

	<p><b>Annals of Social Sciences and Perspective</b></p> <p>ISSN (Print): 2707-7063, ISSN (Online): 2788-8797                  Volume 5, Number 1, January-June 2024, Pages 30-37                  Journal homepage: <a href="http://assap.wum.edu.pk/index.php/ojs">http://assap.wum.edu.pk/index.php/ojs</a></p>
---	---

**Unveiling the TFP Nexus with ICT and IPRs: An Empirical Analysis of Textile & Apparel Industry of Pakistan**  
 Irfan Ali<sup>1\*</sup>, Zafar Mahmood<sup>2</sup>

<sup>1</sup> Ph.D. Scholar, Department of Economics, School of Social Sciences and Humanities (S3H), National University of Sciences and Technology (NUST), Islamabad, Pakistan

<sup>2</sup> Professor, Principal and Dean S3H, Department of Economics, School of Social Sciences and Humanities (S3H), National University of Sciences and Technology (NUST), Islamabad, Pakistan

\* Corresponding Author’s Email Address: [irfan.phde19s3h@student.nust.edu.pk](mailto:irfan.phde19s3h@student.nust.edu.pk)

ARTICLE DETAILS	ABSTRACT
<p><b>History:</b></p> <p>Received: January 01, 2024                      Accepted: April 4, 2024</p>	<p>Textile and apparel industries of Pakistan are the major manufacturing sector contributing about 60% to total exports. The degree of competitiveness in this sector is closely associated with their Total Factor Productivity (TFP), that can be enhanced through trade liberalization, efficient and effective use of Information and Communication Technology (ICT), protection of intellectual property rights (IPRs) along with the investment in human capital, and advertisement expenditures. Additionally, investment in machinery &amp; equipment and the role of subsidies cannot be ignored in enhancing TFP growth. This study directly replies to the call for recognizing the antecedents of TFP. The Census of Manufacturing Industries for the year 2005-06 has been utilized in this study. Total factor productivity has been calculated employing the methodology of Tomiura (2007). The results indicate that TFP is positively and significantly affected by ICT, IPRs, investment in machinery &amp; equipment, human capital, import duties, and subsidies for exports. The textile and apparel sector can be safeguarded from international competition by relocating resources towards improving TFP whereas incorporation of ICT and IPRs enables firms to realize the benefits of foreign developed technology which further improves TFP growth. Furthermore, the positive impact of advertising spending on TFP is statistically insignificant. This study also suggests policy implications to boost the TFP growth in the textile and apparel sector of Pakistan.</p> <p>© 2021 The Authors, Published by WUM. This is an Open Access Article under the Creative Common Attribution Non Commercial 4.0</p>
<p><b>Keywords:</b></p> <p>Total Factor Productivity                      Information and                      Communication Technology                      Advertisement Import Duty                      Textile and Apparel                      Pakistan</p>	
<p><b>DOI:</b></p> <p>10.52700/assap.v5i1.349</p>	

**1. Introduction**

Until the 1980s, Pakistan’s economic progress, particularly in the industrial sector, had been encouraging. However, the manufacturing sector witnessed a gradual decline in growth from 7.87% for the period 1961-90 to 5.10% for 1991-2020 (GoP, 2021). Textile and apparel sector are the major manufacturing sector of Pakistan, having the longest production chain. Furthermore, the sector employs 40% of industrial labor forces, accounts for about 60% in total exports, and comprises one-fourth of the total manufacturing sector’ value-added (GoP, 2021). The textile and apparel sector has great potential to enhance exports, but the country lags behind its due share in world exports despite having a potential comparative advantage. Total Factor Productivity (TFP), which can be increased by human capital development, liberalizing/protection of the industry through import duties,

intellectual property rights (IPRs), and Information and Communication Technology (ICT), is a crucial indicator of the competitiveness of firms in the sector. Moreover, investment in machinery & equipment, the role of subsidies, and advertisement expenditures further improve the productivity of the textile sector.

Total factor productivity growth, a fraction of output growth, not justified by the factors of production, is influenced not only directly by human capital, R&D, multiple types of transfer of technology and know-how via IPRs, foreign direct investment, capital imports, but also indirectly by the interactive effects of royalties, license fee payments, and imports of machinery & equipment (Ali & Mahmood, 2017). Several studies have been conducted to investigate the channels through which various economies' TFP growth is related to each other. However, studies that consider the impact of IPRs, ICT, advertisement expenditure, import duties, subsidies provided for export, and other purposes for manufacturing subsectors are hard to find.

