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PRODUCTIVITY AND ENTRY REGULATION: EVIDENCE FROM THE UNIVERSE OF FIRMS

by Andrea Cintolesi*, Sauro Mocetti** and Giacomo Roma**

Abstract

Burdensome entry regulations can impede productivity growth, particularly in the service sector, which is characterized by limited competition. We examine this issue using a novel indicator of entry regulation at the 5-digit sector level, relying on a unique dataset that covers the universe of firms and exploiting different reforms that changed the extent of regulation across sectors and over time. These new data reveal that, akin to productivity, entry regulation varies significantly across narrowly defined sectors. The empirical analysis shows that, in sectors undergoing reforms, productivity and entry rates increase and prices decrease relative to the control sectors. The increase in the productivity of incumbent firms and, to a lesser extent, reallocation and selection mechanisms contribute to the overall effect on aggregate productivity. Although both professional requirements and red tape negatively affect productivity, the second one proves more relevant. Finally, the impact of entry regulation varies across firms and industries and it is stronger in sectors with higher 'natural' entry rates.

JEL Classification: K20, L20, L51, J44, L80, L90, D24, O47.

Keywords: regulation, red tape, occupational licensing, labour productivity, firm entry, allocative efficiency.

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1 Introduction[1]

In all advanced economies, governments intervene in product markets through regulatory policies. These interventions are generally motivated by market failures, including externalities and asymmetric information. However, if poorly designed, regulation may excessively affect the degree of competition between firms by raising unnecessary barriers to entry and imposing needlessly time-consuming procedures.

In the literature there is wide consensus that cutting red tape and lowering barriers to entrepreneurship and firm entry could stimulate business dynamism and productivity. For example, enhanced competition might induce incumbents to become more productive (the «within-firm») and the most efficient ones to outgrow the others, thus increasing their employment share in the market (the «between-firm» margin). However, some tighter entry barriers might also lead to a positive selection if the firms that finally enter the market have a higher productivity than in an unconstrained economy. Therefore, there might be several mechanisms at work and the answer to this research question is ultimately empirical.

The aim of this paper is to examine whether, and to what extent, entry regulation affects productivity growth in the service sector. We examine this issue building a novel indicator of entry regulation at the 5-digit sector level, relying on a unique dataset that covers the universe of firms (i.e., including corporations, partnerships, self-employed and professionals working alone) and exploiting different reforms that changed the extent of entry regulation across sectors and over time.

Concerning the measurement of entry barriers, we hand-collect and standardize information on two dimensions of regulation. The first one is related to occupational licensing and refers to the minimum years of education and training (and, eventually, further time to prepare and pass the state exam) that are required to practice certain professions. Then, we map these occupations at the 5-digit sector level, i.e., for each economic activity we consider the strength of occupational licensing depending on whether a certain profession is essential or not to make that business. The second dimension concerns the number, complexity and length of administrative procedures, including those related to the authorization and permits required to start-up a business (going from the absence of any formality in certain activities to the existence of authorizations and quotas in others) and administrative compliance regarding health and safety.

In the empirical analysis we exploit the sector-year variation in a two-way fixed effects model, using both firm-level and aggregate evidence. We find that a reduction of entry

[1]We thank Antonio Accetturo, Gaetano Basso, Emanuele Ciani, Federico Cingano, Silvia Del Prete, Andrea Linarello and participants at Bank of Italy and University of Bologna seminars and AIEL, University of Rome Tor Vergata and SIDE conferences for useful comments and suggestions. We use information from Frame-SBS dataset, an integrated firm-level dataset provided by Istat. The analyses were conducted at the Laboratory for Elementary Data Analysis of Istat in compliance with regulations on personal data protection. The views expressed in this paper are those of the authors and do not involve the responsibility of the Bank of Italy. The usual disclaimers apply.

regulation is associated to a significant increase in labour productivity and entry rate and a decrease in prices. Namely, the liberalizations that occurred between 2005 and 2019 has led to an increase in productivity of 3 to 8 percentage points in the treated sectors during the period under review. We also find a positive effect on the entry rate and a negative effect on prices. The aggregate productivity growth is attributable to an increase in the productivity of both new entrants (i.e., positive selection at entry) and established firms; some evidence points to a possible role played by improved allocative efficiency. Exploring the different domains of regulation we find that both professional requirements and bureaucratic procedures have a detrimental impact on productivity, although the effect of the latter is quantitatively more significant. Finally, the impact of entry regulation on productivity varies across firms and industries. It is concentrated among larger firms and those above the median of the productivity distribution, while it is not significant for the left tail of the distribution. Moreover, the effect is stronger in sectors characterized by a higher «natural» entry rate – i.e., where entry barriers might have a more detrimental effect on business dynamism.

In the existing empirical evidence different empirical strategies have been adopted to examine the relationship between entry regulation and business dynamism and productivity. Following the influential paper by Djankov et al. (2002), a first stream of research exploits country-industry variation in the impact of entry regulation to detect effects on job and firm creation (Klapper et al. (2006); Ciccone and Papaioannou (2007)) and productivity (Nicoletti and Scarpetta (2003); Barseghyan (2008); Andrews and Cingano (2014); Egert (2016); Ciapanna et al. (2023)). A second stream of research exploits region and/or industry-specific variation in entry costs created by policies within a particular country (Bertrand and Kramarz (2002); Kaplan et al. (2011)). A third stream of research exploits similar policy changes moving the analysis from aggregate to firm-level data (Branstetter et al. (2013); Schiffbauer et al. (2022)).

With respect to these streams of research, we exploit across sectors variation in a within-country setting and use firm-level data. We contribute to the literature on two main aspects. First, our indicator captures a huge heterogeneity of entry regulation that has so far been neglected. For example, within the trade sector there are economic activities characterized by different entry barriers such as, among others, pharmacies (occupational licensing and restricted administrative concessions), tobacconists (no licensing but restricted concessions), wholesale agents (only mild licensing) and retail sale of clothing (only mild administrative requirements). Similarly, within the professional services there are activities subject to quite diverse entry requirements such as notaries (licensing and quotas), lawyers and accountants (only licensing) and advertising agencies (absence of any entry regulation). While being interesting by itself, this heterogeneity also implies that previous findings relying on broader regulatory indicators (e.g., OECD's PMR indicators) may be subject to significant bias in the estimates.

Second, we use firm-level data on the universe of firms. This, in turn, has a number of advantages if compared to existing papers. On the one hand, we consider also individual firms and those structured as partnerships that represent a significant share of firms (and employment) in the service sector. On the other hand, the comprehensive data at our disposal allow to analyze how the response to the regulatory framework differs across different types of firms and markets and, by doing so, to describe the mechanisms through which product market reforms operate. They also allow to decompose the productivity variation in different components and to examine the role of the selection and reallocation processes at work (Melitz and Polanec (2015)). To the best of our knowledge, this is the first time such an analysis has been carried out, with the unavailability of this data in previous studies likely being the main reason.[2]

The rest of the paper is structured as follows. Section 2 provides a literature review on the economics of entry regulation and its effects. Section 3 describes the data on the universe of firms and the index of entry regulation. Section 4 discusses the empirical strategy and the main findings. Section 5 concludes the paper.

2 Related Literature

Economists have presented two contrasting views of regulation of economic activity. According to the public interest theory, associated with Pigou (1938), regulation serves to remedy market failures such as externalities and asymmetric information. For example, administrative compliance with health and safety rules might help to address the existence of externalities associated to business activities. Moreover, licensing, by setting minimum skills standards for entry into certain occupations (i.e., a better selection of practitioners), might help to overcome market failures due to lack of expert knowledge of consumers on the quality of the services they receive (Leland (1979)). The public choice theory, in contrast, argues that regulation might lead to socially inefficient outcomes, either because industry incumbents are able to lobby government officials to pass laws that grant them rents (Stigler (1971)) or because politicians use regulation to extract rents for their own benefit (Shleifer and Vishny (1993)).[3] Both perspectives suggest that entry regulation in particular will have an impact on industrial structure by directly influencing the costs of starting a new enterprise in a given industry, but differ in their views on the relative trade-off between the correction of externalities and the creation of market power. On these grounds, it is

[2]Previous studies using firm-level data do have sample selection rules, excluding firms with less than US$2 million in Branstetter et al. (2013) or those without employees in Schiffbauer et al. (2022).

[3]In Stigler (1971)'s theory of regulatory capture, «regulation is acquired by the industry and is designed and operated primarily for its benefit». Namely, incumbents are able to shape regulations that create rents for themselves, since they typically face lower information and organization costs than the dispersed consumers. Moreover, politicians and bureaucrats might also use regulation to create and extract rents: according to Shleifer and Vishny (1993) «an important reason why many of these permits and regulations exist is probably to give officials the power to deny them and to collect bribes in return for providing the permits».

fairly impossible from a theoretical point of view to determine whether a more stringent regulation will increase or decrease social welfare.

In the literature, many scholars have examined the *economic* impact of entry regulation, such as business dynamism and productivity, while *de facto* neglecting (also due to the difficulty in finding proper measures) other goals of regulation such as the quality of services.

One set of studies exploits country or country-sector data to examine the association between the stringency of entry regulation and measures of economic performance at that level. Stricter entry barriers have been shown to hamper economy-wide entrepreneurship by favoring a higher concentration of activity in the informal sector (Djankov et al. (2002)), stifling job and firm creation (Klapper et al. (2006); Ciccone and Papaioannou (2007)), reducing investments (Alesina et al. (2005)) and productivity (Nicoletti and Scarpetta (2003); Barseghyan (2008); Egert (2016); Duval and Furceri (2018); Ciapanna et al. (2023)), also by worsening allocative efficiency (Andrews and Cingano (2014)).[4] Beyond direct effects in regulated sectors, regulation might also have relevant indirect effects on the downstream industries, in particular when they impact the production of key non-tradable inputs, reducing output and productivity (Barone and Cingano (2011); Bourlès et al. (2013)).

A second (and complementary) set of studies seeks to directly assess the consequences of policies that reduce firm entry costs using region and/or industry-specific variation created by policies within a particular country. Several papers have notably exploited reforms in the retail industry. Bertrand and Kramarz (2002) evaluate a commercial regulation in France and, using data at department level, find that stricter entry barriers (leading to decisions rejecting requests for the creation or the expansion of stores) reduced employment growth in the retail sector and increased prices. Schivardi and Viviano (2011), exploiting a staggered implementation of a reform across Italian regions, find that entry barriers in the retail trade sector are associated to substantially larger profit margins and lower productivity of incumbent firms. Loecker et al. (2016) examine how prices, markups, and marginal costs respond to liberalization, exploiting India's trade reform episode. Other papers examined the impact of entry costs across all sectors. For example, Kaplan et al. (2011) exploit an entry regulation reform in Mexico that significantly speeds up firm registration procedure and, using data at municipality-industry level, find that the reform increased firm creation and employment.[5] Other studies examine the effect of the volume and fragmentation of regulation on macroeconomic performance with data broken down at local level (Dawson and Seater (2013); Mora-Sanguinetti and Perez-Valls (2021); Mora-Sanguinetti et al. (2023)).

A third set of studies move forwards the analysis with individual and firm-level data. In

[4] Fattal-Jaef (2022) examines the interaction between entry barriers and distortions to allocative efficiency in a model of firm dynamics, also showing that inferred entry barriers resemble regulation-based indicators in advanced economies.

[5] A similar strategy has been adopted for Italy by Amici et al. (2016) who study the impact of a simplification in bureaucratic procedures for starting up a business by exploiting the staggered implementation of the reform at municipality level. They find that both entry rates and survival probability of new entrants increased.

particular, Branstetter et al. (2013) evaluate the effects of a regulatory reform in Portugal, which substantially reduced the cost of firm entry, and find positive effects in terms of firm and job creation, although the effects concerned mostly marginal firms (i.e., small and owned by relatively poorly-educated entrepreneurs).[6] Schiffbauer et al. (2022), using data on the removal of municipal- and sector-specific entry barriers in Peru, find positive impact on firm productivity. A parallel set of studies focused on occupational licensing, thus considering a particular dimension of entry barriers (professional requirements). Empirical evidence in this area shows that the strictness of licensing is correlated with higher wages and prices and some evidence of downward effects on employment and hours worked (Kleiner and Krueger (2013); Gittleman et al. (2018); Pagliero (2019)) and productivity (Bambalaite et al. (2020)).[7]

3 Data and Variables

3.1 Firm-Level Data and Productivity

Our main data source is a unique firm-level dataset that contains the universe of active firms (i.e., firms whose production processes were active for at least 6 months in a given business year) between 2005 and 2019.[8]

The dataset has been jointly developed by the Bank of Italy and the Italian National Statistical Agency (Istat); it combines the information of the Italian Register of Active Firms (ASIA) with data retrieved from statistical, administrative, and fiscal sources. It contains information on firm location, legal status, incorporation date, industry classification (NACE classification at the 5-digit level), number of persons employed, turnover, and value added. Crucially, this dataset includes also partnerships and individual firms (i.e., sole proprietorship) and not only incorporated firms, which are quite unrepresentative of the universe of firms in the service sector.[9]

We focus the analysis on the private non-financial service sector and, in particular, we consider sections G (wholesale and retail trade), H (transportation and storage), I (accommodation and food), J (information and communication), M (professional services) and N (administrative and support services).[10]

[6] Importantly, the reform reduced the time delay of legal incorporation and the monetary fees. Theoretical models show that, while reducing monetary and time costs is likely to increase firm entry, the implications for the selection of new entrants might differ. Higher fees might lead to a selection of most productive firms while the time spent because of red tape (filling out paperwork, getting permits from different offices, etc.) might increase the opportunity cost to enter and lead to a negative selection in terms of individual ability.

[7] See Mocetti et al. (2022) for evidence on the Italian labor market. There is also evidence that occupational regulations stifle geographical mobility of workers (Johnson and Kleiner (2020)).

[8] See Abbate et al. (2017) for a detailed description of the dataset.

[9] See Table A1 in the Appendix for structural information on the service sector by firm size in Italy.

[10] In the sensitivity analysis we also include sections P (education), Q (health and social work), R (arts, entertainment and recreation) and S (other services). We exclude them from the main analysis because the productivity dynamics in these sectors might be flawed by other factors, such as public intervention.

