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Internationally Linked Firms, Integration Reforms and Productivity

Evidence from Pakistan

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Abstract

This paper examines productivity dynamics and drivers for Pakistani firms listed in the stock exchange (publicly listed firms) over 2012–17. It relies on policy and outcome measures of integration in upstream merchandise and services sectors, to assess their impact on productivity downstream. The paper presents three main findings. First, the productivity of publicly listed firms remained stagnant over the period, in line with macro-level indicators for Pakistan. Second, foreign-owned or exporting firms are more productive than domestic-owned or domestic-oriented firms. Foreign investors target more productive firms, and their productivity grows after being acquired. Exporters tend to exhibit productivity growth after becoming exporters. Third, increased import duties on intermediates, or reduced levels of foreign direct investment in upstream services sectors, are associated with decreases in the total factor productivity of firms downstream. Gains from lower input tariffs accrue to those that do not secure duty exemption schemes—domestic-oriented firms or smaller exporters. Gains from upstream services foreign direct investment accrue mostly to firms that are further from the productivity frontier. Taken together, these results suggest that productivity growth in Pakistan would benefit from increased exposure of upstream sectors to global markets.

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Internationally Linked Firms, Integration Reforms and Productivity: Evidence from Pakistan

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1. Introduction

Are firms in Pakistan becoming better at what they do? Is observed GDP growth grounded on firms becoming more efficient? If so, what drives productivity improvements? These questions are relevant. As argued by Krugman (1997) "Productivity isn't everything, but in the long-run it is almost everything". The prosperity of countries is associated with the efficiency with which factors of production are used. Understanding productivity dynamics, and their determinants, is crucial.

In a context in which the benefits of integrating with the global economy are being questioned, measuring the impacts that trade and investment integration have on domestic productivity dynamics has relevant implications for the design of trade and investment policies. Importantly, are the gains from integration automatic and inevitable, or do some firms benefit more than others, depending on their capacity to respond to competition or adopt technologies available due to integration? The second question matters for evaluating the role of complementary policies aiming at increased productivity growth.

A growing body of the empirical literature has investigated the effect of reduced distortions in sectors producing inputs upstream on the performance of firms operating downstream either in the form of restrictions to trade or to investment. Typically, restrictions to trade – for example, in the form of tariffs – affect upstream markets producing goods inputs, while restrictions to (foreign) investment could affect both goods and services input provision. One branch of the literature has focused on the role of trade policy distortions and shows that lower tariffs on intermediate inputs increase productivity. Amiti and Konings (2007), for example, use data on Indonesia and find that, (a) lower output tariffs increase productivity by inducing tougher import competition, and (b) cheaper imported inputs also raise productivity via learning, variety, and quality effects. This channel of tariff reforms on productivity through intermediates appears to be stronger than the former channel. For India, Topalova and Khandelwal (2010) find that lower input tariffs played a larger role in boosting productivity than output tariffs during the liberalization process of the 1990s. Yu (2015) provides evidence on the matter for China. Following a related line of argument, Goldberg et al. (2010) find that lower intermediate input tariffs account for a large portion of output growth in India mainly due to the availability of increased varieties of inputs.

Another branch of the literature focuses on distortions in upstream services sectors – in the form of restrictive policies or implementation hurdles which reduce the scope for increased FDI.[3] When relevant intermediate inputs are services, rather than goods, FDI in upstream sectors can play a key role in increasing their availability and quality, or reducing their prices. Indeed, exposure to multinationals that typically display greater productivity levels in upstream sectors has also been linked with learning and with increased incentives to innovate in downstream sectors. For example, Arnold et al. (2016) found sizable effects on the productivity of the firms operating downstream, when foreign entry restrictions in upstream sectors were relaxed in India. Fernandes and Paunov (2012) use data for Chile showing analogous results, while Duggan et al. (2013) conduct the analysis

[3] There is also a branch of literature that focuses on distortions to investment upstream in goods, as well as in services. See for example, Javorcik (2004).

for Indonesia. More recently, Beverelli et al. (2017) found a cross-section of countries at different stages of development, also unveiling positive productivity effects downstream associated with increased presence of FDI upstream.

The evidence on productivity and its links to integration in the global marketplace for Pakistan is limited, and particularly that relying on firm-level data. Indeed, data availability has been a major constraint and existing research tends to rely on small or sector-specific samples, or cross-sectional data. Wadho et al. (2019), for example, using a survey of about 600 firms in the textiles sector find that export intensive firms grow more slowly in terms of employment and this could be explained by exporting firms being on average larger and older than other firms. Choudhary et al. (2018) collect information on management quality, as a measure of performance, for about 4,500 manufacturing firms. They find that Pakistani firms are well behind the global frontier yet have been displaying some improvement over the past decade. They also find that firms that are more export oriented have more structured management practices, themselves a proxy for productivity. Finally, Kinda (2012) uses a cross-section of firms in Pakistan, and in four other developing countries, and finds that firms that sell more of their production to multinationals tend to be more efficient. Few studies provide a macro-level overview of productivity in Pakistan. Siddique (2020), for example, investigates the main drivers of aggregate TFP growth, while Chaudhry and Haseeb (2014) explore misallocations in productivity across plants in the manufacturing sector.

This paper examines productivity dynamics of publicly listed firms in Pakistan, and the extent to which integration in the global marketplace explains their productivity growth. We exploit substantial variation in import duties along the period of analysis, as well as in FDI penetration to measure the impact of integration upstream in terms of both merchandise and services inputs on productivity downstream, and examine how policy distortions in upstream sectors have affected productivity growth in firms operating downstream. Hence, to the best of our knowledge, this is the first study to unveil firm-level evidence on productivity dynamics and to explore the linkages between the productivity of Pakistani firms and integration in the global marketplace. This adds to the understanding of firms' productivity dynamics in lower-middle-income country contexts, in which firms operate in markets subject to several frictions that constrain their technological choices and affect their performance.

The case of Pakistan is particularly relevant as it allows us to explore the productivity impact of distortions both de jure and de facto in upstream markets typically found in low-to-middle income countries. In addition, it allows us to identify the impact that imperfectly functioning import duty exemption mechanisms for exporters have on their productivity. Indeed, the literature on trade reforms and productivity, in particular that focusing on the channel operating through liberalization of intermediate input trade, has largely neglected the fact that exporters are typically and in principle eligible for intermediate input duty exemptions (for example, Topalova and Khandelwal, 2011 for India; or Amiti and Konings, 2007 for Indonesia. Both India and Indonesia have in place systems of import duty exemptions for intermediates used for exporting). Failure to acknowledge this fact can

lead to the underestimation of the positive effects of input tariff reductions for non-exporters, and overestimation of the effect for exporters.[4]

We rely on firm-level data on 410 firms listed in the stock exchange (publicly listed firms) in non-banking sectors in Pakistan over the period 2012-2017. Publicly listed firms are spread across 11 sectors, with a larger presence in the textile sector, and are among the largest in the economy, accounting for 13 percent of Pakistan's GDP in 2017. We complement this data set with information on foreign ownership status at the firm level, and tariffs and FDI at sector level. We adopt a standard approach in the literature to estimate productivity and measure changes in input tariffs and upstream FDI presence. Yet, while the literature has investigated the role of upstream tariffs and FDI separately, this paper accounts for both forms of integration upstream and, at the same time, controls for output tariffs and FDI in a firm's own sector. This allows us to isolate the effect of input tariffs from other trade liberalization reforms, and to provide a comprehensive analysis of the effect of reducing frictions in upstream markets on the performance of firms in downstream markets.

We present three main findings. First, firm-level productivity has been stagnant – indeed, firms' average productivity has not grown since 2015. This is in line with what macro data suggest and aggregate gains have happened through a better allocation of resources. Second, we find that internationally linked firms – that is, those that are foreign-owned or exporters - perform better than domestic-owned or domestic-oriented firms. For foreign-owned firms we find suggestive evidence pointing to the productivity premium being explained both by a self-selection element – foreign investors cherry picking more productive firms, but also by foreign-owned firms increasing productivity after acquisition. For exporting firms, we find suggestive evidence pointing to the productivity premium being mostly explained by increases in productivity after starting exporting. Third, protection upstream, in the form of import duties on intermediate inputs or restrictions de jure or de facto that reduce penetration of FDI in upstream services sectors, reduces productivity downstream. These effects fall predominantly on non-exporters, relatively smaller firms, and least productive firms. As mentioned above, exporters in Pakistan are granted exemptions on duties paid on imported intermediates and capital equipment. In principle, duty-exemptions are available for exporters of any size. In practice, however, securing them is costly for firms due to administrative burdens. And since duty refunds take time to be processed, exporters face financial costs (World Bank 2019b). We provide suggestive evidence that firms who are less likely to make use of duty exemptions benefit from reduced input tariffs through both an increase in the volume and variety of imported intermediates. Our evidence on FDI in upstream service sectors is consistent with a learning mechanism where less technologically advanced firms benefit from FDI upstream through better quality, cheaper, and more varied services inputs, as well as from the technology embedded in these services. Suggestive evidence also shows a positive relationship between FDI in services and innovative activities of firms downstream, as an underlying mechanism behind the link between FDI in services upstream and productivity downstream.

