Competition, Productivity and Exports: a quick assessment of underlying trends and policy drivers for Colombia[1]

Key messages:

Perception-based and aggregate data suggests that markets in Colombia are generally less contestable than in comparator countries. Analysis based on micro level data shows that market power has been increasing in Colombia: (sales weighted) plant average markup increased by around 37% in manufacturing during 2008-18, while (sales weighted) firm average markup in services increased around 27% in services in the same period. In manufacturing sector, top decile plants in markup and operational profitability distributions are less productive and less willing to invest in ICT related equipment when compared with the rest of plants, and are overly represented in traditional activities as: clothing, beverages, furniture, manufacture of other non-metallic mineral products, and textiles. Some of these sectors are among those with the highest average ad-valorem equivalent of tariffs and non-tariff measures in the country. In services sector, top decile firms in markup and operational profitability distributions are larger and more efficient than the rest of firms, and are overly represented in the following activities: professional scientific and technical activities; health services; automotive dealers and gasoline service; insurance agents, brokers and service. Boosting competition would be associated with gains in productivity growth for both manufacturing and services sectors, and with positive dividends in terms of export activities of manufacturing sector.

These market outcomes result from the interaction between firms, market features and government interventions. As for government interventions in the economy and their potential to stifle competition, the analysis zooms in on product market regulations. Results show that Colombia's regulatory framework, as it is in the books, is more restrictive to competition when compared to the OECD average. Economy-wide restrictiveness stems mainly from distortions induced by state involvement, which are driven by issues around the complexity and transparency of regulations, followed by restrictions related to the high degree of public ownership in the economy. Restrictions associated with barriers to domestic and foreign entry are also pervasive, and more restrictive than the OECD average. They arise in specific service sectors and in relation to trade and the entry of foreign investors. There are also signs of regulatory barriers to competition in network sectors, particularly in telecommunications, which may hinder access to and quality of services provided as well as the continued growth of the digital economy. and overall competitiveness.

A full-fledged competition analysis is needed to identify if other type of government interventions and their implementation – besides those related to regulations in product markets - might be hindering the efficient functioning of markets in Colombia by preventing entry, reinforcing dominance or protecting vested interests. Furthermore, it is key to assess if the government has been fostering competitive neutrality between SOEs and private firms – not only in network sectors but in other sectors where they operate; whether state support measures have been granted in a non-distortive way; and whether the competition law and policy has been effectively implemented to tackle anticompetitive behavior and distortive regulations.

[1] This note was prepared by Mariana Iootty, Georgiana Pop, Jorge Pena, and Clara Alexandra Stinshoff, all from ETIMT. The team would like to thank Alvaro Raul Espitia Rueda for the support with implementation of Stata do files and coordination with DANE to access EAS and EAM datasets, as well as Hernan Winkler and Nadia Rocha for comments provided during the internal peer review process at the World Bank. The team is also grateful to Bill Maloney, Chad Syverson, Gabriel Zaourak, Charl Jooste and participants of the internal workshop for the 'Competition, Productivity, and Growth LAC report' (December 8-9, 2020) for useful comments.

1. Motivation

Competition[2] is a critical ingredient for productivity growth. **In addition, there is a positive association between productivity and export performance.** Competition improves the productive efficiency at firm level ('within-firm' component); it prompts allocative efficiency by allowing more efficient firms to gain market share or to obtain more productive inputs, at the expense of less efficient firms ('between-firm' component), and it boosts market selection by facilitation the entry of more productive firms and encouraging the exit of less productive ones ('selection' component).[3] On the other hand, there is a positive association between productivity and export performance. Stylized facts from empirical literature find two complementary effects. First, a positive correlation between productivity and export status. Second, the productivity of exporting firms increases with their exposure to international markets. See Annex 1 for a summary of the literature review on competition, productivity growth and export performance.

In this context, government interventions can influence the extent of competition pressure in the domestic market and impact productivity and export performances of domestic firms. Since governments can influence markets either through direct participation (as a market maker or as a buyer or supplier of goods and services), or through indirect participation in private markets (through regulation, subsidies or taxation), assessing the economic outcomes of government interventions is important in order to balance economic and non-economic policy objectives and their effects on market functioning.[4] Specifically, removing trade barriers - to boost import competition and widen the range of input sources available to domestic firms - and promoting the entrance of foreign firms are important instruments to promote competition in domestic markets. Competition policy plays a complementary and key role in enhancing the functioning of domestic markets. A comprehensive competition policy framework rests on three key pillars: (i) fostering pro-competition regulations and government interventions in markets; (ii) promoting competitive neutrality and non-distortive public aid; and (iii) enabling effective competition law and antitrust enforcement.[5] Therefore, the implementation of a successful competition policy - in coordination with trade and investment policies - is crucial to set appropriate incentives for domestic

[2] Competition is the process of rivalry between suppliers that takes place either in the market or for the market.

[3] It is worth highlighting however, that some nuances may apply, and an inverted-U shape relation might emerge: the effect of competition on productivity depends on the initial level of competition and the sector where firms operates (and their distance to technology frontier).

[4] The most important criteria to filter distortive government intervention relate to whether the intervention affects (i) the possibility of market entry or exit (such as exclusive rights to supply, limitations on the number of suppliers or interventions that significantly raise the costs of new firms to enter the market), (ii) the market conditions to compete among firms, either through direct restrictions (such as price or product regulation) or by reducing the incentive for firms to compete strongly; and (iii) the ability of consumers to shop around between firms and exercise consumers' choice. See Office of Fair Trading (2009).

[5] The first pillar includes measures to reduce market distortions caused by sector regulation and government interventions in markets that reinforce dominance or limit entry, facilitate collusive outcomes, or increase the cost of competing in markets, and that discriminate and protect vested interests. The second pillar encompasses the introduction of pro-competition principles in broader government policies such as public procurement, state aid, trade policy, foreign direct investment policy, and governance of state-owned enterprises. The third pillar includes the effective enforcement of well-designed antitrust laws (typically constituted by merger control and rules against abuse of dominance and anti-competitive agreements) that aim at controlling distortions caused by non-competitive market structures and the strategic behavior of firms.

firms to invest, innovate and increase productivity growth, and so forth impact the capacity of these firms to thrive in exporting activities.

Against this backdrop, the objective of this note is to assess the extent to which competitive pressure in the Colombian markets affect market outcomes, estimate the productivity and export dividends that would be associated with stronger competition pressure, and assess whether government interventions - with a focus on product market regulations - have been enhancing or distorting market functioning in Colombia.

2. How competitive are the Colombian markets?

Perception-based and aggregate data

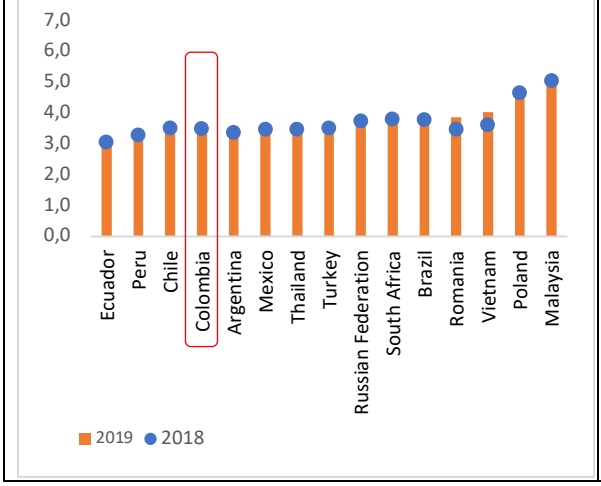
Perception-based data and surveys indicate high levels of market dominance in Colombia. According to the World Economic Forum's Global Competitiveness Index, which captures the views of business executives, business activity in Colombia is perceived to be dominated by relatively few market players. Colombia ranked 102nd out of 141 countries in terms of the perception of market dominance in 2019, falling behind several peers, including Mexico, Brazil and Romania, but on par with Chile and Peru (Figure 1).[6] Firm-level data from the latest World Bank Enterprise Survey (WBES)[7] corroborate these perceptions about market dominance and show that monopolistic, duopolistic and oligopolistic market structures are widespread in the manufacturing sector[8]. The proportion of Colombian manufacturing firms that consider that they operate in monopoly, duopoly, or oligopoly markets appear to be relatively high (26%) compared with European peers Poland, Turkey, Romania and Russia (Figure 2). While market dominance can be associated with higher efficiency, it can also pose risks of anti-competitive behavior. This is particularly relevant when market characteristics, together with, structural and behavioral barriers enable dominant firms to engage in abusive behavior.

[6] For the purpose of this analysis, Colombia is benchmarked against Argentina, Brazil, Chile, Colombia, Ecuador, Malaysia, Mexico, Peru, Poland, Romania, Russian Federation, South Africa, Thailand, Turkey and Vietnam.

[7] A description of the Enterprise Survey methodology is available at: http://www.enterprisesurveys.org/methodology

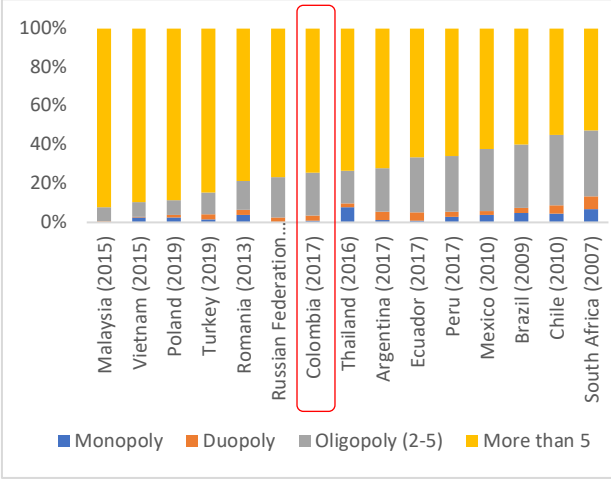
[8] The manufacturing sector covered in the Enterprise Survey includes food, textiles, garments, leather, wood, paper, publishing, printed and recorded media, refined petroleum products, chemicals, plastics and rubber, non-metallic mineral products, basic metals, fabricated metal products, machinery and equipment, electronics, precision instruments, transportation machines, furniture, and recycling. A description of the Enterprise Survey methodology is available at http://www.enterprisesurveys.org/methodology

FIGURE 1. PERCEIVED MARKET DOMINANCE, COLOMBIA AND PEERS (2019)



Note: Response to the survey questions "In your country, how do you characterize corporate activity?" [1 = dominated by a few business groups; 7 = spread among many firms] and ""In your country, to what extent do fiscal measures (subsidies, tax breaks, etc.) distort competition?" [1 = distort competition to a great extent; 7 = do not distort competition at all]
Source: *Source*: World Bank staff based on World Economic Forum (2019) Global Competitiveness Index

FIGURE 2. MARKET STRUCTURE IN THE MANUFACTURING SECTOR, COLOMBIA AND PEERS (LATEST YEAR AVAILABLE)

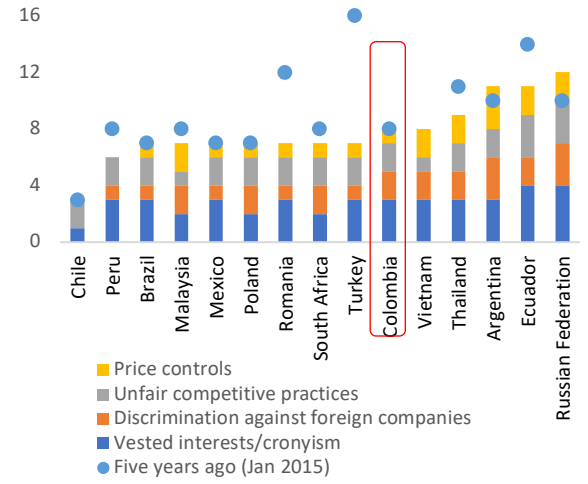


Note: The shares reflect the percentage of responding establishments that answered "None", "One", "2-5" or "More than 5" to the question "For fiscal year [indicated in parenthesis], for the main market in which this establishment sold its main product, how many competitors did this establishment's main product/product line face?", respectively. E.g. "None" was coded as "Monopoly" and "One" as "Duopoly".
Source: World Bank staff based on Enterprise Survey data

Regulations and other government interventions are perceived to hamper competition in Colombian markets. According to the Economist Intelligence Unit's Risk Tracker data, there is a relatively high perceived level of operational risk in Colombia owing to vested interests and cronyism, unfair competitive practices and discrimination against foreign companies. Moreover, this perception has not changed in the past five years, whereas some peers - for example Turkey, Romania and Peru - were able to improve their scores (Figure 3).

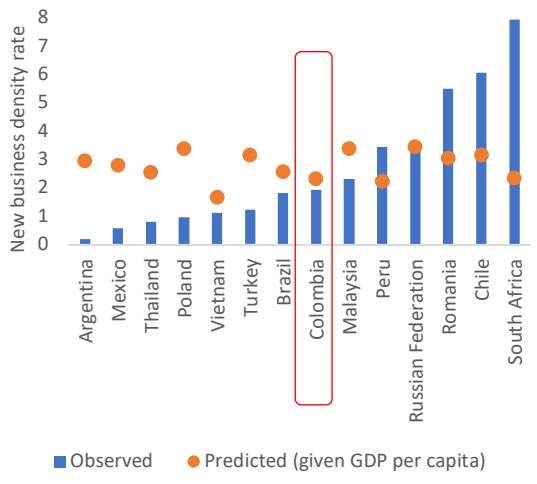
In addition, entry of new firms remains limited, and below what would be expected given the country's level of income per capita. Between 2006 and 2018, the average business entry density rate, which measures the number of newly registered formal private limited-liability firms per 1,000 working-age people (aged 15–64), was lower in Colombia's formal private sector than several of its peers (Figure 4). It is also below what would be expected given its level of income per capita.