We deflate turnover and value added using the value added deflator, drawn from national accounts, which is essentially defined at the NACE 2-digit level, although some small sectors are further aggregated. To the same aim, we also use a newly build index aimed at getting a finer gauge of prices (NACE 4-digit level). We obtained this index in several steps. First, we collect data from ISTAT on services and products prices. Second, we map these services and products into sectors (NACE 4-digit level) using the RAMON tables (Reference and Management of Nomenclatures). For some NACE 4-digit sectors we do not find any reference products or services, whereas for others we have many. In the former case, we impute the deflator using the 2-digit level data. In the latter case, we select and average the most representative products and services for the economic activity. For example, in the case of legal activities we consider only the dynamics of legal services, while we do not consider more general services that are less sector-specific, such as secretariat services.[11]

Labor productivity is defined as the value added per worker, in real terms. If we aggregate firm-level data at the NACE section-level they fairly overlap that inferred from National Account data, as shown in Figure 1. The main divergences concern professional, administrative and support service activities, with figures drawn from national accounts showing a more negative trend. The sector breakdown also highlights strong heterogeneity in the dynamics: from 2005 onwards, the trade activities and, although to a lesser extent, information and communication services exhibit an increase in productivity, while there are varying degrees of negative trends in the other private service sectors.

It is worth noting that labor productivity varies significantly also within the NACE section-level. In Figure 2 we compare the distribution of labor productivity at the 5-digit sector level for main industries. The productivity dispersion is higher in trade activities and in information and communication services.

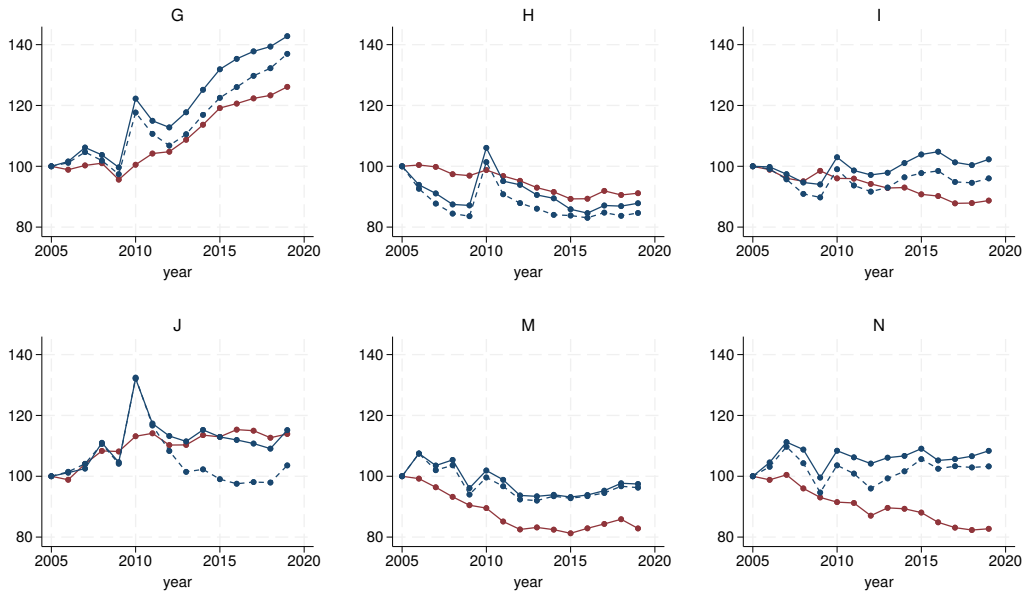
3.2 Entry Regulation Index

We complement firm-level data with a novel indicator of entry regulation for economic activities defined at the NACE 5-digit level. The indicator has a pyramidal structure and includes, as shown in Figure 3, two main regulatory domains: the professional requirements – needed to access and practice some occupations – and the red tape – i.e., the administrative rules to comply with in order to start a business.

Concerning the first domain, in order to identify the economic activities for which professional requirements are required, we operated in two stages. First, we identified among all occupations those for which occupational requirements are provided, based on the Regulated Profession Database of the European Commission. Next, for each NACE 5-digit economic activity, we examined whether having at least one «licensed» worker is necessary

[11] In the empirical analysis we prefer to use the price index that we built at the 4-digit level, in order to better capture within industries heterogeneity. Nevertheless, when collapsed at the same NACE section-level, they show very similar patterns over time (see Figure A1 in the Appendix).

Figure 1: Labor Productivity: Aggregated Firm-Level Data and National Accounts

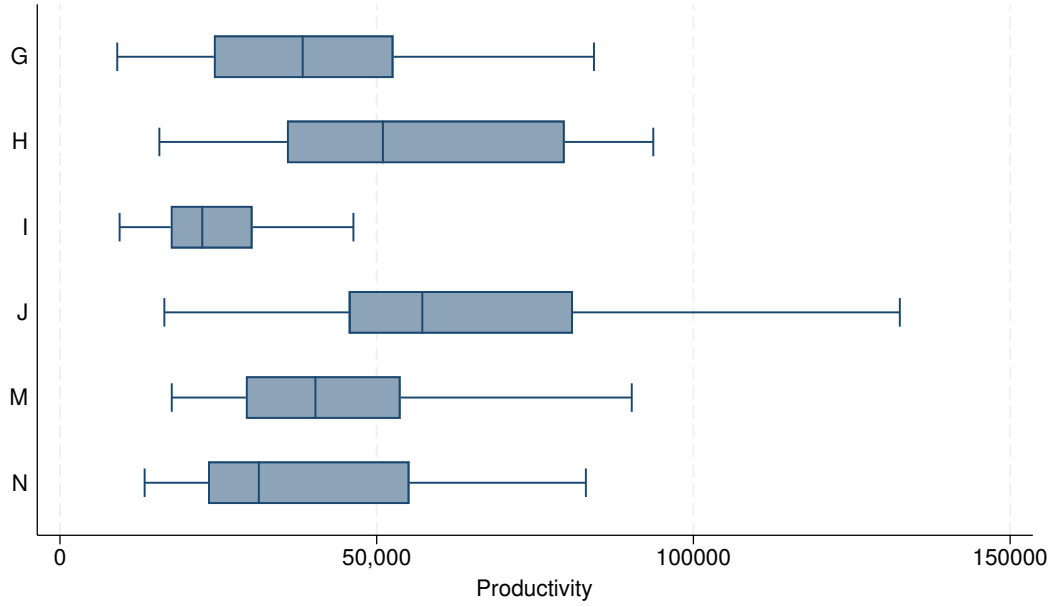


Note — The red line is the labor productivity drawn from the national accounts and deflated with the GDP deflator. The blue lines is the weighted average of labor productivity (value added per worker) drawn from firm-level data, using labor share as weights; these figures have been deflated with the GDP deflator (solid line) and with the price index (dashed line). The NACE sections are: G = Wholesale and retail trade; H = Transportation and storage; I = Accommodation and food service activities; J = Information and communication; M = Professional, scientific and technical activities; N = Administrative and support service activities.

to do that business. This is true both for professional activities (e.g., lawyers, accountants), for which it is necessary for all workers, except for any support figures, to possess the professional requirements, and for others, for which it is necessary for at least the owner to possess higher (e.g., pharmacists) or lower (e.g., bar tenants) professional qualifications. For these occupations, we consider the individual requirements in terms of education and training.[12] We identify in laws and regulations regarding each occupation which education or training degree beyond compulsory education enables an individual to practice a profession (high school diploma, university degree, training course, professional experience or vocational training) and its length. If more than a single degree is necessary, we consider the length of the whole period. Moreover, for each occupation we also record whether passing an entry exam is needed to access and practice the profession; if so, we assume additional six months to prepare for and pass. As a result, there are occupations (and the corresponding economic activities) that have higher education and training requirements (e.g., lawyers and

[12]In advanced economies, the share of occupations and workers covered by such regulations is large and, where historical data are available, this share has been shown to rise over time (Kleiner and Krueger (2013); Mocetti et al. (2022)).

Figure 2: Labor Productivity Across and Within Industries

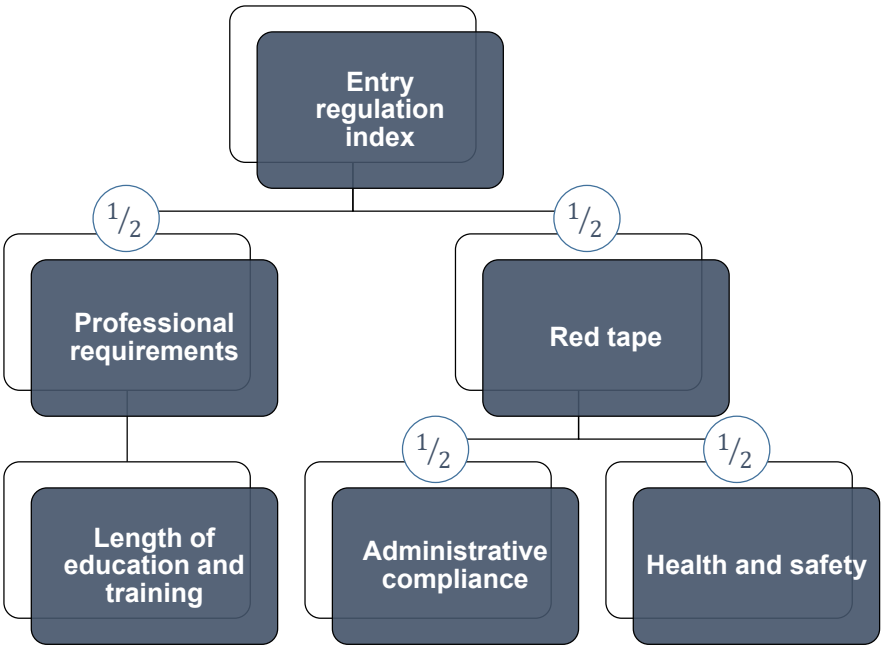


Note — Boxplot of labor productivity across and within industries. The observation unit is productivity average over the 2005-2019 period at the 5-digit level. Lines mark the lower adjacent value, the 1st quartile, the median, the third quartile and the upper adjacent value of the distributions. The NACE sections are: G = Wholesale and retail trade; H = Transportation and storage; I = Accommodation and food service activities; J = Information and communication; M = Professional, scientific and technical activities; N = Administrative and support service activities.

accountants), other occupations that are subject to milder requirements (e.g., aesthetician and dry cleaner) and, finally, unregulated occupations (e.g., shop keeper and advertiser). This continuous variable has been normalized to vary in the range between 0 and 1.

The second domain captures start-up regulation. Due to this regulation, authorizations and permits issued by the public administration are required in order to entry into the market. Such authorizations and permits are aimed at correcting market failures and governing the entry into a specific industry, such as concessions and permits released by public authorities and quotas, and at protecting public interests such as health, environment and safety. In particular, we distinguish two sub-domains. The first refers to administrative compliance that, depending on the type of business activity, is characterized by increasing degrees of restrictiveness: no formality (e.g., intellectual professions); simple declaration to the Chamber of Commerce or auto-declaration (i.e., the SCIA); formal authorization needed by the local authority expressly or implicitly; and concessions that are characterized by a limitation on the number of businesses for certain activities due to physical barriers (e.g., beach resorts), natural monopolies (e.g., local public transport) or legislative provisions (e.g., notaries, pharmacies, tobacconists). The second sub-domain includes different

Figure 3: Entry Regulation Index



Note — The figure shows the main domains and sub-domains of the entry regulation index.

administrative formalities required for fire prevention (e.g., supermarkets and cinemas), health controls (e.g., food stores), noise impact (e.g., bars and discos) and environmental impact (e.g., dry cleaners). These regulations are ranked in terms of number of procedures required by the regulation, time needed to complete them and limitations on the number of businesses allowed to operate in certain markets. The underlying hypothesis is that stricter limitations and longer time employed by public bodies to handle the procedures and release licenses and permits translate into higher entry costs for firms. This rank has been then normalized to vary in the range between 0 and 1.[13]

The entry regulation index is a simple average between the indexes of the two domains (and, correspondingly, each domain index is a simple average between the indexes of each sub-domain). It captures essentially the time costs to start a business rather than its monetary costs (e.g., fees, taxes, compliance costs).[14]

This index has a number of nice features for the empirical design. First, it captures different relevant dimensions of regulation. Second, it is available on a yearly basis, allowing

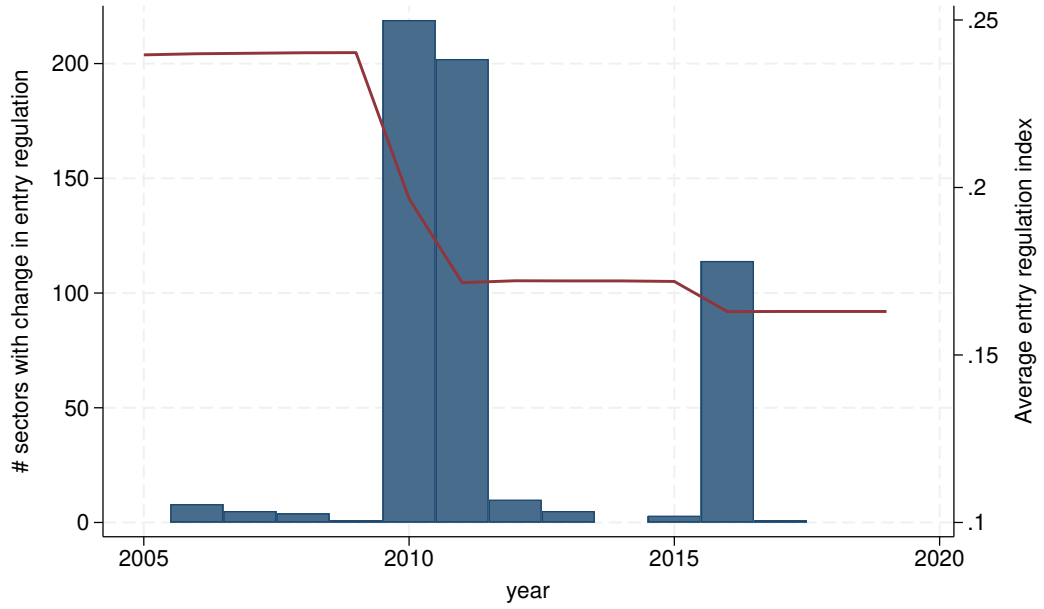
[13]See Figure A2 in the Appendix for more details on the construction of the indicators and the ranking of administrative processes.