IPRs safeguard authors' original/creative works, innovations, product appearances, scientific breakthroughs, and so on. Both firms and countries frequently adjust IPR protection to optimize their advantages, such as enhancing TFP and promoting economic growth (Su *et al.*, 2021). Similarly, ICT is considered as an engine of economic growth. Neoclassical growth theory has been used by researchers to elucidate the contributions of ICT to the production process, classifying information technology as a sort of factor of production in the production process, analogous to labor and capital, that adds to value-added at the enterprise level and GDP at the economy level (Chou *et al.*, 2014). Recently, authors have shifted focus to these factors as a major contributor to TFP growth. Nevertheless, advertisement expenditures are also used by a few authors as a determinant of TFP. Camino-mogro (2019) examined the impact of advertising spending on TFP in the Ecuadorian manufacturing sector and found that advertising spending positively affects TFP growth. Furthermore, advertising not only generates an expected sales return within the same period in which advertising expenses are made, but it also changes customers' perceptions and provides a competitive advantage. Additionally, advertising investment allows firms to raise their gross revenue growth rates and productivity, resulting in greater medium- and long-term returns (Camino-mogro, 2019). Firms often seek economic returns/profitability to stay in business and evolve. To attain this long-term aim, firms invest in both tangible and intangible capital/assets. Tangible capital includes the lease and hire of plant, building, machinery & equipment including ICT equipment while intangible capital includes human capital, IPRs, ICT services, R&D, and advertising spending, that improves business productivity. The global system of protection as a barrier to international trade also plays a crucial role in TFP growth both at the firm and country level.

As the global economic system of protection and regulation is being dismantled by the IMF and the WTO, Pakistani firms are striving for greater access to relevant technology to increase their competitiveness by enhancing their efficiency and productivity. The textile and apparel firms are also striving hard to avail maximum advantage from such dismantling of regulations and trade openness. It should be recognized that Pakistan's industrialization and productivity growth are highly dependent on the acquisition of technological competencies, including the excellence and pace of innovation, which depend on the capacity to assimilate, captivate and apply technology from all sources (Mahmood & Siddiqui, 2000).

The current study adds to the body of knowledge in four ways. First, by examining the effects of IPR expenditures on TFP growth in Pakistan's textile and apparel sector. This analysis directly replies to the call for recognizing the antecedents of TFP and thus enriches our understanding of this issue. Next, it enriches our knowledge by incorporating the ICT as the conduit of TFP for the textile and apparel sector. Third, it includes advertisement expenditure by the firms as another conduit of TFP growth by providing empirical support in this context for the textile and apparel sector. Last but not least, this study includes import duty, subsidies for export and other purposes as a measure of the dismantling of regulations, and trade openness/protection, which are crucial determinants of TFP growth. Likewise, this analysis also provides effective policy implications. It not only advises policymakers, particularly on how to leverage the IPR system and trade openness policies to

stimulate TFP but also helps explain whether advertisement expenditures are productivity-enhancing for firms operating in the textile and apparel sector.

The study is organized as follows: Section 2 discusses the literature review. Theoretical and empirical models relevant to the study are discussed in section 3. While section 4 presents a discussion of the results. Finally, the conclusion and policy implications are presented in section 5.

## **2. Literature Review**

Classical growth theory, which includes contributions from Adam Smith, David Ricardo, and Robert Malthus, is the earliest suggested growth theory. Though these economists expressed their views in slightly different ways, the essential premise is the same. The population growth rate and technical advancement are the two key components that explain the growth process, according to the classical growth theory. Similarly, Harrod and Domar devised the Harrod-Domer model, which laid the groundwork for exogenous growth theory. The mobilization and development of savings are proposed as a primary method for accelerating economic growth.

The neoclassical growth theory, also known as exogenous growth theory, is essentially an extension of the Harrod-Domer model by Solow and Swan. Savings rate and population growth are determined exogenously in the Solow model. Based on these rates, Solow calculated a steady-state level of per capita income. After the steady state is reached, technological advancements, which are exogenous in the model, cause the per capita income to rise. On the other hand, the endogenous growth theory was proposed by Romer (1986) and Lucas (1988). According to the theory, growth is caused by endogenous rather than extrinsic sources. In contrast to the neoclassical growth model, long-term economic growth is connected to technical innovation, which is dependent on government investment in human capital and R&D spending.