FIGURE 3. BUSINESS RISKS DUE TO UNFAIR COMPETITION, 2019: 0 (VERY LITTLE RISK) TO 4 (VERY HIGH RISK)



Note: The graph shows an aggregation of four indicators each scored on a scale from 0 (very little risk) to 4 (very high risk).
Source: World Bank staff based on Economist Intelligence Unit's Risk Tracker data (July 2020).

FIGURE 4. NEW BUSINESS ENTRY DENSITY: 2006-2018 AVERAGE



Note: New business entry density is defined as the number of newly registered formal private limited-liability firms per 1,000 working-age people (aged 15–64). The bars show the average observed density rate for the period 2006–2018. The dots show the benchmark predicted by a (linear) regression with (the log of) average GDP per capita 2006–2018 adjusted for (2011) purchasing power parity as the explanatory variable.
Source: World Bank staff based on World Bank's Entrepreneurship Survey database and World Development Indicators (WDI) database, 2006-2018.

Micro level evidence for manufacturing sector

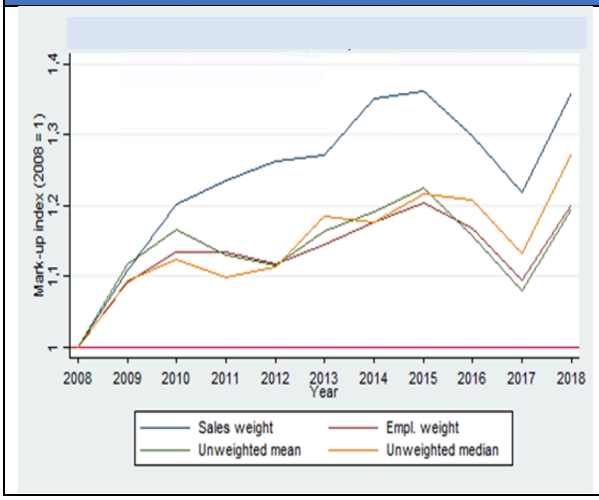
The micro level analysis uses three different indicators to proxy market power: markup, operational profitability and CR4. [9] **Results drawing from plant level data from the 'Encuesta Anual Manufacturera (EAM)' shows that market power in manufacturing sector has increased over the 2008-2018 period.** There are differences in the dynamics within specific sub-sectors. The (sales weighted) average markup in manufacturing increased by around 37% in the period (Figure 5), while operational profitability also experienced an increasing trend across manufacturing sector (11 %). These aggregate numbers mask a lot of heterogeneity. Between 2008-2018, 65 % of 4-digit ISIC manufacturing industries experienced an increase in (sales weighted) average markup, while the remaining 35% experienced a decline in markups (see Table A2.1 in Annex 2, section 2).

In fact, data shows that aggregate increase in average markups in manufacturing has been progressively uneven across plants. Plants in the top decile of the markup distribution shrank their (weighted) average markup by around 50% on average, while the remaining plants of the distribution showed increasing markups with average growth rate around 20% in the same period (Figure 6).[10] These top decile plants of markup distribution in manufacturing sector account for an increasing share of employment, value added

[9] See Annex 2 (sections 1 and 2) for a description of the EAM survey as well as a description of the methodology applied to calculate the competition indicators used in the plant- and firm-level analysis - markup and operational profitability, at plant/firm level, and concentration ratio (at ISIC 4-digit sector level).
[10] It is worth highlighting that even though markups of top decile plants decreased over the period, they are still very high when compared with the remaining plants in the distribution.

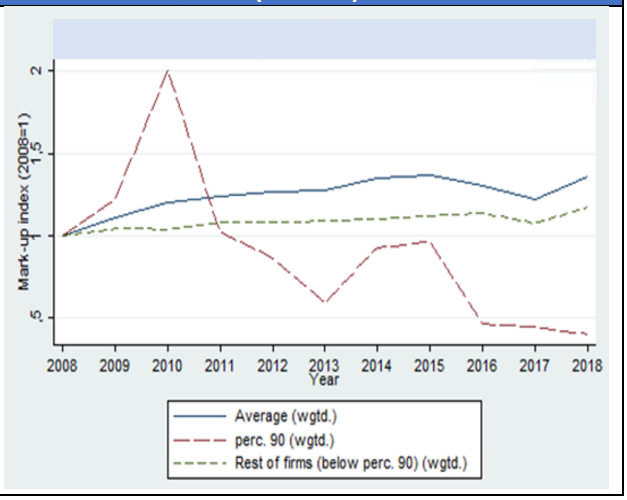
and sales, as a proportion of total manufacturing sector (see Figure A2.1. in Annex 2, section 3). They are overly represented in the following activities: clothing, beverages, furniture, manufacture of other non-metallic mineral products, and, textiles.[11] An in-depth competition assessment of these sectors and markets would be needed to assess the intrinsic market features (including supply-side characteristics and buyer characteristics) and to identify government intervention that may restrict entry, shield dominant firms and protect vested interests through preferential measures. In this regard, a recent study conducted by Garcia Garcia, Uribe and Salazar (2019) shows that some of these sectors - where top decile markup plants are overrepresented - are listed among those with the highest average ad-valorem equivalent of tariffs and non-tariff measures in Colombia.[12]

FIGURE 5. AVERAGE MARKUP IN MANUFACTURING: INDEX (2008=1)



Note: Averages computed at plant level
Source: World Bank staff based on EAM data

FIGURE 6. (SALES-WEIGHTED) AVERAGE MARKUP IN MANUFACTURING, BY PLANT GROUPS (CONTROLLING FOR ISIC4-DIGIT SECTOR): INDEX (2008=1)



Note: 'Perc. 90' group refers to top 10% plants; they are identified as the top 10% - in terms of markup – of the year/ISIC 4-digit sub-sector distribution
Source: World Bank staff based on EAM data

When compared with the rest of plants of markup distribution in manufacturing, top decile plants are less productive and less willing to invest in ICT-related equipment. When plants are ordered in terms of operational profitability, the top decile plants are not only less productive and less willing to invest in ICT-related equipment, but also less likely to export. An econometric analysis was conducted to capture performance differences between the top decile plants and the rest of the plants, based on the markup distribution.[13] Results in Table A2.3 (Annex 2, section 3) show that plants in the top decile of markup distribution in manufacturing have a TFPQ level 10.68% lower than the rest of firms and the probability of investing in ICT-related machinery decreases by 5.4 percentage points. Results are robust to the use of an alternative measure of market power: when plants are ordered by operational profitability, top decile

[11] To identify whether top decile plants are overrepresented in a given sector, the analysis compares the sector's frequency ration among top decile plants against the sector's frequency ratio for all plants. If the former ration is higher than the latter, then the sector is labeled as a sector where top decile plants are overrepresented.
[12] See Section 7, graph 2 of Garcia Garcia, Uribe and Salazar (2019) for a detailed list.
[13] See Annex 2- section 3 for a brief methodological explanation and results.

plants are less productive, less willing to invest in ICT-related equipment, and less likely to export. When taken together, these results suggest that the ability of top decile plats in manufacturing to charge high markups (or to extract high profitability) is more related with strategic behaviour rather than efficiciency rewards activity. This could be interpreted as a potential sign of lack of competition.

Fostering greater competition in domestic product markets would boost productivity growth in manufacturing sector in Colombia. Reducing markups – as would likely occur with *more* competition - is associated with an increase in productivity growth of manufacturing sector.[14]. Specifically, a 10% decrease in average plant's markup in manufacturing sector is associated with an increase of 0.06 percentage points in average (TFPQ) productivity growth (see Table A2.5 in Annex 2, section 4). For the average manufacturing sector, this would imply boosting productivity growth, in the 2008-18 period, from 3.27% to 3.33%. Results are robust to other measures of competition intensity: lowering CR4 (at ISIC 4-digit sub-sector) or average plant's operational profitability is also associated with an increase in productivity growth of firms in the sector.[15]

However, not all manufacturing plants benefit equally from more competition: the positive association between competition and productivity is stronger for plants closer to technology frontier. An econometric model is applied to test the heterogeneity of the relation between competition – proxied by markup – and productivity.[16] Results presented in Table A2.6 (Annex 2, section 4) show that for those firms at the frontier of TFPQ, a reduction of mark-up by 10% is associated with an increase of TFPQ growth by 0.076 percentage points. This positive association between competition and productivity growth becomes weaker for firms that are farther from the frontier of TFPQ: for instance, for firms with a TFPQ that is 10% lower than that of the frontier, the effect from markup reduction on TFPQ growth is 0.066 percentage points. [17]

Reducing markup in manufacturing sector would be associated with stronger export performance as well, both in terms of increase in export intensity and increase of probability of becoming an exporter. A two-stage econometric model is applied to gauge the association between markup reduction and productivity, and then the association of productivity with export performance.[18] Results presented in Table A2.9 (Annex 2, section 5) show that reducing markups in manufacturing sector – as would likely occur with more competition - is associated with higher productivity growth, and then with an increase in plant's 'probability to become an exporter' and increase in plant's export intensity. A 10% decrease from the average markup implies stronger productivity growth, an increase of 0.2 percentage points in plant's

[14] See Annex 2 – section 4 for a brief methodological explanation and results.

[15] While the association between markup and TFPQ might be 'contaminated' by a mechanical correlation – since markup is a byproduct of TFPQ estimation (specifically retrieved by the ratio output elasticity/expenditure share), there is no reason to expect a priori that TFPQ is correlated with operational profitability ratio and CR4. In this regard, the fact that results hold also for operational profitability or CR4 suggests there is indeed an association between increased competition and stronger productivity growth, on average.

[16] See Annex 2 – section 4 for a brief methodological explanation and results.

[17] This result provides supporting evidence for the mechanism proposed in Aghion et al. (2005): more competition leads firms closer to the frontier to invest in efficiency-enhancing technology, therefore the gains in productivity, while firms far from the frontier has less incentives to do so.

[18] See Annex 2 – section 5 for a brief methodological explanation and results.

`probability to become an exporter'[19] and an increase of 0.058 percentage points of plant's export intensity.[20] For the average manufacturing sector in the 2008-18 period, this would imply increasing the probability to become an exporter from 11.07% to 11.27% and augmenting the export sales ratio from 4.33% to 4.91%. Results hold when using operational profitability as an alternative indicator of competition (see Table A2.10, Annex 2 section 5).

The association between markup and trade has some nuances, as markup levels vary across plants with different levels of trade exposure. Plants that import their inputs have lower markup when compared with domestic oriented plants, while plants that simultaneously import inputs and export their products tend to have higher markups. Markup level varies across manufacturing plants with different exposure to trade activities: i) plants that do not export nor import inputs (the so called domestic oriented plants); ii) plants that only export their products; iii) plants that only import inputs; and iv) plants that simultaneously export products and import inputs (a proxy of GVC integrated plants); see Annex 2 – section 4 for a brief methodological explanation and summary results. Results from Table A2.11 (Annex 2, section 6) show there is no statistically significant difference between markup levels of domestic oriented plants and those that export their products. On the other hand, markup of plants that only import inputs (but not export their products) are 30.5% lower than that of domestic firms, while manufacturing plants that are integrated to GVC (both through export and import) have a mark-up 13.5% higher on average than domestic oriented plants. Result are robust when using operational profitability, as an alternative measure of market power. Results are also robust when controlling for productivity level (see Table A2.12 (Annex 2, section 6).

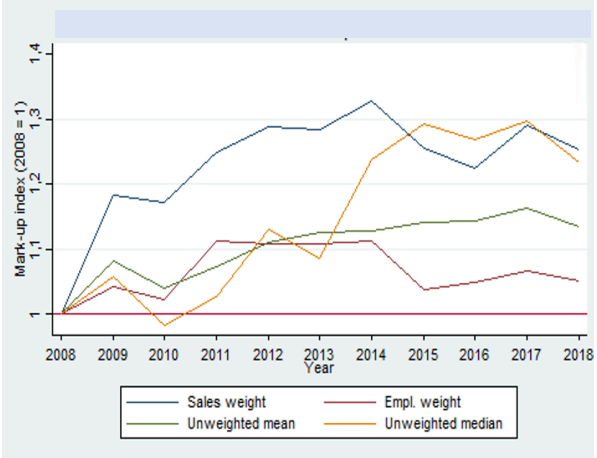
Micro level evidence for services sector

Analysis drawing from firm level data from the 'Encuesta Anual de Servicios (EAS)' shows that aggregate market power also increased in services sector over the 2008-2018 period. Because aggregate numbers mask a lot of heterogeneity, it is not surprising to see different markup trends across sub-sectors within services sector. Across services sector, the (sales weighted) average markup increased by around 27% in the same period (Figure 7). There are differences in the dynamics within specific sub-sectors. In services, 55.8% of 4-digit ISIC sub-sectors experienced an increase in (sales weighted) average markup, while the remaining 44.2% sub-sectors experienced a decline in markups. (see Table A2.2 in Annex 2, section 2).

[19] This estimation uses the export ratio of 1% to classify a plant as an exporter. If moving the export ratio threshold to 5%, the increase in `probability to become an exporter would be 0.15 percentage points. For a 10% threshold, the increase would be 0.12 percentage points.