[14]Time and monetary costs might have different effects on entry: a purely monetary fee might deter individuals with lower productivity levels while time costs might lead to a negative selection effect (as most capable individuals have a higher opportunity cost of devoting time to bureaucratic tasks).

to precisely identify the year of the reforms for each sector. Third, and more importantly, it is available at the 5-digit level. Such breakdown, to the best of our knowledge, has never been exploited. This is due in part to the difficulty of accessing and processing this information in order to build meaningful and easily tractable quantitative indicators. Moreover, such kind of analysis requires an interdisciplinary work between economists and jurists that, in fact, has been rarely adopted.

Some descriptive analysis might help visualize the strengths of our measure. Figure 4 shows the changes in regulation that occurred during the period of our empirical analysis. Most of the changes occurred around two points in time. First, following the implementation of the "Bolkestein" directive (i.e., Services in the Internal Market Directive 2006/123/EC), a significant number of economic activities (240 out of 400 sectors at the 5-digit level in the private non-financial services) experienced a reduction of entry barriers in 2010 and 2011. Second, more than 110 economic activities were characterized by a further reduction of entry barriers in 2016 as a result of the "Madia reform" (Law 124/2015). Overall, our index goes down for 260 economic activities between 2005 and 2019, with some of them experiencing more than one regulatory change. The average value moved from 0.24 to 0.16.

Figure 4: Entry Regulation Over Time



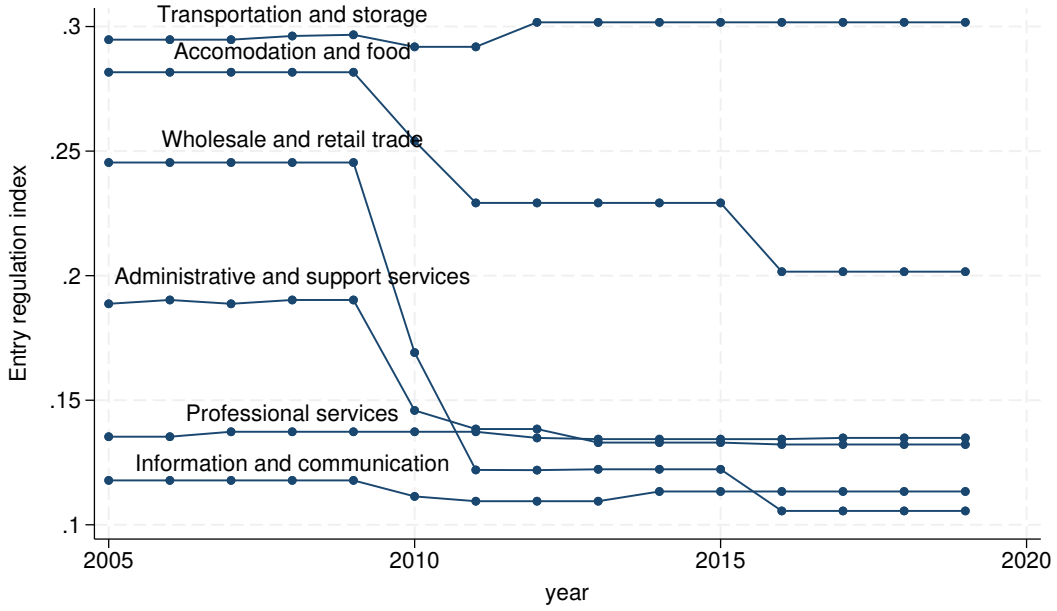
Note — The bars shows the number of sectors (NACE 5-digit level) with a variation in the entry regulation index, by year. The same sector might be interested by multiple policy interventions across years. The line is the average entry regulation index.

Most of the variation comes from the domain of the red tape costs to start a business, while changes in professional requirements concerned a smaller number of sector and were

of lesser intensity.[15]

The variation of the entry regulation index across and within industries is huge. The decrease in entry costs was stronger in the wholesale and retail trade and, although to a lesser extent, in the accommodation and food and administrative and support services (see Figure 5). The other main industries experienced milder variations.

Figure 5: Entry Regulation Across Industries and Over Time



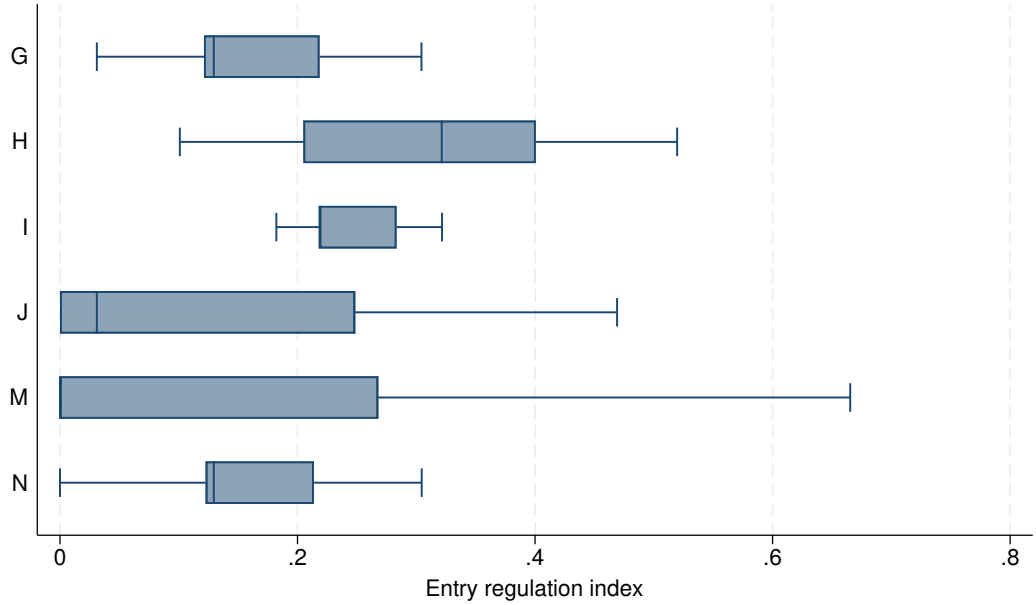
Note — Each line represents the evolution of the entry regulation index for the NACE sections, which in turn is the simple average between the economic activities at the 5-digit level belonging to each section. The NACE sections are: G = Wholesale and retail trade; H = Transporting and storage; I = Accommodation and food service activities; J = Information and communication; M = Professional, scientific and technical activities; N = Administrative and support service activities.

However, the within-industry variation is also surprisingly high, as shown in Figure 6. This huge heterogeneity clearly reflects the diversity of products and services. Some examples might clarify this point. The majority of professional services are unregulated, but they also include some of the most regulated activities. Among the unregulated ones there are translators, copywriters and designers. Among regulated ones, we find professions with a long period of compulsory training (five-year university degree, training and a final exam), such as notaries, lawyers and accountants, and others with a shorter period, e.g. for which an high school diploma or a a three-year degree is sufficient. Another striking example is the transportation sector: freight transportation has relatively low entry barriers, whereas food transportation or even more so passenger transportation are among the activities that

[15]See Figure A3 for a graphical representation of regulatory changes distinguishing between professional requirements and red tape.

require the most formalities to be initiated. Finally, the trade sector shows considerable heterogeneity too, based for example on the recipients of the products (wholesale trade is less stringently regulated than retail) or the type of products traded (the trade in food products is subject to more stringent regulation than that of non-food products).

Figure 6: Entry Regulation Across and Within Industries



Note — Boxplot of entry regulation index across and within sections (average over the period 2005-2019). Lines mark the lower adjacent value, the 1st quartile, the median, the third quartile and the upper adjacent value of the distributions. The NACE sections are: G = Wholesale and retail trade; H = Transporting and storage; I = Accommodation and food service activities; J = Information and communication; M = Professional, scientific and technical activities; N = Administrative and support service activities.

Main summary statistics are shown in Table 1, also distinguishing between cross-sectional and longitudinal sources of variation.

Table 1: Main Descriptive Statistics

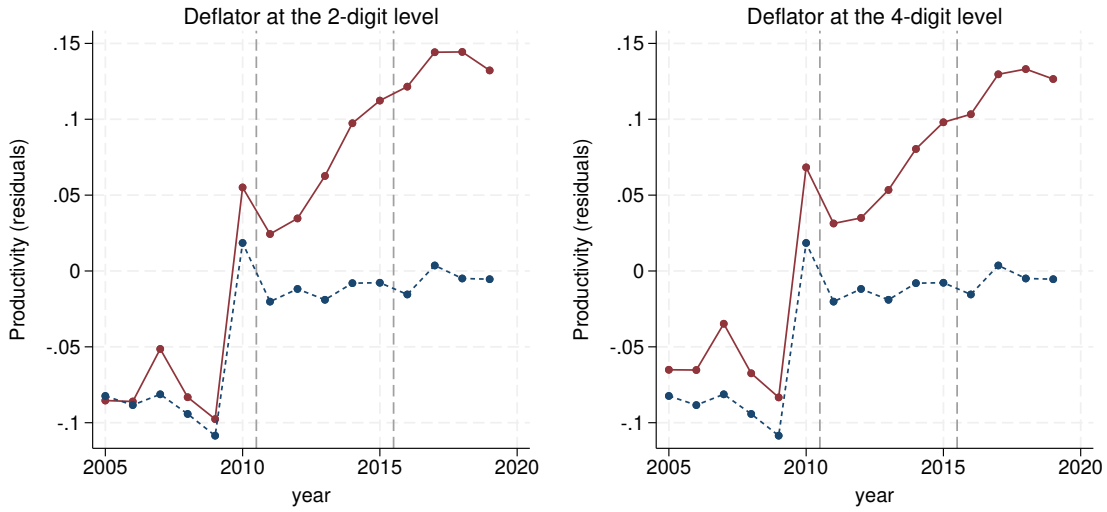
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Mean	Percentile		Standard Deviation		
		10th	90th	Overall	Between	Within
Labour Productivity	10.049	9.438	10.629	0.453	0.435	0.126
Entry rate	0.101	0.039	0.180	0.083	0.062	0.056
Prices	4.681	4.518	4.952	0.172	0.148	0.089
Entry regulation index	0.194	0.000	0.374	0.176	0.170	0.049
Licensing index	0.076	0.000	0.418	0.183	0.182	0.020
Red Tape index	0.291	0.000	0.556	0.230	0.212	0.091

The table shows the main descriptive statistics, also distinguishing between cross-sectional and longitudinal sources of variation. Labour productivity and prices are expressed in log terms.

4 Empirical Strategy and Results

To help illustrate the impact of entry regulation, Figure 7 plots the productivity patterns for firms classified in two groups, depending on whether they were exposed to a variation of entry regulation below or above the median over the period 2005-2019. More specifically, plotted values are the residuals (average of the two groups) of a regression of logarithm of deflated value added per worker on sectors (NACE 5-digit level) and municipality-year fixed effects, to control for structural differences in productivity across narrowly defined sectors and for common local shocks to which each firm might be exposed. The two lines suggest that a stronger decrease of entry regulation is associated with a larger increase in productivity, with a divergent dynamic that started from the first wave of reforms.

Figure 7: Labor Productivity and the Entry Regulation Index



Note — The lines represent the dynamic of labor productivity (after having controlled for sectors- and municipality-year fixed effects) of two groups of firms, i.e. those exposed to a marked reduction of the entry regulation index in the entire temporal window and those exposed to a fairly stable entry regulatory framework.

The following sections of the paper statistically substantiate this visual evidence in a regression setting, using firm-level (Section 4.1) and sector-level (Section 4.2) perspectives. We also provide several robustness checks (Section 4.3), we explore further outcomes (Section 4.4) and heterogeneous effects (Section 4.5) and we decompose the various channels through which entry regulation impacts on aggregate productivity growth (Section 4.6)

4.1 Firm-Level Results

The empirical specification is the following:

$$y_{i,t} = \alpha + \beta \cdot R_{s,t-1} + \delta_s + \delta_{m,t} + \epsilon_{i,t} \quad (1)$$

where $y_{i,t}$ is the dependent variable observed for firm i in year t; for each firm we also observe the 5-digit sector s and municipality m in which it operates. $R_{s,t-1}$ is the (lagged) entry regulation index at the sector-year level. Finally, δ_s and $\delta_{m,t}$ are, respectively fixed effects at the 5-digit sector level – to control for time-invariant heterogeneity at the sector-level – and at the municipality-year level – to control for local shocks, that are common to the firms located in the same municipality.[16]

Table 2 shows the effect of entry regulation on labor productivity. There are three columns characterized by three different definitions of the dependent variable. The first dependent variable (our preferred one) is labour productivity per worker, deflated by the price index at the 4-digit level. The second is labour productivity per worker, deflated by the value added deflator at the 2-digit level. The third is labour productivity obtained deflating the value added with the price index at the 4-digit level and using hours worked (instead of workers) as labour input. Hours worked are not directly observed at the firm-level and are imputed using ancillary information from national accounts (i.e., the average hours worked by employees and self-employed at the 2-digit level). Each model includes, as discussed above, fixed effects at the 5-digit sector level and at the municipality-year level. The (unbalanced) panel data contains more than 36 million observations (about 2.4 million firms per year).

We find a significant and negative effect of entry regulation on labour productivity in all empirical specifications. The results are similar between the two definitions of the dependent variable that use a 4-digit deflator. Instead, the coefficient is higher for labor productivity deflated by the value added deflator at the 2-digit level: a possible explanation is that the 4-digit deflator account for heterogeneous price dynamics occurring within the 2-digit level. Over the entire period, the entry regulation index decreases for 7 firms out of 10. For treated activities, the liberalizations that occurred from 2005 onwards reduced the entry regulation index by an average of 0.09. To gauge the size of the results, we apply this value to our estimates and we find that the increase in labor productivity ranges between 3.3 and 5.1 percent (over the 15-year period considered here).