In terms of empirical studies, there is indeed a huge amount of empirical work on economic and TFP growth, particularly at the aggregate scale. At the international level, notable economists such as Benhabib & Spiegel (1994), Coe & Helpman (1995), and Hall & Jones (1999) among others have conducted extensive research. TFP and ICT nexus have been studied by various researchers such as Chang *et al.* (2024), Castillo & Vonortas (2023), Roth *et al.* (2023) among others. Specifically, Roth *et al.* (2023) explored the role of intangibles on productivity at the firms' level. Similarly, there is a considerable amount of local literature on TFP in the case of Pakistan, such as Mahmood & Siddiqui (2000) analyzed the productivity trends and R&D capability in the manufacturing industries of Pakistan. The growth accounting framework has been utilized by Mahmood & Siddiqui (2000) for the calculation of total and partial productivity. Their findings, based on data from 1972 to 1997, revealed a direct link between TFP growth and the failing scientific and technology system. Pasha *et al.* (2002) used data from 1972 to 1997 to examine the slowdown of productivity growth in the Pakistani economy, concluding that the economy developed faster during times when TFP increased significantly. Khan (2006) assessed TFP and determined the macro factors of TFP. Using the OLS approach and data from 1960 to 2003, the study discovered that FDI, macroeconomic stability, and financial sector development boost TFP. Similarly, for Pakistan, Tufail & Ahmed (2015) measured TFP for the agriculture and manufacturing sector. Last but not least, Ali & Mahmood (2017) investigated the effect of R&D, human capital, various types of technology transfer including IPRs, and their interactive effects in the case of Pakistan.

There are several studies on Pakistan, but none of them investigates the determinants of TFP in Pakistan's textile sector, leaving a research gap. To address this knowledge gap, this study looks at the effect of information & communication technology, investments in human capital development, advertisement expenditures, intellectual property rights, export subsidies, and trade liberalization/protection through import duties on TFP growth in Pakistan's textile sector.

## **3. Theoretical and Empirical Model**

According to the neoclassical growth model, technology transfer is a crucial source of technical

improvement for emerging nations. The trade-capital-technology change-growth nexus has sparked widespread attention because of technological advancement. According to recent literature, trade causes significant supply-side effects, which drive industrial advancement and economic expansion. As a result, capital goods imports by any firm or nation from more advanced countries can boost productivity and accelerate growth, as well as enable firms and the economy as a whole to start their own innovation activities.

The total factor productivity at the firm level is not possible to measure using cross-sectional data, thus we calculate Approximate TFP (ATFP) following the methodology used by Tomiura (2007).

$$ATFP = \ln\left(\frac{Q}{L}\right) - s \ln\frac{K}{L} \quad \dots (1)$$

where Q shows total production at basic prices, L Average daily employment of labor and K indicates capital for which gross fixed capital formation is used as a proxy. According to Tomiura (2007), the parameter measuring the significance of capital (s) in production function is 1/3 in the case of Japan. However, this parameter is 0.3015 in the case of Pakistan same as Ali & Mahmood (2024) (see Table A1 in Appendix) which has been used to measure the ATFP for the textile and apparel industry of Pakistan.

The theoretical model is

$$ATFP = f(HC, IPRs, ICT, Ads, MD, Sub, ME) \quad \dots (2)$$

where, ATFP, ICT, IPRs, HC, Ads, MD, Sub, and ME represent approximate total factor productivity, information and communication technology, intellectual property rights, human capital, advertisement expenses, import duties, subsidies received by firms, and investment in machinery & equipment. The total factor productivity data is not available for the textile sector of Pakistan; so, we calculate the ATFP using the methodology described by Tomiura (2007) as explained above. Literature indicates different proxies of human capital such as educational enrolment, expenditures on education, average years of schooling, monetary values of human capital stock, international test scores, and adult literacy rate. In the present study, expenditures on training/education (external costs only) by the firms operating the textile and apparel sector of Pakistan have been used as a proxy of human capital. Payments for the accounting year 2005-06 for copy-rights royalties, patents as proxied for IPRs, and payments for postage, telephone, telegraph, telex, fax, etc., have been used as a proxy for ICT. Similarly, payments made for advertisements, lump-sum figures for the accounting year 2005-06 for import duties, subsidies on exports & others received by the firm, and payments for lease & hire of plant, building, machinery & equipment, has been used as a proxy for advertisement expenses, import duties, subsidies received by firms, and investment in machinery and equipment, respectively.