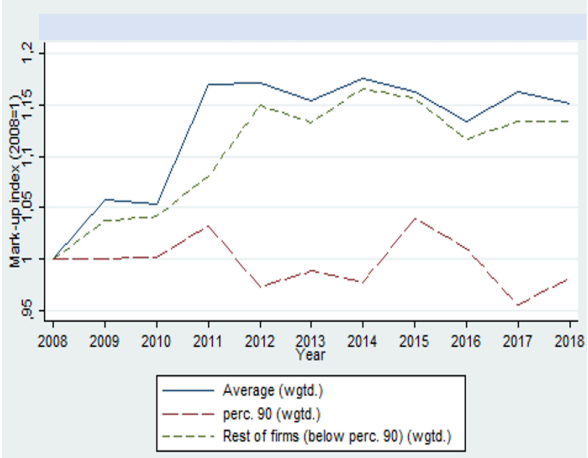
[20] It is worth acknowledging the multiple channels at play and the limitations of this exercise. Because the analysis does not track plants before and after entering the export market- becoming an exporter is simply identified as plants with at least 1%, 5% or 10% export sales ratio - it is not possible to disentangle the association between export activities and markups dynamics. Some papers have found that markup increases after entering the export market – see De Loecker and Warsinsky (2012) for Slovenia, and that exporters have higher output prices than non-exporters – see Kugler and Verhoogen (2012) for Colombia. The current analysis shed light on the association between markup – as a proxy of market power – productivity and export activity without taking into consideration that once firms/plants become exporters they tend to increase both their productivity (learning by exporting) and also their prices and markups. The purpose was just to show that reducing average markup – which is likely to happen with stronger competition – is associated with productivity increase and then export performance. The 'post export entry' is not taken into consideration, neither the sectoral nuances that might be at play.

FIGURE 7. AVERAGE MARKUP IN SERVICES: INDEX (2008=1)



Note: averages computed at firm level
Source: World Bank staff based on EAM data

FIGURE 8. (SALES-WEIGHTED) AVERAGE MARKUP IN SERVICES, BY FIRM GROUPS (CONTROLLING FOR ISIC4-DIGIT SECTOR): INDEX (2008=1)



Note: 'Perc. 90' group refers to top 10% firms; they are identified as the top 10% - in terms of markup – of the year/ISIC 4-digit sub-sector distribution
Source: World Bank staff based on EAM data

In fact, the aggregate increase of markup in services has been uneven. Firms in the top decile of the markup distribution kept their (sales-weighted) average markup almost constant over the period – experiencing a small decrease of 1% - while the remaining plants of the distribution increased their (sales-weighted) markups by around 15%, on average (Figure 8)[21]. These top decile markup firms in the services sector account for an increasing share of value added and sales, as proportion of services sector (see Figure A2.2. in Annex 2, section 3), and they are overly represented in the following activities: professional scientific and technical activities; health services; automotive dealers and gasoline service; and, insurance agents, brokers and service.

When compared with the rest of firms of markup distribution in services, these top decile firms are relatively larger and more efficient. The same result applies if firms are ordered by operational profitability. Results from the econometric analysis show that the top decile firms of markup distribution in services are 42.4% larger and have a TFPQ level 2.1 times higher than the rest of firms. Results are robust to the use of operational profitability as an alternative measure of market power; in this case, the top decile plants are also less likely to export (see Table A2.4 in Annex 2, section 3). When taken together, these results suggest that the ability of top decile firms in services sector to charge high markups (or to extract high profitability) has been accompanied by efficiency performance.

Fostering greater competition in domestic product markets would boost productivity growth in services sector as well. Lowering average firms' markup in services sector by 10% is associated with an increase of 0.89 percentage points in average productivity growth in the sector (see Table A2.7 in Annex 2, section 4). For the average service sector, this would imply boosting productivity growth, in the 2008-18 period, from -1.04% to -0.15%. Results are robust to other measures of competition intensity: reducing average operational profitability at firm level or CR4 at ISIC 4-digit sub-sector is associated with an increase in average productivity growth of service firms. However, there is no significant evidence that the positive

[21] Again, even though markups of top decile firms in services distribution kept their (sales-weighted) average markup almost constant over the period, they are still very high when compared with the remaining firms in the distribution.

association between markup and productivity growth is heterogeneous across firms with different distances to productivity frontier (see Table A2.8 in Annex 2, section 4).

3. Are government interventions enhancing or distorting markets in Colombia? A zoom in on product market regulation

Market outcomes result from the interaction between firms, market structure and government interventions. Market outcomes - such as those presented in the previous sections (e.g. growing mark-ups in manufacturing and services, and perceptions about high levels of market dominance) – are typically the result of the interaction between the inherent features of the market, such as economies of scale, vertical integration or the existence of multi-market contacts, the behavior of firms and government interventions. Government interventions can influence competition in domestic markets in three ways. Going beyond trade and investment policies meant to open markets to international competition, governments can introduce pro-competition market regulations and reducing distortive direct participation in markets. Distortions arise when government interventions reduce the ability of firms to enter or exit the market (for example, through exclusivity rights, limitations on the number of suppliers, or expensive licensing schemes), when they affect competition between market participants or when they restrict consumer choice. Second, by promoting non-distortive public aid and competitive neutrality, including with respect to state-owned enterprises (SOE) when SOEs compete in commercial sectors and markets. And third, by ensuring that the competition policy and law is effectively implemented to sanction – and deter – anticompetitive behavior by firms.

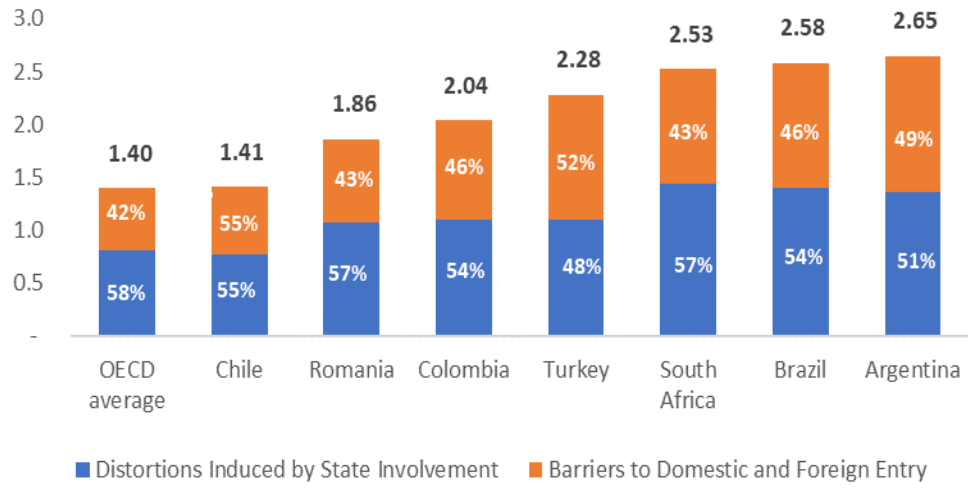
This section focuses on product market regulations (PMR) to assess whether government interventions have been enhancing or distorting market functioning in Colombia. This analysis uses the OECD PMR indicator to examine how government regulations, as they are 'in the books', affect competition in Colombia. The 2018 OECD dataset provides information on PMR across 46 OECD and non-OECD countries.[22] The OECD-PMR indicators assess the extent to which public policies promote or inhibit market forces in areas of the product market where competition is viable, both economy-wide and in specific sectors. PMR scoring reflects only regulations 'in the books' (and in the year 2018) and does not capture informal regulatory practices, nor how effective enforcement of regulations is. The economy-wide assessment focuses on two key types of restrictions in regulatory frameworks: distortions induced by state involvement (pillar I) and barriers to domestic and foreign entry (pillar II). These high-level pillars are further subdivided into three indicators each. The sectoral PMR uncovers regulatory restrictiveness in key sectors and the economy – energy, transport, e-communications and professional services. Indicators for each sector are composed a measurement of the extent of public ownership and -control (pillar I) and of information on how entry and conduct is regulated (pillar II). See Annex 3 for an overview of the PMR framework (both the economy-wide and the sectoral indicators).

[22] The countries covered by the 2018 OECD PMR database are: (a) OECD countries: Australia, Austria ,Belgium, Canada, Colombia, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom and (b) Non-OECD countries: Argentina, Brazil, Bulgaria, Costa Rica, Croatia, Cyprus, Kazakhstan, Malta, Romania, South Africa. Data can be downloaded from https://www.oecd.org/economy/reform/indicators-of-product-market-regulation/.

Economy-wide product market regulation

Results for 2018 economy-wide PMR indicator show that regulations in Colombia are less conducive to competition than in the OECD countries. Colombia's PMR score indicates a regulatory framework that is more restrictive to competition than that of regional peers, such as Mexico and Chile, selected European peers (Poland and Romania), and the OECD average (see Figure 9).

FIGURE 9. ECONOMY-WIDE PMR, 2018: INDEX SCALE 1 (LESS) TO 6 (MORE) RESTRICTIVE



Source: World Bank staff based on 2018 OECD Product Market Regulation dataset

Distortions induced by State involvement in the economy represent the main source of regulatory restrictiveness to competition in Colombia. More than half of the score of the overall PMR indicator (54%) can be explained by "distortions induced by state involvement' (Figure 10), which captures the frictions that can be caused by the involvement of the state in the economy through the activity of SOEs and other forms of control and obligations imposed on private firms.

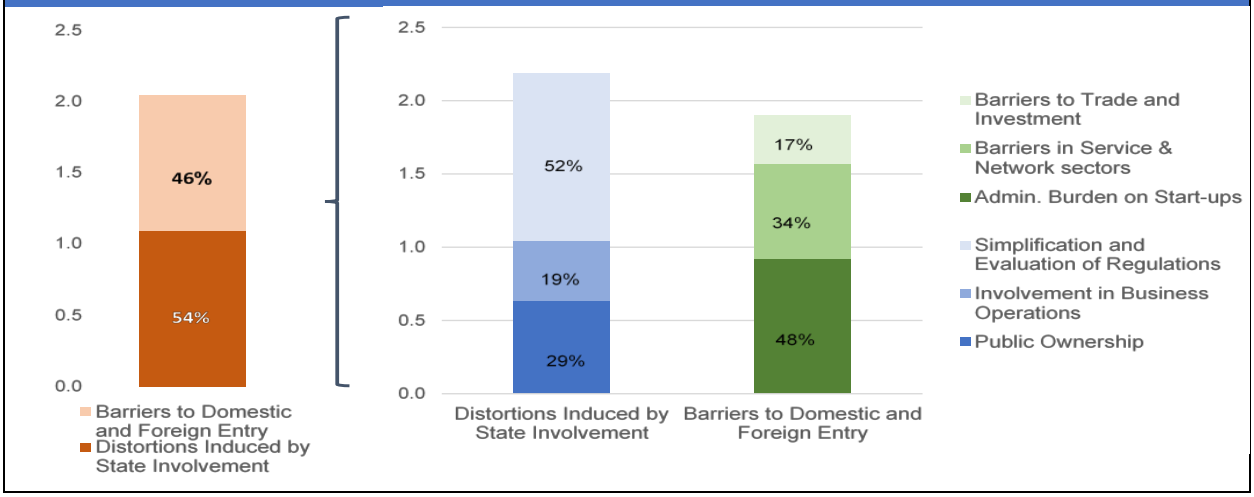
The distortions associated with State presence are, in turn, primarily due to the complexity of regulatory procedures, and gaps in the framework for the regulatory impact assessment (RIAs). A further decomposition of the high-level indicator 'distortions induced by State involvement' show that more than half of its variation (52%) is explained by aspects pertaining to 'simplification and evaluation of regulations' (Figure 10). A closer look shows that key rules and regulations to increase accountability and transparency of government and regulatory agencies are lacking. Colombia is the only country in the entire OECD PMR sample that does not allow the right to appeal for affected parties against adverse regulatory decisions[23] and there are no requirements regarding the publication of laws and subordinate regulations by government entities to increase transparency of lawmaking.[24] Moreover, Colombia's framework also lacks key rules for engaging stakeholders (lobbying regulations), such as a requirement to publicize interactions between public officials and representatives of interest groups to register an

[23] See also OECD (2014).

[24] As per 2018 OECD PMR database, this includes both existing and planned laws and regulations: the government does not publish online a list of primary laws or subordinate regulations to be prepared, modified, reformed or repealed in the next six months or more and there is no online register of all subordinate regulations currently in force.

interest group in a public registry ('lobbying register'). Finally, there are gaps in the framework for ex ante regulatory impact assessments (RIA) for new laws and regulations, which are a critical tool to foster regulatory efficiency, including in terms of competition impacts. Specifically, there is no obligation for RIAs in primary laws, while RIAs applicable to secondary legislation do not include an assessment of the impact on competition and are not subject to review by government bodies other than the sponsoring entity.