The impact of entry regulation on labour productivity is concentrated in larger firms, while is not statistically significant for individual firms although they represent the majority of firms in our setting (Table 3).

The firm-level approach allows to control for time-invariant characteristics of the firm and local shocks. However, the aggregation of micro-data at the NACE 5-digit level would allow us to account for changes in the composition of the firms, through entry and exit, and to decompose the variation of productivity in various channels.

[16] Note that the possible non-stationarity of $y_{i,t}$ is not a relevant concern because the panel has large N and small T (e.g., Baltagi (2008)).

Table 2: Effect of Entry Regulations on Labor Productivity: Firm-Level Evidence

	(1)	(2)	(3)
Dependent variable:	Labour productivity		
Entry regulation index	-0.373***	-0.574***	-0.383**
	(0.144)	(0.108)	(0.149)
R^2	0.241	0.179	0.276
Observations	36,069,063	36,069,063	36,069,063
NACE 5-digit FEs	✓	✓	✓
Municipality-Year FEs	✓	✓	✓

Each column refers to a separate regression from model 1. The dependent variable is (log of) labor productivity, defined as value added per worker (in columns 1 and 2) and per (imputed) hours worked (in column 3); the value added is deflated using the price index at the 4-digit level (in columns 1 and 3) and the value added deflator at the 2-digit level (in column 2). Standard errors are clustered at the NACE 5-digit level and shown in parentheses. * (p<0.1), ** (p<0.05), *** (p<0.01).

Table 3: Effect of Entry Regulations on Labor Productivity by Firm Size

	(1)	(2)	(3)
Dependent variable:	Labour productivity		
Entry regulation index	-0.130	-0.639***	-0.658***
	(0.159)	(0.153)	(0.178)
R^2	0.233	0.302	0.487
Observations	20,819,707	13,954,218	1,291,519
NACE 5-digit FEs	✓	✓	✓
Municipality-Year FEs	✓	✓	✓
Firm size (workers)	1	2 to 9	>10

Each column refers to a separate regression from model 1. The dependent variable is (log of) labor productivity, defined as value added per worker; the value added is deflated using the price index at the 4-digit level. Firms are divided into three groups, depending on whether they have only one worker (column 1), two to nine workers (column 2) or ten or more workers (column 3). Standard errors are clustered at the NACE 5-digit level and shown in parentheses. * (p<0.1), ** (p<0.05), *** (p<0.01).

4.2 Results at the aggregate level

Moving to the analysis at the sector level, we slightly revise the empirical specification as follows:

$$y_{s,t} = \alpha + \beta \cdot R_{s,t-1} + \delta_s + \delta_t + \epsilon_{s,t} \tag{2}$$

where $y_{s,t}$ is the dependent variable observed for the 5-digit sector s in year t; $R_{s,t-1}$ is the (lagged) entry regulation in the same sector-year; δ_s and δ_t are fixed effects at the 5-digit sector level – to control for time-invariant heterogeneity at the sector-level – and year level – to control for common shocks, respectively.

Table 4 mirrors Table 2 at sector level. The almost balanced panel data includes more than 5,000 observations.

The negative association between the strictness of entry regulation and labour productivity is confirmed with aggregate data. The estimated coefficient is even higher, in absolute

terms, suggesting that composition effects, due to entering and exiting firms, do play a role. According to our findings, the average decrease in the entry regulation index between 2005 and 2019 for the treated economic activities is associated with a 5.2 to 7.3 percent increase in labor productivity.[17]

Table 4: Effect of Entry Regulations on Labor Productivity: Sector-Level Evidence

	(1)	(2)	(3)
Dependent variable:	Labour productivity		
Entry regulation index	-0.594***	-0.818***	-0.713***
	(0.125)	(0.119)	(0.131)
R^2	0.920	0.909	0.931
Observations	5,085	5,085	5,085
NACE 5-digit FEs	✓	✓	✓
Year FEs	✓	✓	✓

Each column refers to a separate regression from model 2. The dependent variable is (log of) labor productivity, defined as value added per worker (in columns 1 and 2) and per (imputed) hours worked (in column 3); the value added is deflated using the price index at the 4-digit level (in columns 1 and 3) and the value added deflator at the 2-digit level (in column 2). Standard errors are clustered at the NACE 5-digit level and shown in parentheses. * (p<0.1), ** (p<0.05), *** (p<0.01).

As potential threat to the identification of a causal nexus, we need to notice that variation in terms of the timing and degree of deregulation might not be exogenous to firm performance. 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. For example, de Haan and Wiese (2022) find that product market reforms do not enhance growth after controlling for endogeneity of reforms. However, it is worth stressing that variation in our data come from wide-economy reforms – e.g., following EU Services Directive – and that variation across sectors was mostly due to idiosyncratic characteristics of the economic activities.[18]

To further alleviate these endogeneity concerns, in Section 4.3 we also provide several robustness checks. For example, we add a rich set of fixed effects, including those at more aggregate sector level. We also provide visual evidence about the absence of divergent pretrend in productivity between treated and control groups.

[17] We find qualitatively similar results if we extend the analysis to other services – namely, education, health and social work, arts, entertainment and recreation and other services (Table A2). We excluded these services from the main analysis because they are less directly related to the business activity and characterized by a greater public sector presence.

[18] Administrative reforms, for example, introduced simplified procedures for starting up a business, but these apply only to activities that do not require specific formalities to protect certain public interests. This is the reason why retail trade, which takes place in an establishment open to the public that has to meet certain safety standards, is more affected by this type of intervention than professional activities, which do not require a physical location for their performance. Even within the trade sector, more stringent requirements may apply by virtue of the goods handled or the size of the store.

4.3 Sensitivity Analysis

This section contains some robustness checks to address potential endogeneity concerns.

The variation in the entry regulation index, as we have shown, is huge both within and across sectors. However, some sectors, and in particular wholesale and retail trade, have undergone a more significant change than others. If the same sectors were also exposed to some (unobserved) macroeconomic shocks, then our results would not reflect the impact of regulatory reforms and would be, at best, severely biased. To address this point, we include in the specification the interaction between NACE sections (i.e., 1 digit) and year fixed effects (Table 5). As suggested in Altonji et al. (2005)) and Oster (2019), significant changes in coefficient estimates imply the potential importance of unobserved confounders. However, according to our results the coefficient estimates remain remarkably stable when controlling for these macro-shocks.[19]

Table 5: Effect of Entry Regulations on Labour Productivity: Robustness

	(1)	(2)	(3)
Dependent variable:	Labour productivity		
Entry regulation index	-0.564***	-0.507***	-0.570***
	(0.164)	(0.151)	(0.163)
R^2	0.922	0.912	0.934
Observations	5,085	5,085	5,085
NACE 5-digit FEs	✓	✓	✓
Industry-Year FEs	✓	✓	✓

Each column refers to a separate regression from model 2. The dependent variable is (log of) labor productivity, defined as value added per worker (in columns 1 and 2) and per (imputed) hours worked (in column 3); the value added is deflated using the price index at the 4-digit level (in columns 1 and 3) and the value added deflator at the 2-digit level (in column 2). Standard errors are clustered at the NACE 5-digit level and shown in parentheses. * (p<0.1), ** (p<0.05), *** (p<0.01).

Partially related, the distribution of economic activities is not homogeneous across the regions and therefore, local shocks might have a differential impact across sectors (and, specifically, stronger for those sectors that are over-represented in that region). To account for this, we move the analysis from the sector to the sector-region level, thus slightly revising the empirical specification as follows:

$$y_{s,r,t} = \alpha + \beta \cdot R_{s,t-1} + \delta_{s,r} + \delta_{r,t} + \epsilon_{s,r,t} \tag{3}$$

where $y_{s,r,t}$ is the dependent variable observed for the 5-digit sector s in the region r in year t; $R_{s,t-1}$ is, as above, the (lagged) entry regulation in the same sector-year; $\delta_{s,r}$ and $\delta_{r,t}$ are fixed effects aimed at controlling for, respectively, time-invariant heterogeneity

[19] In Table A3, we perform a "leave-one-out" analysis, which excludes one 1-digit NACE sector at a time to ensure that no single sector is driving the results. In line with previous findings that demonstrated the positive impact of trade liberalization, we found that NACE section G plays an important role in the results. Nonetheless, the association between entry regulation and productivity is confirmed even when this sector is excluded from the study.

at the region and 5-digit sector level and regional cycles (i.e., shocks common for all firms operating in a certain region).

Quite reassuringly, the results showed in Table 6 are fairly similar to those showed in Table 4.

Table 6: Effect of Entry Regulations on Labor Productivity: Sector-Region-Level Evidence

	(1)	(2)	(3)
Dependent variable:	Labour productivity		
Entry regulation index	-0.615***	-0.839***	-0.719***
	(0.106)	(0.098)	(0.113)
R^2	0.761	0.734	0.783
Observations	93,300	93,300	93,300
Region-NACE 5-digit FEs	✓	✓	✓
Region-Year FEs	✓	✓	✓

Each column refers to a separate regression from model 3. The dependent variable is (log of) labor productivity, defined as value added per worker (in columns 1 and 2) and per (imputed) hours worked (in column 3); the value added is deflated using the price index at the 4-digit level (in columns 1 and 3) and the value added deflator at the 2-digit level (in column 2). Standard errors are clustered at the NACE 5-digit level and shown in parentheses. * (p<0.1), ** (p<0.05), *** (p<0.01).

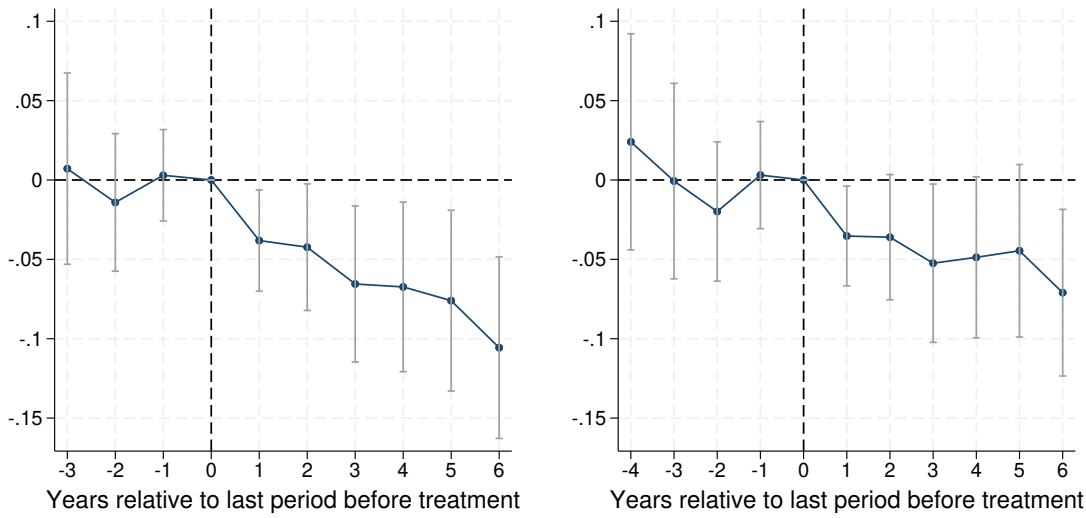
Finally, it is now widely acknowledged that the coefficients from standard two-way-fixed-effects models might not represent a straightforward weighted average of unit-level treatment effects when treatment effects are staggered and heterogeneous (Roth et al. (2023)). Indeed, in our setting we have multiple periods and units are treated at different point in times: in this setting, the two-way-fixed-effects model make both «clean» comparisons between treated and not-yet-treated units as well as «forbidden» comparisons between units who are both already-treated. To address these issues, we set up an event-study difference-in-difference estimation – introduced by de Chaisemartin and D'Haultfoeuille (2020) – that can be used with a binary and absorbing (staggered) treatment but it can also be used with a non-binary treatment that can increase or decrease multiple times, as in our case.

Figure 8 shows the results. In the years before the treatment, the coefficients are centered around zero, consistent with the parallel-trends assumption. After the treatment, instead, we find negative coefficients, whose magnitude slightly increases over time (in absolute terms) and that are statistically significant. Therefore, the de-regulation reforms (leading to a decrease of entry regulation index) are associated to an increase in labor productivity, in line with previous results.

4.4 Further Outcomes

To dig more in depth in the relationship between regulation and labor productivity, we separately examine the impact of the former on the numerator (value added), denominator (number of workers) and deflator (service prices) of the latter. As shown in Table 7, stricter entry regulation lower both the value added and the number of workers, although the de-

Figure 8: Event-study Difference-in-Difference Estimates



Note — Each point is the point estimate of the treatment effect in different years before and after the treatment (leads and lags), with t=0 being the last year before the treatment; vertical bands are the corresponding confidence intervals. The specification includes sector- (5-digit level) and year-fixed effects. The figures have been deflated using the value added deflator at the 2-digit level (left panel) and the price index at the 4-digit level (right panel).

crease in workers is not statistically significant. Moreover, the strictness of entry regulation is also positively and significantly associated to the prices of services: the decrease in the regulatory index for treated economic activities occurred between 2005 and 2019 is associated to a reduction of their prices by 6.5 percent. Finally, we also find a positive impact on wages, although this result should be interpreted with some caution as compensation of self-employed is not accounted. Such a measurement might lead to a bias in the economic interpretation of the data. Moreover, the amount of bias critically depends on the sector, as some feature a larger presence of self-employed - e.g., professional services - whereas in other cases their share is negligible.

As suggested above, differences between firm-level and aggregate results might be due to changes in the composition of firms within the sectors. Table 8 examines the changes in the selection process following variations in entry regulations. We measure the entry (exit) rate as the fraction of firms entering (exiting) the market to the total number of firms in each sector and year. As expected, a decrease in the strictness of regulation is associated to an increase in the entry rate: according to our estimates the deregulation occurred in the entire period increased it of 0.5 percentage points. The impact on the exit rate, instead, is not significantly different from zero. Interestingly, we do find effects also on the productivity of entrants and exiters that are observed the year after their entrance and the year before their exit, respectively. The average decrease in the entry regulation index for the treated

Table 7: Effect of Entry Regulations on Value Added, Workers and Prices

	(1)	(2)	(3)	(4)
Dependent variable:	Value added	Workers	Prices	Wage
Entry regulation index	-1.204***	-0.386	0.722***	-0.977***
	(0.364)	(0.324)	(0.084)	(0.200)
R^2	0.962	0.958	0.814	0.885
Observations	5,085	5,085	5,085	5,085
NACE 5-digit FEs	✓	✓	✓	✓
Year FEs	✓	✓	✓	✓

Each column refers to a separate regression from model 2. The dependent variable is value added, number of workers, prices and wage, all expressed in log terms, respectively. Standard errors are clustered at the NACE 5-digit level and shown in parentheses. * (p<0.1), ** (p<0.05), *** (p<0.01).

economic activities is associated with an 8.9 and 3.1 percent increase in the productivity of entering and exiting firms, respectively.