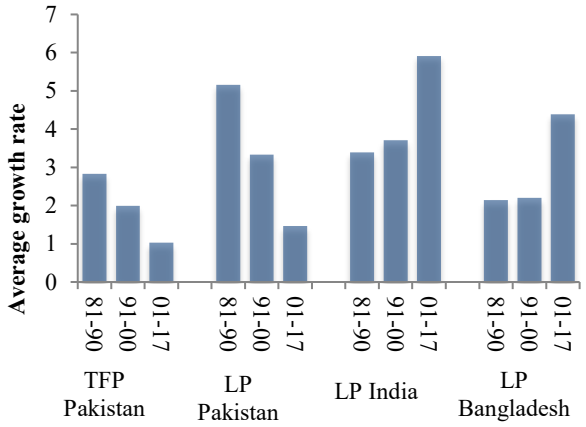
[4] Note that Amiti and Konings, (2007) find that the effect of import tariffs is stronger for importers than firms using domestic inputs only. In addition, Defever et al. (2020) show that the effect of input tariffs depends on whether inputs are imported directly or through intermediaries. Unfortunately, in our data we are not able to identify whether firms import intermediates and if they do so directly or indirectly. This would have offered another possibility to identify firms that can access duty exemptions as only direct importers in Pakistan can claim duty exemptions.

The remainder of this paper is structured as follows. Section 2 presents background information on trade and investment integration in Pakistan. Sections 3 and 4 describe the data used and the empirical strategy. Section 5 presents the results and discusses the underlying channel, and Section 6 concludes.

2. Productivity, Trade, and Investment Integration Trends in Pakistan

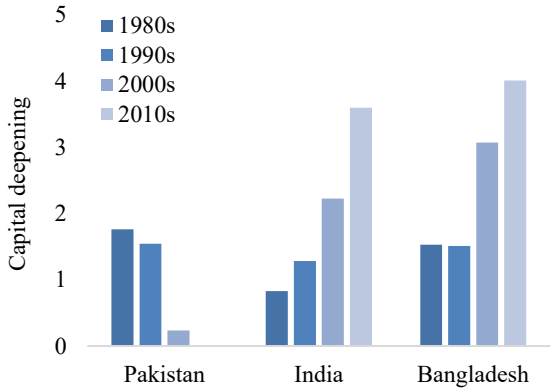
Long-term trends of macro indicators on productivity for Pakistan – both total factor productivity (TFP) and labor productivity – show relatively low rates of growth when compared with other countries in the region.[5] While labor productivity has been increasing since the turn of the century, its rate of growth has fallen with respect to that of the previous decades, and lower than that observed in India or Bangladesh.

Figure 1– TFP and Labor Productivity (1981-2017, Pakistan and Comparators)



Note: Authors' calculation based on the APO Productivity Database 2019.

Figure 2– Capital Deepening (1981-2017, Pakistan and Comparators)



Note: Authors' calculation based on the APO Productivity Database 2019. Capital deepening indicates the rate of change in capital stock per labor hour.

A similar pattern is observed for TFP (Figure 1). In the international comparison, Pakistan also does not fare well. Since 2000, labor productivity grew at an average rate of 1.5 percent annually, substantially below what is observed in India (6 percent) and Bangladesh (4.4 percent). This can be partly explained by the slowdown in capital deepening – the increase in the stock of capital per worker. Indeed, while India and Bangladesh have experienced positive growth in capital per worker over the past decades (Figure 2), in Pakistan, capital per worker has been growing at a declining rate, and has practically stagnated since 2010.

Policy measures of integration also show some stagnation. According to the Overall Trade Restrictiveness Index (OTRI), Pakistan is currently the world's seventh most-protected economy

[5] These macro indicators on productivity are obtained from the APO Productivity Database, based on a Solow decomposition, assuming constant returns to scale, and perfect competition.

(World Bank 2019b). While import duties were reduced, and the overall tariff structure simplified during the 1990s, this trend stopped in the mid-2000s. Table 1 shows that since 2010 average tariffs have been falling gradually from an average of 11.25 percentage points in 2010 to 9.03 percentage points in 2018, yet the decline was temporarily interrupted in 2013 when average tariffs bounced back to 10.95 percentage points on average, as a consequence of a pronounced fiscal and balance of payments crisis. Indeed, during fiscal year 2013 (July 2012-June 2013), the fiscal deficit reached 8 percent of GDP and the current account deficit stood at 1.1 percent of GDP, while external financing dried up as evidenced by the balance of the financial account of the balance of payments going from US$5,097 million in fiscal year 2010, to US$2,103 million in 2011, to US$1,275 in 2012, to a deficit of US$90 million in 2013.

Table 1– Average output tariffs, input tariffs by year

	Output tariffs		Input tariffs	
year	Mean	SD	Mean	SD
2010	11.25	11.27	2.54	2.52
2011	10.16	11.13	2.27	2.37
2012	9.58	11.1	2.02	2.3
2013	10.95	11.46	2.53	2.37
2014	9.60	9.92	2.14	2.00
2015	9.34	9.47	2.19	1.77
2016	9.49	9.82	2.27	1.80
2018	9.03	9.98	1.88	1.70
Between-sector SD		10.43		2.07
Within-sector SD		1.68		0.53

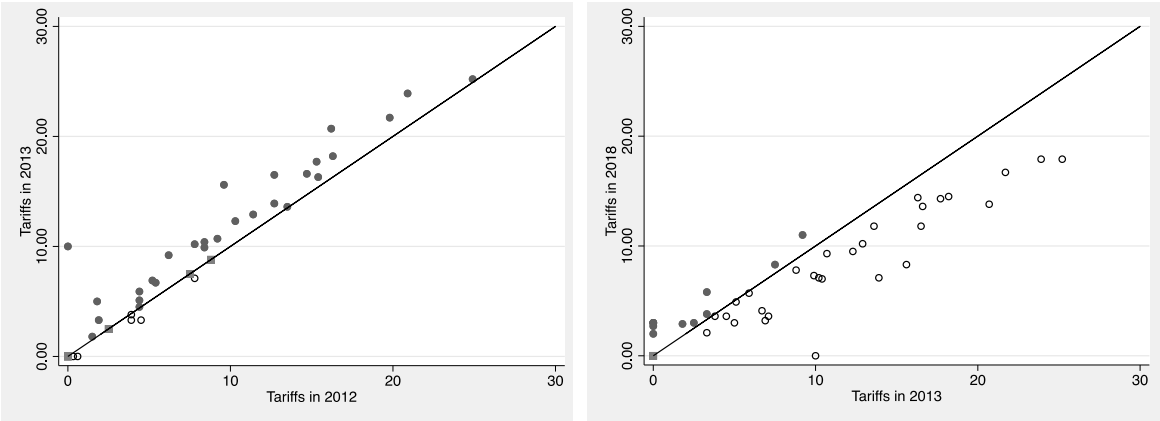
Source: UN TRAINS. No data available for 2017. Note: SD stands for standard deviation.

Figure 3 shows that in 2013 there was a generalized increase in tariffs across most sectors – as a result of a balance of payments crisis. In the following period, sectors with relatively lower tariffs experienced further small increases in tariffs, while sectors with higher tariffs in 2013 experienced larger reductions. This movement towards the reduction of dispersion was driven by the Extended Fund Facility (EFF) agreed with the IMF in August 2013, in which the government committed to the simplification of tariff rates, moving to four slabs (which implied some increases and some reductions in tariffs).[6]

Over the period 2013-2018, the use of customs duty exemptions became even more prevalent. In 2012, for example, 34 percent of imports claimed some form of exemptions (World Bank 2019b). In 2016/17 the exemptions reached 50% of imports. Exporters are entitled to import duty exemptions on intermediates and capital equipment used to produce exportable products. There are two main forms of accessing them; either by being eligible for a duty suspension mechanism, for those firms that are mainly export oriented (export-oriented units), or by being eligible for a refund of the paid duty (for example, the duty tax remission for exporters, DTRE). Most firms use the latter and argue that the process of securing the refund is long and cumbersome.

