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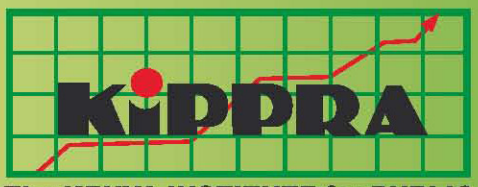

The KENYA INSTITUTE for PUBLIC POLICY RESEARCH and ANALYSIS

The Interplay Between Intellectual Property Rights and Total Factor Productivity in Kenya

Benedictor Cheronoh
Eric Rono

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THE KENYA INSTITUTE FOR PUBLIC POLICY RESEARCH AND ANALYSIS (KIPPRA)

YOUNG PROFESSIONALS (YPs) TRAINING PROGRAMME

The Interplay Between Intellectual Property Rights and Total Factor Productivity in Kenya

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Kenya Institute for Public Policy
Research and Analysis

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Abstract

Kenya is an innovation-driven country powered by knowledge, creativity, and technology, each of which is fundamentally supported by intellectual property (IP) and intellectual property rights (IPRs) protections. This study uses the World Bank's 2018 Enterprise Development Survey data for Kenya to examine the effect of intellectual property rights on total factor productivity in the manufacturing sector, whose contribution to GDP has been decreasing. It looks at total factor productivity within Kenya's manufacturing sub-sectors and its determinants. Growth accounting framework provides the estimates for total factor productivity for manufacturing firms in Kenya using a balanced panel data for the year 2007, 2013, and 2018. A second model explores the determinants of total factor productivity with key focus being on intellectual property rights. The results show that the key determinants of total factor productivity were intellectual property rights, research and development, training, quality certification, foreign direct investment, and direct exports. These factors had statistically significant effect on total factor productivity. The study recommends an increase in the uptake of IPR through sensitization and public awareness to protect innovations, combat illicit trade and increase total factor productivity in the manufacturing sector of Kenya.

Abbreviations and Acronyms

ACA	Anti-Counterfeit Authority
IP	Intellectual Property
IPRs	Intellectual Property Rights
KIPI	Kenya Industrial Property Institute
KRA	Kenya Revenue Authority
FDI	Foreign Direct Investment
R&D	Research and Development
GDP	Gross Domestic Product
KAM	Kenya Association of Manufacturers
KIPI	Kenya Industrial Property Institute
KECOBO	Kenya Copyrights Board
KENIA	Kenya National Innovation Agency
KIRDI	Kenya Industrial Research and Development Institute
NACOSTI	National Commission for Science Technology and Innovation
NTB	Non-Tariff Barriers
PMI	Purchasing Managers Index
TFP	Total Factor Productivity
UNCTAD	United Nations Conference on Trade and Development

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1. Introduction

Intellectual Property Rights (IPRs) are the intangible and exclusive rights granted to creations of the mind referred to as intellectual property, and it includes artistic works, designs, inventions, literary, and symbols used in commerce. The Intellectual Property (IP) takes the form of patents, trademarks, industrial designs, copyrights, trade secrets and utility model.

An innovation is protected by a patent, which is an exclusive right awarded to the inventor. It gives the owner the power to decide how and if others can utilize the innovation and if it becomes accessible to the public. The patent owner gains financially in return for the technical information about the invention. There are numerous examples of patents, which are classified as utility, design, or plant patents. Pens with scanners, machines, and plants capable of reproduction are some examples. Patents must be novel, non-obvious, legally recognized as "patentable," capable of industrial application, and contain clear and concise patent information.

A mark, name, logos, signature or a sign that distinguishes a good or product from another is called a trademark. Trademark protection can be obtained by filling an application with a trademark office, and usually spans up to a period of 10 years but can renewed after additional payment has been made.

Copyright are the rights that creators have over their literary or artistic works such as books, music, games, broadcasting, printing, audio, motion, video, paintings, applications, sculpture and films. Industrial design is the right over an ornamental or aesthetic part of a product. They include the dimensional features such as patterns, lines, shape, surface or colour.

Patents, trademark, copyrights, industrial designs, and utility models are rights that are conferred to individual parties and, therefore, not freely accessible to the public and are protected and enforced through court orders. A phone will be used for further illustration. Industrial designs include the aesthetic features of the phone, trade marks comprise of the brand name of the manufacturer and logos, copyright are the operating software, games, applications and integrated interfaces in the phone while patent will include the innovative aspects of the phone, such as the battery, antenna and keyboard.

Intellectual property (IP) can and is used by innovative businesses in a variety of ways to create profitable new markets, goods, services, and processes. The corporation makes money by selling intellectual property-based goods and services. Businesses can use their intellectual property to collaborate in a variety of ways, including licensing other companies to manufacture or use their IP,

building franchises, cross-licensing other companies' technologies, and forging strategic partnerships.

The fact that a corporation owns intellectual property rights assists to reassure investors that they should invest in the firm. IP can improve the financial value of enterprises that own it, be it on the stock market or through acquisition. Not only for established organizations that rely on IP rights to protect their value, innovation, and reputation but also for developing businesses hoping to generate a consistent stream of investment and innovation, the use of IP to stimulate investment is critical.

The main field of application of patents, trademarks, utility models, industrial design is the manufacturing sector. For example, they are applied in the foods and beverage, agro-processing, plastic and rubber, automotive, chemical and allied, timber, energy, electrical and electronics, metal and allied, paper, leather and footwear, textile and apparel, and pharmaceutical sub-sectors.