Our interpretation is that our measure of entry regulation essentially captures the time needed to comply with licensing, bureaucratic registration and startup procedures. This time poses a fixed cost of entry that increases with an agent's ability to generate income, i.e., the opportunity cost of devoting time to bureaucratic tasks. This, in turn, have a negative effect on selection of entrepreneurs. Moreover, tougher competition, induced by lower regulation, leads to more selectivity in the market and the exit of firms that are marginally more productive.

Table 8: Effect of Entry Regulations on Selection: Entrants, Exiters and their Productivity

	(1)	(2)	(3)	(4)	(5)
Type of firms:	Entrants		Exiters		Incumbents
Dependent variable:	Entry rate	Productivity	Exit rate	Productivity	Productivity
Entry regulation index	-0.057**	-0.999***	0.004	-0.345**	-0.794***
	(0.029)	(0.170)	(0.018)	(0.156)	(0.170)
R^2	0.549	0.721	0.430	0.752	0.769
Observations	5,076	5,076	5,076	5,076	5,076
NACE 5-digit FEs	✓	✓	✓	✓	✓
Year FEs	✓	✓	✓	✓	✓

Each column refers to a separate regression from model 2. The dependent variables are, respectively, the entry rate (ratio between the number of entrants and the number of firms active in the sector), the (log of) labor productivity of entrants, the exit rate (ratio between the number of exiters and the number of firms active in the sector) and the (log of) labor productivity of exiters. Standard errors are clustered at the NACE 5-digit level and shown in parentheses. * (p<0.1), ** (p<0.05), *** (p<0.01).

4.5 Heterogeneity and Mechanisms

The effects of entry regulation might be heterogeneous across various dimensions: the domains of regulation, the types of firms and the characteristics of the market in which they operate. In this subsection we explore these dimensions.

We start by exploring the two main domains of regulation. In Table 9, we separately include our two indicators of professional requirements (i.e., licensing) and red tape regulations in the regressions.[20] Both types of regulation have a negative effect on labor productivity. Even though the point estimates are fairly similar the implied effects are different. On the one hand, between 2005 and 2019 the red tape indicator decreased by 0.19 while the licensing indicator increased by 0.02. According to our results, over this period red tape deregulation increased labor productivity by 5.7 percent, while the stricter licensing requirements reduced it by 0.7 percent. Moreover, the within standard deviation of the red tape index is 4.5 times higher with respect to that of licensing. Therefore, a more proper comparison (i.e., using standardized coefficient) would lead to a larger effect of red tape.

Table 9: Effect of Entry Regulations by Domains

	(1)	(2)	(3)	(4)	(5)
Dependent variable:	Labor Productivity			Entry rate	Prices
Licensing	-0.341	-0.386	-0.368	-0.096*	0.402***
	(0.249)	(0.244)	(0.266)	(0.055)	(0.108)
Red tape	-0.310***	-0.438***	-0.378***	-0.021	0.378***
	(0.070)	(0.066)	(0.073)	(0.016)	(0.051)
R^2	0.920	0.909	0.931	0.549	0.800
Observations	5,085	5,085	5,085	5,085	5,085
NACE 5-digit FEs	✓	✓	✓	✓	✓
Year FEs	✓	✓	✓	✓	✓

Each column refers to a separate regression from model 2. The dependent variables are (log of) labor productivity (columns 1 to 3), the entry rate (column 4) and the (log of) prices (column 5). Labor productivity is defined as value added per worker (in columns 1 and 2) and per (imputed) hours worked (in column 3); the value added is deflated using the price index at the 4-digit level (in columns 1 and 3) and the value added deflator at the 2-digit level (in column 2). Standard errors are clustered at the NACE 5-digit level and shown in parentheses. * (p<0.1), ** (p<0.05), *** (p<0.01).

Table 10 shows the effects of entry regulation over different quantiles of labor productivity, i.e., the 10th, 25th, 50th, 75th and 90th percentiles of the labour productivity of each 5-digit NACE sectors, instead of the mean. The effect is present and consistent throughout the distribution with the exception of the first decile in which reduced entry regulation requirements have no effect on the labor productivity. These findings are consistent with the possibility that more competition raises incumbents' average productivity while also fostering an efficient reallocation of workers towards the most productive firms. We dig into this in Section 4.6.

Table 11 examines the heterogeneous effects across sectors characterized by (structural) differences in the entry rate, following Klapper et al. (2006). The entry rate may be influenced by regulatory or technological barriers (such as economies of scale, incumbents' advantage in experience and networks, or reliance on external financing). We would expect

[20] It is worth noting that the effect of licensing on productivity is ex-ante unclear. On the one hand it might reduce entry and, therefore, competitive pressure on incumbents. On the other hand, tighter entry barriers (in terms of quality of the practitioners) might lead to a positive selection in terms of productivity.

Table 10: Effect of Entry Regulations on Different Percentiles of Productivity Distribution

	(1)	(2)	(3)	(4)	(5)
Dependent variable:	Percentile of Labor productivity				
Percentile:	10th	25th	50th	75th	90th
Entry regulation index	-0.300	-0.525***	-0.690***	-0.592***	-0.530***
	(0.225)	(0.149)	(0.131)	(0.136)	(0.150)
R^2	0.774	0.840	0.901	0.907	0.901
Observations	5,076	5,076	5,076	5,076	5,076
NACE 5-digit FEs	✓	✓	✓	✓	✓
Year FEs	✓	✓	✓	✓	✓

Each column refers to a separate regression from model 2. The dependent variable is (log of) labour productivity computed at different percentile of the within-sector distribution Standard errors are clustered at the NACE 5-digit level and shown in parentheses. * (p<0.1), ** (p<0.05), *** (p<0.01).

that the impact of entry regulation is stronger in sectors that naturally have low entry barriers. To do so, we calculate the entry rate at the 5-digit level at the beginning of the period and we regress it on our index of entry regulation. The residuals approximate the differences in the entry rate across sectors that are idiosyncratic and are, more importantly, not attributable to regulation. We use these residuals to separate the sample in two groups with high and low entry rate. As expected, our findings show that regulatory measures have a heightened impact on labor productivity in industries characterized by fewer barriers for new entrants, suggesting that in those sectors regulation imposes a more substantial burden. Conversely, in industries where regulation is merely one of the several entry barriers, policies aimed at deregulation may yield comparatively less effective outcomes.

In columns 3 and 4 we examine whether the impact of entry regulation varies across sectors characterized by different market power, as measured by markup at the beginning of the period. Namely, we compute the Lerner markup as the ratio between the gross operating margin and revenues and we divide the sample in two groups, depending on whether the markup is above or below the median in 2005. In this case we do not detect statistically significant differences between sectors with different (at-the-beginning-of-the-period) market power.

In columns 5 and 6 we explore potential non-linearities. In our empirical strategy we are implicitly assuming the linearity of the effects of regulation on labor productivity. Nevertheless, one might wonder whether such an assumption holds and whether on the contrary the effects of relaxing regulation could differ between sectors starting from very high values of the index, and others displaying lower figures. In order to address this issue, we split the sample between those with an index of entry regulation above the median at the beginning of the period and those with an index below the median. We find that the impact of the same variation of entry regulation is slightly larger in sectors characterized, in 2005, by stricter regulation. The difference between the two coefficients, however, is not significant at the conventional levels.

Table 11: Heterogeneous Effect of Entry Regulations Across Sectors

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Labor Productivity					
Type of sectors:	Natural Entry Rate		Mark-up		Entry Regulation	
	Low	High	Low	High	Low	High
Entry regulation index	-0.374**	-0.803***	-0.538***	-0.551***	-0.531***	-0.799***
	(0.153)	(0.195)	(0.202)	(0.173)	(0.156)	(0.174)
R^2	0.959	0.874	0.917	0.922	0.898	0.947
Observations	2,550	2,535	2,545	2,540	2,545	2,540
NACE 5-digit FEs	✓	✓	✓	✓	✓	✓
Year FEs	✓	✓	✓	✓	✓	✓

Each column refers to a separate regression from model 2. The dependent variable is the (log of) labor productivity. Sectors are divided into two groups, depending on whether they are characterized (at-the-beginning-of-the-period) by a natural low or high entry rate (columns 1 and 2), high or low markup (columns 3 and 4) high or low entry regulation (columns 5 and 6). Standard errors are clustered at the NACE 5-digit level and shown in parentheses. * (p<0.1), ** (p<0.05), *** (p<0.01).

In order to explore heterogeneity also along the geographical dimension, we exploit the sector-region level (equation 2). In Table 12 we look at whether there are differences between the Centre-North and the South of the country, which have very different levels of productivity and bureaucratic efficiency (Accetturo et al. (2022)). On the one hand, a simplification of red tape activities should have a greater impact in areas where entry delays are higher due to inefficiencies of the public administration, i.e. arguably the South. On the other hand, lighter entry regulation should be more effective in areas with higher demand for services (and therefore where the supply restrictions bite the hardest) and areas where regulations are more likely to be enforced (Klapper et al. (2006)), i.e. arguably the Centre-North.

In columns 3 and 4, we also explore the differential effects of entry regulation changes across markets characterized (ex-ante) by a different degree of market concentration. Following Autor et al. (2020), we measure market concentration as the share of sales of superstar firms, defined as the ten largest firms in each region-sector cell. On the one hand, markets with a high level of concentration might benefit of increased competition due to the decrease of entry costs. On the other hand, markets that are highly concentrated can be more resilient to regulatory reforms, due to the competitive advantages that these established players have developed over time.

We do not find relevant heterogeneities in both exercises, suggesting that several mechanisms might be at work simultaneously.

4.6 Dynamic Olley-Pakes Productivity Decomposition

The availability of micro-data allows to decompose the productivity variation and examine the channels through which entry regulation affects efficiency. To do so, we follow the Melitz and Polanec (2015) aggregate labor productivity decomposition that allows to assess, for

Table 12: Heterogeneous Effect of Entry Regulations Across Markets

	(1)	(2)	(3)	(4)
Dependent variable:	Labor Productivity			
Type of markets:	Geographical Area		Market Concentration	
	Centre-North	South	Low	High
Entry regulation index	-0.644***	-0.798***	-0.759***	-0.821***
	(0.108)	(0.121)	(0.119)	(0.148)
R^2	0.747	0.679	0.944	0.627
Observations	56,520	36,840	46,245	47,055
Region-NACE 5-digit FEs	✓	✓	✓	✓
Region-Year FEs	✓	✓	✓	✓

Each column refers to a separate regression from model 3. The dependent variable is the (log of) labor productivity. Region-sectors cells are distinguished on two groups, depending on whether they are in the Centre-North or South of Italy (columns 1 and 2) and whether the market concentration is below or above the median (columns 3 e 4). Standard errors are clustered at the NACE 5-digit level and shown in parentheses. * (p<0.1), ** (p<0.05), *** (p<0.01).

any period, the relative contribution of three groups of firms: the ones that survive (i.e., incumbents), entrants and exiting firms.[21] Moreover, for incumbents, it is also possible to further distinguish the contribution of two more components: the variation in the efficiency of individual firms (i.e., within margin); and the reallocation of resources to firms characterized by different productivity levels (i.e., between margin).

Therefore, for each 5-digit sector of economic activity and any period, we decompose the productivity growth in four main components: productivity growth of incumbent firms, the covariance between employment shares and productivity (which measures the extent of reallocation), and the contribution of entering and exiting firms.

Formally, and following Melitz and Polanec (2015), we split firms into entrants (E), exiters (X) and incumbents (S), and we define Φ_{gt} and w_{gt} as the aggregate productivity and the share of employment in group $g \in \{E, X, S\}$ at time t. Then:

$$\Phi_1 = \Phi_{S1}\omega_{S1} + \Phi_{X1}\omega_{X1} \tag{4}$$

$$\Phi_2 = \Phi_{S2}\omega_{S2} + \Phi_{E2}\omega_{E2} \tag{5}$$

the difference between Φ_1 and Φ_2 is:

$$\Phi_2 - \Phi_1 = (\Phi_{S2} - \Phi_{S1}) + \omega_{E2}(\Phi_{E2} - \Phi_{S2}) + \omega_{X1}(\Phi_{S1} - \Phi_{X1}) \tag{6}$$

and further decomposing the variation among incumbents:

$$\Phi_2 - \Phi_1 = \Delta\varphi_S + \Delta Cov_S + \omega_{E2}(\Phi_{E2} - \Phi_{S2}) + \omega_{X1}(\Phi_{S1} - \Phi_{X1}) \tag{7}$$

[21] This is an extension of the Olley and Pakes (1996) productivity decomposition of aggregate productivity changes.

where $\Delta\varphi_S$ measures the gain deriving from average productivity changes, ΔCov_t the increase due to reallocation of workers toward more productive firms, $w_{E2}(\Phi_{E2} - \Phi_{S2})$ the gain from new firm entering the market and $w_{X1}(\Phi_{S1} - \Phi_{X1})$ the contribution of firm exiting the market.

It is worth noting that the contribution of the selection margin at the productivity decomposition depends on the reference productivity level for entrants and exiters. Namely, entrants generate positive productivity growth if (and only if) they have higher productivity than the remaining (surviving) firms in the same time period when entry occurs. Exiters, in turn, generate positive productivity growth if (and only if) they have lower productivity than the remaining (surviving) firms in the same time period when exit occurs.