[6] See Pakistan 2013 Article IV Consultation, and August 2013 Letter of Intent (IMF 2013).

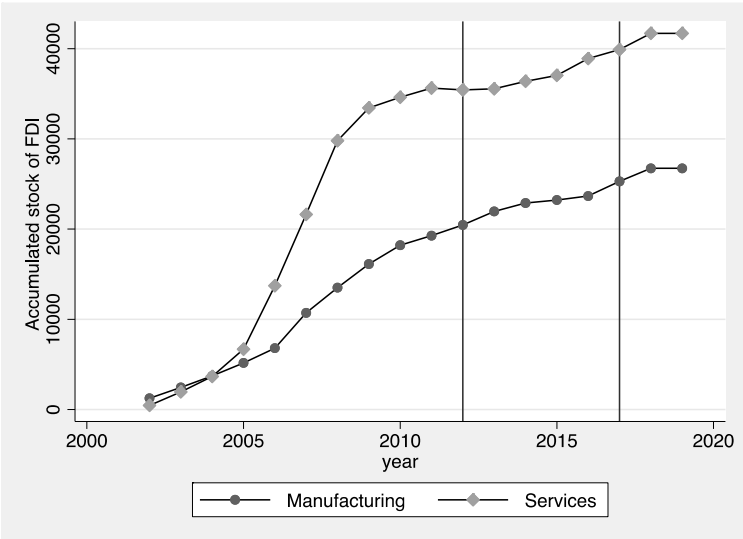
Figure 3– Product-level tariffs changes: 2012-2013 and 2013-2018



Note: UN TRAINS. We excluded from the graph the motor vehicles, beverages, and tobacco products sectors that have an average tariff of 38.5 and 60.5 respectively.

FDI inflows in Pakistan have been relatively low during the period of analysis, remaining systematically below 2 percent of GDP. In absolute terms, FDI inflows surged from about US$300 million in 2000 to about US$5 billion in 2008, resulting in increases in stocks, as shown in Figure 4, which plots the accumulated stock of FDI. The increases have been largely driven by FDI in the services sector, in particular communications and financial services. FDI in both manufacturing and services has stagnated since 2010, with FDI in services experiencing a negative net inflow in 2012. As a percent of Pakistan's GDP, overall FDI was less than 1 percent (0.06 percent) in 2015, compared to 2 percent in India and 1.5 percent in Bangladesh in the same year. Communications (27 percent of total FDI inflow in 2015) and the financial sector (19 percent) remain the dominant services sectors matched by the oil and gas sector (21 percent).

Figure 4– Accumulated FDI stock



Note: Author's calculation based on data from State Bank of Pakistan. The vertical line indicates the period of analysis. Data are in million USD (constant).

3. Data

Data on publicly listed firms are obtained from the Financial Statements Analysis of Companies (Non-Financial) Listed at Pakistan Stock Exchange. The data set contains balance sheet, income statement, and export flow data for 410 publicly listed firms in Pakistan over the period 2012-2017.[7] We exclude from the analysis firms that are either in the coke and petroleum sector or are state-owned companies. Of the remaining 322 companies, 262 companies are observed throughout the period, while 46 companies exited at various points during the period and only 14 entered the sample after 2012. Firm-level data are matched to the Orbis data set from Bureau van Dijk (BvD) to obtain information on foreign ownership for most firms (98 percent), and data on the number of employees for about 68 percent of firms. All nominal variables are deflated using sectoral deflators provided by the Pakistan Bureau of Statistics. We define foreign ownership by the presence of at least one direct foreign shareholder as reported by BvD.[8] We construct a measure of innovation by considering the presence of intangible assets, which include patents, copyrights, trademarks, exploration accounts, and knowledge accounts. The innovation ratio is defined as the ratio of intangible assets over total assets. Tariffs are obtained from the UN TRAINS database, while FDI inflows are obtained from the State Bank of Pakistan.

Table 2 – Descriptive statistics

Sector	Average sales	Average wages	Employees	Share of exporters	Share of foreign owned	Share of innovators	Obs	Firms
Beverages and tobacco	13.87	8.86	215.30	0.20	0.25	0.40	20	4
Chemicals	11.98	5.93	270.19	0.44	0.31	0.61	228	50
Food	16.53	6.18	307.97	0.47	0.41	0.54	70	15
Machinery	5.84	3.43	368.39	0.47	0.42	0.65	43	9
Metals	12.39	3.62	465.29	0.71	0.00	0.68	34	7
Motor	19.78	4.50	452.22	0.41	0.17	0.71	90	20
Non-metallic minerals	11.16	4.47	475.63	0.76	0.37	0.39	135	29
Paper	9.45	4.73	198.52	0.55	0.38	0.88	40	8
Power	38.66	4.85	165.44	0.00	0.35	0.53	79	17
Sugar	5.62	1.45	453.49	0.69	0.59	0.21	147	31
Textiles	5.62	2.65	425.62	0.70	0.73	0.20	591	132
Total	10.63	3.78	376.43	0.58	0.51	0.39	1477	322

Note: authors' calculations based on Financial Statements Analysis of Companies (Non-Banking) public at Pakistan Stock Exchange and data on foreign ownership from Bureau van Dijk. Sales are in billion PKR while wages are in million PKR.

Publicly listed firms are among the largest in the economy, accounting for 13 percent of Pakistan's GDP in 2017. Firms in our sample employ on average 380 employees and are spread across 11 sectors, with a larger presence in the textiles sector. In terms of sales, the median publicly listed firm is more than six times larger than a relatively large medium-sized firm in Pakistan, yet about 16 percent of firms in our sample would classify as medium-sized firms.[9]

[7] A similar data set is available for 168 listed companies in the financial sector, which are not considered in this analysis.
[8] BvD collects ownership data from official registers, stock exchanges, annual reports, company websites, and news outlets.
[9] Using 2017 data, the median publicly listed firm has annual sales of about 4 billion PKR compared to the upper threshold for a medium firm, as indicated by the State Bank of Pakistan, update to 2017 is 600 million PKR.

Table 2 shows that the share of foreign-owned firms varies across sectors. The textiles sector shows the largest share of foreign-owned firms (73 percent) and 70 percent of firms participate in the export market, yet only 20 percent of publicly listed firms in this sector have invested in intangible assets. Overall, about 62 percent of publicly listed firms have exported at least once over the period, suggesting that they are more likely to export than an average private company.[10]

4. Empirical Strategy

We estimate total factor productivity (TFPR) using the Ackerberg, Caves, and Frazer (ACF) (2015) methodology, which is based on a two-step estimation procedure that helps overcome the issue of functional dependence when the elasticity of labor is estimated in the first stage, as in Olley and Pakes (1996), and Levinsohn and Petrin (2003).[11] The choice of variables used to estimate productivity is constrained by the available data.[12] Hence, we use total wages instead of the number of employees, which is usually used in productivity estimates. A measure of TFP based on the number of employees is available for a subsample of firms for which data are available and is highly correlated with our wage-based TFP measure (65 percent). The cost of materials is used as a proxy to control for unobserved productivity shocks and real sales are used to measure output. The lack of firm-level prices and employment prevents us from estimating quantity-based productivity (TFPQ). Foster, Haltiwanger, and Syverson (2008) indicate that when using sector-level deflators, differences in plant-specific prices show up in TFP measures. In particular, they distinguish between physical productivity (TFPQ) and revenue productivity (TFPR). TFPR tends to overestimate the productivity of firms producing higher price products while underestimating that of firms producing lower price (quality) products, since real sales are obtained by using the same deflator at the sector level. The authors, however, also show that traditional measures of TFPR and TFPQ are highly correlated. Also, since our sample is composed of large publicly listed firms, variations in product quality are likely to be smaller than in more heterogenous samples.

To establish whether there is a causal relationship between firm productivity and global integration in upstream sectors, we exploit the specific timing and the differential degree of tariff changes and FDI inflows across upstream industries, and adjust the approach proposed by Amiti and Konings (2007) to accommodate both changes in input tariffs and upstream FDI. In particular, we begin by regressing our measure of total factor productivity of listed firms on input tariffs and estimate the following equation:

$$TFPR_{ist} = \beta_1 T_{st-1}^{UP} + \beta_2 T_{st-1}^{O} + \gamma X_{it-1} + v_t + u_i + \varepsilon_{ist} \quad (1)$$

[10] Ali (2015) using administrative data for more than 50,000 firms estimates that only about 34% of firms were exporting in 2012/13. According to the same study, exporting is highly skewed towards large firms, which are responsible for around 82% of total exports, hence our data set is likely to be representative of the average exporting firm in Pakistan.