According to the (ICC, 2019), the intellectual property has become one of the major currencies and it helps developing countries to increase economic activities, generate employment and improve the economy. To break it down further, it catalyzes research and development, knowledge creation, development of new production methods and creation of inventions in modern industries. With the improvement in technology and production processes, IP rights increases productivity both at firm level, therefore increasing output. For policy makers, the IP rights generate export opportunities, attracts inward foreign direct investment, accelerates industrial development, technological transfer and promotes innovation. The role of intellectual property has gradually evolved into a force to reckon with, which affects a range of demand and sectors, and in turn making it an increasingly influential tool that affects not only innovation, but also trade, competition, taxes (Stephen and Nigel, 2019).

The Organization for Economic Cooperation and Development (OECD) and European Union Intellectual Property Office - OECD/EUIPO) (2019) report defines counterfeiting and piracy as illicit activities that relate to infringement of intellectual property rights. The report further states that counterfeit refers to tangible goods that infringe trademarks, patents and industrial designs while pirated goods are the tangible good that infringe copyrights. In 2013, the report states that the value of counterfeited and pirated goods stood at US$ 461 billion in 2013 (representing 2.5% world trade), US$ 509 billion in 2016 (representing 3.3% of world trade, and US$ 464 billion in 2019 (2.5% of world trade). The top trade in fake goods are footwear, clothing, leather goods, electrical equipment, watches, perfume and cosmetics, toys, jewelry, and pharmaceuticals. Counterfeit and

pirated goods have been sold for years on e-commerce platforms, social media, on street corners, in alleys, from trunks of cars, and from unscrupulous physical markets (USTR, 2021).

Counterfeiting and piracy are illegal forms of trade practices. IP rights are the underlying laws connected to this practice. Counterfeiting is the infringement of IP rights such as trademarks, patents, designs, and utility models. Piracy, on the other hand, is a type of illegal trading that violates copyrights.

The Kenya National Baseline Survey on Illicit Trade of 2019 provides the figures that the government recorded complaints on counterfeited, pirated from the private sector. The Anti-Counterfeit Agency provided this report (ACA). The numbers are as follows: there were 765 complaints in 2016, 734 in 2017, and 817 in 2018. Manufacturing is a subset of the private sector. According to the report, the total value of illicit trade in 2019 was Ksh 35 billion based, on domestic seizures. When compared to other industries such as coffee which earned Ksh 15 billion in the same year. Illicit trade in targeted sectors was worth Ksh 586.17 billion in 2018, up from Ksh 519.93 billion in 2017. This reflects an increase in the value of the country's illicit trade. The counterfeited and pirated goods include pesticides, medicines, food, fertilizers, electronic equipment, and clothing. Furthermore, the government lost approximately Ksh 94 billion and Ksh 93 billion in revenue in 2017 and 2018, respectively, as a result of illicit trade.

Counterfeiting and piracy goods leads to sales losses, shrinking in market share of the manufacturing firms. Less funds are allocated to Research and Development (R&D) and the firms increase prices to offset the market losses from the counterfeited products.

The illegal trade practice has a wide-ranging social impact. It has an impact on the Sustainable Development Goals (SDGs) 3 (excellent health and well-being), 8 (decent work and economic growth), 9 (industry, innovation, and infrastructure), 16 (peace, justice, and strong institutions), and 17 (peace, justice, and strong institutions) (partnerships for the goals).

According to the World Bank (2018), adequate IPR protection measures can address the problem of counterfeiting, which causes annual losses to industries and reduces the tax-to-GDP ratio. Improved indicators of “good governance,” such as property rights, have a positive impact on economic growth. According to (UNCTAD, 2019), IP rights should be used and enforced to increase the value and benefits of innovation and to reduce illicit trade.

The main objective of this study is to determine the effect of Intellectual Property Rights on total factor productivity (TFP) in Kenya. The specific objectives is to estimate the TFP within the manufacturing sub-sectors in Kenya, and secondly

to establish the effect of Intellectual Property Rights on TFP of the manufacturing firms in Kenya.

The rest of the sections are organised as follows: an overview of IP protection and the manufacturing sector in Kenya is provided in section 2 while a review of literature is in section 3, methodology in section 4, data analysis and results in section 5. Section 6 provides the conclusion and policy recommendations, and the limitations of the study.

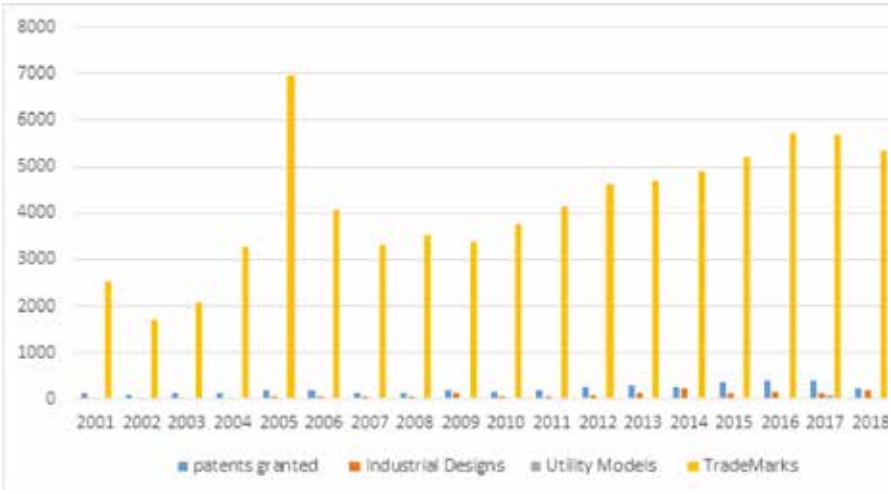
2. Intellectual Property Protection and Manufacturing Sector in Kenya

Kenya's intellectual property rights framework has gradually evolved over the last decade. IP rights are now central to the operation of both the private and public sectors, and they are incorporated into policy and legal frameworks.