Moving to the empirical specification, we run a regression at the 5-digit sector level as the following:

$$\Delta y_{st} = \alpha + \beta \cdot \Delta R_{st} + \delta_s + \delta_t + \epsilon_{st} \tag{8}$$

where Δy_{st} represents the variation in labor productivity or one of the four components of its dynamic decomposition, ΔR_{st} the variation in the index of regulation, and δ_s and δ_t are sector- and period-fixed effects, respectively. The coefficient of interest is β, which captures the impact of a variation in regulation strictness on labor productivity.[22]

Crucially, we measure variations in labor productivity over three time periods, identified on the basis of the main reforms. For each period, in other words, the base year is the one preceding the reform and the final year is between 4 and 6 years after the reform, to capture smooth and delayed effects of the policy changes. Specifically, the first covered the years 2005 to 2009, the second from 2009 to 2015, and the third from 2015 to 2019.[23]

Table 13 shows the effects of entry regulation changes on variation of labor productivity at the sector level. We consider different definitions of labor productivity and, for each of them, two empirical specifications: the first contains only time-fixed effects, to capture common shocks. Since the variables are expressed in variations, the economic interpretation is similar to the regressions with fixed effects and variables expressed in (log) levels. In the second empirical specification we also include fixed effects at the sector level, thus exploiting variation due to deviation from the sectoral trend. The results confirm the negative impact of entry regulation on labor productivity. The decrease in entry regulation between 2005 and 2019 corresponds to 3.3 to 8.1 percentage points increase in labor productivity.

Examining the components of productivity change allows us to better understand the mechanism. In Figure 9 we plot the main components of the productivity variation composition described by equation 8. Each histogram refers to a different definition of labor productivity. The two panels, in turn, differ for the set of the fixed effects included in the

[22] Linarello et al. (2022), using the same data and the same methodology, examine the impact of credit supply shocks on aggregate labor productivity and its main components.

[23] See Figure A4 in the Appendix for descriptive evidence on the contribution of the different channels to aggregate labor productivity variation in the main NACE sectors and periods.

Table 13: The Effects of Entry Regulations on Aggregate Productivity Growth

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Labor Productivity Variation					
Entry regulation index	-0.586***	-0.377*	-0.879***	-0.645***	-0.774***	-0.558***
	(0.157)	(0.194)	(0.146)	(0.187)	(0.156)	(0.187)
Observations	954	954	954	954	954	954
R"	0.187	0.414	0.111	0.374	0.144	0.429
Year FEs	✓	✓	✓	✓	✓	✓
NACE 5-digit FEs		✓		✓		✓

The table shows the effect of a variation of the entry regulation index on the variation of labor productivity according to equation 8. Labor productivity is defined as value added per worker (in columns 1 to 4) and per (imputed) hours worked (in columns 5 and 6); the value added is deflated using the price index at the 4-digit level (in columns 1 and 2) and the value added deflator at the 2-digit level (in columns 3 and 4). Standard errors are clustered at the NACE 5-digit level and shown in parentheses. * (p<0.1), ** (p<0.05), *** (p<0.01).

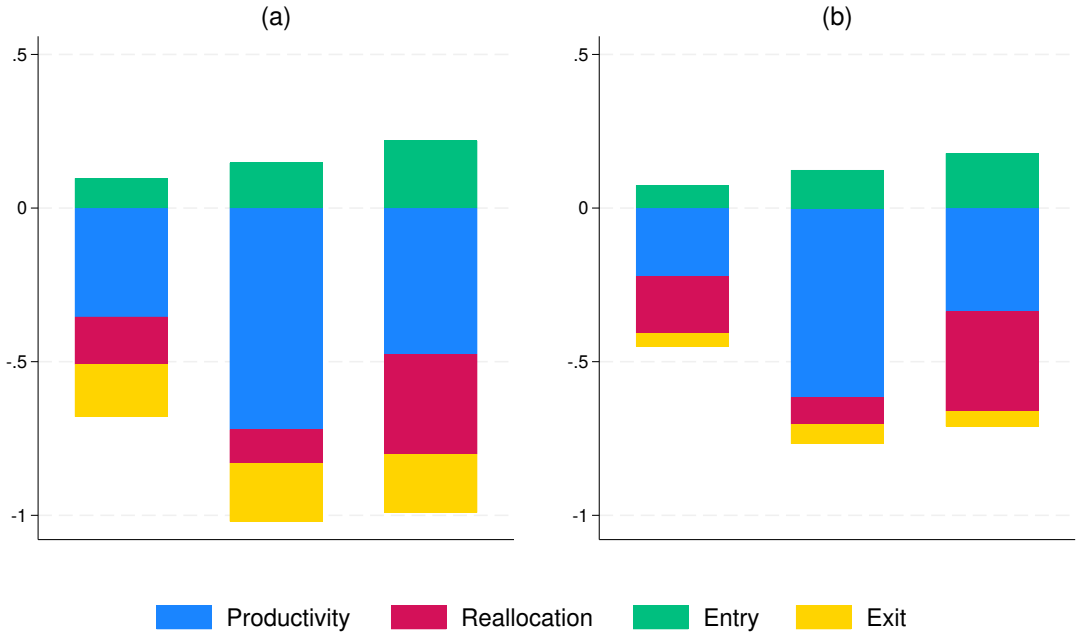
specification. The results are qualitatively similar. The largest part of the effect comes from an increase in the productivity of incumbent firms, which is due to two components. First, lower bureaucratic barriers to entry increase the productivity growth of existing firms because competition's disciplinary effects are strengthened. Second, we also do find a sizeable contribution of reallocation: when these barriers are relaxed the higher competitive pressure also leads to a reallocation of workers towards more productive firms. Then, we do not find a positive contribution to productivity growth from new entrants: this may be because in equation 7 the contribution of entrants is defined in relation to the productivity of incumbents in the final period. Since incumbents increase their productivity, the contribution to productivity brought by new businesses may be hidden by the increased productivity of incumbents. Finally, regulation also has a positive impact on productivity through exit, i.e., pushing lower-productivity firms out of the market.

5 Conclusions

Services employ an increasing share of workers (above 70 percent of the total in advanced economies). This trend is likely to continue, implying that the performance of the service sector is increasingly crucial for overall growth and productivity. As the latter tends to be lower in services than in manufacturing, the shift to services has been a moderate but persistent drag on aggregate productivity growth. The growth of the service sector and the growing awareness of the negative consequences of excessive regulation prompted the adoption of reforms aimed at reducing burdensome entry regulation.

In this paper we provide a policy evaluation of the effects of different waves of reforms of entry regulation on productivity in the service sector. To this end, we built a novel indicator of professional requirements and red tape procedures at the 5-digit sector level. Then, we rely on a unique dataset that covers the universe of firms and exploit various reforms that

Figure 9: Decomposing the Effects of Entry Regulations on Aggregate Productivity Growth



Note — The graphs show the impact of entry regulation changes (i.e. the coefficient β in equation 8) on the four components of the aggregate productivity variation composition described in equation 7. Panel a includes only time-fixed effects. Panel b also contains NACE 5-digits fixed effects. Labor productivity is defined as value added per worker (bars on the left and in the middle in each panel) and per (imputed) hours worked (bars on the right in each panel); the value added is deflated using the price index at the 4-digit level (bars on the left and the right in each panel) and the value added deflator at the 2-digit level (bars in the middle in each panel).

changed the extent of entry regulation across sectors and over time.

Our main results can be summarized as follows. First, we note that just as productivity levels vary significantly among different economic activities within the same industry, entry regulations also showcase substantial heterogeneity within the same industries. This highlights the importance of having detailed measures of regulation to analyze its effects. Second, we find that a reduction in entry regulations is associated with a significant upswing in productivity and entry rates, coupled with a noticeable decrease in prices. This suggests that easing the burden of regulatory constraints fosters a more competitive environment, encouraging efficiency while benefiting consumers through lower costs. Third, the aggregate productivity growth is attributable to an increase in the productivity of both new entrants (i.e., positive selection at entry) and established firms, partly owing to improved allocative efficiency. Fourth, exploring the effects of various regulatory domains we find that both professional requirements and bureaucratic procedures exert a detrimental influence on productivity. However, the impact of red tape is more significant, underscoring the importance of streamlined and efficient administrative processes. Finally, the effect of entry regulations on productivity is notably stronger in sectors characterized by a higher natural entry rate.

Overall, our findings highlight the importance of liberalization for increasing productivity and growth. Moving to the policy implications, regulations that provide barriers to entry, both in terms of occupational requirements and administrative burden, are generally based on the presence of market failures and the need to protect certain public interests. It is therefore necessary to review such regulations periodically, in order to verify that they are truly relevant to the intended purpose and that there are no other suitable tools to achieve the same result with less obstacle to competition (proportionality test). Moreover, entry constraints should be reduced particularly in those markets where the demand is increasing.

Concerning professional requirements, some policy interventions might include the possibility of reducing excessively long internships or eliminating the state exam.[24] As far as internship is concerned, reducing its lenght or anticipating at least part of the training during the university studies should be taken into account, in order to avoid discouraging more capable graduates who have a higher opportunity cost. Moreover, in some cases the asymmetric information between suppliers and clients for certain services might be reduced in other ways. For example, the judgment on the provider of the service issued through digital platforms could make some limitations on entry into the market superfluous. In general it would be desirable to have greater knowledge of and ability to measure the quality of the service provided, which would allow intervention where actual deficiencies occur, instead of placing generalized barriers ex ante.

With respect to red tape, authorizations could be further simplified and cases of silent

[24]The composition of the examining commissions in state exams could also be modified to promote greater transparency and fairness in evaluations. The organization of national-level exams, or greater separation between those who evaluate the tests and candidates, could allow for a fairer and more efficient selection.

assent expanded in cases where an express ruling from the public administration is not necessary to protect a public interest. Furthermore, it is clear that improving the functioning of public administration as a whole would simplify market access for businesses, even without specific reform interventions.

References

Abbate, C. C., Ladu, M. G., and Linarello, A. (2017). An Integrated Dataset of Italian Firms: 2005-2014. *Bank of Italy Occasional Paper*, (384).

Accetturo, A., Albanese, G., and Torrini, R. (2022). Il Divario Nord-Sud: Sviluppo Economico e Intervento Pubblico. *Bank of Italy Occasional Paper*, (25).

Alesina, A., Ardagna, S., Nicoletti, G., and Schiantarelli, F. (2005). Regulation and Investment. *Journal of the European Economic Association*, 3(4):791–825.

Altonji, J., Elder, T., and Taber, C. (2005). Selection on Observed and Unobserved Variables: Assessing the Effectiveness of Catholic Schools. *Journal of Political Economy*, 113(1):151–184.

Amici, M., Giacomelli, S., Manaresi, F., and Tonello, M. (2016). Red Tape Reduction and Firm Entry: New Evidence from an Italian Reform. *Economics Letters*, 146:24–27.

Andrews, D. and Cingano, F. (2014). Public Policy and Resource Allocation: Evidence from Firms in OECD Countries. *Economic Policy*, 29(78):253–296.

Autor, D., Dorn, D., Katz, L., Patterson, C., and Van Reenen, J. (2020). The Fall of the Labor Share and the Rise of Superstar Firms. *Quarterly Journal of Economics*, 135(2):645–709.

Baltagi, B. H. (2008). *Econometric Analysis of Panel Data*, volume 4. Springer.

Bambalaite, I., Nicoletti, G., and Von Rueden, C. (2020). Occupational Entry Regulations and Their Effects on Productivity in Services: Firm-Level Evidence. Economics Department Working Papers 1065, OECD.

Barone, G. and Cingano, F. (2011). Service Regulation and Growth: Evidence from OECD Countries. *Economic Journal*, 121(555):931–957.

Barseghyan, L. (2008). Entry Costs and Cross-Country Differences in Productivity and Output. *Journal of Economic Growth*, 13(2):145–167.

Bertrand, M. and Kramarz, F. (2002). Does Entry Regulation Hinder Job Creation? Evidence from the French Retail Industry. *Quarterly Journal of Economics*, 117(4):1369–1413.

Bourlès, R., Cette, G., Lopez, J., Mairesse, J., and Nicoletti, G. (2013). Do Product Market Regulations in Upstream Sectors Curb Productivity Growth? Panel Data Evidence for OECD Countries. *Review of Economics and Statistics*, 95(5):1750–1768.

Branstetter, L., Lima, F., Taylor, L., and Venancio, A. (2013). Do Entry Regulations Deter Entrepreneurship and Job Creation? Evidence from Recent Reforms in Portugal. *Economic Journal*, 124(577):805–832.

Ciapanna, E., Mocetti, S., and Notarpietro, A. (2023). The macroeconomic Effects of Structural Reforms: An Empirical and Model-Based Approach. *Economic Policy*, 38(114):243–285.

Ciccone, A. and Papaioannou, E. (2007). Red Tape and Delayed Entry. *Journal of the European Economic Association*, 5(2):444–458.

Dawson, J. and Seater, J. (2013). Federal Regulation and Aggregate Economic Growth. *Journal of Economic Growth*, 18:137–177.

de Chaisemartin, C. and D'Haultfoeuille, X. (2020). Two-Way Fixed Effects Estimators with Heterogeneous Treatment Effects. *American Economic Review*, 110(9):2964–2996.

de Haan, J. and Wiese, R. (2022). The Impact of Product and Labour Market Reform on Growth: Evidence for OECD Countries Based on Local Projections. *Journal of Applied Econometrics*, 37(4):746–770.

Djankov, S., La Porta, R., Lopez de Silanes, F., and Shleifer, A. (2002). The Regulation of Entry. *Quarterly Journal of Economics*, 117(1):1–37.

Duval, R. and Furceri, D. (2018). The Effects of Labor and Product Market Reforms: The Role of Macroeconomic Conditions and Policies. *IMF Economic Review*, 66:31–69.

Egert, B. (2016). Regulation, Institutions, and Productivity: New Macroeconomic Evidence from OECD Countries. *American Economic Review: Papers Proceedings*, 106(5):109–113.

Fattal-Jaef, R. N. (2022). Entry Barriers, Idiosyncratic Distortions, and the Firm Size Distribution. *American Economic Journal: Macroeconomics*, 14(2):416–468.

Gittleman, M., Klee, M., and Kleiner, M. (2018). Analyzing the Labor Market Outcomes of Occupational Licensing. *Industrial Relations*, 57(1):57–100.

