain the downstream effects we uncover. Controlling for firm fixed effects, which effectively shuts down the reallocation channel, reduces the point estimate of the coefficient on *UpstreamPMR* by about one-quarter to one-half (with the exception of the coefficient on value added growth). Nevertheless, across all measures, we observe *within* firm improvements in performance in response to deregulation in network industries. The estimated effects are of a similar order of magnitude as those found in other studies. If we were to consider a one standard deviation change in the upstream PMR (which captures both variation in the deregulation and input intensities), it would be associated with a 4 percent increase in TFP. Arnold and others (2015) find that a one standard deviation

Table 3. Italy: Product Market Regulation Upstream and Performance of Firms Downstream: Firm Fixed Effects

	Growth	Size		Productivity		
	Value Added	Value Added	Output	Value Added per worker	Output per worker	TFP
	(1)	(2)	(3)	(4)	(5)	(6)
Upstream PMR	-0.771 ***	-0.567 ***	-0.646 **	-0.759 ***	-0.420 ***	-0.331 ***
	[0.123]	[0.157]	[0.292]	[0.108]	[0.114]	[0.098]
r2	0.51	0.89	0.80	0.74	0.85	0.65
N	3195309	3932165	4966821	2582690	2891712	3292512

Note: All regression include region-year and firm fixed effects. Robust standard errors clustered at the industry-year level. Sample period 2003–2013.

change in a similarly constructed aggregate service reform indicator is associated with a 9.1 percent higher productivity in the manufacturing sector in India.

C. Downstream Effects: Difference by Firm Size and Sector

Smaller firms downstream benefit the most from deregulation of network industries. In Table 4, we estimate eq. (2) for four different categories of firms based on firm's average number of employees: firms with 1–9 employees, 10–19 employees, 20–49 employees, and 50 or more employees. Across all measures of firm performance, there is a very clear pattern. The point estimates of the estimated effect of deregulation upstream are significantly larger the smaller the downstream firms are. This likely reflects larger firms' ability to substitute inputs provided by regulated network industries if needed. The finding has important implications for the potential role of further deregulation in network industries in supporting the growth of Italy's very large SME sector.

Table 4. Product Market Regulation Upstream and Performance of Firms Downstream: Difference by Firm Size

	Growth	Size	Productivity	
	Value Added	Value Added	Value Added per worker	TFP
		Firms with 1-9 employees		
Upstream PMR	-0.488 ***	-1.869 ***	-1.607 ***	-0.566 ***
	[0.087]	[0.189]	[0.183]	[0.132]
r2	0.09	0.11	0.17	0.03
N	2008523	2640904	1633016	2148051
		Firms with 10-19 employees		
Upstream PMR	-0.330 ***	-1.269 ***	-0.940 ***	-0.368 ***
	[0.104]	[0.170]	[0.169]	[0.135]
r2	0.17	0.19	0.26	0.08
N	568724	687365	465426	587282
		Firms with 20-49 employees		
Upstream PMR	-0.259 **	-0.841 ***	-0.829 ***	-0.095
	[0.105]	[0.204]	[0.167]	[0.148]
r2	0.15	0.22	0.28	0.13
N	346042	410926	287111	355617
		Firms with 50 or more employees		
Upstream PMR	0.014	-0.484 **	-0.593 ***	-0.061
	[0.083]	[0.216]	[0.143]	[0.130]
r2	0.08	0.20	0.33	0.25
N	197373	192970	197137	201562

Note: All regression include region-year and industry fixed effects. Robust standard errors clustered at the industry-year level. Sample period 2003–2013.

Across broad sectors, on the other hand, product market reforms appear to have similar downstream effects. In Table 5, we examine the downstream effect of deregulation on the performance of firms in the manufacturing and construction sector, and in the services sectors. While there is some variation in the magnitude of the point estimates across the two

broad sectors of the economy, there is no evidence indicating that firms in the manufacturing sector are benefiting more from enhancing competition in network industries upstream than firms in the services sector.

Table 5. Product Market Regulation Upstream and Performance of Firms Downstream: Sectoral Differences

	Growth	Size	Productivity	
	Value Added	Value Added	Value Added per worker	TFP
		Manufacturing and Construction		
Upstream PMR	-0.280 ***	-1.487 ***	-1.179 ***	-0.761 ***
	[0.108]	[0.297]	[0.248]	[0.224]
r2	0.06	0.59	0.16	0.10
N	1320072	1592389	1075826	1364592
		Services		
Upstream PMR	-0.104	-1.599 ***	-1.403 ***	-0.320 ***
	[0.094]	[0.167]	[0.234]	[0.101]
r2	0.05	0.49	0.23	0.12
N	1810291	2257924	1456340	1859048

Note: All regression include region-year and industry fixed effects. Robust standard errors clustered at the industry-year level. Sample period 2003–2013.