According to the Global Innovation Index 2020, Kenya is the third most innovative country in Sub-Saharan Africa after South Africa and Mauritius. The Global Innovation Index presents global innovation trends and the innovation performance of 131 economies. The report highlights that research and development expenditure, and IP filings move in parallel with GDP and during economic downturn, R&D and innovations are likely to fall especially during the COVID-19 pandemic. The report states that R&D is now an important part of business strategy in a competitive environment, and it predicts that number of trademarks and patents will reduce in 2020 as revenue and cashflow decreases during the economic downturn. Top R&D-spending sectors as a share of global top R&D spenders for 2018-2019 were discovered to be 23.5 per cent for ICT hardware and electronic equipment, 18.8 per cent for pharmaceuticals and biotechnology, 15.6 per cent for automobiles, and 14.4 per cent for software and ICT services.

Patents, trademarks, utility models, and industrial designs are examples of intellectual property that is legally recognized and directly applied in the manufacturing sector.

Figure 1: Trends of industrial designs, utility models, trademarks and patents granted in Kenya between 2001-2019



Data source: Kenya Industrial Property Institute - KIPI (2020)

Figure 1 shows the trend of the various IP rights in Kenya between 2001 and 2019. Between that period, about 82,000 trademarks has been granted, 270 utility models, 1,770 industrial designs, and 4,100 patents.

Government and companies use trademarks as a tool to indicate quality and at the same time eliminate pirated and counterfeited products from the market. With this unique mark, businesses and consumers are able to differentiate the real product from another.

In Kenya, a number of institutions have been established to support IP rights and enforcement. The Kenya National Innovation Agency (KENIA) collaborates with other relevant agencies to provide incubators for creative ideas, raise knowledge of intellectual property rights among innovators, scout and nurture unique ideas, and create an innovation database. The Kenya Industrial and Property Institute (KIPI) administers industrial property rights, disseminates technology knowledge to the public, encourages Kenyans to be imaginative, and provides industrial property training.

The Kenya Copyright Board administers and enforces copyright, and conducting public awareness, enforcement, copyright registration, licensing of collective management organizations, and copyright education.

The Anti-Counterfeit Agency (ACA) educates the public about counterfeiting, provides training, and combats counterfeiting. It is also a member of international, regional, and national organizations that work to combat counterfeiting. The major objective of the Kenya Revenue Authority (KRA) is revenue collection, but it also plays an important role in the battle against counterfeiting and piracy of commodities.

These institutions have been working together to fight illicit trade and, in 2019, they seized illicits of value of Ksh 35 billion. However, there have raised concerns about limited resources, such as inadequate workforce and budgetary challenges, which undermines their effectiveness in service delivery, especially to combat illicit trade and have long been a cause of worry for these organizations, undermining their efficacy.

The legal landscape supporting the intellectual property rights in Kenya has undergone a gradual and steady process.

Intellectual Property Bill 2020 provides unique laws to protect the traditional expertise, genetic properties, and traditional cultural expressions and was drafted by a taskforce drawn from both the public and private sector.

The Consumer Protection Act of 2012 states that everyone has the right to own property of any kind, including intellectual property. As a result, intellectual

property, like any other type of property or commodity, is subject to consumer protection regulations in Kenya.

The objective of Sessional Paper No. 9 of 2012 on National Industrialization Policy framework for Kenya 2012-2030 main is to drive growth in the industrial sector to an annual growth rate of 15 per cent and maintain this growth rate in subsequent periods. It lists the potential industrial sub-sectors in Kenya and promotes the procurement of locally manufactured products, encourage the use of local materials as raw and intermediate materials for the manufacturing firms, and support training to enhance research and development needs. Among the shortcomings, however, is that manufacturing industry and training institutions have not worked together to train on the skills needed - technical, production and managerial skills. In addition, access to affordable finance by the manufacturing firms through the Industrial Development Fund (IDF) has not been institutionalized. There was a plan to institutionalize the National Industrial Development Commission, which provides a framework for consultative approach to industrial development. However, this has not been done.

The Industrial Property Act of 2001 outlines the promotion of unique and creative activities, and the award and control of patents, utility models, technological developments, and industrial designs, and the formation, powers, and functions of the Kenya Industrial Property Institute.

The Industrial Property Tribunal is tasked with, among other things, preserving the legal viability of intellectual property rights by intercepting the passing off and infringements of all IP rights. It also screens, analyzes, monitors, keeps a register of offending trademarks and licenses, weeds out similar trademarks, and scrutinizes technology transfer agreements and patent licenses to avoid archaic and oppressive agreements that may impede market access to essential products.

The IP rights system protects intellectual property through both judicial and administrative means, and it adheres to international standards. Administrative refers to the recording and monitoring of granted intellectual property rights. Judicial means the sense that it includes approaches such as arbitration and mediation that are used to strengthen the system. The courts use their full authority in both civil and criminal proceedings to levy appropriate fines for intellectual property infringement and counterfeiting. Inadequate resource allocation, an ineffective legal reporting system, and public ignorance of the existence of IP infringement courts are just a few of the issues these tribunals face.