The econometric model for assessing the determinants of TFP is as under

$$ATFP_i = \beta_0 + \beta_1 \ln(1 + HC_i) + \beta_2 \ln(1 + IPRs_i) + \beta_3 \ln(1 + ICT_i) + \beta_8 \ln(1 + Ads_i) + \beta_4 \ln(1 + MD_i) + \beta_5 \ln(1 + Sub_i) + \beta_6 \ln(1 + ME_i) + \varepsilon_i \quad \dots (3)$$

The suffix i indicates the firm. We have added 1 to all the right-hand-side variables to take the log of all explanatory variables. The data for the estimation of Eq. 3 have been taken from the CMI 2005-06, which was officially received from the Pakistan Bureau of Statistics (PBS). Specifically, Pakistan Standard Industrial Classification (PSIC) codes 17 and 18, which indicate textile and wearing apparel manufacturing, respectively, have been employed for empirical analysis within CMI 2005-06, and the relevant data have been used for empirical analysis.

#### 4. Results and Discussion

The OLS with robust standard errors (OLS w/RSE) estimation technique has been utilized as data has

the problem of heteroskedasticity. The results of OLS w/RSE are reported in Table 1. Five models to confirm the robustness of the findings. The standard errors are reported in parentheses. All the variables have expected positive signs in all four models.

**Table 1:** Determinants of TFP in Textile Sector of Pakistan (Dependent Variable: AFTP)

	Model 1 OLS w/RSE	Model 2 OLS w/RSE	Model 3 OLS w/RSE	Model 4 OLS w/RSE
Log Human Capital	0.0816 (0.0563)	0.0556 (0.0558)	0.0454 (0.0574)	0.0419 (0.0576)
Log IPRs	0.263*** (0.0477)	0.241*** (0.0455)	0.219*** (0.0465)	0.221*** (0.0461)
Log ICT	0.443*** (0.0523)	0.414*** (0.0528)	0.378*** (0.0533)	0.369*** (0.0544)
Log Advertisements	0.0347 (0.0427)	0.0194 (0.0426)	0.0145 (0.0425)	0.0137 (0.0425)
Log Import Duty		0.149*** (0.0267)	0.127*** (0.0276)	0.123*** (0.0279)
Log Subsidies			0.136*** (0.0244)	0.136*** (0.0243)
Log Machinery Equipment				0.0284 (0.0306)
Constant	0.891*** (0.291)	0.983*** (0.291)	1.064*** (0.288)	1.064*** (0.288)
<i>N</i>	1653	1653	1653	1653
<i>R</i> <sup>2</sup>	0.065	0.071	0.078	0.079

Standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$

The results indicate that the total factor productivity is positively but insignificantly affected by human capital in all models. The direct effect of human capital on total factor productivity is also found by Mahmood & Siddiqui (2000), Tufail & Ahmed (2015), Ali & Mahmood (2017) in the case of Pakistan. Ali *et al.* (2016) also found the positive influence of better human capital on TFP growth in a panel study of twenty European economies using the 1995-2010 dataset. The impact of IPRs as measured by payments for copy-rights royalties, patents, etc. has a positive influence on TFP. A 1% surge in payments for copy-rights royalties, patents will increase TFP by 0.263% on average in the textile and apparel sector of Pakistan (see Model 1). The results are in concordance with the results of Su *et al.* (2021) who find out that IPRs positively affect TFP in the case of developing economies. The impact of ICT is also found to be positive which indicates that a 1% rise in ICT investment raises TFP by 0.443% on average in Model 1. This result is in line with the existing literature, for instance, Haider *et al.* (2021) find out the positive impact of ICT on TFP using panel data from 1990-2006 considering twelve manufacturing industries for twelve developed economies. Similarly, the impact of advertisement spending on total factor productivity is positive but statistically insignificant. The positive impact of advertisement on TFP is consistent with previous literature. This is because when firms advertise up to level, they commit to deliver a quality product as advertised, this compels them to invest in activities that increase the quality of products and such activities in turn increase TFP. Camino-mogro (2019) analyzed the effect of advertisement expenditures on TFP in the Ecuadorian manufacturing sector and concluded that advertisement expenditures positively affect TFP growth. Furthermore, advertising not only generates an estimated sales return within the same time frame within which the advertising expenditures are made, but it also alters customer perceptions and establishes a competitive advantage. Additionally, this direct link between advertising spending and TFP supports the learning by advertising theory. As noted by Camino-mogro (2019), advertising investment permits enterprises to boost their gross revenue growth rates

and productivity, resulting in superior performance in the medium and long term.