[11] As an alternative measure of productivity, we use a Solow-residual based measure of conventional TFP and show the results in the Appendix.

[12] Note that observations with zero investment are dropped when computing TFP since the estimation method demands a strictly monotonous relationship between the proxy, which is investment, and output.

where TFPR is the measure of productivity described above and T^{UP} is a measure of input tariffs at the sector level, which is described below. All our specifications include firm- and time-fixed effects, and sector time trends. We also control for output tariffs (T^{O}), share of exports at the firm level, and lagged FDI flows in the sector. The model is estimated as a standard linear fixed effects estimator, all independent variables are lagged on period, and standard errors are clustered at the sector level.

A second specification (equation 2) considers FDI in upstream sectors. We first control for FDI in upstream manufacturing sectors, $FDI^{UP,M}$, also described below, to account for other trade liberalization reforms that could potentially confound the effects of input tariffs. Second, we include a measure of FDI in upstream service sectors, $FDI^{UP,S}$, to capture vertical linkages from the openness of services to FDI. We are particularly interested in the effect of this variable as listed firms are more likely to outsource services. Indeed, typical services feasible for outsourcing, such as sales, distribution, and other administrative costs, represent a significant share of production costs (11 percent) for these publicly listed firms.

$$TFPR_{ist} = \beta_1 T^{UP}_{st-1} + \beta_2 T^{O}_{st-1} + \beta_3 FDI^{UP,M}_{st-1} + \beta_3 FDI^{UP,S}_{st-1} + \gamma X_{it} + v_{t} + u_i + \varepsilon_{ist} \quad (2)$$

Our measures of upstream tariffs and FDI are obtained by computing weighted averages of these conditions in upstream sectors, using this generic formula:

$$Z^{UP}_{st} = \sum_s w_{sj} Z_{jt} \quad (3)$$

where weights, *w*, are fixed over time and constructed from the 2007 GTAP input-output (IO) table as input shares, which give a sense of the importance of each upstream sector in terms of input and service costs. Hence, the expectation is that firms using certain inputs or services more intensively benefit from the integration of these sectors. Our measures of upstream tariffs and FDI are, therefore, a form of Bartik instrument (in a reduced form setting) where IO weights reflect the differential exposure of downstream sectors to common shocks in upstream sectors. In this context, the main identification assumption is that input shares are exogenous to changes in TFPR, not to its level (Goldsmith-Pinkham et al. 2020). The use of IO table-based weights has several advantages. Weights are at the sector level and are based on both imported and domestic inputs. This reduces possible endogeneity concerns about productivity-related input adjustments at the firm level. Sectors are also aggregated at two-digit level (or higher level), [13] which limit input substitutability. In addition, the inclusion of both imported and domestic inputs when computing input shares ensures that weights reflect actual sector-level input requirements rather than tariff-induced input choices, which could bias results. Indeed, this latter concern is further mitigated by the use of predetermined fixed weights, i.e. before the tariff changes used in our estimations took place. When computing upstream FDI penetration, we separate manufacturing and service sectors.

Endogeneity of trade policy and FDI penetration

[13] For input tariffs we maintained the sector disaggregation of the original GTAP input-output table, consisting of 57 sectors. To compute upstream FDI, IO sectors were aggregated to match FDI data that were provided for 16 manufacturing sectors and 6 service sectors.

Before estimating the impact of tariffs on productivity, we consider whether changes in tariffs and FDI were correlated with pre-existing sector-level performance to exclude the possibility that trade policy decisions were driven by differences in productivity levels across sectors. Indeed, if trade and investment policy makers responded to their perception of the performance of Pakistani sectors and their ability to face competition, then firms' productivity would be causing trade and investment policy changes rather than the reverse. To test that hypothesis, we follow the approach used by Topalova and Khandelwal (2011) for tariffs and extend it to the case of FDI.

The top panel of Table 3 shows the correlation between output and input tariffs and sector-level productivity in the previous year. Considering future output tariffs, overall, we find a negative and significant correlation with current levels of sector-level productivity, suggesting that future trade policy may have reflected differences in sector-level performance. When exploring this association further, however, we observe that this was only true during the period 2012-2014 when most tariffs were increased. This suggests that, during this period, protectionist measures might have been used to protect weaker sectors. When considering input tariffs, we do not find an overall significant correlation with pre-existing sector-level productivity, which mitigates potential endogeneity concerns regarding this variable. Yet, when restricting the analysis to the 2012-2014 period we again find a negative and significant correlation. From 2014 onwards, both input and output tariff changes do not seem to correlate with sector performance. As mentioned above, tariff changes introduced after 2013 were partly driven by the intention to simplify tariff rates as part of the conditions for the EFF agreed with the IMF. This adds further support to the plausible exogeneity of tariff changes in this second period. Considering these findings, to limit potential endogeneity concerns we show results for the entire period and for the 2014-2017 period only.

Results on correlations between sectoral productivity and future FDI penetration in upstream manufacturing sectors show a similar pattern. For the period 2012-2014, an increase in sectoral productivity is associated with an increase in FDI in upstream manufacturing sectors in the following period. This could be consistent with multinationals deciding to set up shop after they see improved performance in sectors that could potentially be their clients. Yet, the result is not significant for overall FDI, nor for FDI in upstream services sectors. As for tariffs, for the period 2014-2017, the correlations are not significant for any type of FDI, mitigating endogeneity concerns.

Table 3 – Tariffs, FDI penetration, and sectoral performance

Dependent variable:		Output tariffs			Input tariffs	
	Entire period	2012- 2014	2014 - 2017	Entire period	2012- 2014	2014 - 2017
	(1)	(2)	(3)	(4)	(5)	(6)
Average TFP in t-1	-15.475***	-29.268***	-3.686	-0.353	-2.923***	-0.241
	(0.008)	(0.000)	(0.466)	(0.430)	(0.002)	(0.635)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1213	617	903	1213	617	903
Average change in tariffs	-0.39	0.58	-0.34	0.037	0.008	-.0.052
Dependent variable:	FDI		Upstream FDI manufacturing		Upstream FDI services	
	2012- 2014	2014 - 2017	2012- 2014	2014 - 2017	2012- 2014	2014 - 2017

Average TFP in t-1	-34.594	12.254	6.546**	4.408	0.810	0.076
	(0.310)	(0.416)	(0.033)	(0.440)	(0.789)	(0.905)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	657	957	657	957	657	957
Average change FDI (million USD)	39.8	21.3	-3.29	-1.47	4.93	-1.47

Note: The top panel of the table shows the coefficients obtained by regression sector-level output tariffs (columns 1, 2 and 3) and input tariffs (columns 3, 4 and 5) on sector-level productivity in the preceding year. Sector-level productivity is calculated as the weighted average of listed firms TFP, weighted by sales shares. The bottom panel considers FDI (in logs) in own sector (column 1), FDI in upstream manufacturing sectors in column 3 and 4, and FDI in upstream service sectors in column 5 and 6. All regressions include sector and year fixed effects and are weighted by the number of firms in each sector for each given year. Standard errors are clustered at the sector level. Significant at *10%, **5%, ***1%.

5. Results

5.1. Productivity differences and dynamics

The results of the productivity estimates reported in Table 4 reveal two patterns. First, aggregate productivity growth at the firm level for the subset of firms under analysis is consistent with patterns observed at the macro level. Second, there are sizable differences in productivity within sectors, suggesting some distortions at play that prevent productivity convergence.

Estimated aggregate productivity grew at an average rate of 2.5 percent between 2013 and 2017, with maximum growth of 4.7 percent in 2015 and a minimum of 1.1 percent in 2017. We decompose the aggregate TFP growth into a within-firm component, which explains the extent to which aggregate productivity grew because individual firms increased their productivity given the firms' market shares, and a between-firm component, explaining the extent to which aggregate productivity grew because of more productive firms absorbing resources from less productive ones (given firm's productivity). Results are presented in Table 4.[14] Most aggregate productivity growth observed during the period has been driven by more productive firms becoming larger (the between-firm component). This is suggestive of a growth-enhancing 'Darwinian' market mechanism (or 'creative destruction'), which allocates resources away from low-productivity firms towards high-productivity firms. Firms' average productivity (the within-firm component) has not grown since 2015, which has put downward pressure on aggregate productivity.