2.1 Kenya's Manufacturing Sector

Kenya's manufacturing sector includes the beverages and tobacco; rubber and plastic products; basic metals; food products; electrical equipment; motor vehicle, trailers and semi-trailers; and cement production. The industrial sector shrunk from approximately 16.4 per cent in 2015 to 15.5 per cent in 2019 (KNBS, 2021). Growth in the manufacturing sector dropped to 3.5 per cent compared to 4.4 per cent in 2018.

The manufacturing sector's contribution to GDP reduced to 7.5 per cent in 2019 from 7.8 per cent in 2018 and 8.0 per cent in 2017, implying de-industrialization rather than industrialization. The continuous fall in the sector's contribution to GDP raises concerns about meeting the policy goal of 15 per cent contribution to GDP by 2022, as envisaged under the "Big Four" agenda. At the national and county levels, a strong manufacturing sector is expected to generate productive employment possibilities. The minimal representation of the manufacturing sector shows that there are few options for productive employment (KIPPRA, 2020)

According to (KNBS, 2021), the wage employment share in the formal manufacturing sector increased by 1.6 per cent from 347,000 in 2018 to 353,000 in 2019. In 2019, the number of local employees in EPZ enterprises increased by 4.6 per cent to 60,383. Despite the manufacturing sector's high potential for creating more productive jobs, the workforce employed remains low. This demonstrates Kenya's manufacturing sector's poor performance and, as a result, the need to establish a link between intellectual property rights and total factor productivity.

The value of output in the manufacturing sector was 1,977,169 in 2015, 2,131,907 in 2016, then it increased to 2,255,687 in 2017 and further upwards to 2,409,981 in 2018 and 2,596,758 in 2019. The growth in output has been attributed to increase in production of motor vehicles, trailers and semi-trailers; plastics; animal and vegetables fats and oils; and pharmaceutical sub-sectors.

According to the World Bank (2018), industrial output in 2020 declined due to major disruptions in supply chains, reduced demand for output, and factory closures following the outbreak of the corona virus pandemic. But even in the absence of the pandemic, Kenya's manufacturing is grappling with structural inefficiencies, low productivity and lags behind compared to the overall economic growth, which shows that firms are performing below their abilities. It is therefore crucial to establish sector efficiency and competitiveness.

The large proportion of Kenya's manufacturing is informal, which is unregulated, semi-organized and use simple and low technologies. The youth who leave learning institutions and cannot find white collar jobs easily join the informal sector, and

the number of persons engaged in the informal manufacturing sector was 2,438 in 2015. This increased to 2,596 in 2016, and further increased to 2,728 in 2017 and up to 2,878 in 2018 and 3,044 in 2019 (KNBS, 2021).

The sector recorded an increase in credit advanced by commercial banks and industrial financial institutions from Ksh 335.7 billion in 2018 to Ksh 366.9 billion in 2019.

The purchasing Managers Index (PMI) for Kenya's manufacturing between May 2018 and July 2021 showed that the average value for Kenya during that period was 51.1 index points, with a minimum of 34.8 index points in April 2020, then to 52.5 in May, 51.0 in June and 50.6 in July.

Kenya's manufacturing sector is facing several challenges. The manufacturing sector's poor performance can be attributed to the following factors: Electricity costs are currently at 16 cents per kWh, which can be attributed to lack of competitive energy costs, high labour costs owing to an increase in the cost of living, and high cost of industrial inputs as a result of levies such as import declaration fees and the Railway Development Levy (currently 1.5%).

According to Yegon, Kibet and Lagat (2015), the challenges affecting this sector include an unclear strategy to promote local procurement by government ministries, departments, and agencies, insufficient export incentives and narrowing export markets, costly long-term financing, and skill gaps. Odhiambo (1991) highlighted other challenges to be unhelpful public service system, costly transport and logistics system, and upward trend in Non-Tariff Barriers (NTBs) to trade in the EAC market. Corruption, illicit trade practices such as counterfeit goods, high trade costs because of multiple levies and taxes, and lack of predictable and stable industrial policies are also other challenges (KAM, 2020).

Kenya has established three new Special Economic Zones in Mombasa, Lamu, and in Kisumu. These zones are beneficial to manufacturing because the areas have much less downtime due to electricity and other power interruptions (KAM, 2020).

The Constitution of Kenya, 2010 acknowledges the IP rights. In Article 11(2), 40 and 69, it highlights that the state shall support and enhance IP rights.

Kenya's Vision 2030 Economic Pillar aims to build a strong, diverse, and competitive manufacturing sector in three ways: Firstly, by increasing local production, secondly by extending to regional markets, and thirdly exploiting global market niches. The manufacturing sector was identified as one of the critical pillars of the "Big Four" agenda, since it is expected to stimulate economic growth.

The rise in manufacturing's contribution to GDP from 8.4 per cent to 15 per cent is one of the four primary aims of the Government's priorities up to 2022, according to the "Big Four" agenda, which was launched on 12th December 2017. The strategic measures to strengthen economic areas at the crossroads of manufacturing and other sectors of the economy will be critical to this endeavour. The eight (8) priority sectors under its manufacturing pillar includes agro-processing, textile, leather, construction materials, oil and mining, iron and steel and ICT.

Total Factor Productivity (TFP) is a "measure of our ignorance about the causes of economic growth" (Abramovitz, 1956: p.11). It is the contribution to output because of more efficient resource utilization or the adoption of new manufacturing techniques. It shows the effectiveness in utilization of inputs, and it provides the real driver of output growth, not contributed by growth in productivity or inputs, such as capital stock and the labour force.

Since Solow (1957), TFP growth is generally quantified using the Solow residual. Three conditions need to be met. If (a) the production function is Cobb–Douglas, (b) there is perfect competition in factor markets, and (c) the growth rates of output and inputs are properly determined, then Solow residual appropriately reflects TFP growth.