In model 2, we have extended model 1 by incorporating import duties. The impact of human capital, IPRs, ICT, and advertisement on TFP growth is positive as found in Model 1. However, the magnitude of coefficients has reduced marginally. The effect of human capital and advertisement expenditures on total factor productivity growth is insignificant as found in Model 1 whereas IPRs and ICT significantly and positively affect TFP growth. An increase in import duty affects TFP growth positively and significantly, i.e., a 1% surge in import duty increases TFP growth by 0.149%. This is because when we insulate textile sector firms from foreign competition this increases TFP. Generally, this is known that import substitution causes inefficiency, but results indicate that if we protect textile firms from foreign competition this enhances their TFP because they get additional resources, and firms invest in those activities that enhance their TFP significantly. Similarly, model 3 is extended by incorporating subsidies received for exports & other purposes by the textile and apparel firms which has a positive and significant effect on TFP growth. A 1% increase in subsidies provided for exports and other purposes increases TFP growth by 0.136%. Moreover, Model 4 is extended using expenditure for lease and hire of plant, building, machinery, and equipment that has a direct but insignificant effect on TFP. In sum, it can be said that protecting the textile sector from foreign competition using import duties and providing export subsidies significantly increases the productivity growth of textile and apparel manufacturing firms in the case of Pakistan.

## 5. Conclusion and Policy Implications

This analysis tests the impact of human capital, IPRs, ICT expenditures, advertisement expenditures, import duty, export subsidies, and machinery & equipment expenditures on TFP of the textile and apparel manufacturing sector of Pakistan. Ordinary least squares with robust standard errors have been employed for empirical estimation. The results indicate that the impact of human capital, advertisement expenditure, and machinery & equipment payments are positive but statistically insignificant. The direct impact of advertising spending on TFP has supported the learning by advertising theory which boosts firms' productivity and enhances gross revenue growth rates. Additionally, the effect of IPRs, ICT expenditures, import duty, and subsidies are positive and significant. Thus, the protection of the textile and apparel sector from foreign competition by employing import duties and providing export subsidies significantly boosts TFP. The impact of ICT on TFP growth is highest as compared to other explanatory variables which indicate that ICT investment is a key factor that can boost the productivity of textile and apparel firms. The acquisition of intellectual property and utilization of information & communication technology enables the textile and apparel firms to have access to modern and protected technology & know-how that boost their productivity and enable them to become more competitive.

Considering the above-mentioned conclusion, the following policy implications for improving TFP growth in Pakistan may be deduced.

- The use of ICT and IPRs permits businesses to gain the benefits of foreign developed technology; therefore, the protection of properties and technologies would be beneficial for TFP growth.
- The protection of industry relieves resources to boost TFP growth; therefore, in the program of trade reforms cascading in tariffs must be maintained.

All these measures would lead not only the Pakistani textile and apparel industry to enhance the TFP growth but also enable it to increasingly become part of the global supply/value chain.

## References

- Ali, I., & Mahmood, Z. (2017). Technology Transfer , Development , Deployment and Productivity Performance in Pakistan. *NUST Journal of Social Sciences and Humanities*, 3(1), 95–128.
- Ali, I., & Mahmood, Z. (2024). Foreign Outsourcing Collaboration, and Firm-Level Characteristics. *34th RSEP International Conference on Economics, Finance and Business 6-7 March 2024*,