D. Robustness

Our findings on the downstream effects of network industries deregulation are robust to various modifications. Table 6 summarizes our findings as we vary the treatment of outliers, control for changes in energy prices, use the U.K. input-output matrix, and include indicators of deregulation in the retail and professional services industries.

- In our baseline, we exclude the top and bottom 1 percent of values of firm performance variables to avoid distortions that might be introduced by extreme values. In panel B–D of Table 6, we present several modifications to this approach. In panel B, we exclude the top and bottom 2 percent of values, in panel C, we exclude the top and bottom 5 percent of values, while in panel D we winsorize at the 2nd and 98th percentile of the distribution of the relevant respective dependent variable. Across all of these treatments of outliers, the estimated point estimate on upstream PMR remains quite similar in magnitude and statistically significant.

- Global changes in energy prices could have significant effect on firm performance. To the extent that such changes coincide with deregulation in the energy sectors, our strategy may incorrectly attribute the effects of global energy price shocks to the reduction in upstream PMR. To account for this possibility, we include an additional interaction term to the baseline specification, defined as the log change in international oil price in euros times the energy intensity of each sector. Our baseline results are robust to the inclusion of energy prices (Table 6, Panel E).

- The baseline specification uses the Italian input-output matrix to measures the dependence of industries on regulated products. This allows us to better reflect the structure of the Italian economy and reduce measurement error, but it may also reflect the endogenous response of firms, which may chose to avoid inputs from highly regulated markets. Similarly to Barone and Cingano (2011), we address the issue by using the input-output matrix of a third country believed to have good product market regulation, on the basis that in such a country input-use decisions would not be distorted by regulation. We use the U.K. input-output matrix on the basis that it is the European country with the best OECD PMR scores in 2010. Results are generally stronger when using U.K. input intensities across all measures of firm performance metrics (Table 6, Panel F).

- Our baseline results focus on the downstream effect of deregulation in the network sectors, for which we have annual data on the degree of product market regulation. We examine to what extent our findings extend to liberalization in other key inputs of production, such as the retail sector and professional services. We augment our measure of upstream PMR to include all 9 sectors and reestimate equation (1) using the three years of data (2003, 2008 and 2013) for which PMR indicators for the retail and professional services are available. Using this restricted sample, we find very similar patterns in the data. Deregulation leads to significant productivity improvements in firms in downstream industries (Table 6, Panel G).

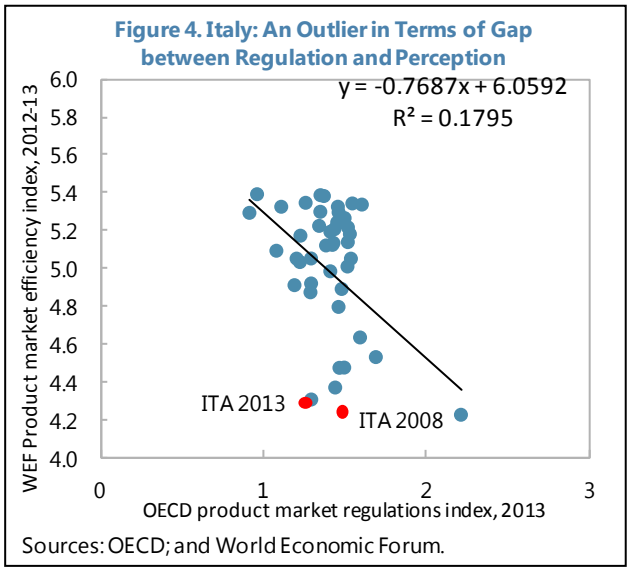
Table 6. Italy: Product Market Regulation Upstream and Performance of Firms Downstream: Robustness