TFP has a significant impact on economic volatility, growth, and variations in per capita income between countries. Increase in TFP must drive long-run growth in income per capita in an economy with an aggregate neoclassical production function. When trying to endogenize TFP growth, the problem was figuring out how to compensate for the fixed costs of innovation in a fully competitive economy with constant capital and labour returns to scale. Comin (2010), Romer (1990) Aghion and Howitt (1992) handled this difficulty by providing the innovator monopoly rights over his idea, which may be sustained through the patent system. In this approach, inventors might repay their original fixed expenses of innovation by profiting from the sale of their patent.

Endogenous growth models shed light on the drivers of TFP growth by linking the rate of TFP growth to the rate of innovation. Subsidies for R&D and a large pool of trained labour, according to (Comin, 2010), lower the marginal cost of performing R&D, increasing the rate of innovation development and, as a result, the rate of TFP growth. Expanding markets increases inventor revenue, resulting in more invention and better TFP growth.

TFP estimation has been done in the literature using either parametric or non-parametric techniques. Index numbers, data envelopment analysis, stochastic frontiers, GMM, and semi-parametric estimation are the five most widely used approaches for estimating TFP; to the existence of measurement error and

changes in manufacturing technology. To get direct productivity measurements, econometric approaches are used to estimate parameters of a production function in the parametric approach. The properties of a production function and conclusions from economic theory of production are utilized in the non-parametric technique to find empirical measures that offer a good estimate of the unknown "true" and economically defined index number (Solow, 1957).

3. Literature Review

3.1 Introduction

This section looks into literature and previous works by different authors in the area of intellectual property rights, total factor productivity and the manufacturing sector.

3.2 Theoretical Literature

This section relates intellectual property rights to endogenous growth theories. Because intellectual property exhibits many of the characteristics of a public good, IPR protection plays a role. It is typically non-rival and can be non-excludable. In the extreme, these characteristics may remove the incentive to invest in R&D, and IPR protection can thus restore that incentive. The significance of R&D and innovation has been accentuated by new growth theory.

3.2.1 Labour theory

One of the powerful basis for justifying IPR lies in the belief that a person deserves the fruits of his labour as stated by John Locke. According to Locke, all that is in nature is provided for by God, and that it is available to all as it is held in common for the benefit of all. Locke further asserts that when an individual exerts his labour over resources, he can claim it as his property because he has benefit through labour. Based on this theory advanced by Locke, property can be granted to individuals if it does not deny other resources available in nature. In such instances, an individual who has exerted his labour over the scarce resources cannot claim property rights.

Locke further posited that one owns the product of his labour on two conditions. Firstly, if his doing so does not result in loss to others and, secondly, that the property owner does not take more than he needs and thus create wastage. Those conditions help set the boundary for property ownership.

This theory has been criticized especially by Robert Nozick on the basis that Locke only allowed private property rights if it does not cause harm to others, and there is enough left for others. According to Nozick, fruits of labour is usually valuable, and property rights enables the labourer to appropriate this value. Nozick argues, by the assignment of a patent right to an inventor because, although other persons' access to the invention is undoubtedly limited by the issuance of the patent, the invention would not have existed at all without the efforts of the inventor. In other words, consumers are helped, not hurt, by the grant of the patent. However, this

theory will be informative to this study particularly in providing a theoretical justification for protection of IPRs and, further, the Lockean conditions provide a framework for balancing the IPRs *vis a vis* general society's well-being. The protection of intellectual property rights, patents, works of copyright, registered designs, and trademarks may be justified by the labour theory.

This study will also utilize the economic theory, which justifies protection of IPRs based on their economic benefit. Granting IPRs on inventions and creations gives individuals the energy to commit resources in Research and Development (R&D), because they are certain to recoup their investment costs and make profits. It is unlikely for individuals to invest in R&D if free riders at the innovators' expense could appropriate the products of their labour. This theory opined that there is an element of utilitarian. It is suggesting that by providing incentive for R&D, IPRs ensure availability of quality goods and services in the market to the benefit of the entire society.

There is, therefore, the other side of economic rationalization, which argues that IPRs encourage public disclosure of knowledge. IPR regimes, in particular patents, offer the innovators ownership in exchange for disclosure of the secrets of the innovations. Theoretically, therefore, the ideas behind the innovation become available for use by others in promoting science and development. The disclosure arising from IPRs system is important for developing countries by enabling technology transfer, where such countries grant protection to IPRs of foreign entities.

The theory can be criticized for failing to consider the technological gap between developed and developing countries and the limitation that hinders technology transfer and limits utilization of the disclosed technology in the patent issuing country.

3.3 Empirical Literature

The goal of the study by Habib, Abbas and Noman (2019) was to look at the impact of human capital (HC), intellectual property rights (IPRs), and research and development (R&D) expenditures on total factor productivity (TFP), which leads to economic growth. The researchers employed a fixed effect model as an estimation method for regression on a sample of 16 nations divided into two groups, namely Brazil, Russia, India, and China (BRIC) and Central and Eastern European (CEE) countries, to conduct a comparison for the time period 2007-2015. The findings show that human capital, IPRs, and R&D spending are statistically important and powerful determinants in determining TFP changes, with favourable outcomes in

all sample sets. Furthermore, it concludes that IPRs alone do not drive economic growth, particularly in emerging economies.