FIGURE 10. : DECOMPOSITION OF PMR SUB-INDICATORS FOR COLOMBIA: INDEX SCALE 1 (LESS) TO 6 (MORE) RESTRICTIVE



Source: World Bank staff based on 2018 OECD Product Market Regulation dataset

Another relevant source of distortions associated with State involvement in the economy is public ownership. The second most relevant driver behind State-led distortions in the economy – accounting for 29% of its variation – is public ownership,[25] which captures the scope of ownership and direct control by the state in the economy (Figure 10). A closer look at restrictions associated with public ownership show there are no coherent and stringent rules around public ownership and competitive neutrality. Existing laws allow the preferential treatment of SOEs through state aid, which can unlevel the playing field between SOEs and private firms. For example, SOEs are excluded from the application of the bankruptcy law,[26] exonerating them from its obligations and procedures for private operators. SOEs across the economy can access finance at favorable conditions and; in some sectors, SOEs can benefit from other favorable treatments that are not available to private firms.[27] Further, the regulation around the ownership and governance of public entities lack safeguards to limit political interference. Importantly, line ministries exercise ownership rights of SOEs, instead of a specialized agency or the Ministry of Finance. In addition, the ministries (owners) are also the regulator in some sectors. Finally, there is no formal requirement for SOEs to separate their competitive or potentially competitive activities from their

[25] According to the 'Reporte Anual de las Empresas de la Nación' (2018), the government holds shares in 105 SOEs and retains majority control in 30 of them. The data suggest that Colombian SOEs operate in at least 15 sectors or subsectors of the 30 broad sectors covered by the 2013 PMR methodology. While the average for OECD countries is 15 sectors as well, it is more than an average of 13 in Pacific Alliance peers Chile and Peru and 12 in other peers such as Slovakia and Uruguay, reflecting a relatively high extent of state involvement in commercial activities.

[26] Article 3, para. 5 of the Law 1116 of 2006.

[27] For example, Isagen, S.A., a state-owned electricity generation company, was backed up with a state guarantee in 2015 to get access to a loan from a U.S. development bank.

non-competitive activities[28] which is an important safeguard to ensure a level playing field in those sectors where SOEs compete with private firms.[29]

Restrictions associated with barriers to domestic and foreign entry are also pervasive and mostly due to high administrative burden on start-ups. A further decomposition of the high-level indicator 'barriers to domestic and foreign entry' show that almost half of its variation (48%) is explained by administrative burden on start-ups (Figure 10). Colombia's regulatory framework includes significant red tape for new firms, which increases barriers to entry. For instance, there is no online database for accessing information on all required permits and licenses required to start up a business. Similarly, the government does not provide information on the number of permits and licenses required for start-up and there is no mandatory use of plain language to facilitate the understanding of applicable rules. In addition, significant red tape involved in licensing and permits create further barriers for entrants. For example, there is no single contact point ("One-stop shop") for applying and receiving licenses and permits and no 'silence is consent' rule that would speed up the licensing process.

The PMR data shows there are several barriers to domestic and foreign entry in specific service sectors as well as remaining restrictions pertaining to trade and entry of foreign investment.[30] In service sectors, regulatory restrictions for all entrants (regardless of ownership) arise either through burdensome entry regulations or conduct constraints of regulated professions or through regulatory issues in retail trade. For example, there are limits on the number of competitors (either by regulation or enforced through professional associations) in road freight transport and authorizations required to sell LPG and self-care medical devices, among others. When it comes to restrictions to entry of foreign investors and trade, the regulatory framework treats foreign suppliers differently vis-à-vis domestic suppliers in some instances, which restricts competition between them. For example, foreign firms have restricted access to tendering processes of public works and these contracts may be awarded based on non-objective/discriminative criteria that favor domestic firms over foreign ones. In some sectors, it is required that a certain percentage of a public works contracts is reserved to domestic firms, excluding foreign firms altogether.

[28] Separation between the noncompetitive and the potentially competitive ones activities could mean: 1) keeping separate accounts for the competitive and noncompetitive activities (so-called accounting separation) 2) the competitive and noncompetitive activities are located into distinct legal entities, which have separate boards of directors (so-called legal separation) 3) The competitive and noncompetitive activities are operated separately with separate management, and separate information systems. (so-called operational separation) 4) any combination of the above.

[29] Article 18 of Law 142 / 1994 on public service obligations mandates an accounting separation of public service obligations and other activities carried out by public service providers. While separating accounts does provide for the separation of commercial and non-commercial activities, it is the least interventionist form of separation (see footnote above). In addition, there seems to be limited implementation of the accounting separation in practice. For example, Satena, S.A., an SOE active in the airlines sector, has not defined the cost of its non-commercial activities in its accounts, which makes it difficult to identify any possible cross-subsidization. See OECD, 2020: OECD review of the corporate governance of State-Owned Enterprises in Colombia. Available at: https://www.oecd.org/colombia/oecd-review-corporate-governance-soe-colombia.htm.

[30] The services sector indicators cover six professions (accountants, architects, civil engineers, estate agents, lawyers, and notaries), as well as two sectors in retail distribution (general retail trade and retail sales of medicines). The network sectors indicators cover eight network sectors (four transport, two E-Communications and two energy sectors); Restrictions in networks sectors will be elaborated in more detail as part of the discussion of the sectoral PMR.

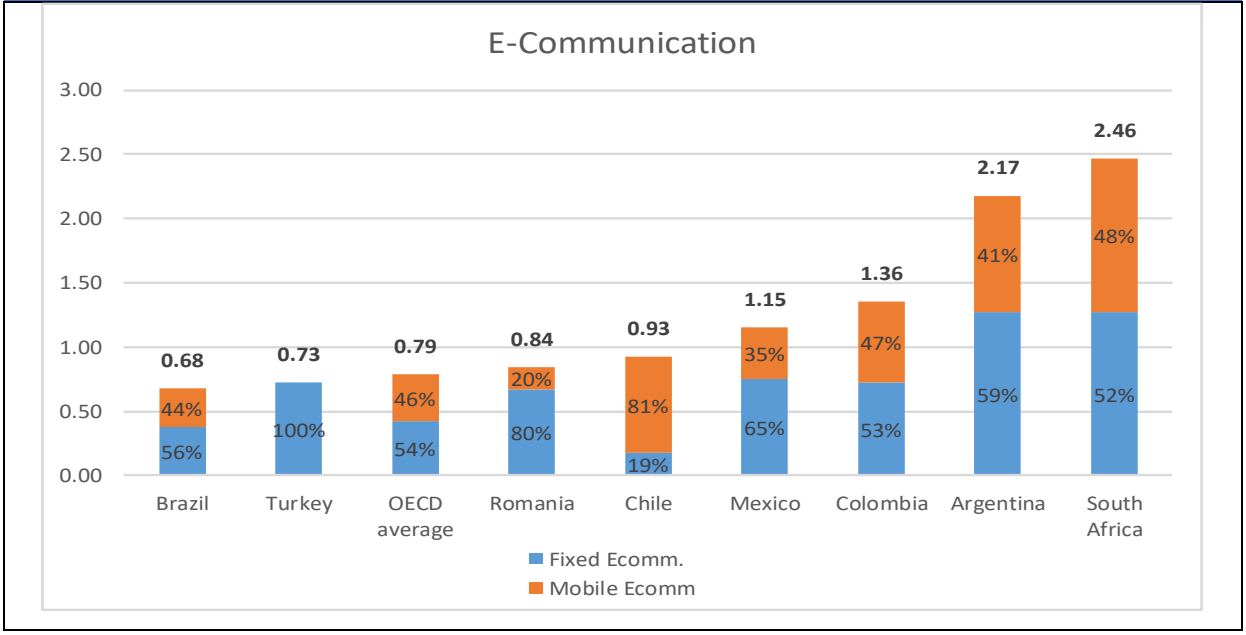
Sector-specific product market regulations in network sectors

Measuring regulatory restrictiveness to competition in network sectors is particularly important as these activities provide significant intermediate inputs in the production of other services and manufacturing products. For this reason, efficient provision of network related services – which is influenced by the level of regulatory restrictiveness to competition - affect the performance, as well as incentives to increase productivity, of downstream sectors and the overall economy. Bourles et al (2013) highlight two main channels through which competition in upstream sectors can influence productivity performance of downstream users. Through the direct channel, fiercer competition in services can generate downstream productivity gains, as final good producers get access to cheaper/higher quality intermediate inputs. Through the indirect channel, stronger upstream competition can encourage downstream firms to reallocate the resources they saved (with lower price inputs) towards productivity-enhancing activities such as innovation, technology adoption, workers' training, and managerial practices.

E-communications

The E-communication sector[31] – encompassing fixed and mobile voice and internet – is the network sector where Colombia fares worse than its peers in terms of regulatory restrictiveness to competition. Colombia's regulatory framework for E-communication sector is more restrictive to competition when compared to most of the selected peers and the OECD average. Restrictiveness in e-communications is driven by both restrictive regulations and the extent of public ownership in the sector (Figure 11). Lack of competitive telecommunications markets may hinder the continued growth of the digital economy.

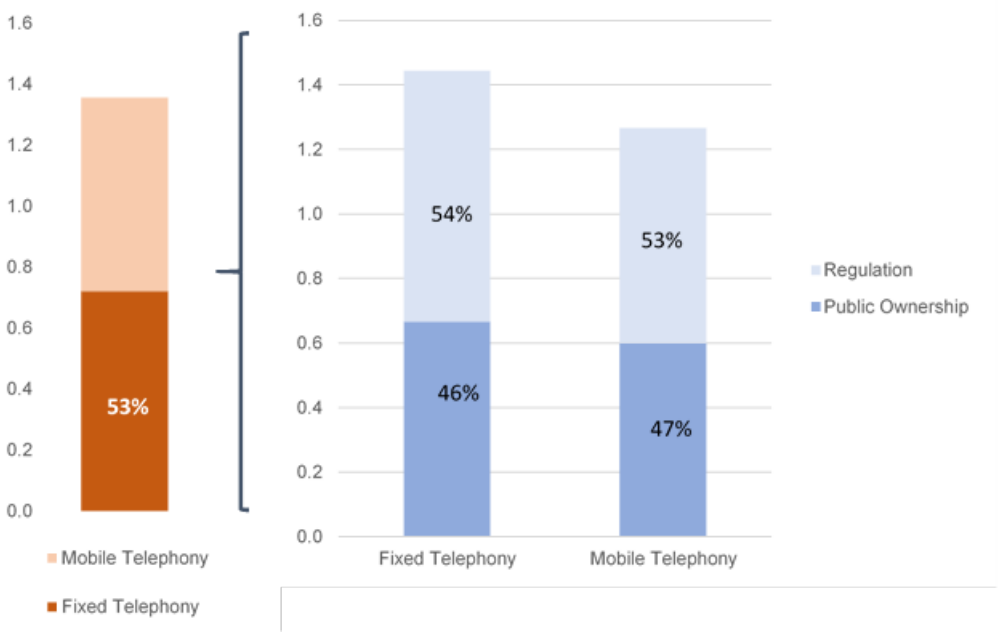
FIGURE 11. SECTOR PMR IN E-COMMUNICATIONS,2018: INDEX SCALE FROM 1 (LESS) TO 6 (MORE) RESTRICTIVE



Source: World Bank staff based on 2018 OECD Product Market Regulation dataset

[31] E-Communications covers fixed line services (voice, data, video) and mobile services (voice, data, video) across three dimensions: Public ownership, Entry Regulation and Retail Price Regulation.

FIGURE 12. DECOMPOSITION OF PMR E-COMMUNICATIONS INDICATOR FOR COLOMBIA



Source: World Bank staff based on 2018 OECD Product Market Regulation dataset

Despite a sustained growth of mobile and fixed broadband in recent years, Colombia could improve on telecommunications infrastructure. Colombia's mobile internet market has grown significantly in recent years, reaching a population penetration of 105%, but remains lower than the OECD average of 127%.[32] While access to fixed-line internet has also grown in recent years, there are only 14.2 fixed broadband subscriptions per 100 people in Colombia, which remains below the average for other OECD countries of 31.8 subscriptions per 100 population.[33] In addition, the share of high speed internet (fiber) in Colombia (15% of total fixed broadband subscriptions) is lower than in neighboring countries like Chile (32.3%) and Mexico (25.9%) and the OECD[34] and Colombia ranks among the lowest in the region in terms of overall broadband download speeds.[35] While mobile internet drives most of the growth in the sector, broadband plays an important role in increasing overall connectivity and in enhancing the quality of service (QoS) across networks. In fixed telephony, there were a total of 7.012 million fixed lines[36] in 2019,[37] covering around 50% of households.[38]

[32] Data are for September 2020. Source Telegeography (2020).
[33] OECD (2019).
[34] Data are for June 2020. Source Telegeography (2020).
[35] Ookla (2020) Speedtest Global Index; available at https://www.speedtest.net/global-index [accessed Jan 19 2021]
[36] Including voice-over-IP (VoIP) and Public Switched Telephone Networks (PSTN)
[37] Ibid.
[38] According to the National Statistical Office, there were 14.0 million households in Colombia in 2019.

Both fixed and mobile broadband markets are relatively concentrated and state ownership throughout the sector may require attention to ensure a level playing field. As of 2020, the three leading operators account for 79.8% of the market[39] of fixed broadband and for 95.7% in mobile broadband (see Figure 13 and Figure 14).[40] Claro Colombia is the market leader in both mobile and broadband markets, accounting for 51.5% and 38.8% of subscribers, respectively, as well as in Voice-over-IP (VoIP).[41] In addition, the government controls at least one firm in the fixed and mobile infrastructure and retail services sectors (voice, video and data).[42] It holds a 30% minority stake in Telefonica Colombia, which accounts for 15.1% of the broadband and 26.3% of the mobile market (under the Movistar brand). Fixed operator Empresa de Telecommunicaciones de Bogota (ETB) is majority-owned (88.4%) by a regional government, the Capital District of Colombia.[43] Further, the state retains significant ownership in telephony, despite recent private investment in the sector.[44] Ensuring that the regulatory framework applies in the same way to private and public players is key to minimize distortions and sub-optimal market outcomes for consumers.