	Growth	Size		Productivity		
	Value Added	Value Added	Output	Value Added per worker	Output per worker	TFP
	(1)	(2)	(3)	(4)	(5)	(6)
A. Baseline						
Upstream PMR	-0.248 ***	-1.453 ***	-1.622 ***	-1.115 ***	-1.156 ***	-0.470 ***
	[0.073]	[0.178]	[0.239]	[0.154]	[0.237]	[0.126]
r2	0.05	0.55	0.39	0.21	0.32	0.11
N	3195309	3932165	4966821	2582690	2891712	3292512
B. Top and Bottom 2 percent excluded						
Upstream PMR	-0.224 ***	-1.415 ***	-1.61 ***	-1.019 ***	-1.034 ***	-0.471 ***
	[0.066]	[0.175]	[0.229]	[0.154]	[0.225]	[0.118]
r2	0.05	0.53	0.39	0.21	0.32	0.13
N	3,130,100	3,858,907	4,884,330	2,529,982	2,832,698	3,232,825
C. Top and Bottom 5 percent excluded						
Upstream PMR	-0.141 ***	-1.368 ***	-1.489 ***	-0.923 ***	-0.758 ***	-0.479 ***
	[0.051]	[0.161]	[0.198]	[0.140]	[0.189]	[0.102]
r2	0.04	0.49	0.36	0.21	0.3	0.14
N	2,934,468	3,633,194	4,637,376	2,371,859	2,655,653	3,042,928
D. Winsorized at the 2nd and 98th percentil						
Upstream PMR	-0.277 ***	-1.453 ***	-1.653 ***	-1.128 ***	-1.131 ***	-0.432 ***
	[0.077]	[0.174]	[0.243]	[0.149]	[0.227]	[0.129]
r2	0.07	0.57	0.41	0.21	0.32	0.1
N	3,260,520	4,004,159	5,051,452	2,635,396	2,950,726	3,349,424
E. Control for oil price shocks						
Oil Price Shock*Oil Intensity	-0.314	-0.786 *	-1.014	-0.963 ***	-0.965 ***	-0.747 **
	[0.299]	[0.449]	[0.626]	[0.302]	[0.353]	[0.306]
Upstream PMR	-0.289 ***	-1.457 ***	-1.629 ***	-1.125 ***	-1.168 ***	-0.468 ***
	[0.075]	[0.178]	[0.239]	[0.154]	[0.237]	[0.126]
r2	0.05	0.55	0.39	0.21	0.32	0.11
N	3150293	3932165	4966821	2582690	2891712	3292512
F. UK Input-Output Matrix						
Upstream PMR	-0.302 ***	-1.638 ***	-1.588 ***	-1.130 ***	-0.981 ***	-0.541 ***
	[0.088]	[0.185]	[0.259]	[0.152]	[0.249]	[0.133]
r2	0.05	0.55	0.39	0.21	0.32	0.11
N	3150420	3932330	4967105	2582808	2891868	3292646
G. Upstream PMR Based on All Regulated Sectors						
Upstream PMR All sectors	-0.008	-1.405 ***	-1.897 ***	-0.960 ***	-1.344 ***	-0.013
	[0.108]	[0.361]	[0.447]	[0.259]	[0.364]	[0.332]
r2	0.04	0.55	0.38	0.18	0.30	0.10
N	699983	837307	1065785	715422	812380	620041

Note: All regression include region-year and firm fixed effects. Robust standard errors clustered at the industry-year level. Sample period 2003 –2013 in Panels A - F, and 2003, 2008, and 2013 in Panel G.

IV. LEGISLATED VS. IMPLEMENTED REFORMS

There is large regional variation in public sector efficiency and ample anecdotal evidence that the implementation of structural reforms is uneven in Italy. The issue may be especially important in policy areas where regional governments have implementing powers, such as in some product markets, for example, the retail sector.[14] Work by the Italian anti-trust authority is consistent with this idea: commercial liberalization measures legislated by the central government in 1998 appear to have had heterogeneous effects across regions (AGCM 2007). The unusually large discrepancy between the OECD PMRs and a survey-based index of product market efficiency by the World Economic Forum (Figure 4) also lends support to the theory that product market reform implementation may be imperfect.[15]



We examine whether the efficiency of the public sector shapes the effects of *de jure* product market regulation. In particular, if we believe that provinces with more efficient public administration are better at *implementing* legislation regarding product market regulation, we would expect deregulation to lead to better outcomes in these provinces, both in the regulated sectors themselves, as well as in downstream industries located there. As mentioned earlier, there is equally a possibility that firms benefit from complementarities between better public services and product market regulation, irrespective of whether efficient public administrations are better at implementing regulation. In our empirical framework, complementarities and heterogeneous implementation of product market reforms are observationally equivalent.