*HCC. ST. MORITZ HOTEL, Barcelona, Spain, March, 22–37.*

- Ali, M., Cantner, U., Roy, I., & Ali, M. (2016). Knowledge spillovers through FDI and trade: the moderating role of quality-adjusted human capital. *Journal of Evolutionary Economics*, 26, 837–868. <https://doi.org/10.1007/s00191-016-0462-8>
- Benhabib, J., & Spiegel, M. M. (1994). The role of human capital in economic development evidence from aggregate cross-country data. *Journal of Monetary Economics*, 34(2), 143–173. [https://doi.org/10.1016/0304-3932\(94\)90047-7](https://doi.org/10.1016/0304-3932(94)90047-7)
- BoI. (2021). *Sector Profile Textiles ( value addition )*. <https://invest.gov.pk/sites/default/files/inline-files/Textiles.pdf>
- Camino-mogro, S. (2019). *Does Investment in Advertising Boost Economic Performance? Firm-Level Evidence of Ecuadorian Manufacturing*. 14(4), 100–118.
- Castillo, J. C., & Vonortas, N. S. (2023). TFP, ICT and absorptive capacities: micro-level evidence from Colombia. *Journal of Technology Transfer*, 1–16. <https://doi.org/10.1007/s10961-023-10042-w>
- Chang, K., Tomljanovich, M., & Ying, Y. H. (2024). ICT development and total factor productivity growth. *Journal of Infrastructure, Policy and Development*, 8(3), 1–26. <https://doi.org/10.24294/jipd.v8i3.3108>
- Chou, Y., Chuang, H. H., & Shao, B. B. M. (2014). The impacts of information technology on total factor productivity: A look at externalities and innovations. *Intern. Journal of Production Economics*, 158, 290–299. <https://doi.org/10.1016/j.ijpe.2014.08.003>
- Coe, D. T., & Helpman, E. (1995). International R&D spillovers. *European Economic Review*, 39, 859–887. <https://doi.org/10.1111/1468-0297.00146>
- GoP. (2021). *Pakistan Economic Survey 2020-21*. Ministry of Finance, Government of Pakistan (GoP), Islamabad
- Haider, F., Kunst, R., & Wirl, F. (2021). Total factor productivity, its components and drivers. In *Empirica* (Vol. 48, Issue 2). Springer US. <https://doi.org/10.1007/s10663-020-09476-4>
- Hall, R. E., & Jones, C. I. (1999). Why Do Some Countries Produce So Much More Output Per Worker Than Others? *Quarterly Journal of Economics*, 114(1), 83–116.
- Khan, S. U. (2006). *Macro Determinants of Total Factor Productivity in Pakistan* (Working Paper Series #10, State Bank of Pakistan, Karachi).
- Lucas, R. E. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, 22(1), 3–42. [https://doi.org/10.1016/0304-3932\(88\)90168-7](https://doi.org/10.1016/0304-3932(88)90168-7)
- Mahmood, Z., & Siddiqui, R. (2000). State of technology and productivity in Pakistan's manufacturing industries: Some strategic directions to build technological competence. *Pakistan Development Review*, 39(1), 1–21. <https://doi.org/10.30541/v39i1pp.1-21>
- Pasha, H. A., Pasha, A. G., & Hyder, K. (2002). *The slow down of the Growth of total factor productivity in Pakistan* (Research Report No. 44; Social Policy and Development Centre (SPDC), Karachi, Pakistan).
- Romer, P. M. (1986). Increasing Returns and Long-Run Growth. *Journal of Political Economy*, 94(5), 1002–1037. <https://www.jstor.org/stable/1833190>
- Roth, F., Sen, A., & Rammer, C. (2023). The role of intangibles in firm-level productivity—evidence from Germany. *Industry and Innovation*, 30(2), 263–285. <https://doi.org/10.1080/13662716.2022.2138280>
- Su, Z., Wang, C., & Peng, M. W. (2021). Intellectual property rights protection and total factor productivity. *International Business Review*, November, 101956. <https://doi.org/10.1016/j.ibusrev.2021.101956>
- Tomiura, E. (2007). Foreign outsourcing, exporting, and FDI: A productivity comparison at the firm level. *Journal of International Economics*, 71(3), 113–127. <https://doi.org/10.1016/j.jinteco.2006.11.003>
- Tufail, M., & Ahmed, A. M. (2015). Measuring Total Factor Productivity and Finding the

Determinants of Total Factor Productivity at Sectoral Level : A Case Study of Pakistan.  
*Industrial Engineering Letters*, 5(6), 38–53.  
<https://www.iiste.org/Journals/index.php/IEL/article/view/23136>

**Appendix**

**Table A2: Importance of Capital in the Production Function**

<b>Variable</b>	<b>Coefficient</b>	<b>Importance of Capital in the Production Function</b>	<b>Importance of Capital in the Production Function (%)</b>
Log Capital	0.354918	0.3015	30.15
Log Labor	0.821936		

Sample: 1990 2021  
 Dependent Variable: Log Y