Baomin Dong (2022) examined the intellectual property enforcement, exports and productivity of heterogeneous firms in developing countries. This research develops and tests a heterogeneous company model to investigate how provincial-level enforcement of intellectual property rights influences Chinese enterprises' decisions on market exit and entry, technology adoption through capital imports, and process innovation. They carried out empirical tests using Chinese firms' experience during a period of both legal reforms and greater judicial enforcement. The findings revealed that first, stronger enforcement should force less productive firms out of the market. Second, better access to IPRs' litigation reduces the minimum productivity needed for exports, which implies that firms in the intermediate margin are more likely to start exporting. Third, IPRs' enforcement reduces the productivity levels at which firms will implement newer technologies, whether through capital-goods imports or their own process innovation.

Branstetter, Fisman, Foley and Saggi (2011) investigated whether intellectual property reforms promote industrial growth. The researchers look at how domestic industrial production in the United States reacted to a series of intellectual property reforms in the 1980s and 1990s. The Poisson fixed effects regression model was used in this investigation. After IPR reforms, there was a 28 per cent increase in the manufacturing of new items, according to the findings. Strong IPR also speeds up the shift of production to reforming countries, according to the study. Their research found evidence of rising sales, employment, physical assets, and R&D, and an increase in the variety of exports.

In a growth model where final goods and intermediate goods firms engage in R&D, Saito (2017) looked at the effects of patent protection. The study's findings revealed that strengthening patent protection will raise the technology level of the final goods' sector relative to the intermediate goods' sector. It concluded that if R&D productivity in the final goods' sector is lower than that in the intermediate goods' sector, the relationship between patent protection and economic growth will take an inverted-U shape.

Rod, Neil and Olga (2006) explores the impact of IPR protection, high-tech imports, and FDI on innovation and per capita GDP growth in a linked work. Once again, the number of US patent applications filed by inhabitants of a certain country is used to measure innovation. The model is based on panel data collected from 47 industrialized and developing nations between 1970 and 1990. The findings once again imply that IPR protection encourages innovation. When Schneider divides the sample into developed and developing countries, he discovers that while

IPRs have a favourable impact on innovation in developed countries, they have a negative and frequently considerable impact in underdeveloped ones.

The findings of a study conducted by (Lin and Luan, 2019) to investigate the patent collaboration network of China Wind Power revealed that R&D investment, FDI, and patent subsidies have distinct effects on different categories of patents. For starters, R&D spending has a favourable and considerable impact on patenting activities for all sorts of patents and under various model parameters. Second, foreign direct investment only has a strong stimulating influence on patent applications for utility model and design patents. Third, the patent subsidy is exclusively beneficial to design patents. The findings suggest that FDI and patent subsidies may favour low-quality patents disproportionately.

Sweet and Maggio (2015), Zhang, Leoncini and Tsai (2018) and Mrad (2017) discovered that IPRs had both positive and strong effects on innovation and growth. Those studies contradicted Yang et al. (2016) on the impact of intellectual property rights (IPRs') protection on the relationship between third-party relational governance and collaborative innovation performance. The theories are empirically tested using survey data from Chinese high-tech businesses who discovered that the potential of a stronger patent system to attract superior technology is determined by the strength of two factors: its impact on technology transfer costs, and knowledge spillover. If the influence on knowledge spillover is stronger (weaker) than the effect on technology transfer cost, a stronger patent system reduces (increases) the quality of the technology to be transferred in reforming the country.

Seenaiah and Rath (2018) uses chosen manufacturing enterprises in India to look at the factors that influence innovation. The research is based on a survey of 190 manufacturing companies in the Indian cities of Bengaluru and Hyderabad. The results of the panel probit model show that in the manufacturing sector, exports and R&D expenditure have a positive and considerable impact on innovation. Other factors such as human capital, financial development and FDI do not affect the TFP growth in the long-run. However, these variables significantly affect the productivity growth in the short-run.

Yegon, Kibet and Lagat (2015) investigated the factors influencing technical efficiency in smallholder soybean production in a rural farm setting in Bomet County. A standardized questionnaire was given to a proportionate sample of 100-soybean farmer. An inefficiency model was utilized to investigate inefficiency variables, while a stochastic Cobb-Douglas frontier model was employed to estimate technical efficiency levels. Technical inefficiency was affected by education level, occupation, age, and gender. Education and occupation had negative effects on inefficiency, whereas age and gender had beneficial effects. As a result, initiatives

promoting farmer education and professionalism would result in a large rise in smallholder soybean production technical efficiency.

From 1975 to 1997, Balasubramanian and Sivadasan (2011) study a US census dataset connected to data on US patents for the industrial sector. When compared to similar non-patentees, businesses who receive their first patent have a large gain in employment, capital, added value, and output. Helmers and Rogers (2011) investigate the influence of patenting on a group of UK high- and medium-tech start-ups. They attempted to systematically disentangle the impact of patents from other factors and discovered that patentees have higher yearly asset growth compared to non-patentees, which lies between 8 per cent and 27 per cent.

Onjala (2020) studied total factor productivity in Kenya. Using aggregated data from 1960 to 1995, this study investigates productivity sources in the manufacturing and agricultural sectors. Productivity is explained by two factors: factor input growth, and total factor productivity change. Manufacturing is significant in growth-oriented analysis, which sees it as critical to increasing the rate of growth for the entire economy. The study determines the direction of the relationship between TFP change in these sectors and trade policy episodes such as imports, export penetration, and trade volume. Nonetheless, the impact of trade policy on productivity remains ambiguous. Evidence suggests that extending the analysis to a disaggregated level for each of the sectors could yield more robust results, with broader policy consensus.