For firms in regulated sectors, we estimate the following extension of equation (1):

$$Y_{ip\pi t} = \delta * PMR_{pt} + \theta * GovEff_{\pi} * PMR_{pt} + \gamma X_{ip\pi t} + \alpha_{\pi t} + \alpha_{p} + \varepsilon_{ip\pi t} \qquad (3)$$

[14]A Constitutional Court ruling in 2012 attenuated the regional implementation issues in the retail sector. Judgment of the Constitutional Court no. 18 of 7.2.2012, on trade by Mr. Gabriele, IL COMMERCIO TRA COMPETENZA LEGISLATIVA REGIONALE, TUTELA DELLA CONCORRENZA ED INIZIATIVA ECONOMICA PRIVATA.

[15]O'Brien (2013) discusses the relative disconnect between improvements in the PMR over 1998–2008 and poor growth. He argues that regulation may be more restrictive than it appears on paper due to the way legislation is drafted, and factors such as the operation of the public administration and corruption.

where $Y_{ip\pi t}$ is a performance indicator for firm *i* operating in regulated sector *p* in province π at time *t*, PMR_{pt} is the standard PMR for sector *p* at time *t*, $GovEff_{\pi}$ is an indicator of government efficiency in province π (higher values mean more efficiency), $X_{ip\pi t}$ contains firm-specific controls as in the baseline, $\alpha_{\pi t}$ is a set of province-year fixed effects (103 provinces), and α_p is a set of sector fixed effects (2-digit NACE Revision 2 classification). $\varepsilon_{ip\pi t}$ is an error term, clustered at the industry-year level. If a certain level of *de jure* product market regulation as captured by PMR_{pt} is associated with relatively better firm outcomes in provinces where the government is more efficient, we would expect θ to be negative and significant and we would also expect $\frac{\partial Y}{\partial PMR} = \delta + \theta * GovEff_{\pi} < 0$. The province-year fixed effects would absorb all the non-interacted effects of government efficiency on firm performance.

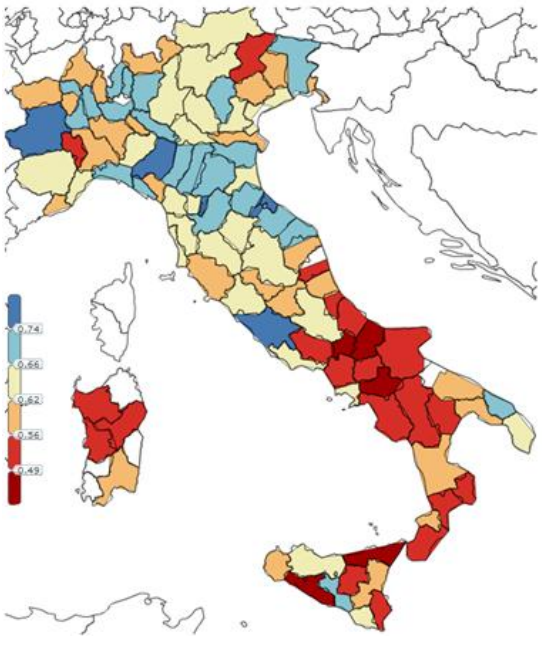
The strategy to study the role of government efficiency in shaping the downstream effects of regulation is similar:

$$Y_{is\pi t} = \beta * UPMR_{st} + \rho * GovEff_{\pi} * UPMR_{st} + \gamma X_{is\pi t} + \alpha_{\pi t} + \alpha_s + \varepsilon_{is\pi t}$$

Similarly to equation (3), if the downstream effects of a certain set *de jure* OECD PMRs is increasing with government efficiency, ρ will be negative and significant.

We rely on Giordano and Tommasino (2013) for a measure of government efficiency at the provincial level. Their measure, based on data for 2007, compares actual and potential performance of provincial governments based on the concept of technical efficiency. Efficiency is calculated for five key public services in 103 provinces: education, civil justice, health, child care, and waste collection. The final score is an average across the five categories and displays significant variation across provinces (Figure 5). The work of Giordano and Tommasino (2013) does not measure directly the capacity of local government to implement product market legislation but can be seen as a reasonable proxy under the assumption that a government that is fairly efficient in the five areas above is also efficient at implementing product market regulation. The lack of time variation in the efficiency measure is also a potential issue but of second order since the determinants of efficiency are largely institutional in nature and slow moving.

Figure 5. Italy: Public Sector Efficiency



Source: Giordano and Tommasino (2013).

We find evidence that public sector efficiency matters.