FIGURE 13. MARKET SHARES OF THE MAIN OPERATORS IN THE FIXED BROADBAND MARKET

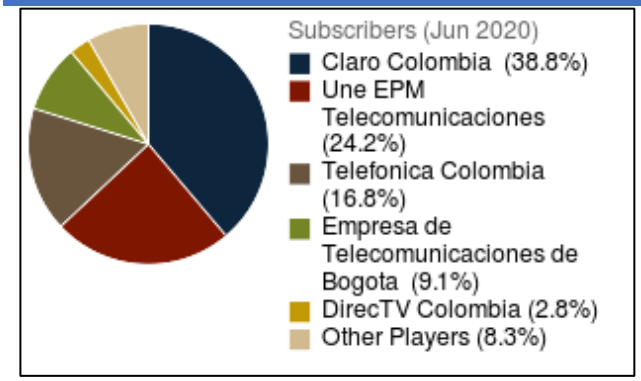
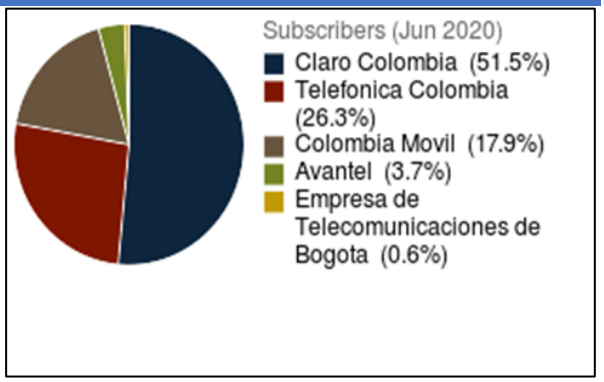


FIGURE 14. MARKET SHARES OF THE MAIN OPERATORS IN THE MOBILE BROADBAND MARKET



Note: Figures are for Q2 2020.
Source: World Bank staff based on Telegeography (2020)

The regulatory framework in mobile E-Communications has improved with the ICT Modernization law, but may still lack adequate regulation to foster competition, especially with respect to radio spectrum. The ICT Modernization Law of 2019 (Law 1978 of 2019), among others, merged the Communications Regulation Commission (CRC) with the National Television Agency (ANTV) to create a single regulator and introduced a new institutional setup and a non-discriminatory standard for spectrum access – a key

[39] Ibid.
[40] The Herfindahl–Hirschman Index, a commonly accepted measure of market concentration, for mobile services is 3,678.4 and between 2,193 and 2,400 for fixed broadband (due to incomplete information on smaller providers' market shares). The US Justice Department considers that an HHI below 1,500 indicates a market that is not concentrated, an HHI between 1,500 and 2,500 points to be moderately concentrated and consider markets in which the HHI is in excess of 2,500 points to be highly concentrated. See U.S. Department of Justice & FTC, Horizontal Merger Guidelines § 5.3 (2010), https://www.justice.gov/atr/herfindahl-hirschman-index
[41] Claro accounts for 60.1% of the total 4.1 million VoIP subscriptions in Colombia. Telegeography (2020).
[42] Control refers to ownership of +50%, sectors are a) fixed-line networks, (b) retail fixed line services (voice, video and data), (c) mobile networks and (d) retail mobile services (voice, video and data)
[43] The government had planned to sell its stake in ETB but abandoned this plan after a range of court decisions blocked the sale in 2017 and 2018.
[44] For instance, in 2014 the then market leader of the fixed telephony sector Une EPM merged with mobile operator Tigo Colombia, with parent companies Empresas Publicas de Medellin (Une) and Millicom International Cellular (Tigo) taking a 51% and 49% stake, respectively. See Telegeography (2020).

resource for mobile connectivity – aimed at maximizing efficiency and social welfare. The law extends license terms for new licenses to a maximum of 20 years[45] and includes provisions to allow for faster spectrum assignment and modifications. However, Colombia is one of the few OECD countries that does not have a framework for secondary spectrum trading.[46] Secondary spectrum trading is a market-based instrument to ensure efficient spectrum use. In turn, the lack of such a market can act as a barrier to new entrants, limiting market dynamism. In addition, the law includes a maximum threshold for coverage obligations[47] included in spectrum awards of up to 60% of the total amount that the mobile operator has to pay for the spectrum license, which may limit the autonomy and flexibility of the CRC. Envisaged to promote competition in the sector, the spectrum framework still includes spectrum caps for operators. These can lead to inefficiencies in spectrum allocation and in the telecommunications market more broadly,[48] while it may be less efficient than other policies in promoting competition.[49]

The CRC may not be well-equipped to effectively address significant market power (SMP) and lacks a well-defined approach to access, interconnection and infrastructure sharing. With relatively concentrated markets in mobile and fixed internet, regulation technically enables the CRC to impose asymmetric obligations on dominant providers.[50] However, the CRC has not decided on Claro's dominance,[51] indicating a lack of effective implementation of the law. In addition, there are no regulations for asymmetric regulation in case of SMP. For example, operators without significant market power have access obligations, in the case of fixed to provide access to a wholesale product at regulated prices. This lack of asymmetric regulation may further the incumbent's market position and deter entry of new,

[45] With possibility of renewal for another 20 years, see article 12 of Law 1978 of 2019 available at https://normograma.mintic.gov.co/mintic/docs/ley_1978_2019.htm.

[46] In addition, data from the 2019 ITU Telecommunication/ICT Regulatory Survey covering 195 countries show that 31.79 percent of countries allow secondary spectrum trading, including Chile, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Mexico and Peru. See https://www.itu.int/net4/itu-d/icteye#/topics/1012.

[47] Mobile coverage obligations can be included in spectrum awards to provide certainty about the future coverage of networks, even where network deployment may make less sense from a commercial standpoint. In turn, coverage obligations may reduce the total amount that mobile operators owe the government for the spectrum.

[48] For instance, they can lead to an increased number of operators that is not economically sustainable. See discussion in GSMA (2009) "Mobile Broadband, Competition and Spectrum Caps." Available at https://www.gsma.com/spectrum/wp-content/uploads/2012/07/Spectrum-Mobile-broadband-competition-and-caps-report-2009.pdf. And ITU (2019) Spectrum Policies for Wireless Innovation – Allocations and Assignment and Spectrum Caps. Available at https://www.itu.int/en/ITU-D/Regional-Presence/ArabStates/Documents/events/2019/SPP4WI/Presentation%2012_SP4WI%20%E2%80%93%20Allocations%20and%20Assignment%20and%20Spectrum%20Caps-V2.pdf.

[49] Such as such as MVNO licensing, reserving spectrum for new entrants (which has been done recently) and secondary spectrum trading.

[50] See https://www.crcom.gov.co/resoluciones/00002058.pdf.

[51] In 2019, the CRC asserted, after the other mobile operators Tigo, Movistar and Avantel had accused Claro of abuse of dominance, that Claro's market dominance was the result of greater investment. See https://oxfordbusinessgroup.com/overview/public-and-private-sector-initiatives-have-seen-positive-results-increasing-internet-coverage-and.

innovative fixed, mobile[52] and virtual network providers.[53] In addition, there is no well-defined approach to infrastructure sharing. Importantly, local loop unbundling has yet to be introduced.[54] Local loop unbundling significantly lowers the costs of entering the market as it allows new entrants to use the incumbent's existing infrastructure – thereby also avoiding infrastructure duplication and thus inefficiencies. Finally, number portability in fixed lines is not provided for, which restricts competition between fixed line operators by raising consumers' switching costs.

Transport sector

Regarding the transport sector[55], Colombia presents lower barriers to competition when compared to OECD average. There are however some remaining regulatory aspects to be tackled, particularly entry barriers in road transport (see Figure 15). A closer look reveals the existence of restrictions in road transport, where Colombia's score is higher than that of peers and the OECD average (except for Turkey). This is driven by restrictive entry regulations, especially for foreign firms. For instance, the regulator or another public body has the ability to limit industry capacity in terms of the number of competing firms allowed to operate in road cargo and there are requirements to gain approval for the operation of new roads in long-distance domestic passenger transport. In addition, cabotage by foreign firms is restricted in two sub-sectors: road freight and long-distance passenger transport services by coach.[56] These restrictions to entry and to cabotage might contribute to relatively high prices[57] and inefficiencies of road transport in Colombia, which can have direct consequences for firms relying on cargo and, ultimately, consumers in the form of higher prices for essential goods.[58]

[52] During the 2019 consultation with the CRC, representatives from Claro's competitors Tigo, Movistar and Avantel indicated that the lack of a regulatory intervention to address market dominance may impact market conditions. See https://www.commsupdate.com/articles/2019/07/09/colombian-authorities-under-pressure-to-declare-claros-dominance/.

[53] While Mobile virtual network providers (MVNOs) are not directly affected by the lack of asymmetric access obligations – given they do not own infrastructure – they may be impacted indirectly. For instance, smaller mobile operators might be less inclined to let MVNOs roam on their networks if they do not compete on a level playing field with the dominant operator.

[54] While the regulatory regime includes the ability to impose wholesale obligations for dominant operators (which could potentially include local loop unbundling), there has been limited progress in this field.

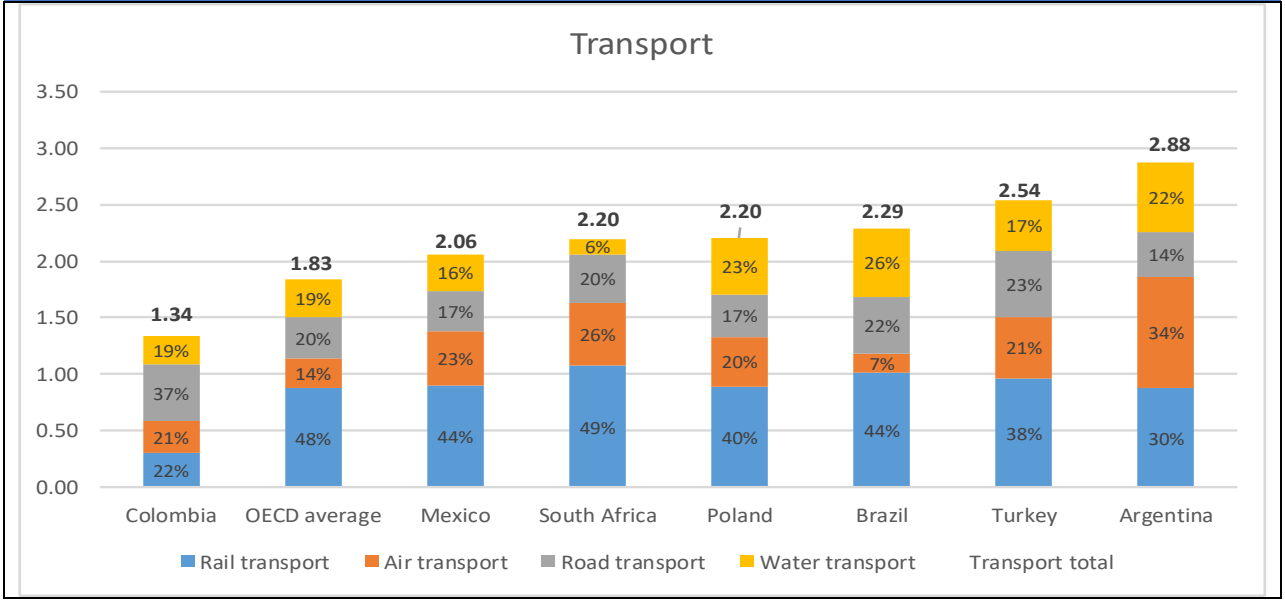
[55] The PMR sector indicator for transport covers the subsectors rail, air, road and water transport across three dimensions: Entry regulation, Public Ownership and Retail price regulation. For rail and water transport it also covers Vertical integration/-separation and for air and road transport it also covers Barriers to foreign entry.

[56] 31 out of 45 countries in the PMR sample allow cabotage by foreign road freight transport firms (at least for some firms) and 29 out of 45 countries allow (at least for some foreign companies) cabotage services for foreign companies in Long-Distance International Passenger Transport Services by Coach. However, countries in LAC (Brazil, Argentina, Chile and Mexico) do not allow cabotage in these markets as well.

[57] Logistical costs represent an average of 15% of sales for Colombian companies, which limits firms' competitiveness. For more information, see Oxford Business Group (2017) "Developing infrastructure and reducing transport costs top priorities for Colombia", available at https://oxfordbusinessgroup.com/overview/paving-way-developing-infrastructure-and-reducing-transport-costs-are-top-investment-priorities.

[58] A 45-day strike of truckers in 2016 illustrates Colombia's dependence on trucking for cargo transport. The strike led to a sharp increase in food prices for consumers, while it also clogged ports and reduced exports Arabica coffee. See Oxford Business Group (2017).