Table 4 – Aggregate TFP growth has been driven by between-firm reallocations while within-firm productivity growth has been mostly low or negative

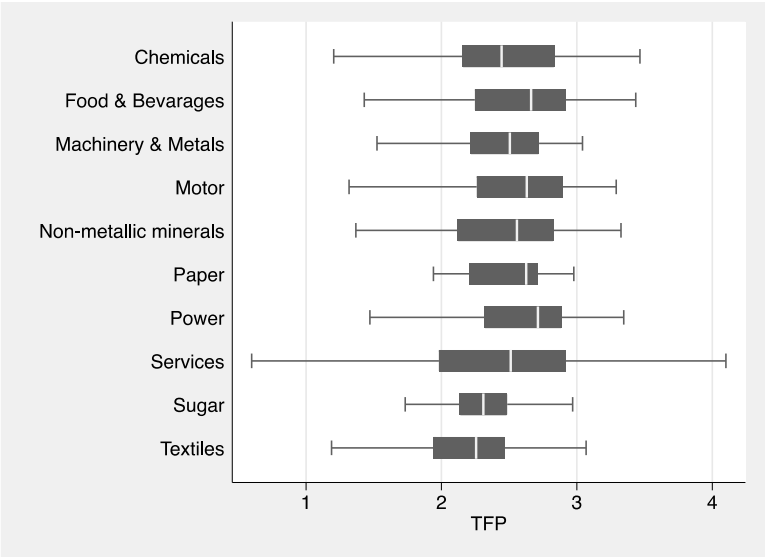
Year	Overall TFP growth	Within-firm TFP growth	Between-firm TFP growth
2013	0.026	0.005	0.021
2014	0.016	0.014	0.002
2015	0.047	-0.035	0.082
2016	0.024	-0.012	0.036
2017	0.011	-0.015	0.026
2013-2017	0.025	-0.009	0.033

[14] Two other terms in the decomposition – exit and entry of firms – are negligible in this case. Given the small number of companies "exiting", their contribution to aggregated TFP has also been found to be extremely small, hence it is not reported in the table. The analysis, therefore, focuses on a balanced panel of 357 firms.

Note: authors' calculations based on Financial Statements Analysis of Companies (Non-Banking) listed at Pakistan Stock Exchange.

Despite most productivity growth being accounted for the reallocation of resources away from low-productivity firms into high-productivity firms, substantial productivity differences persist within sectors (Figure *5*). This is revealing, given that the publicly listed firms under analysis are likely to be concentrated at the top end of the productivity distribution. High levels of TFP dispersion within sectors can be a symptom of imperfect markets that prevent the efficient allocation of resources. In an extreme case of perfect competition, low-productivity firms could not compete with high-productivity firms. The latter group will tend to absorb the former group's resources up to the point at which there is a convergence in productivity. Market imperfections, in the form of firm-specific protection through subsidized access to financing, controlled prices, or some form of market power that prevents competition from having a Darwinian effect on firms, may explain high dispersion of firms' productivity in narrowly defined sectors.[15] For example, if domestic-oriented firms cannot access inputs at global prices while exporters can, domestic-oriented firms will face technological constraints to upgrading productivity. Similarly, if access to finance is restricted to specific types of firms, this will discourage risky investments needed for productivity growth.

Figure 5 – Productivity differences within and between sectors



Note: The middle tick indicates the median TFP in the sector, while the left and right hinges of the box indicate the 25th and the 75th percentile, respectively.

Within our sample, firms in the top quartile of the distribution of sales are on average more than five times more productive than those in the bottom quartile. A similar pattern is observed within sectors. Figure 5 shows the distribution of estimated productivity by sector. In the textiles sector, for example, firms in the top 10th percentile are 3.5 times more productive than those in the bottom 10th percentile.

[15] See, for example, Hsieh and Klenow, 2009.

In the motor vehicles sector, firms in the top 10th percentile are only 4.2 times more productive than those in the bottom 10th percentile. Below, we take a first pass at identifying firms' characteristics that can explain these documented differences in productivity.

5.2 Internationally linked firms and productivity

Among publicly listed firms in Pakistan, those firms that are internationally linked – either because they are foreign-owned or because they export, enjoy a productivity premium.

Foreign ownership and productivity in Pakistan

Despite the observed negative trend in aggregate FDI, publicly listed firms have been increasingly the target of foreign shareholders. The percentage of firms with foreign participation increased from 23 percent in 2012 to almost 36 percent in 2017 (Figure A1). In Table 5 we compare, within given sectors, the productivity of domestic-owned firms, i.e. those never acquired by a foreign investor over the entire period (column 1), to the productivity of foreign-owned firms in the year preceding acquisition by the foreign investor (column 2), and to the productivity of firms that had been foreign-owned over the entire period (column 3). In Pakistan, as elsewhere (Bellak 2004), firms with foreign participation in their boards (foreign-owned) are more productive than domestic-owned firms. The premium is estimated at 66 percent, on average, for the whole period (column 5) and is widening.[16] This premium is explained both by foreign investors acquiring more productive firms, and by foreign firms performing better over time than domestic firms. The difference between column 2 and column 1 reveals that firms that are about to be acquired by a foreign investor in Pakistan are, on average, more productive than those that remain domestic-owned. This difference is both statistically and economically significant, at an average of 39 percent (column 4), revealing that foreign investors tend to cherry pick more productive firms. Moreover, the productivity of firms that have been foreign-owned over the whole period is in turn economically and statistically higher than that of firms that are about to be acquired by foreign owners – with an average difference of 26 percent (Column 6), suggesting that the foreign acquisition leads to improvements in performance over time. To ensure that these findings are not an artifact of sectoral compositions, we tested differences in productivity, including a vector of sector-fixed effects, and found that the overall results remained qualitatively unchanged. While establishing a causal link between foreign acquisition and performance is beyond the scope of this paper,[17] this evidence is suggestive of its beneficial effects and is consistent with the literature showing that foreign-acquired firms benefit from improved technology and management practices (Chen 2011; Javorcik and Poelhekke 2016) and from knowledge spillovers (Javorcik 2004).

[16] The productivity gap between foreign and domestic-owned firms also widens over time. See Figure A1 of the Appendix.

[17] This is also partly driven by data availability. The limited number of firms, years, and variables available prevent us from adopting methods that would allow us to establish a causal link as in Bastos et al. (2018) who use difference-in-differences with matching estimator.

Table 5 – Average productivity by ownership status

Year	Domestic over the entire period	Acquired by foreign owner in the following year	Foreign owned over entire period	Gap (2) – (1)	Gap (3) – (1)	Gap (3) – (2)
	(1)	(2)	(3)	(4)	(5)	(6)
2012	2.17	2.56	2.72	0.40***	0.56***	0.16*
2013	2.17	2.61	2.73	0.44***	0.57***	0.13
2014	2.19	2.45	2.77	0.26***	0.58***	0.32***
2015	2.14	2.56	2.81	0.42***	0.66***	0.25*
2016	2.11	2.54	2.82	0.43***	0.71***	0.28*
2017	2.03		2.88		0.85***	
Whole period	2.13	2.52	2.79	0.39***	0.66***	0.26***

Note: Difference in means tests reported with significance at *10%, **5%, ***1%. Differences in column 5 are increasing over time as the gap in 2017 is statistically larger, at 1%, than the gap in 2012 . The other differences in columns 4 and 6 are not statistically different over time. We tested differences in means also controlling for sector-fixed effects and the results are qualitatively similar.

Export status and productivity in Pakistan

Export orientation, defined as the share of firms with positive exports, stands at 55 percent among Pakistani publicly listed firms. This share is three times larger than in the economy as a whole.[18] In Table 6 we compare, within given sectors, the productivity of three types of firms: Those that never exported over the period of analysis ('never exporters', column 1), those exporting in the following year ('future exporters', column 2), and those that exported every year during the period ('always exporters', column 3). The productivity premium observed for Pakistani exporting firms is – as with foreign firms – also consistent with the international evidence. Exporters are on average 25 percent more productive than domestic-oriented firms (column 5). The exporters' productivity premium holds across sectors and size classes. Most of the productivity premium between exporters and non-exporters is driven by the difference between the productivity of the future exporters and that of the always exporters. This is suggestive of a process of learning by exporting rather than self-selection of the most productive into exporting status. Indeed, the productivity gap between firms that are not exporting but will export in the following year and those that never export is economically small (2 percent, column 4) and statistically insignificant. Instead, the difference between future exporters and always exporters is both economically and statistically significant (22 percent, column 6). The fact that firms' productivity increases as they move from the 'future exporters' class to the 'always exporters' class adds a kernel of truth to the assertion that the estimated TFPR in this paper is capturing efficiency rather than mark-ups. With high effective rates of protection in Pakistan (see for example, World Bank, 2020), increasing export orientation is likely to increase the extent of competition the firm faces.