Johnson, J. and Kleiner, M. (2020). Is Occupational Licensing a Barrier to Interstate Migration? *American Economic Journal: Economic Policy*, 12(3):347–373.

Kaplan, D., Piedra, E., and Seira, E. (2011). Entry Regulation and Business Start-Ups: Evidence from Mexico. *Journal of Public Economics*, 95(11):1501–1515.

Klapper, L., Laeven, L., and Rajan, R. (2006). Entry Regulation as a Barrier to Entrepreneurship. *Journal of Financial Economics*, 82(3):591–629.

Kleiner, M. and Krueger, A. (2013). Analyzing the Extent and Influence of Occupational Licensing on the Labor Market. *Journal of Labor Economics*, 31(51):173–202.

Leland, H. (1979). Quacks, Lemons and Licensing: A Theory of Minimum Quality Standards. *Journal of Political Economy*, 87(6):1328–1346.

Linarello, A., Petrella, A., and Sette, E. (2022). Credit Shocks and Allocative Efficiency during a Financial Crisis. *International Journal of Central Banking*, 18(3):125–171.

Loecker, J. D., Goldberg, P. K., Khandelwal, A. K., and Pavcnik, N. (2016). Prices, Markups, and Trade Reform. *Econometrica*, 84(2):445–510.

Melitz, M. J. and Polanec, S. (2015). Dynamic Olley-Pakes Productivity Decomposition with Entry and Exit. *Rand Journal of Economics*, 46(2):362–375.

Mocetti, S., Rizzica, L., and Roma, G. (2022). Regulated Occupations in Italy: Extent and Labor Market Effects. *International Review of Law and Economics*, forthcoming.

Mora-Sanguinetti, J. and Perez-Valls, R. (2021). How Does Regulatory Complexity Affect Business Demography? Evidence from Spain. *European Journal of Law and Economics*, 51:203–242.

Mora-Sanguinetti, J., Quintana, J., Soler, I., and Spruk, R. (2023). The Heterogenous Effects of a Higher Volume of Regulation: Evidence from More than 200k Spanish Norms. *Journal of Regulatory Economics*, forthcoming.

Nicoletti, G. and Scarpetta, S. (2003). Regulation, Productivity and Growth: OECD Evidence. *Economic Policy*, 18(36):9–72.

Olley, G. and Pakes, A. (1996). The Dynamics of Productivity in the Telecommunications Equipment Industry. *Econometrica*, 64(6):1263–1297.

Oster, E. (2019). Unobservable Selection and Coefficient Stability: Theory and Evidence. *Journal of Business and Economic Statistics*, 37(2):187–204.

Pagliero, M. (2019). Occupational Licensing in the EU: Protecting Consumers or Limiting Competition? *Review of Industrial Organization*, 55(1):137–153.

Pigou, A. (1938). *The Economics of Welfare*. Macmillan.

Roth, J., SantâAnna, P. H., Bilinski, A., and Poe, J. (2023). Whatâs trending in difference-in-differences? a synthesis of the recent econometrics literature. *Journal of Econometrics*, 235(2):2218–2244.

Schiffbauer, M., Sampi, J., and Coronado, J. (2022). Competition and Productivity: Evidence from Peruvian Municipalities. *Review of Economics and Statistics*, forthcoming.

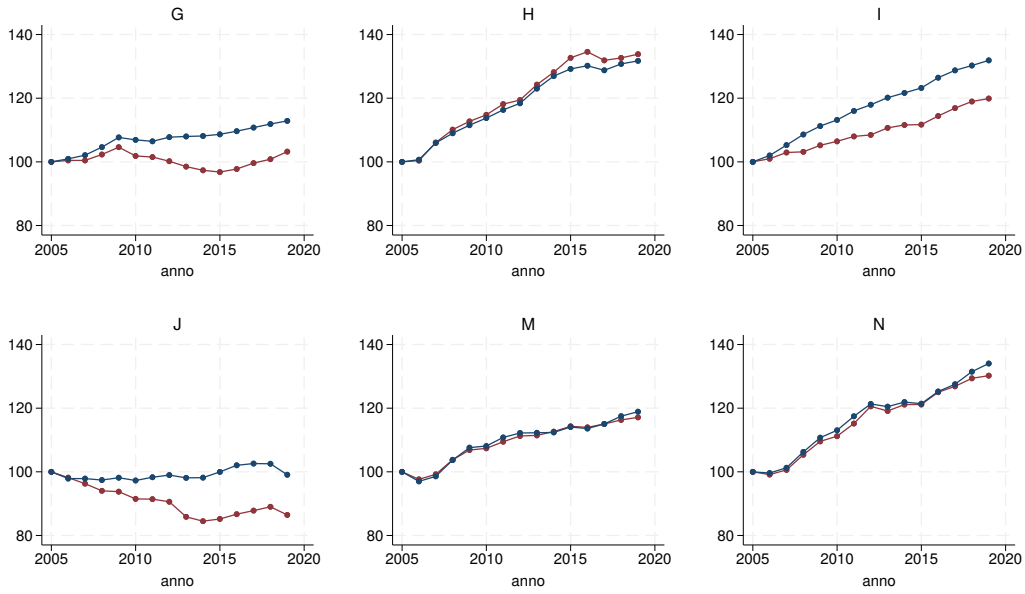
Schivardi, F. and Viviano, E. (2011). Entry Barriers in Retail Trade. *Economic Journal*, 121(551):145–170.

Shleifer, A. and Vishny, R. (1993). Corruption. *Quarterly Journal of Economics*, 108:599–617.

Stigler, G. (1971). The Theory of Economic Regulation. *Bell Journal of Economics*, 2(1):3–21.

A Appendix

Figure A1: Price Indexes



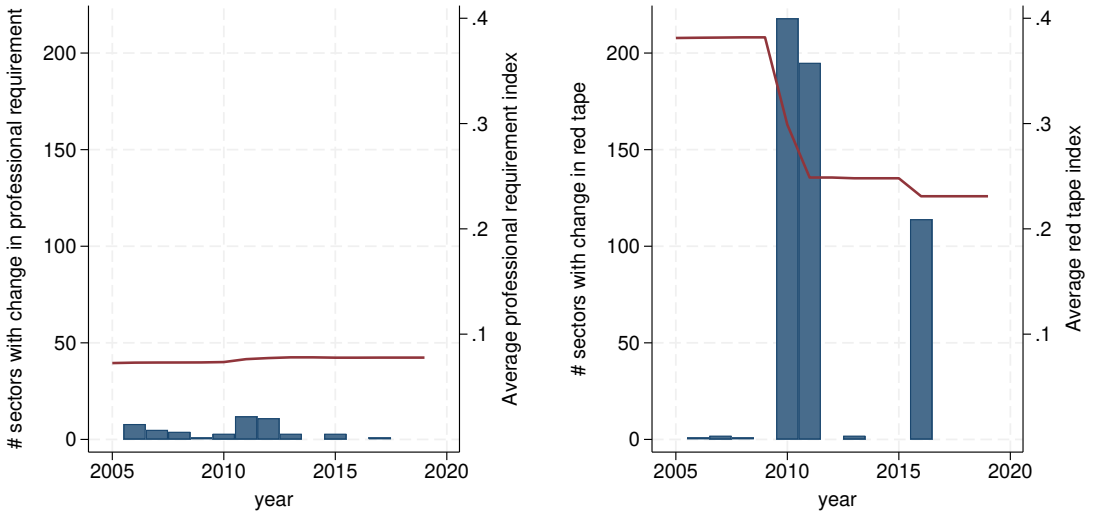
Note — The red line is the 2-digit GDP deflator, drawn from National Account, aggregated at the NACE-section level. The blue line is the 4-digit price index, aggregated at the same level.

Figure A2: Entry Regulation Details

Entry regulation index	**1. Professional requirements**			N = Years of training (=1 for every year in education or training from the high school to obtaining the necessary qualification to practice + 0.5 if a professional exam is required)
	2. Red tape	**2.1 Administrative compliance**		1 = sending a simple communication of start-up of the business to the Chamber of Commerce (*comunicazione*) 2 = self-declaration of possession of the requirements which allows the start of the business immediately, subject to checks by the public administration within 60 days (*SCIA*) 3 = self-declaration as in case 2 which includes different administrative procedures (*SCIA unica*) 4 = self-declaration as in case 2 which is subject to an explicit act from the public administration for a specific fulfilment (*SCIA condizionata*) 5 = authorization by the public administration explicit or by silent assent – after a certain period of time passes, authorization is granted (*silenzio assenso*) 6 = authorization by the public administration explicit or by silent assent with additional requirements – after a certain period of time passes, authorization is granted (*silenzio assenso*) if additional authorizations, permits and/or certifications have been obtained 7 = explicit authorization 8 = explicit authorization with additional requirements 9 = concession with quota
		2.2 Health and safety	2.2.1 Noise impact	0 = not required 1 = sending a simple communication to the Municipality 2 = authorization required under certain circumstances (e.g., if certain size thresholds are exceeded) 3 = authorization always required
			2.2.2 Fire prevention	0 = not required 1 = low-risk self-declaration (*SCIA*) under certain circumstances 2 = low-risk self-declaration (*SCIA*) always required 3 = opinion of firefighters and medium-risk self-declaration (*SCIA*) under certain circumstances 4 = opinion of firefighters and medium-risk self-declaration (*SCIA*) always required 5 = authorization required under certain circumstances 6 = authorization always required
			2.2.3 Environment	0 = not required 1 = authorization required under certain circumstances 2 = authorization always required
			2.2.4 Health control	0 = not required 1 = self-declaration (*SCIA*) under certain circumstances 2 = self-declaration (*SCIA*) always required 3 = opinion of the local agency of public health

* *SCIA = segnalazione certificata di inizio attività*

Figure A3: Entry Regulation by Domains Over Time



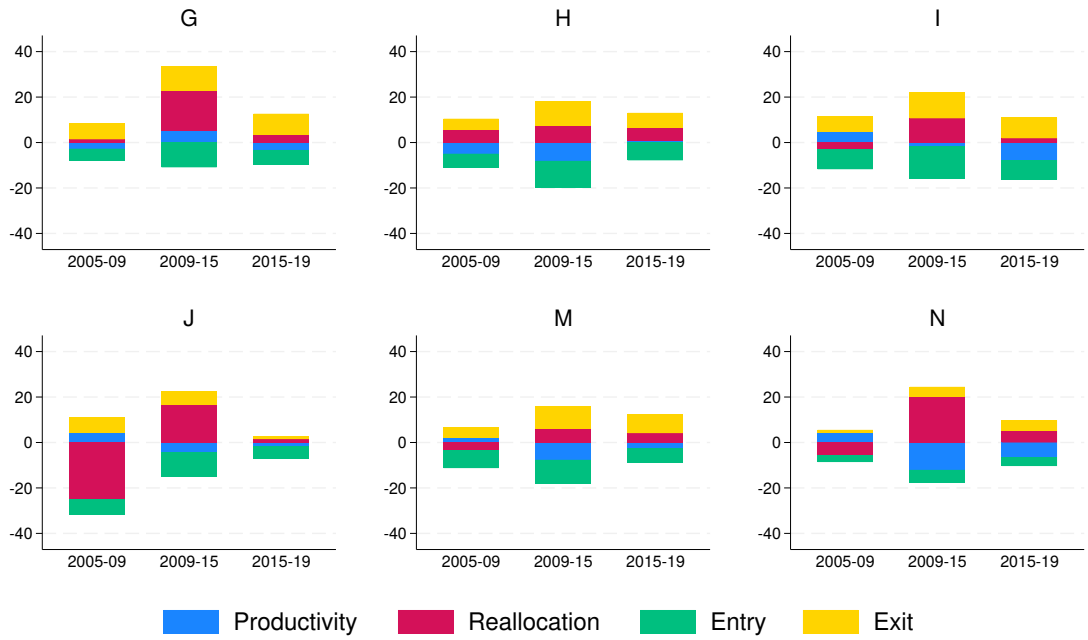
Note — The bars show the number of sectors (NACE 5-digit level) with a variation in the corresponding domain of entry regulation index, by year; the line is the average regulation index, distinguished again between the two domains of professional requirements and red tape.

Table A1: Structural Characteristics of the Service Sector

Firm size:	0-9	10-49	50-249	250+	Total
	Universe of firms				
Number of firms/000	3,084	100	11	2	3,197
Number of employees/000	5,530	1,734	1,075	2,391	10,730
	of which: corporations				
Number of firms/000	359	61	7	2	429
Number of employees/000	941	1,109	707	1,920	4,677

The table shows the distribution of firms and employees in the service sector, by firm size.

Figure A4: Dynamic Olley-Pakes Aggregate Decomposition of Productivity Growth for Service Sectors



Note — The graphs shows the Olley and Pakes decomposition of labor productivity variation for service sectors (equation 7) over three time periods (2005-09, 2009-15 and 2015-19) and for each NACE section. Labor productivity is defined as value added per worker and the value added is deflated using the price index at the 4-digit level. The NACE sections are: G = Wholesale and retail trade; H = Transporting and storage; I = Accommodation and food service activities; J = Information and communication; M = Professional, scientific and technical activities; N = Administrative and support service activities.

Table A2: Effect of Entry Regulations on Labour Productivity: All Services

	(1)	(2)	(3)
Dependent variable:	Labour productivity		
Entry regulation index	-0.668***	-0.918***	-0.811***
	(0.114)	(0.109)	(0.121)
R^2	0.924	0.914	0.933
Observations	5,987	5,987	5,987
NACE 5-digit FEs	✓	✓	✓
Year FEs	✓	✓	✓

Each column refers to a separate regression from model 2. The dependent variable is (log of) labor productivity, defined as value added per worker (in columns 1 and 2) and per (imputed) hours worked (in column 3); the value added is deflated using the price index at the 4-digit level (in columns 1 and 3) and the value added deflator at the 2-digit level (in column 2). Standard errors are clustered at the NACE 5-digit level and shown in parentheses. * (p<0.1), ** (p<0.05), *** (p<0.01).