FIGURE 15. SECTOR PMR IN TRANSPORT, 2018: INDEX SCALE FROM 1 (LESS) TO 6 (MORE) RESTRICTIVE



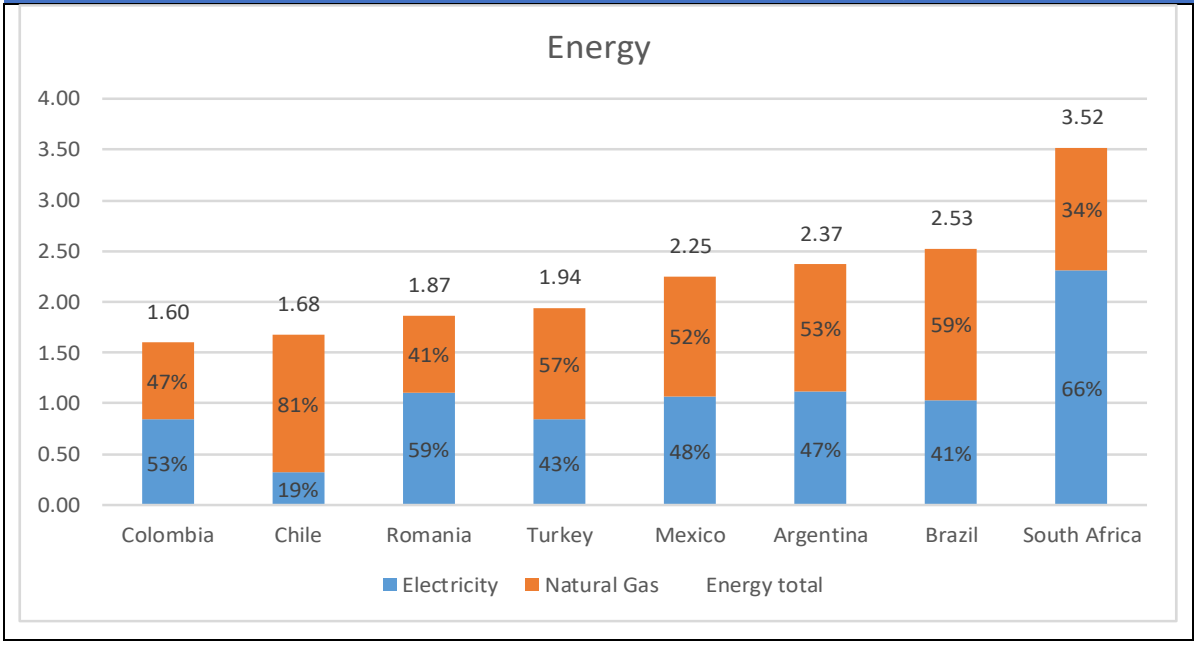
Source: World Bank staff based on 2018 OECD Product Market Regulation dataset

Energy

Colombia's regulatory framework in energy sector[59] is less restrictive than that of its peers, but it is slightly more stringent than the OECD average. Most of the remaining restrictions are driven by public ownership in the electricity sector and regulations in natural gas. With the overall PMR score in energy being more restrictive in Colombia than the OECD average (Figure 16), restrictiveness appears to be driven by two sub-indicators: public ownership and related regulation in electricity and regulations in natural gas. With respect to the former, the Colombian state holds 100% ownership in electricity generation firms and controls (51%) of electricity retail supply. Selling of stakes of the publicly owned electricity generating firms would require legislative action, which may burden potential liberalization efforts. Restrictions are present especially in the retail supply. Vertical separation between electricity distribution and retail supply, and between gas transmission/distribution, and retail supply is not required by law, which increases the risk of market foreclosure to competing firms in the retail market. In addition, domestic firms and small foreign firms do not have a legal right to choose their retail gas supplier and the regulator CREG (Comisión de Regulación de Energía, Gas y Combustibles) sets formulas for calculating gas tariffs for a five-year period each,[60] thereby actively intervening in retail prices. Overall, the concentrated structure of the energy market affects the market dynamics and ultimately the quality of service.[61]

[59] The PMR sector indicator for energy covers the subsectors electricity and gas across four dimensions: Entry regulation, Public ownership, Vertical integration and Retail price regulation.
[60] See http://zeus.creg.gov.co/Publicac.nsf/1aed427ff782911965256751001e9e55/f995cbcf46d048630525785a007a5c7b?OpenDocument
[61] See WBG (2019): Colombia Energy Sector Engagement: Activity Completion Summary.

FIGURE 16. SECTOR PMR IN ENERGY, 2018: INDEX SCALE FROM 1 (LESS) TO 6 (MORE) RESTRICTIVE



Source: World Bank staff based on 2018 OECD Product Market Regulation dataset

4. Concluding remarks and policy considerations

Perception based and aggregate data suggests that markets in Colombia appear to be generally less contestable than in comparator countries. Analysis based on plant level data (for manufacturing) and firm level data (for services) shows that market power has been increasing in Colombia. Across the manufacturing sector, the (sales weighted) average markup increased by around 37% during 2008-2018, while in services the (sales weighted) average markup increased by around 27% in the same period. In both sectors, the aggregate expansion of markup has been progressively uneven. In manufacturing sector, plants in the top decile of the markup (and operational profitability) distribution are overly represented in few industries - clothing, beverages, furniture, manufacture of other non-metallic mineral products, and textiles. Some of these sectors are listed among those with the highest average ad-valorem equivalent of tariffs and non-tariff measures in Colombia. When compared with the rest of plants in markup/operational profitability distribution, these top decile plants are less efficient, less likely to invest in ICT-related equipment, and less willing to export (when considering operational profitability). This suggest that the ability of this group of manufacturing plants to charge high markups might be more related with strategic behaviour rather than with efficiency rewards activity. The story is a bit different in services sector: firms in the top decile of the markup (and operational profitability) distribution are larger and more efficient than the rest of firms in the distribution, and are overly represented in few activities - professional scientific and technical activities; health services; automotive dealers and gasoline service; insurance agents, brokers and service –.

The note also showed that boosting competition would be associated with positive productivity growth dividends for both manufacturing and services sectors in Colombia. Reducing markups – as would likely occur with *more* competition - is associated with an increase in productivity growth of both manufacturing

and services sector. Results show that a 10% decrease in average plant's markup in manufacturing sector is associated with an increase of 0.06 percentage points in average productivity growth. Results are robust to other measures of competition intensity: lowering CR4 (at ISIC 4-digit sub-sector) or average plant's operational profitability is associated with an increase in productivity growth of firms in manufacturing. In services, results showed that lowering average firm's markup in services sector by 10% is associated with an increase of 0.89 percentage points in average productivity growth in the sector. Again, results are robust to other measures of competition intensity.

The dividends for export activities of manufacturing sector would be also positive. Results from a two-stage model showed that reducing markups in manufacturing sector – as would likely occur with more competition - is associated with higher productivity growth, and then with an increase in plant's 'probability to become an exporter' and increase in plant's export intensity. A 10% decrease from the average markup implies stronger productivity growth and then an increase of 0.2 percentage points in plant's `probability to become an exporter' and an increase of 0.058 percentage points of plant's export intensity.

The state of competition in Colombian markets results from the interaction between firms, market features and government interventions. As for the latter, the analysis focused on only on the product market regulations. The analysis found evidence that regulations in Colombia, as they appear 'on the books' are less conducive to competition than the OECD average. Economy-wide restrictiveness stems mainly from distortions induced by state involvement, which are driven by issues around the complexity and transparency of regulations, followed by restrictions related to the high degree of public ownership in the economy. Restrictions associated with barriers to domestic and foreign entry are also more restrictive than the OECD average. They arise both in specific service sectors and with respect to trade and the entry of foreign investors.

The analysis showed that regulatory barriers to competition in network sectors, particularly in e-communications, may hinder access to and the quality of services provided. This may hamper the continued growth of the digital economy, while bringing negative trickle-down effects for the performance of downstream sectors and overall competitiveness. The analysis showed that despite the approval of the ICT Modernization law, the regulatory framework in mobile E-Communications may still lack adequate regulation to foster competition, especially with respect to spectrum management. In addition, the CRC may not be well-equipped to effectively address significant market power in mobile services. In fixed E-Communications, key provisions are lacking to ensure a level playing field and to enable the entry of new, innovative operators; for instance, local loop unbundling has yet to be introduced. In addition, state ownership may require attention to ensure the same rules of the game for private and public operators.

A full-fledged competition analysis is needed to complement the current assessment and identify if other type of government interventions and their implementation might be hindering the efficient functioning of markets in Colombia. Specifically, it would be important to assess regulatory restrictions that might still deter entry, reinforce dominance or protect vested interests in markets where competition pressure is weak; whether the government has been fostering competitive neutrality between SOEs and private firms – not only in network sectors but in other commercial sectors where they compete; whether public aid has been granted in a non-distortive way; and whether the competition policy and law enforcement has been effective to tackle anticompetitive behavior and distortive regulations.

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Annex 1. Competition, productivity and export performance: a brief literature review

Competition is a critical driver for productivity growth. Productivity growth can be broken down in three main components: 'within firm', 'between-firm', and 'selection'. Competition can enhance productivity growth through all these components, First, competition leads to an improvement of productive efficiency at firm level; it acts as a disciplining force by placing pressure on individual firms to increase their internal capabilities to become more productive – i.e. producing more output with the same amount of inputs ('within-firm' component). Second, competition leads to an improvement in allocative efficiency by allowing more efficient firms to gain market share or to obtain more productive inputs, at the expense of less efficient firms ('between-firm' component). Third, competition boosts market selection by facilitation the entry of more productive firms and encouraging the exit of less productive ones (selection' component).

The productivity benefits from competition are well documented. There is a strong body of empirical evidence showing that competition enhances productivity across all components of productivity growth. As for the 'within component', Nickell (1996) runs an analysis of about 670 U.K. firms over the period 1972-1986 and finds evidence that greater competition - as proxied by increased numbers of competitors or lower rents - incentivizes managers to work harder in shareholders' interests which then leads to significant productivity growth. In addition, and more recently, several authors as such Bloom and Van Reenen (2007); Bloom and Van Reenen (2010); and Bloom et al. (2015) corroborate the finding that increased product market competition is positively correlated with higher management quality or practice scores. As for the 'between-firm component', several empirical studies have provided evidence of the positive effect of stronger product market competition on better allocation of factors of production across firms, thus boosting aggregate productivity growth. For evidence across countries, se for instance, Hsieh and Klenow (2009); Arnold, Nicoletti, and Scarpetta (2011). Evidence for specific sectors can be found in Olley and Pakes (1996,), for the US telecommunication industry; Syverson (2004) for the US ready-mixed concrete sector; Foster, Haltiwanger, and Krizan (2006) for the US retail trade sector. Regarding the 'selection' component, Eslava et al. (2013) find that increased competition stemming from trade liberalization, introduced during the 1990s, facilitated the exit of less productive plants in Colombia.

While the association of increased competition and productivity are expected to be positive on average, there are important nuances at play and an inverted U shape relationship might emerge. Aghion et al. (2005) argue that for firms competing neck and neck (closer to the technology frontier) more competition is expected to lead to more innovation to escape competition and then firms become more productive. On the other hand, for firms competing far from the frontier, more competition reduces the incentives to innovate and leads to lower productivity growth. These effects were found to create an inverted U-shaped relation between product market competition and productivity (innovation).Aghion et al. (2005) provides empirical evidence supporting for this mechanism using U.K. patent count data, and Hashmi and Van Biesebroeck (2016) estimates a structural model for the automobile industry, finding supporting evidence for an inverted U-shape relationship between innovation and competition. More recently, Aghion et al (2019) bring the IT revolution as an additional component to explain this inverted U shape relationship. According to the authors, when the IT revolution first hit, it reduced the costs of adding new products and encouraged firms to innovate and become more productive. In a second stage, Aghion et al. (2019) hypothesis is that an increase in competition among efficient firms may have lower much profit could be

gained from further innovation. This, in turn, may have resulted in a slowdown of innovation activities and productivity growth.

On the other hand, there is a positive association between productivity and export performance. Stylized facts from empirical literature find two complementary effects. First, a positive correlation between productivity and export status. Evidence for this positive association has been found in Slovenia (De Loecker, 2007), Taiwan and Korea (Aw, Chung, and Roberts 2000), Chile (Pavcnik 2002), and sub-Saharan Africa (Van Biesebroeck 2005). In Colombia, Clerides, Lach, and Tybout (1998) found evidence that the more efficient firms self-select into being exporters, while Casas et al. (2015) find that productivity increases a firm's probability of being an exporter, and that exporters have higher productivity, with a premium as high as 85 percent. The second effect is the productivity of exporting firms increases with their exposure to international markets. For instance, Lopez (2006) found that Colombian exporters are more productive ex ante, and that the productivity of exporting _firms increases with their exposure to international markets.

Annex 2. Assessing market power trends and implications for productivity growth and export performance using firm level data: econometric analysis

Section 1. Dataset

This assessment draws on firm level data from the non-public versions of two surveys: the "Encuesta Anual Manufacturera (EAM)" for the manufacturing sector and the "Encuesta Anual de Servicios (EAS)" for the services sector, in both cases with data for the period 2007-2018.

The EAM is a truncated census that has information about all the Colombian manufacturing establishments (plants) with more than 10 employees. The dataset encompasses complete financial information, including information needed to estimate productivity, as such : values and quantities of outputs produced and different type of raw materials bought (which were used to construct establishment-level price deflators to deflate revenue and the cost of intermediate materials used in production[62]). Number of employees is also available as well as capital stock (measured as the net book value of physical assets) which is deflated using capital specific deflators from the UN. Any other variables measured in value – as such those to capture operational expenses[63], as well as export activity (export revenues), import activity (expenditures with imported inputs) and investment on general purpose and innovative machinery investment in computer and communication equipment) - are deflated using the GDP deflator. In addition, the survey assigns one ISIC 4-digit sub-sector classification for each plant, where the plant's main product is classified.[64] Multiproduct firms receive a single ISIC code corresponding to the output with the highest share over total revenue. As such, all plants within a ISIC 4-digit sub-sector classification are considered to be in one product market.[65] Based on this survey design, an unbalanced panel is constructed with 14,856 establishments in 2007-2018.