In summary, the majority of the literature on intellectual property rights and the manufacturing sector focuses on developed countries (Sweet and Maggio, 2015; Zhang, Leoncini and Tsai, 2018; Saito, 2017; Mrad, 2017; Lin and Luan, 2019). The majority of these studies have concentrated on the impact of intellectual property rights on total factor productivity. This paper aims to fill that gap by providing comprehensive information, particularly on the performance of manufacturing firms in Kenya.

This study deviates a bit to look at the effects of IP rights on TFP in the manufacturing sector. This study looks at the measurement of total factor productivity change in the manufacturing sector and specifically the effect of IPR on output, hereby creating a richer policy environment. The study also fills a knowledge gap in Kenya's manufacturing sector, where productivity and intellectual property rights are little understood. Only a few studies have been done; therefore, this study adds to the previous works and using the most recently gathered panel data. The methodology employed, which includes Levinsohn-Petrin estimation, is also new and has not been widely used in Kenya. Other similar studies include the African Community of Practice on Managing for Development Results in 2017,

which conducted a case study on Kenya, looking into the role of trademarks in addressing counterfeit crisis.

This paper asserts that it is critical to create the necessary conditions for Kenya's manufacturing sector by encouraging the adoption and enforcement of intellectual property rights to reduce the negative impact that illegal trade in counterfeit and pirated goods has on legitimate firms, jobs, consumer safety, and the economy as a whole.

4. Methodology

4.1 Introduction

This section describes the methodology adopted to undertake this study. It provides details of the data and data sources consulted in the study. Panel data was drawn from the World Bank Enterprise Survey. The theoretical and empirical frameworks are presented and discussed in detail.

4.2 Theoretical Framework

The Solow residual is used in the theoretical framework of this study to calculate the TFP for manufacturing firms in Kenya and their respective sub-sectors. The Solow residual is the amount of growth that cannot be attributed to factor inputs. The term TFP refers to a measure of productivity growth. TFP growth is calculated by deducting the growth rates of factor inputs from the growth rate of outputs. The same approach was used in Lin and Luan (2019) study on TFP of wind power in China. Yegon, Kibet and Lagat (2015) used the same approach to investigate the factors influencing technical efficiency in smallholder soybean production in a rural farm setting in Bomet County.

The Cobb-Douglas production function approach takes the following form:

$$Yit = AitKit^{\alpha}Lit^{\beta} \qquad (1)$$

Where Yit= is the output of firms in the *ith* sub-sector at a given time, say *t*, *K* is capital for firms in the *ith* sub-sector at time *t*, *Lit* is labour for firms in the *ith* sub-sector at time *t*, and *Ait* is the TFP. Technological progress is assumed to be Hicks neutral in the sense that it increases the marginal product of capital and labour equally, and thus has no effect on income distribution on the production factors.

Taking the logarithm of the production function and differentiating with regard to time, equation (1) is translated into changes in output growth and components of production, respectively.

$$\Delta Yit/Yit = \Delta Ait/Ait + \alpha\, \Delta Kit/Kit + \beta\, \Delta Lit/Lit \qquad (2)$$

Ait/Ait is technological efficiency, and *Kit/Kit* is the rate of growth of capital, and *Lit/Lit* is the rate of growth of labour.

To derive the Solow residual, the next step is to make $\Delta Ait/Ait$ the subject of the formula.

$$\Delta Ait/Ait=\Delta Yit/Yit-\alpha\, \Delta Kit/Kit-\beta\, \Delta Lit/Lit \qquad (3)$$

Technical efficiency is stated as: $\Delta Ait/Ait=g$, where g is the Solow residual, suggesting that TFP assesses changes in production that cannot be explained by changes in factor inputs.

We use a three-factor input production function in this investigation. Cobb-Douglas production functions exist in each of the sub-sectors' enterprises. Furthermore, the businesses are believed to operate in a market that is totally competitive. The production function of enterprises in each sector is assumed to take the following form for analytical purposes:

$$Yit = [Ait\ (Kit)^{\alpha}\ (Lit)^{\beta}\ ]\ (Mit)^{q} \qquad (4)$$

Where $i=1,2,3,\ldots,n$ denotes the vector of segmented manufacturing industry sectors, and t denotes the time period between 2007 and 2018. The elasticities of the shares of physical capital, labour, and raw materials from *ith* sector in total production are represented by α, β, and μ, respectively. The elasticities add up to a total of one.

With this production function, each firm creates gross output by purchasing intermediate goods from other companies, use capital, and purchasing labour from households.

4.3 Empirical Model

To estimate the TFP within the manufacturing sub-sectors in Kenya, equation 4 above is transformed using the Levinsohn and Petrin (L-P) estimation method, which yields estimates of the production coefficients. Levinsohn (2004) estimation is an extension of the OP model (1996), which uses intermediate inputs as a proxy to control for endogeneity. Furthermore, intermediate goods are taken into account in the production function to control the unobserved correlation between inputs and productivity shocks. TFP was estimated using the same method by Onjala (2020). The equation is linearly transformed into the econometric approach as shown below:

$$log_{TFPit} = \alpha\ log\ Kit - \beta log\ Lit - \mu\ log\ Mit \qquad (5)$$

TFP is total factor productivity in the ith sub-sector at time t, K is capital for firms in the *ith* sub-sector at time t, Lit is labour for firms in the *ith* sub-sector at time t, and Mit is raw materials and intermediate inputs for firms in the *ith* sub-sector at time t α, β and μ, respectively, represent the production coefficients of capital, labour and raw materials and intermediate inputs.