- For regulated sectors, the association between PMR liberalization and firm performance is substantially stronger in where the provincial government is more efficient (negative and significant interaction terms in Table 7). For instance, a one-standard-deviation improvement in the PMR is associated with a 0.3 percent increase in output for a firm in a province on the upper quartile of government efficiency, but only 0.1 percent for a firm in a province on the lower quartile of government efficiency. The equivalent figures for output per worker are 0.2 and about zero percent. As noted above, the findings would also be consistent with the presence of significant complementarities between high-quality public services and more efficient product markets.

Table 7. Italy: Product Market Regulation and Performance of Firms in Regulated Sectors: The Role of Government Efficiency

	Growth	Size		Productivity		
	Value Added	Value Added	Output	Value Added per worker	Output per worker	TFP
	(1)	(2)	(3)	(4)	(5)	(6)
PMR	0.034 **	0.273 ***	0.263 ***	0.191 ***	0.235 ***	0.059 ***
	[0.015]	[0.040]	[0.057]	[0.035]	[0.051]	[0.022]
PMR * Public Sector Efficiency	-0.088 ***	-0.533 ***	-0.531 ***	-0.351 ***	-0.436 ***	-0.107 ***
	[0.021]	[0.050]	[0.068]	[0.046]	[0.067]	[0.031]
r2	0.06	0.54	0.32	0.16	0.15	0.10
N	168176	210589	263825	154845	175956	167196

Note: All regression include province-year and industry fixed effects. Robust standard errors clustered at the industry-year level. Sample period 2003–2013.

- In the downstream regressions, there is also some evidence to that effect (Table 8). Except for value added and TFP, all the interactions of the upstream PMR indicator and provincial government efficiency have the expected negative sign and are statistically different from zero. Our findings would indicate that moving from the lower to the upper quartile of government efficiency increases the impact of a one-standard-deviation improvement in the road PMR on firm size by 0.3 percentage points (assuming median dependence on road transportation).

Table 8. Italy: Product Market Regulation Upstream and Performance of Firms Downstream: The Role of Government Efficiency

	Growth	Size		Productivity		
	Value Added	Value Added	Output	Value Added per worker	Output per worker	TFP
	(1)	(2)	(3)	(4)	(5)	(6)
Upstream PMR	-0.229 ***	-1.577 ***	-0.650 **	-0.934 ***	0.237	-0.590 ***
	[0.079]	[0.204]	[0.266]	[0.162]	[0.238]	[0.130]
Upstream PMR * Public Sector Efficiency	-0.078 **	0.208 **	-1.436 ***	-0.263 ***	-2.054 ***	0.190 ***
	[0.034]	[0.105]	[0.132]	[0.079]	[0.125]	[0.052]
r2	0.05	0.55	0.39	0.21	0.33	0.11
N	3150293	3932165	4966821	2582690	2891712	3292512

Note: All regression include province-year and industry fixed effects. Robust standard errors clustered at the industry-year level. Sample period 2003–2013.

V. CONCLUSION

Growth and productivity have been stagnant in Italy for more than a decade. Many proximate causes have been put forward, including weak product market competition. The empirical evidence in this paper suggests that further product market reforms could be an important policy lever to lift potential growth.

Using a rich dataset, we study the association between regulation and the performance of firms in regulated sectors, as well as broader downstream effects. For firms in regulated sectors, we find a positive association between liberalization and firm growth, size, employment, and productivity. For instance, a one-standard deviation improvement in the PMR is associated with 9 percent larger firms. We also find evidence of positive downstream effects of liberalization. Firms that use inputs of regulated network industries more intensely, increase their size and productivity relatively more.

We also find evidence that deregulation has a stronger positive impact in provinces with more efficiently provided public services. This finding suggests that there may be important complementarities between public services provision and deregulation. Alternatively, if government efficiency proxies the quality of implementation of legislated deregulation, it suggests that the quality of implementation shapes the effectiveness of deregulation. While our analysis is unable to pinpoint the exact mechanism behind this empirical finding, it underscores the synergies of advancing public administration and product market reforms simultaneously.

Appendix

Table A.1. Italy: Summary Statistics

	Network industres			All industries		
	N	Mean	Standard Deviation	N	Mean	Standard Deviation
Growth of value added	170,581	0.058	0.481	3,195,309	0.031	0.466
Log Value Added	210,589	12.255	1.455	3,932,165	12.287	1.415
Log Output	263,825	13.409	1.654	4,966,821	13.326	1.684
Log Value Added per Worker	154,845	10.542	0.761	2,582,690	10.578	0.757
Log Output per worker	175,956	11.969	1.017	2,891,712	11.895	1.085
TFP	167,196	-0.007	0.513	3,292,512	0.001	0.525

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