Table 6 – Average productivity by export status

Year	Did not export over entire period	Export in the following year	Export over the entire period	Gap (2) – (1)	Gap (3) – (1)	Gap (3) – (2)
	(1)	(2)	(3)	(4)	(5)	(6)
2012	2.25	2.12	2.50	-0.13	0.25***	0.38***

[18] The share of exporting firms in the universe of firms above five employees is estimated at 14 percent, according to the latest World Bank Enterprise Survey for Pakistan. In 2017, the last year of our sample, there were a total of 14,000 exporting firms according to records from the Federal Board of Revenues.

2013	2.24	2.11	2.52	-0.14	0.28***	0.42***
2014	2.29	2.33	2.56	0.04	0.27***	0.23***
2015	2.30	2.45	2.55	0.15	0.25***	0.10
2016	2.33	2.55	2.55	0.22	0.22***	0.00
2017	2.31		2.53		0.22***	
Whole period	2.28	2.31	2.53	0.02	0.25***	0.22***

Note: Difference in means tests are reported with significance at *10%, **5%, ***1%. We tested differences in means also controlling for sector-fixed effects and the results are qualitatively similar.

5.3 Trade policy, investment integration, and productivity

Baseline results

The results of estimating equation 1 are reported in Table 7. We find a significant negative overall effect of input tariffs on within-firm productivity (column 3). Our estimates indicate that a one-standard deviation increase in input tariffs (0.2 percentage points in our sample) induces a decrease in productivity of 1.3 percent.

Table 7 – Productivity and input tariffs– manufacturing firms only

	Whole period			2014-2017
Dep. Var.: TFP (log)	(1)	(2)	(3)	(4)
Output tariffs (lagged)	0.002**	0.009	0.007	-0.002
	(0.001)	(0.012)	(0.009)	(0.010)
Input tariffs (lagged)	-0.088**	-0.021	-0.073**	-0.067*
	(0.036)	(0.042)	(0.025)	(0.035)
Export share (lagged)	0.145***	0.315***	0.297***	0.278***
	(0.027)	(0.030)	(0.033)	(0.039)
Sector-level FDI (lagged)	0.000	-0.000	0.000	0.000
	0.002**	0.009	0.007	-0.002
Firm FE	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sector-by-year trend	No	No	Yes	Yes
Observations	1477	1477	1477	1170
Firms	322	322	322	316

Note: The table reports the estimates of linear regressions. In column 1 we also control for foreign ownership, province and firm size based on quartiles of the distribution of sales. Standard errors clustered at the sector level are reported in parenthesis. We obtain similar results when using an alternative measure of TFP in table A2 of the Appendix. Significant at *10%, **5%, ***1%.

Over the period, all sectors experienced ups and downs in input tariffs, although economy-wide there has been a tariff decrease. Because our weighted measure of upstream tariffs uses fixed weights (inverse Leontief coefficients), the change in the indicator is only driven by changes in import tariffs. Back-of-the-envelope calculations suggest that the largest positive effects were experienced by the chemicals sector, where the average decrease in input tariffs over the period is associated with a 0.8 percent increase in productivity. On the other hand, the highest average increase in input tariffs was experienced by the metal sector and is associated with a 0.7 percent decrease in productivity. The positive and significant effect of output tariffs shown in column 1 becomes insignificant once we control for firm fixed effects, possibly suggesting that sectors with higher productivity display higher

tariffs. Once we focus on within-firm variations (columns 2-4), we do not find any significant effect of changes in output tariffs on firm productivity. Hence, our estimates suggest that the input channel is a larger force in driving productivity changes, compared to the competitive channel in line with the findings of Topalova and Khandelwal (2011) for India and Amiti and Konings (2007) for Indonesia. Our results persist when controlling for the presence of FDI in upstream manufacturing sectors (Table 8, columns 1 and 3) which allows us to account for other integration-enhancing reforms that could potentially confound the effects of input tariffs.

Firms operating downstream also use inputs from the services sector. We focus on those that are traded (supplied) through commercial presence in the country and examine how increased FDI penetration in these upstream services affects the productivity of firms downstream. Results are presented in Table 8. Controlling for input tariffs, our results show that increases in FDI in upstream services sectors are associated with increased productivity of firms operating in downstream sectors that use these services inputs more intensively. Indeed, a 1 standard deviation increase in FDI presence in upstream services sectors (1.5 percent) is associated with a 0.2 percent increase in productivity (30 percent of a standard deviation in TFP). This suggests vertical spillovers from FDI in services upstream. The same does not hold for FDI in manufacturing sectors upstream. These results are in line with those presented in Arnold et al. (2012) for India, Fernandes and Paunov (2013) for Chile, and Duggan et al. (2013) for Indonesia.

Table 8 – The effect of upstream FDI

	Whole period		2014-2017	
Dep. Var.: TFP (log)	(1)	(2)	(3)	(4)
Output tariffs (lagged)	0.007	-0.001	-0.002	-0.011
	(0.009)	(0.008)	(0.010)	(0.007)
Upstream tariffs (lagged)	-0.081***	-0.055**	-0.071*	-0.044*
	(0.025)	(0.023)	(0.033)	(0.024)
FDI in upstream manufacturing sectors (lagged)	0.006	0.008	0.001	0.003
	(0.004)	(0.006)	(0.004)	(0.003)
FDI in upstream service sectors (lagged)		0.123***		0.102***
		(0.020)		(0.010)
Sector-by-year trend	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	1477	1477	1170	1170
Firms	322	322	316	316

Note: The table reports the estimates of linear regressions. In all specification we control for foreign ownership, sector-level FDI and share of exports. Standard errors clustered at the sector level are reported in parenthesis. We obtain similar results when using an alternative measure of TFP in table A2 of the Appendix. Significant at *10%, **5%, ***1%.

Deciphering the mechanisms

So far, we have established that tariffs on goods inputs and FDI presence in services sectors upstream affect the productivity of firms operating downstream. In this section, we provide some suggestive evidence to disentangle possible underlying mechanisms.

Input tariffs and the availability of imported inputs – intensive and extensive margins

Changes in input tariffs alter domestic prices of imported inputs and therefore their affordability. When input tariffs fall, the cost of accessing potentially higher quality intermediates also falls – for example, it becomes cheaper to import more of the synthetic fibers that Pakistani producers of dry-fit sportswear were already importing, allowing them to improve their input mix. In addition, the number of varieties of imported intermediates increases. A reduction in the prohibitive tariff on melt-blown fibers – the nanofiber used to produce N95 masks – could make the fibers available in Pakistan and make N95 production in-country feasible. Through both mechanisms, firms' technological choices improve, and, with that, their productivity.

Our results are consistent with an increase in the imports of intermediate inputs following a reduction in tariffs. Table 9 shows the results of regressing imports of intermediate inputs (at the HS six-digit disaggregation, within the BEC classification for industrial supplies) on lagged tariffs. We find that lower input tariffs resulted in an increase in the volume of imported intermediate inputs. To give a sense of the magnitude of these effects, the average decrease in import tariffs experienced over the period 2014-2017 explains about 30 percent of the observed increase in the total volume of imported intermediates.

Table 9 – The association between tariffs and imports of intermediate products

	(1)	(2)	(3)
Dep. Var.: import of intermediate imports (value)			
Lagged Tariffs (6 digits)	-0.020***	-0.034***	-0.026***
	(0.005)	(0.007)	(0.008)
Year FE	Yes	Yes	Yes
Sector (2 digits) FE	No	Yes	Yes
Sector (6 digits) FE	No	No	Yes
Observations	13833	13833	13833
Sectors (6 digits)	2584	2584	2584

Note: The table reports the estimates of linear regressions. Standard errors clustered at the sector level are reported in parenthesis. Significant at *10%, **5%, ***1%. Products are classified as intermediates if they fall within the "Industrial supplies" category of the Broad Economic Categories (BEC) classification. Source: UN Comtrade.

Table 10 shows the results of regressing the number of varieties of imported intermediates at the six-digit level of disaggregation (within a two-digit HS chapter) on import tariffs using both linear regression and Poisson (columns 1 and 2). We find that a decrease in tariffs is also associated with an *increase in the number of intermediate input varieties* imported.