The EAS is also a truncated census but the population covered is firms (not establishments) with more than 40 employees. The survey covers standard financial information, including those to estimate productivity – as such: values of outputs produced and values of raw materials bought, as well as number of employees and capital stock (net book value of physical assets). Because the EAS does not have the

[62] The construction of input and output price indexes at plant level draw on information on the quantities and values of each output and input produced or bought by plant. The prices of different outputs (inputs) were aggregated through a geometric mean using the share of each output/input over total revenue (cost of materials) as weights. To obtain only one average price for each plant – for both output and input, the average for each two consecutive years is computed through a Tornqvist index. The aggregate prices are then used to generate plant level indexes, where the initial year for each plant the index takes value one.

[63] Operational expenses are measured as the following expenses: cost associated with the sale of products not manufactured by the establishment, sale of raw materials, materials and packaging sold without transformation, expenses of industrial products and services prepared by third parties, services contracted with third parties, lease of real estate, leasing without option to purchase of machinery and equipment, insurance, water, communications, advertising, maintenance, repairs, transportation, copyrights, franchises, brands, patents, etc.

[64] For production function variables, outliers were defined as those observations with values greater tan Q3+3*IQR or lower tan Q1-3*IQR, where Q1 and Q3 and the first and third quartiles and IQR is the interquartile range. For mark-up and operational profitability, we define outliers as those observations with values greater tan Q3+4*IQR or lower tan Q1-4*IQR.

[65] In the current analysis, the product market definition deliberately does not coincide with the classical definition of "relevant market," which normally considers the degree of product substitution, geographic location of both producers and consumers, transportation costs, and so on.

required information to construct firm level price deflators, all nominal variables are deflated using the GDP deflator, except for the capital stock, which is deflated using a specific capital deflator. There is no information on export revenues and import expenditures. Firms are also classified by ISIC 4-digit sub-sector. Based on this survey design, an unbalanced panel is constructed with 9,181 firms in the period 2007-2018.[66]

Section 2. Competition indicators

Markup (at plant/firm level)

The analysis uses three different indicators to proxy market power. The first measures markup at (plant or) firm level or the ratio between price and marginal cost. The method applied to compute markup follows De Loecker and Warzinsky (2012). For manufacturing plants, the estimation draws from EAM data. In the first step, a Translog production function is estimated. Since the materials and revenue are deflated using plant-level price deflators, the estimation of the Translog production function, using the Ackerberg, Caves, and Frazer (2015) approach, gives an estimate of TFPQ. In the second step, the input-output elasticity of materials (assumed as variable input), which results from the production function estimation, is averaged at the ISIC 2 digits level and used to compute the mark-up as the ratio between the input-output elasticity of materials and the ratio of materials to revenues. For services, since there is no information in EAS to compute firm-level price deflators, the methodology used is slightly different. The elasticity of materials is estimated as the share of cost materials to total cost, which is averaged at the ISC 2-digit level to compute the mark-up using the same methodology than in manufacturing. The estimate of TFPQ is calculated following Hsieh and Klenow (2009) approach that relies on a Cobb-Douglas production function.[67]

The interpretation of the mark-up should be made with caution. First, markup cannot be taken as an absolute value and should not be used to compare different markets, since markups will be naturally higher in markets where a large proportion of costs are fixed.[68] Second, it is important to stress that changes in markups may reflect factors other than competition. It can reflect vertical differentiation strategies (such as quality upgrading or advertising), or even the implementation of more efficient production processes (or the introduction of innovative products), for which rising markups enable firms to recoup growing fixed costs or to reward high-risk activities, such as investment in R&D. In this context, an in-depth competition assessment would be needed not only to better understand the intrinsic market features (including supply-side and buyer characteristics), but also to identify and assess the potential anticompetitive effects of government intervention in markets.

Operational profitability (at firm level) and CR4 (at market level)

[66] The same criterion applied to identify and remove outliers under the EAM data analysis is applied for the EAS data analysis.

[67] The Hsieh-Klenow method gives estimates of TFPQ measures relative to the average of the corresponding industry in which the firm operates, while this may affect the interpretation of the estimated coefficients of some equations, it does not affect the possible relations between the variables.

[68] This is even more true in the context of the current exercise, as TFPQ estimation methods are different in manufacturing and services, so the markup values – which are retrieved as a byproduct of TFPQ estimation - and trends cannot be compared across manufacturing and services.

In addition to the mark-up, two additional measures of market power are applied: operational profitability at firm level and concentration ratio at market level. First, operational profitability – reflecting the ability of firms to extract economic rents (extraordinary profits) – is measured as the difference between sales and operational expenses divided by sales.[69] Second, The CR4 is the sum of the market share of the top four firms (in terms of market-share) in the industry in which the firm operates, where the industry is defined at the ISIC 4-digit level.

Table A2.1. Change in ISIC 4-digit sub-sectors average markup across MANUFACTURING sector from 2008 to 2018

	% of manufacturing ISIC sub-sectors with positive/negative change in markup		Average change in ISIC 4 digit sub-sector markup for sub-sectors with positive/negative markup	
	Positive	Negative	Positive	Negative
Unweighted mean	77.06	22.94	55.28	-49.22
Sales weighted	65.14	34.86	0.33	-1
Employment weighted	56.88	43.12	0.32	-0.13
Unweighted median	76.6	23.4	52.21	-38.82

Table A2.2. Change in ISIC 4-digit sub-sectors average markup across SERVICES sector from 2008 to 2018

	% of manufacturing ISIC sub-sectors with positive/negative change in markup		Average change in ISIC 4 digit sub-sector markup for sub-sectors with positive/negative markup	
	Positive	Negative	Positive	Negative
Unweighted mean	59.7	40.3	41.7	-45.1
Sales weighted	55.8	44.2	0.76	-0.74
Employment weighted	49.4	50.6	0.73	-0.79
Unweighted median	59.7	40.3	48.9	-44.6

Section 3. Assessing the disconnect between the top decile plants/firms in markup/operational profitability and the rest of firms in the distribution

This exercise consists of a set of multiple linear regressions where the main explanatory variable is a dummy variable taking value 1 for the top 10% firms in terms of markup/operational profitability in each year-industry at the ISIC 4-digit level. The regression takes the following general form:

$$y_{it} = \alpha_0 + \alpha_1 \, \text{top\_decile}_{it} \, \text{controls} + \text{residual} \qquad (1)$$

where yit is the dependent variable that can be probability of exporting (defining exporters as those whose exporting revenues is at least 1%, 5% or 10% of the total sales), employment (ln), TFPQ (ln) and the

[69] Operational profitability - defined as the ratio of sales and operational expenditures difference to sales -can be taken as an empirical measure of Lerner index. It focuses on overall, not marginal, operational profitability. Therefore, it proxies the wedge between prices and average—not marginal—costs. On the other hand, markup - as defined by De Loecker and Warzynski (2012) - are measured as the ratio of a firm's output elasticity of a variable input to the share of that input in total revenue. As a result, there is no reason to expect both measures to be correlated a priori.

probability of investing in computer equipment and communication (ICT). For the analysis of services firms, the export related variables are not included as info on export revenues was not available in the EAS. The estimate of the parameter α1 gives the difference in the corresponding dependent variable between top firms in terms of mark-up and the rest after controlling for systematic differences by industry at the ISIC 4-digit level, employment and year (variables used as controls). The significance of the estimated difference can be tested by using robust standard errors clustered by industry and region (departamento). It is worth highlighting that region is considered only clustered standard errors calculation; it is not included as a control-fixed effect in the regression

Table A2.3. Characteristics of top-decile markup (operational profitability) plants in MANUFACTURING: *conditional correlations between markups (operational profitability) and individual plant characteristics*

		Dependent variable					
		Export dummy (export sales ratio>=1%) Probit	**Export dummy (export sales ratio>=5%) Probit**	**Export dummy (export sales ratio>=10%) Probit**	**Empl (ln) OLS**	**TFPQ (ln) OLS**	**Invest. on general purpose and innovative machinery (yes/no) Probit**
Dummy Top 10% markup plants (by year/ISIC 4digit)	Coeff	-0.0142	-0.01	-0.004	0.026	-0.113***	-0.054***
	t-ratio	(-1.12)	(-0.95)	(-0.47)	-1.09	(-6.14)	(-2.83)
	Obs.	103703	103703	103703	103703	82765	103703
Dummy Top 10% operational profitability plants (by year/ISIC 4digit)	Coeff	-0.0338***	-0.025***	-0.018***	0.022	-0.068***	-0.078***
	t-ratio	(-5.87)	(-5.07)	(-4.08)	-0.78	(-7.55)	(-10.34)
	Obs	103703	103703	103703	103703	82765	103703

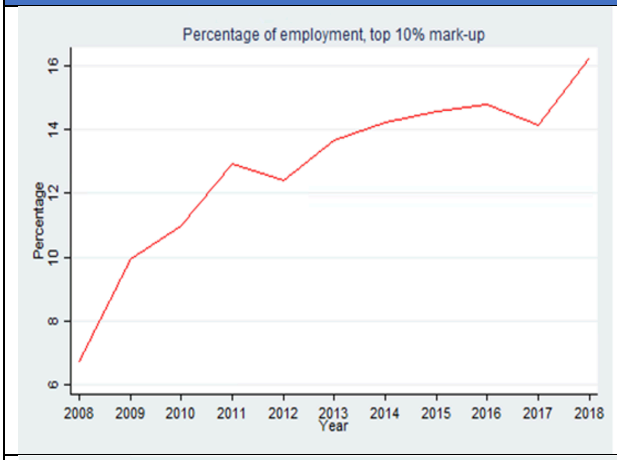
Note: Top 10% markup/operational profitability plants is a dummy variable that takes the value of one for those plants in the 90th percentile of year/ISIC 4 manufacturing digit sub-sector distribution.
Regressions include the following controls: size (employment), at plant level, plus ISIC-4 digit sub-sector, and year fixed effects. The size (employment) control is not used in the Employment equation.

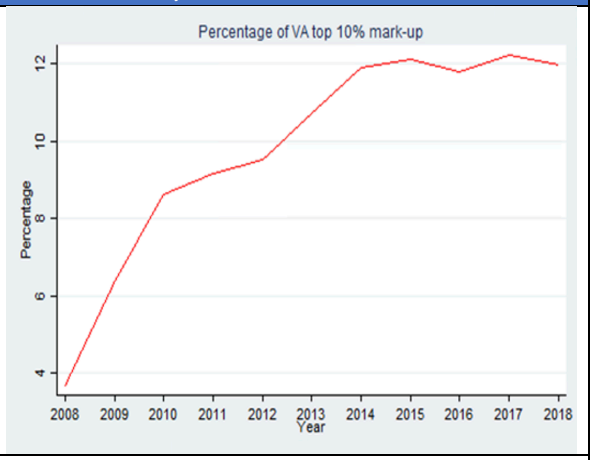
Table A2.4. Characteristics of top-decile markup (operational profitability) firms in SERVICES: conditional correlations between markups *(operational profitability)* and individual firm characteristics

		Dependent variable		
		Empl (ln) OLS	**TFPQ (ln) OLS**	**Investment on general purpose and innovative machinery (yes/no) Probit**
Dummy Top 10% markup plants (by year/ISIC 4digit)	Coeff	0.354***	1.290***	-0.02*
	t-ratio	(3.14)	(4.65)	(-1.92)
	Obs.	54684	22140	54684
Dummy Top 10% operational profitability plants (by year/ISIC 4digit)	Coeff	0.656***	0.394***	-0.021***
	t-ratio	(2.50)	(7.71)	(-3.34)
	Obs	54684	22140	54684

Note: Top 10% markup/operational profitability firms is a dummy variable that takes the value of one for those firms in the 90th percentile of year/ISIC 4 digit sector distribution. Regressions include size (employment), at firm level, plus ISIC-4 digit sub-sector, and year fixed effects; the size (employment) control is not used in Employment equation. There is no info on exports for service firms in EAS

FIGURE A2.1. SHARE OF TOTAL VALUE ADDED/EMPLOYMENT/SALES REVENUES ACCOUNTED FOR BY THE TOP DECILE PLANTS IN MANUFACTURING MARKUP DISTRIBUTION, 2008– 18





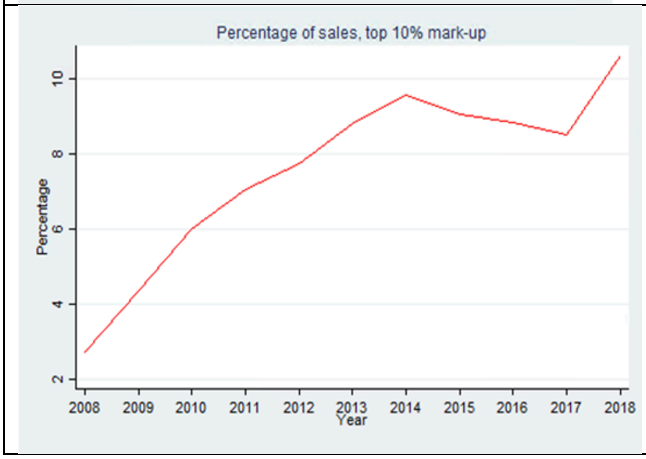


FIGURE A2.2. SHARE OF TOTAL VALUE ADDED/EMPLOYMENT/SALES REVENUES ACCOUNTED FOR BY THE TOP DECILE FIRMS IN SERVICES MARKUP DISTRIBUTION, 2008– 18

Section 4. Assessing the association between competition and productivity (TFPQ) growth

The following model is estimated to explore the relation between productivity (TFPQ) and competition – proxied by markup:

$$\text{Ln(TFPQ\_growth)it} = \beta_0 + \beta_1 \ln\mu_{it-1} + \text{controls} + \text{res} \qquad (2)$$

where lnμ is the natural logarithm of the markup and the parameter β1 gives the effect of reducing markup on TFPQ, for instance a 1% increase (decrease) of markup would decrease (increase) TFPQ by β1%. Alternative measures of market power are tested to assess the robustness of the analysis: operational profitability (defined at firm level), and concentration ratio (defined at ISIC 4-digit sub-sector level); both indicators are included as ratios in the equations (not in ln format). The OLS estimation is controlled for industry at the ISIC 4-digit level, employment and year and the standard errors are robust to general heteroskedasticity and clustered by industry and region. The same equation applies to manufacturing and services. For services, a 2SLS method is applied when regressing TFPQ growth against lagged markup to control for potential endogeneity in markup measurement, as TFPQ estimation in services does not use firm level deflators; the instrument applied in this case is the average markup by

year, ISC 4 digit and departamento. When regressing TFPQ growth against lagged operational profitability or CR4, the OLS method is applied (as in manufacturing).