Table A3: Effect of Entry Regulations on Labour Productivity: All Services

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Labour productivity					
Entry regulation index	-0.367*	-0.661***	-0.597***	-0.695***	-0.560***	-0.500***
	(0.222)	(0.136)	(0.127)	(0.120)	(0.143)	(0.136)
R^2	0.876	0.922	0.921	0.948	0.926	0.935
Observations	2.310	4.591	4.805	4.642	4.590	4.472
NACE 5-digit FEs	✓	✓	✓	✓	✓	✓
Year FEs	✓	✓	✓	✓	✓	✓
Excluded sector	G	H	I	J	M	N

Each column refers to a separate regression from model 2. The dependent variable is (log of) labor productivity, defined as value added per worker; the value added is deflated using the price index at the 4-digit level. Standard errors are clustered at the NACE 5-digit level and shown in parentheses. * (p<0.1), ** (p<0.05), *** (p<0.01).

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2022

ANDINI M., M. BOLDRINI, E. CIANI, G. DE BLASIO, A. D'IGNAZIO and A. PALADINI, *Machine learning in the service of policy targeting: the case of public credit guarantees,* Journal of Economic Behavior & Organization, v. 198, pp. 434-475, **WP 1206 (February 2019).**

ANGELICO C., J. MARCUCCI, M. MICCOLI and F. QUARTA, *Can we measure inflation expectations using twitter?,* Journal of Econometrics, v. 228, 2, pp. 259-277, **WP 1318 (February 2021).**

BARTOCCI A., A. NOTARPIETRO and M. PISANI, *Covid-19 shock and fiscal-monetary policy mix in a monetary union,* Economic challenges for Europe after the pandemic, Springer Proceedings in Business and Economics, Berlin-Heidelberg, Springer, **WP 1313 (December 2020).**

BOTTERO M., C. MINOIU, J. PEYDRÒ, A. POLO, A. PRESBITERO and E. SETTE, *Expansionary yet different: credit supply and real effects of negative interest rate policy,* Journal of Financial Economics, v. 146, 2, pp. 754-778, **WP 1269 (March 2020).**

BRONZINI R., A. D'IGNAZIO and D. REVELLI, *Financial structure and bank relationships of Italian multinational firms,* Journal of Multinational Financial Management, v. 66, Article 100762, **WP 1326 (March 2021).**

CANTELMO A., *Rare disasters, the natural interest rate and monetary policy,* Oxford Bulletin of Economics and Statistics, v. 84, 3, pp. 473-496, **WP 1309 (December 2020).**

CARRIERO A., F. CORSELLO and M. MARCELLINO, *The global component of inflation volatility,* Journal of Applied Econometrics, v. 37, 4, pp. 700-721, **WP 1170 (May 2018).**

CIAPANNA E. and G. ROVIGATTI, *The grocery trolley race in times of Covid-19. Evidence from Italy,* Italian Economic Journal / Rivista italiana degli economisti, v. 8, 2, pp. 471-498, **WP 1341 (June 2021).**

CONTI A. M., A. NOBILI and F. M. SIGNORETTI, *Bank capital requirement shocks: a narrative perspective,* European Economic Review, v.151, Article 104254, **WP 1199 (November 2018).**

FAIELLA I. and A. MISTRETTA, *The net zero challenge for firms' competitiveness,* Environmental and Resource Economics, v. 83, pp. 85-113, **WP 1259 (February 2020).**

FERRIANI F. and G. VERONESE, *Hedging and investment trade-offs in the U.S. oil industry,* Energy Economics, v. 106, Article 105736, **WP 1211 (March 2019).**

GUISO L., A. POZZI, A. TSOY, L. GAMBACORTA and P. E. MISTRULLI, *The cost of steering in financial markets: evidence from the mortgage market,* Journal of Financial Economics, v.143, 3, pp. 1209-1226, **WP 1252 (December 2019).**

LAMORGESE A. and D. PELLEGRINO, *Loss aversion in housing appraisal: evidence from Italian homeowners,* Journal of Housing Economics, v. 56, Article 101826, **WP 1248 (November 2019).**

LI F., T. MÄKINEN, A. MERCATANTI and A. SILVESTRINI, *Causal analysis of central bank holdings of corporate bonds under interference,* Economic Modelling, v.113, Article 105873, **WP 1300 (November 2020).**

LOBERTO M, A. LUCIANI and M. PANGALLO, *What do online listings tell us about the housing market?,* International Journal of Central Banking, v. 18, 4, pp. 325-377, **WP 1171 (April 2018).**

MIRENDA L., M. SAURO and L. RIZZICA, *The economic effects of mafia: firm level evidence,* American Economic Review, vol. 112, 8, pp. 2748-2773, **WP 1235 (October 2019).**

MOCETTI S., G. ROMA and E. RUBOLINO, *Knocking on parents' doors: regulation and intergenerational mobility,* Journal of Human Resources, v. 57, 2, pp. 525-554, **WP 1182 (July 2018).**

PERICOLI M. and M. TABOGA, *Nearly exact Bayesian estimation of non-linear no-arbitrage term-structure models,* Journal of Financial Econometrics, v. 20, 5, pp. 807-838, **WP 1189 (September 2018).**

ROSSI P. and D. SCALISE, *Financial development and growth in European regions,* Journal of Regional Science, v. 62, 2, pp. 389-411, **WP 1246 (November 2019).**

SCHIVARDI F., E. SETTE and G. TABELLINI, *Credit misallocation during the European financial crisis,* Economic Journal, v. 132, 641, pp. 391-423, **WP 1139 (September 2017).**

TABOGA M., *Cross-country differences in the size of venture capital financing rounds: a machine learning approach,* Empirical Economics, v. 62, 3, pp. 991-1012, **WP 1243 (November 2019).**

2023

APRIGLIANO V., S. EMILIOZZI, G. GUAITOLI, A. LUCIANI, J. MARCUCCI and L. MONTEFORTE, *The power of text-based indicators in forecasting Italian economic activity,* International Journal of Forecasting, v. 39, 2, pp. 791-808, **WP 1321 (March 2021).**

BARTOCCI A., A. NOTARPIETRO and M. PISANI, *Non-standard monetary policy measures in non-normal times,* International Finance, v. 26, 1, pp. 19-35, **WP 1251 (November 2019).**

CAPPELLETTI G. and P. E. MISTRULLI, *The role of credit lines and multiple lending in financial contagion and systemic events,* Journal of Financial Stability, v. 67, Article 101141, **WP 1123 (June 2017).**

CECI D. and A. SILVESTRINI, *Nowcasting the state of the Italian economy: the role of financial markets,* Journal of Forecasting, v. 42, 7, pp. 1569-1593, **WP 1362 (February 2022).**

CIAPANNA E, S. MOCETTI and A. NOTARPIETRO, *The macroeconomic effects of structural reforms: an empirical and model-based approach,* Economic Policy, v. 38, 114, pp. 243-285, **WP 1303 (November 2020).**

CORNELI F., *Sovereign debt maturity structure and its costs,* International Tax and Public Finance, v. 31, 1, pp. 262-297, **WP 1196 (November 2018).**

DAURICH D, S. DI ADDARIO and R. SAGGIO, *The macroeconomic effects of structural reforms: an empirical and model-based approach,* Review of Economic Studies, v. 90, 6, pp. 2880–2942, **WP 1390 (November 2022).**

DI ADDARIO S., P. KLINE, R. SAGGIO and M. SØLVSTEN, *The effects of partial employment protection reforms: evidence from Italy,* Journal of Econometrics,v. 233, 2, pp. 340-374, **WP 1374 (June 2022).**

FERRARI A. and V. NISPI LANDI, *Toward a green economy: the role of central bank's asset purchases,* International Journal of Central Banking, v. 19, 5, pp. 287-340, **WP 1358 (February 2022).**

FERRIANI F., *Issuing bonds during the Covid-19 pandemic: was there an ESG premium?,* International Review of Financial Analysis, v. 88, Article 102653, **WP 1392 (November 2022).**

GIORDANO C., *Revisiting the real exchange rate misalignment-economic growth nexus via the across-sector misallocation channel,* Review of International Economics, v. 31, 4, pp. 1329-1384, **WP 1385 (October 2022).**

GUGLIELMINETTI E., M. LOBERTO and A. MISTRETTA, *The impact of COVID-19 on the European short-term rental market,* Empirica, v. 50, 3, pp. 585-623, **WP 1379 (July 2022).**

LILLA F., *Volatility bursts: a discrete-time option model with multiple volatility components,* Journal of Financial Econometrics, v. 21, 3, pp. 678-713, **WP 1336 (June 2021).**

LOBERTO M., *Foreclosures and house prices,* Italian Economic Journal / Rivista italiana degli economisti, v. 9, 1, pp. 397-424, **WP 1325 (March 2021).**

LOMBARDI M. J., M. RIGGI and E. VIVIANO, *Worker's bargaining power and the Phillips curve: a micro-macro analysis, and wages,* Journal of the European Economic Association, v. 21, 5, pp. 1905–1943, **WP 1302 (November 2020).**

NERI S., *Long-term inflation expectations and monetary policy in the Euro Area before the pandemic*, European Economic Review, v. 154, Article 104426, **WP 1357 (December 2021).**

ORAME A., *Bank lending and the European debt crisis: evidence from a new survey*, International Journal of Central Banking, v. 19, 1, pp. 243-300, **WP 1279 (June 2020).**

RIZZICA L., G. ROMA and G. ROVIGATTI, *The effects of shop opening hours deregulation: evidence from Italy,* The Journal of Law and Economics, v. 66, 1, pp. 21-52, **WP 1281 (June 2020).**

TANZI G. M., *Scars of youth non-employment and labour market conditions,* Italian Economic Journal / Rivista italiana degli economisti, v. 9, 2, pp. 475-499, **WP 1312 (December 2020).**

2024

BRANZOLI N., R. GALLO, A. ILARI and D. PORTIOLI, *Central banks' corporate asset purchase programmes and risk-taking by bond funds in the aftermath of market stress,* Journal of Financial Stability, v. 72, Article 101261, **WP 1404 (March 2023).**

BRANZOLI N., E. RAINONE and I. SUPINO, *The role of banks' technology adoption in credit markets during the pandemic,* Journal of Financial Stability, v. 71, Article 101230, **WP 1406 (March 2023).**

BUONO I, F. CORNELI and E. DI STEFANO, *Capital inflows to emerging countries and their sensitivity to the global financial cycle,* International Finance, v. 27,2, pp. 17-34, **WP 1262 (February 2020).**

DEL PRETE S, G. PAPINI and M. TONELLO, *Gender quotas, board diversity and spillover effects. Evidence from Italian banks,* Journal of Economic Behavior & Organization, v. 221, pp. 148-173, **WP 1395 (December 2022).**

DE MARCHI R. and A. MORO, *Forecasting fiscal crises in emerging markets and low-income countries with machine learning models,* Open Economies Review. v. 35, 1, pp. 189-213, **WP 1405 (March 2023).**

FERRARI A. and V. NISPI LANDI, *Whatever it takes to save the planet? Central banks and unconventional green policy,* Macroeconomic Dynamics, v. 28, 2, pp. 299-324, **WP 1320 (February 2021).**

FLACCADORO M., *Exchange rate pass-through in small, open, commodity-exporting economies: lessons from Canada,* Journal of International Economics, v. 148, Article 103885, **WP 1368 (May 2022).**

MORO A. and V. NISPI LANDI, *The external financial spillovers of CBDCs,* Journal of Economic Dynamics and Control, v. 159, Article 104801, **WP 1416 (July 2023).**

FORTHCOMING

BALTRUNAITE A., M. CANNELLA, S. MOCETTI and G. ROMA, *Board composition and performance of state-owned enterprises: quasi experimental evidence,* The Journal of Law, Economics, and Organization, **WP 1328 (April 2021).**

BENVENUTI M. and S. DEL PRETE, *The evolution of banking competition in italian credit markets using a profit elasticity approach,* Italian Economic Journal / Rivista italiana degli economisti, **WP 1237 (October 2019).**

CIANI E., A. GROMPONE and E. OLIVIERI, *Jobs for the long-term unemployed: place-based policies in depressed areas,* Italian Economic Journal / Rivista italiana degli economisti, **WP 1249 (November 2019).**

CUCINIELLO V. and N. DI IASIO, *Determinants of the credit cycle: a flow analysis of the extensive margin,* Journal of Money, Credit and Banking, **WP 1266 (March 2020).**

FLACCADORO M., *Exchange rate pass-through in small, open, commodity-exporting economies: lessons from Canada,* Journal of International Economics, **WP 1365 (April 2022).**

GAUTIER E., C. CONFLITTI, R. FABER, B. FABO, L. FADEJEVA, V. JOUVANCEAU, J.-O. MENZ, T. MESSNER, P. PETROULAS, P. ROLDAN-BLANCO, F. RUMLER, S. SANTORO, E. WIELAND and H. ZIMMER, *New facts on consumer price rigidity in the euro area,* American Economic Journal: Macroeconomics, **WP 1375 (July 2022).**

LOSCHIAVO D., F. TULLIO and A. DI SALVATORE, *Measuring households' financial fragilities: an analysis at the intersection of income, financial wealth, and debt,* Review of Income and Wealth, **WP 1452 (April 2024).**

MICHELANGELI V. and E. VIVIANO, *Can internet banking affect households' participation in financial markets and financial awarness?,* Journal of Money, Credit and Banking, **WP 1329 (April 2021).**

MISTRETTA A., *Synchronization vs transmission: the effect of the German slowdown on the Italian business cycle,* International Journal of Central Banking, **WP 1346 (October 2021).**

MODENA F., S. PEREDA-FERNANDEZ and G. M. TANZI, *On the design of grant assignment rules,* Politica economica/Journal of Economic Policy, **WP 1307 (December 2020).**

MORO A., *Optimal policies in a small open economy with an environmental externality and shallow foreign exchange markets,* Portuguese Economic Journal, **WP 1348 (October 2021).**

RAINONE E., *Reservation rates in interbank money markets,* Journal of Money, Credit and Banking, **WP 1160 (February 2021).**

RAINONE E., *Real-time identification and high frequency analysis of deposits outflows,* Journal of Financial Econometrics, **WP 1319 (December 2017).**

ROPELE T., Y. GORODNICHENKO and O. COIBION, *Inflation expectations and misallocation of resources: evidence from Italy,* American Economic Review: Insights, **WP 1437 (December 2023).**