Table 10 – The association between tariffs and the variety of products imported

	OLS	Poisson
Dep. Var.: number of products (at 6 digit level within a 2 digit chapter)		
	(1)	(2)
Lagged Tariffs (2 digits)	-0.262*	-0.010*
	(0.152)	(0.006)
Year FE	Yes	Yes
Sector time trends	Yes	Yes
Observations	502	502
Sectors (2 digits)	84	84

Note: The table reports the estimates of linear regressions (column 1) and a Poisson model (column 2). Standard errors clustered at the sector level are reported in parenthesis. Significant at *10%, **5%, ***1%.

Tariffs, other competitive-enhancing reforms, and exemptions to exporters

If trade policy reforms conducive to reductions in upstream tariffs tend to happen with institutional reforms that reduce costs of doing business, then our estimated effect of upstream tariffs on productivity of firms downstream may be contaminated by an overall improved environment to doing business upstream (and downstream) that also helps productivity. To isolate the effect of upstream tariffs, we take advantage of the fact that, while changes in the overall doing business environment should in principle affect all firms, changes in upstream tariffs should only affect non-exporting firms, given that exporters in Pakistan are eligible for import duties exemptions, for those paid on intermediate inputs, under several schemes run by the Federal Board of Revenue.

Results of estimating an extension of equation (1) where we interact input and output tariffs with an indicator of whether a firm is an exporter are presented in Table 11, columns 1. Evidence suggests that the impact of upstream tariffs on the productivity of firms downstream is entirely driven by non-exporting firms (columns 1 and 2). This is in line with the fact that duty exemptions on intermediate inputs are granted to exporting firms. Hence, non-exporting firms are indeed those that would benefit the most from reductions in tariffs on inputs, confirming that the mechanism at play is increased availability of inputs at cheaper prices and of increased varieties.

Table 11 – The effect of input tariffs by type of firm

Dep. Var.: TFP (log)	(1) All	(2) Exporters	(3) Exporters
Output tariffs: exporters	-0.005		
	(0.006)		
Output tariffs: non-exporters	0.002		
	(0.008)		
Input tariffs: exporters	-0.009		
	(0.020)		
Input tariffs: non-exporters	-0.116***		
	(0.024)		
Output tariffs: foreign		-0.004	
		(0.004)	
Output tariffs: domestic		0.006	
		(0.004)	
Input tariffs: foreign		-0.004	
		(0.033)	
Input tariffs: domestic		-0.061**	
		(0.020)	
Output tariffs: small			-0.013**
			(0.005)
Output tariffs: large			0.006
			(0.004)
Input tariffs: small			0.026
			(0.045)
Input tariffs: large			-0.060**
			(0.025)

FDI upstream manufacturing	0.007	0.007*	0.007**
	(0.005)	(0.003)	(0.003)
FDI upstream services	0.117***	0.001	-0.001
	(0.014)	(0.011)	(0.011)
Sector time trend	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	1477	648	648
Firms	322	137	137
T-test for input tariff coefficients	0.000	0.019	0.091

Note: The table reports the estimates of linear regressions. Standard errors clustered at the sector level are reported in parenthesis. All independent variables are lagged one period. In columns 5 and 6, large firms are those in the top quartile of the distribution of sales. All specifications control for FDI in own sector (lagged). Significant at *10%, **5%, ***1%. Results refer to the entire period. Results for the 2014-2017 period are reported in table A1 of the Appendix.

In principle, duty-exemptions or refunds are available for exporters of any size. In practice, securing them is costly for firms due to administrative burdens, and they take time to be processed, adding financial costs. Indeed, a pilot survey conducted online of 80 firms in the textile and apparel sector, complemented with six focus group discussions, revealed that, for the Manufacturing Under Bond (MUB) and Duty Tax Remission for Exporters (DTRE) schemes – two of the available duty-exemption schemes – the time it took for Customs to approve applications was less than 60 days for 40 percent of respondents, and more than 60 days for 60 percent of respondents. The time it takes for approvals to be processed, and for refunds to be paid, even after applications have been approved, induces some firms to opt out of the mechanism or rely on domestic intermediates in the first place.[19] Because the process to secure exemptions is not only lengthy but also complex (for example, the aforementioned pilot survey revealed that the number of documents required by an application were, at the time of the survey, 12 for MUB and 20 for DTRE), it is likely that these schemes favor larger firms, which can devote resources for this purpose, or in general firms with greater expertise and capacity. The administrative burdens associated with claiming (and receiving) duty exemptions are essentially a relatively fixed cost. This means the average administrative cost of claiming duty exemptions tends to decrease as firm size increases. Indeed, almost 75 percent of *customs* duty exemptions are claimed by the largest 100 firms (World Bank 2019b). In addition, to benefit from a customs duty exemption, a firm needs to import its inputs directly, which is more likely for large and internationally connected exporters.

Our results in column 2 and 3 of Table 11 are consistent with the above evidence, since within the exporters' group, it is smaller and domestic-owned firms that benefit from reduced input tariffs, which is consistent with these type of firms opting out of the exemption mechanism. To get a sense of the size of these 'smaller' publicly listed exporters, we look at their average sales and compare them to average sales of firms in Pakistan. In this paper, 'smaller exporters' are defined as those in the bottom third quintile of the distribution of sales. These exporters employ about 100 fewer employees than larger exporters.[20] They exported on average about 760 million PKR in 2017, which is close to the

[19] The survey evidence is only anecdotal. A total of 80 firms in the textile and apparel sector were interviewed in early 2019 through an online platform. See World Bank (2019b) for a discussion of the survey results.
[20] Based on available employees' data, smaller exporters employ about 330 employees on average versus an average of 480 employees for larger exporters. According to the State Bank of Pakistan, SMEs have up to 250 employees.

annual exports of an export-oriented, non-publicly listed, medium-sized firm in Pakistan. Instead, the larger exporters in this sample exported more than seven times that amount, on average. This set of results also shows that the effects of input tariff changes on the set of firms who are less likely to access exemptions are much larger, suggesting that failing to account for the way duty exemptions work can lead to the mismeasurement of the productivity effect of tariff reductions.

Characterizing the effect of FDI in services upstream on firms' productivity downstream

The literature on productivity gains downstream from increased FDI in upstream sectors argues that the distance to the technological frontier matters. Fernandes and Paunov (2012), for example, argue that technologically less advanced firms could experience stronger productivity gains from FDI upstream as they have an opportunity to catch up by learning about advanced managerial and organization techniques, optimizing their machinery use, and improving their production as more reliable services are available, and more knowledge is embodied in services brought by FDI. More advanced firms instead may have less to gain since they already use better technologies. Similarly, Blalock and Simon (2010) show, for Indonesia, that firms with better capabilities tend to gain less from supplier-client interactions with multinationals than more sophisticated firms. Note that learning from FDI upstream may require a minimum of firms' capabilities. Since we focus on publicly listed firms that tend to be larger and more sophisticated than average, it is reasonable to assume that these firms display a minimum level of absorptive capability. Hence, we explore whether distance from the technological frontier matters in determining the extent to which Pakistani firms operating downstream benefit from FDI in upstream services. We do so in two ways. First we interact upstream FDI in services with the distance from the frontier[21] (Table 12, column 1) and find that firms that are further away from the frontier benefit substantially more than those closer to it. Second, we estimate our main specification separately for frontier and non-frontier firms, where frontier firms are those in the top 2 quintiles of the distribution of average TFP in the first 2 years of the analysis. In column 2 and 3 of Table 12 we find that, indeed, the effect of FDI in services is higher for non-frontier firms. Taken together, these results point to a larger distance to the technological frontier as an associated enabling factor for gains from upstream services FDI in Pakistan.

Table 12 – The effect of upstream FDI by type of firm

	(1)	(2)		(3)
Dep. Var.: TFP (log)	All	All	Dep. Var.: Intangible assets (log)	Innovators
Output tariffs	0.004	-0.001	Output tariffs	0.005
	(0.009)	(0.006)		(0.028)
Upstream tariffs	-0.014	-0.048**	Upstream tariffs	-0.189
	(0.022)	(0.021)		(0.169)
FDI upstream manufacturing	0.004	0.005	FDI upstream manufacturing	0.034
	(0.008)	(0.006)		(0.026)
FDI upstream service	0.117***	0.130***	FDI upstream service	0.271***
	(0.022)	(0.021)		(0.048)
FDI upstream service × distance frontier	0.249***			

[21] The distance from the frontier is measured by the difference between the average productivity of a firm and the average productivity of firms in the top quantile of the distribution. The measure is time invariant and is computed using data from the first two years a firm participates in the sample.