The previous model can be slightly modified to explore the heterogeneity of the effect of the markup on TFPQ, as a function of the level of firms TFPQ. The proposed model is the following:

$$\text{Ln(TFPQ\_growth)it} = \Upsilon_0 + \Upsilon_1 \ln\mu_{it-1} + \Upsilon_2 \ln\mu_{Gapt-1} + \Upsilon_3 (\ln GAP_{it-1})\ (\ln\mu_{it-1}) + \text{controls} + \text{res} \quad (3)$$

where lnGap is the logarithm of the difference of firms TFPQ with respect for the maximum TFPQ in its industry and we use the same set of controls. In this case the effect of mark-up on TFPQ is given by

$$\gamma_{1+}\ \gamma_3 (\ln Gap_{it-1}) \quad (4)$$

so the partial effect can be different for firms far from the frontier in terms of TFPQ if the parameter γ3 is significance. In particular, this parameter is expected to be positive, so the effect of reducing mark-up in TFPQ decreases as the level of TFPQ decreases.

Table A2.5. Competition and productivity (TFPQ) growth in MANUFACTURING

	Dependent variable			
		Lagged mark-up (ln) OLS	**Lagged operational profitability OLS**	**Lagged CR4 OLS**
TFPQ growth(ln)	Coeff	-0.0062***	-0.0154***	-0.0095***
	T-ratio	(-2.79)	(-4.89)	(-2.79)
	Obs.	60184	64381	69987

Note: regressions include ISIC 4 digits and year fixed effects; plus employment (ln), at plant level

Table A2.6. Competition and productivity (TFPQ) growth in MANUFACTURING, heterogeneous 'effects'

		Dependent variable		
		Lagged mark-up (ln) OLS	**Lagged gap with respect to frontier (ln) OLS**	**Interaction lagged markup and lagged gap (ln) OLS**
TFPQ growth (ln)	Coeff	-0.0076***	0.0886***	0.0098**
	T-ratio	(-3.80)	-9.45	-3.28
	Obs.	61293	61293	61293

Note: frontier is defined at ISIC 4 digit industry-year level as the difference between the physical productivity of the most efficient plant and plant's TFPQ. Regressions include ISIC 4 digits and year fixed effects; plus employment (ln), at plant level

Table A2.7. Competition and productivity (TFPQ) growth in SERVICES

		Dependent variable		
		Lagged mark-up (ln) 2SLS	Lagged operational profitability OLS	Lagged CR4 OLS
TFPQ growth(ln)	Coeff	-0.0898***	-0.267***	-0.0085***
	T-ratio	(-2.39)	(-8.28)	(-0.20)
	Obs.	16084	16084	16068

Note: regressions include ISIC 4 digits and year fixed effects; plus employment (ln), at plant level

Table A2.8. Competition and productivity (TFPQ) growth in SERVICES, heterogeneous 'effects'

		Dependent variable		
		Lagged mark-up (ln) OLS	Lagged gap with respect to frontier (ln) OLS	Interaction lagged markup and lagged gap (ln) OLS
TFPQ growth (ln)	Coeff	-0.038*	0.0328***	0.004
	T-ratio	(-1.82)	(3.28)	(-0.67)
	Obs.	14601	14601	14601

Note: frontier is defined at ISIC 4 digit industry-year level, as the difference between the physical productivity of the most efficient firm and firm's TFPQ

Regressions include ISIC 4 digits and year fixed effects; plus employment (ln), at firm level

Section 5. Assessing the association between competition, productivity (TFPQ) and export performance

The last model aims at exploring the relation between exports as dependent variable and the lagged values of TFPQ and the mark-up as explanatory variables. The model proposed is the following:

$$EXP_{it} = \varphi_0 + \varphi_1 \ln TFPQ_{it-1} + \varphi_2 \ln \mu_{it-1} + controls + res \qquad (5)$$

where EXP can be any measure of export performance like export intensity, or the probability of exporting at the 1, 5 or 10% level, where we use the same set of controls as in the previous models. This specification allows exploring the relation between mark-up and export performance. In particular, we would expect the parameter $\phi 2$ to be non-significant, so the mark-up would only have effect on exports through TFPQ. The final effect of a reduction of mark-up on export performance can be computed using a 2-stage model combining equations (2) and (5). In particular, the estimate of a reduction of the markup on export

performance could be computed as the product of the effect of markup on TFPQ growth computed in equation (2) times the effect of TFPQ on export performance, that is β1 ϕ1.

To see it, note that ϕ1 = ΔEXPit /ΔlnTFPQit-1, therefore ΔEXPit = ϕ1ΔlnTFPQit-1. Therefore, the change in export performance can be decomposed in two terms

$$\Delta EXPit = \phi_1(\Delta lnTFPQ_{it-1} + \Delta lnTFPQ'_{it-1})$$

The second term refers to the extra change in TFPQ growth due to a decrease in mark-up. For instance, if we decrease mark-up by 10% then using equation 2 TFPQ growth changes by

$$\Delta lnTFPQit' = -10\%\beta_1$$

Therefore, we can replace in the expression of the change in export performance

$$\Delta EXPit = \phi_1(\Delta lnTFPQ_{it-1} - 10\beta_1)$$

Hence, the change in export performance associated with the change in markup is given by

$$\Delta EXPit = -10\phi_1\beta_1.$$

Table A2.9. Markups, productivity (TFPQ) growth and export performance in MANUFACTURING

	First stage	Second stage			
	Association between mark-up and TFPQ growth (ln) OLS	Association between TFPQ and export intensity OLS	Association between TFPQ and prob of becoming exporter (export ratio>=1%) OLS	Association between TFPQ and prob of becoming exporter (export ratio>=5%) OLS	Association between TFPQ and prob of becoming exporter (export ratio>=10%) OLS
Coeff	-0.0062***	0.949**	0.0352***	0.0251***	0.0194**
t-ratio	(-2.79)	-1.96	-3.69	-2.95	-2.54
Obs	60184	62386	65315	65315	65315

Note: both regressions, first and second stage, include ISIC 4 digits and year fixed effects; plus employment (ln), at plant level

Table A2.10. Operational profitability, productivity (TFPQ) growth and export performance in MANUFACTURING

	First stage	Second stage			
	Association between operational profitability and TFPQ growth (ln) OLS	Association between TFPQ and export intensity OLS	Association between TFPQ and prob of becoming exporter (export ratio>=1%) OLS	Association between TFPQ and prob of becoming exporter (export ratio>=5%) OLS	Association between TFPQ and prob of becoming exporter (export ratio>=10%) OLS
Coeff	-0.015***	0.711	0.0323***	0.0223***	0.0182**
t-ratio	(-4.89)	(1.55)	(3.28)	(2.56)	(2.46)
Obs	64381	65509	68318	68318	68318

Note: both regressions, first and second stage, include ISIC 4 digits and year fixed effects; plus employment (ln), at plant level

Section 6. Association between markup levels and trade exposure

The following model is estimated to assess the markup differences between trade exposure and firm markup/operational profitability performance. The dependent variables this model are the two variables used to measure competition, mark-up and operational profitability, while the explanatory variables are export dummy (taking value 1 if any part of firm's revenues comes from exports), import dummy (taking value 1 if any part of firm's raw materials come from imports) and the interaction between import and export dummy (taking value 1 if the firms import and export). The reference category is domestic firms, or firms that do not import or export. The equation used is

$$\mathrm{COMP}_{it} = \rho_0 + \rho_1 \mathrm{EXP}_{it} + \rho_2 \mathrm{IMP}_{it} + \rho_3 \mathrm{EXP}_{it}\mathrm{IMP}_{it} + \mathrm{controls} + \mathrm{res} \qquad (6)$$

where COMP can be mark-up or operational profitability and the list of controls include ISC 4-digit and year fixed effects and (ln) employment at plant level.

Table A2.11 Markups (operational profitability) and trade exposure in MANUFACTURING

		Dependent variable	
		Mark-up (ln)	**Operational Profitability.**
Export dummy	Coeff	-0.0189	-0.0165***
	t-ratio	(-0.37)	(-3.46)
Import dummy	Coeff	-0.305***	-0.0094
	t-ratio	(-5.67)	(-1.75)
Export and import dummy	Coeff	0.135**	0.0166**
	t-ratio	(-2.14)	(-2.29)
	Obs	72043	82277

Note: Regressions include ISIC 4 digits and year fixed effects; plus employment (ln), at plant level

Table A2.12 Markups (operational profitability) and trade exposure in MANUFACTURING, controlling for productivity level

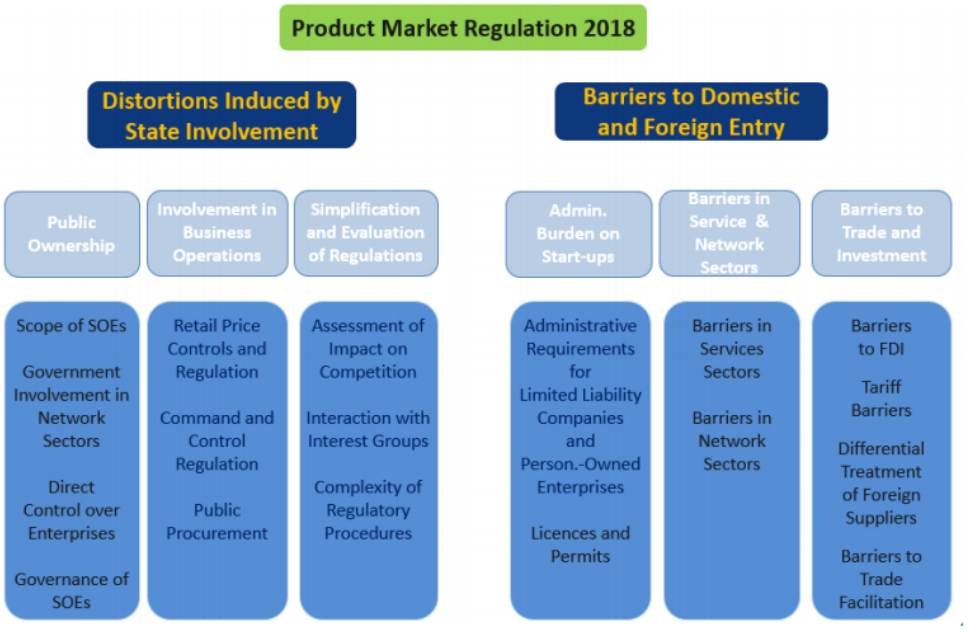
		Dependent variable	
		Mark-up (ln)	**Operational Profitability.**
Export dummy	Coeff	0.0185	-0.018***
	t-ratio	(0.37)	(-3.58)
Import dummy	Coeff	-0.215***	-0.0151**
	t-ratio	(-4.44)	(-2.65)
Export and import dummy	Coeff	0.120*	0.0216**
	t-ratio	(1.90)	(2.74)
	Obs	72043	75717

Note: Regressions include ISIC 4 digits and year fixed effects; plus employment (ln) and TFPQ (ln), at plant level

Annex 3- Overview of the OECD-WBG PMR database

The Economy-wide indicator

The methodology of the 2018 OECD-WBG PMR indicators form a comprehensive and internationally comparable set of indicators that measure the degree to which policies promote or inhibit competition in areas of the product market where competition is viable. PMR indicators are useful to monitor the regulatory achievements of monitored countries and to evaluate the effectiveness of policies introduced over the years. Moreover, they have been widely used to help policy makers create a clear picture of regulations in different countries, with the objective of identifying gaps in regulations and/ or room for improvements.



The indicators rely on information collected through the OECD's regulatory indicators questionnaires, which are filled in by country representatives and verified by OECD or WBG teams. To calculate scores, answers to the questionnaires are coded into numerical values (scores range from 0 to 6, with 6 being the worst). Then, scores of individual regulations are aggregated into the broader regulatory areas from "lower- level indicators" (18 areas), using specified weights to "intermediate indicators" (6 areas) using equal weights, and finally the two "sub-indicators," also using equal weights. These are averaged to calculate the overall PMR score.

The PMR sector indicators

The PMR sector indicators measure regulatory barriers to firm entry and competition at the level of individual sectors, with a focus on network industries, professional services, and retail distribution. The network sectors are Electricity and Natural gas (Energy), Air, Rail, Road and Water transport and Fixed and Mobile E-Communications (see graph below). For each sub-sector, the index measures restrictiveness in terms of regulation and public ownership. The indicators of the network PMR are collected via the same questionnaire as the economy wide PMR.