	(0.059)			
FDI upstream service × Top firms		-0.036*		
		(0.017)		
Sector-by-year trend	Yes	Yes	Sector-by-year trend	Yes
Year FE	Yes	Yes	Year FE	Yes
Firm FE	Yes	Yes	Firm FE	Yes
Observations	1477	1477	Observations	707
Firms	322	322	Firms	153

Note: The table reports the estimates of linear regressions. Standard errors clustered at the sector level are reported in parenthesis. Significant at *10%, **5%, ***1%. Results refer to the entire period. All independent variables are lagged one period. Distance from the frontier is time invariant and is measured by the difference between the average productivity of a firm in the first 2 years, and the average productivity of firms in the top quantile of the distribution. Frontier firms are those in the top 2 quintiles of the distribution of average TFP in the first 2 years.

Finally, we observe that the effect on productivity possibly materializes through an increase in innovative activities. For the subsample of firms that have invested in intangible assets, our proxy for innovation, at least once over the period (innovators in column 3 of Table 12) we find that FDI in upstream services is positively associated with innovative investment. Hence, this evidence is suggestive of the link between upstream FDI in services and downstream firms' productivity operating through the mechanism of increased investment in innovation. The existence of knowledge spillovers from FDI in services has been recognized in the literature (Blind and Jungmittag 2004). Foreign-owned firms tend to enjoy some technological advantages that make their engagement with the domestic market profitable. In the service sectors, these largely involve intangible assets, which, given their only partial excludability, can generate knowledge spillovers to firms that utilize the services. Indeed, evidence suggests the presence of information and knowledge flows from foreign firms to their domestic customers and a consequent learning-from-supplier effect (Crespi et al. 2008). There is also evidence that increasingly goods embody some accompanying services, which themselves can be considered a form of innovation in products. Both forms of FDI-induced innovation would result in an increase in investment in intangible assets. Ultimately, investment in intangible assets has been found to increase productivity, not only in relation to its R&D component, but also in the form of organizational capital, ICT, and firm-specific human capital (Syverson 2011; Battisti et al. 2015), and stimulate firm growth (Hosono et al. 2020).

6. Conclusions

This paper examines productivity dynamics of publicly listed firms in Pakistan, and the extent to which integration in the global marketplace explains their productivity growth. We rely on firm-level data on publicly listed firms in non-banking sectors in Pakistan over the period 2012-2017. We adopt a standard approach in the literature to estimate productivity and measure changes in input tariffs and upstream FDI presence. Estimating the effect of integration on productivity is challenging because integration policies are shaped by governments that respond to some extent to private sector interests. We show that in the case of Pakistan the concern is valid, and, following the literature, we address this identification problem by focusing on a narrow window for which this concern is dissipated by the data.

We present three main findings. First, we find that firm-level productivity has been stagnant, as suggested by macro-data indicators, and that the aggregate gains have been mostly driven by more productive firms gaining market shares. Indeed, firms' average productivity has not grown since 2015. Second, we find that in Pakistan, as in many other contexts, internationally linked firms perform better than domestic-owned or domestic-oriented firms. For foreign-owned firms we find suggestive evidence pointing to the productivity premium being explained both by a self-selection element – foreign investors target more productive firms in the first place – but also by foreign-owned firms increasing productivity after they are acquired by foreign investors. For exporting firms, we find suggestive evidence that the productivity premium is mostly explained by increases in productivity after starting exporting. Third, we find that integration with the global marketplace of upstream sectors – both for goods and services – has led to increased productivity in downstream sectors. Tariff reductions upstream helped increase productivity downstream mainly for non-exporters, and relatively smaller exporters – for which the process of claiming import duty exemptions is too cumbersome. FDI in upstream services sectors, instead, tends to benefit the productivity of those firms downstream that are further away from the technological frontier. We also find that the type of FDI encourages investments in intangible assets, pointing to a potential mechanism through which upstream services FDI increases productivity downstream.

Finally, data constraints prevent us shedding more light on the causal links between exporting and foreign ownership and productivity in Pakistan. Exploring this is important both from an analytical and a policy perspective. That should be an important task for future research.

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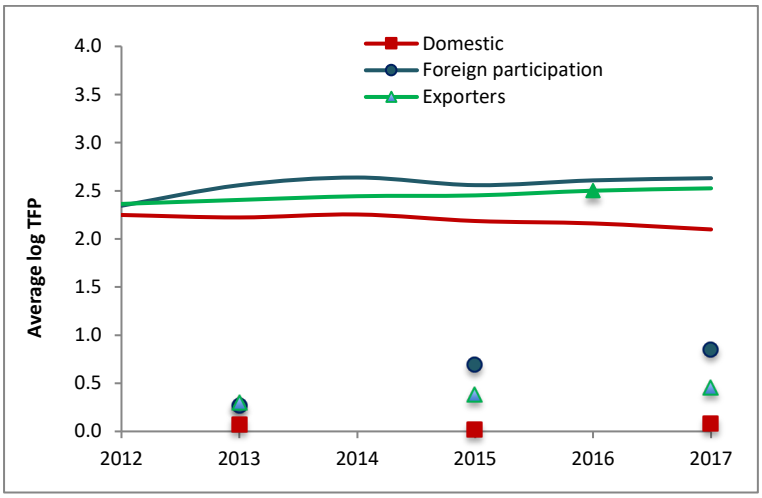
Appendix

Figure A1 – Firms with foreign participation are more productive than domestic firms. The gap is increasing over time



Note: authors' calculations based on Financial Statements Analysis of Companies (Non-Banking) Listed at Pakistan Stock Exchange.

Table A1: Productivity, input tariffs, and FDI by type of firm – period 2014-2017

Dep. Var.: TFP (log)	(1) All	(2) Exporters	(3) Exporters
Output tariffs: exporters	-0.010		
	(0.007)		
Output tariffs: non-exporters	-0.006		
	(0.008)		
Input tariffs: exporters	-0.070*		
	(0.035)		
Input tariffs: non-exporters	-0.112**		
	(0.043)		
Output tariffs: foreign		-0.015**	
		(0.006)	
Output tariffs: domestic		-0.007	
		(0.006)	
Input tariffs: foreign		-0.052	
		(0.031)	
Input tariffs: domestic		-0.080**	
		(0.031)	
Output tariffs: small			-0.022***
			(0.006)
Output tariffs: large			-0.006
			(0.006)
Input tariffs: small			-0.028
			(0.041)
Input tariffs: large			-0.081**
			(0.030)
FDI upstream manufacturing	0.003	0.003	0.003
	(0.003)	(0.005)	(0.005)
FDI upstream services	0.087***	-0.002	-0.002
	(0.016)	(0.007)	(0.008)

Sector time trend	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	1170	515	515
Firms	316	136	136
T-test for input tariff coefficients	0.049	0.199	0.188

Note: The table reports the estimates of linear regressions. Standard errors clustered at the sector level are reported in parenthesis. All specifications control for FDI in own sector (lagged). In columns 5 and 6, large firms are those in the top 2 quintile of the distribution of sales Significant at *10%, **5%, ***1%.

Table A2: Estimates obtained using alternative measures of TFP

	Whole period	2014-2017	Whole period	2014-2017
Dep. Var.: Solow-based TFP (log)	(1)	(2)	(3)	(4)
Output tariffs (lagged)	0.004	-0.007	-0.002	-0.014
	(0.009)	(0.011)	(0.009)	(0.008)
Input tariffs (lagged)	-0.088***	-0.081***	-0.066***	-0.060**
	(0.024)	(0.025)	(0.019)	(0.026)
FDI in upstream manufacturing sectors (lagged)			-0.001	0.001
			(0.005)	(0.004)
FDI in upstream service sectors (lagged)			0.090***	0.077***
			(0.019)	(0.021)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sector-by-year trend	Yes	Yes	Yes	Yes
Observations	1477	1170	1477	1170
Firms	322	316	322	316

Note: The table reports the estimates of linear regressions. Standard errors clustered at the sector level are reported in parenthesis. TFP is computed using the non-parametric Solow residual method, where the output elasticity of each of the three input factors (labor, capital, and intermediate inputs) is calculated as the average share of that input in total output. TFP is then estimated as the residual of the production function, making use of these calculated elasticities. Significant at *10%, **5%, ***1%.