To establish the effect of intellectual property rights on TFP of the manufacturing firms in Kenya, the TFP obtained above will be utilized as a dependent variable and regressed on a set of exogenous variables, such as intellectual property rights variables, Research and Development (R&D), Foreign Direct Investment (FDI), age, exports, firm ownership, size of the firm, experience, training, credit access as indicated in equation (6).

$$ln\ TFP = \beta 1 lnR\&D + \beta 2 lnIPR + \beta 4\ ln\ Age + \beta 5 lnFDI + \beta 6 lnExport + \beta 7 ln\ Ownership + \beta 8 lnTraining + \beta 9 lnCreditAccess + \beta 10 lnExperience + \beta 11 ln\ Size\ of\ the\ firm + \beta 12 lnEnergy + \beta 13 lnImports + € \quad (6)$$

βs are parameters that indicate the proportions of each of the independent variables in TFP. The € is an error term that represents any other factor that influences total factor productivity, but it is unobservable or absent in the Panel Enterprise Survey datasets used in 2007-2013-2018.

4.4 Data and Variables Description

The study employs a panel dataset derived from the Kenyan Manufacturing Industry's Enterprise Surveys conducted in 2007, 2013 and 2018. The information is available in the World Bank's database. The most recent micro-level dataset is anticipated to represent current changes in Kenya's manufacturing industry. The survey gathers data on manufacturing firms' firm characteristics, inputs used in production, company outputs, and other firm-level activities, among other things. 1,438 manufacturing companies were surveyed. The manufacturing firms were sampled at random to create a sample of manufacturing firms from various sub-sectors with varying characteristics. As a result, the dataset is ideal for quantifying TFP across a wide range of industries. Datasets containing multiple observations on each sampling unit at the firm level will be statistically analyzed.

Table 1: Variables Description

Dependent variables	**Variable type**	**Measurement**	**Expected sign**
Total Factor Productivity	Continuous	Technological progress	
Independent variables		Measurement	Expected sign
Capital	Continuous	US$ to purchase machinery vehicles, and equipment in last fiscal year	+
Labour	Continuous	Number of full-time employees	+
Intermediate Output	Continuous	Cost of raw materials and intermediate goods used in production in last fiscal year	+
Training	Dummy	0-employees received training 1-otherwise	+
Innovation	Dummy	0-introduced new process 1-otherwise	+
Intellectual Property Rights	Dummy	0=Have licensed technology; 1= otherwise	+
R&D (Research and Development)	Dummy	Conduct R&D=1; 0 otherwise	+
Size	Dummy	1-small 2-Medium 3-Large	+/-
Energy	Nominal	Cost of electricity	+
Age	Nominal	Year of existence since the firm establishment	+
FDI (Foreign Direct Investment)	Ratio	% owned by private foreign individuals, companies or organizations	+
Export	Dummy	Exporting firms=1; 0 otherwise	+/-

Ownership	Dummy	Firms at least 10 per cent. Foreign owned=1; 0 otherwise	+/-
Quality Certification		Quality certified=1; 0 otherwise	+/-

Source: Author's compilation

4.5 Descriptive Statistics

The coefficients in Table 2 summarize the data by providing the mean, maximum, minimum and the standard deviation.

Table 2: Descriptive Statistics

Variable	Mean	Std. Dev.	Minimum	Maximum	Observations (N)
TFP	5.191	0.819	3.145	7.900	51
Output	6.640 *108	2.080*109	2,000,000	1.700*1010	78
Labour	118.024	237.186	4	1700	83
Capital	4.900 *107	2.040 *108	0	1.500*109	57
Material	2.610 *108	1.200 *109	540,000	1.000*1010	72
Credit Access	1.531	0.502	1	2	81
Age	56.083	217.895	3	2023	84
Size	2.059	0.700	1	3	84
Experience	21.523	12.119	2	52	84
Training	1.578	0.496	1	2	83
R&D	1.428	0.497	1	2	84
Energy	1.770 *107	4.930 *107	36,000	2.900 *108	76
Ownership	81.821	34.235	0	100	84
Indirect Exports	9.047	16.979	0	85	84
Direct Export	3.809	8.117	0	35	84
Imports	1.631	1.249	-9	2	84
FDI	16.273	33.544	0	100	84

Source: Author's computation from World Bank Enterprise Surveys, 2007, 2013 and 2018

The descriptive statistics reveal that the mean of Total Factor Productivity (TFP) is 5.191, with the minimum being 3.145 and the maximum at 7.9.

The average score of output is Ksh 664 million, with the minimum at Ksh 2 million and maximum at Ksh 170 billion.

The mean of labour is 188.024, standard deviation is 237.186, and this means that the average number of employees in the manufacturing firms in Kenya is 188. The lowest number of employees in the manufacturing firms is 4 employees and the maximum number is 1,700.

The average amount of capital stock is recorded at US$ 49 million and the maximum level is US$ 11.5 billion. Machines and equipment are critical to the industrial sector's expansion. It encompasses all sorts of machines and equipment used in the manufacturing of commodities. In the manufacturing industry, machinery and equipment may be found in every sub-sector. Through its influence on productivity growth, it plays an important role in the long-term development of social and financial well-being.

As for intermediate goods (M= 2.61 *108 SD=1.20 *109) indicating that the average amount of intermediate goods used in the production process was US$ 261 million.

5. Findings and Discussions

5.1 Introduction

This section describes the dataset by providing comprehensive empirical results obtained after the estimation procedure of the panel data, which spans from 2007, 2013 and 2018. A balanced panel data was used, meaning that the firms included in the final dataset for analysis are those that are interviewed in the 2007, 2013 and 2018 survey. Therefore, the panel data analysis is effective, since the same enterprises are included in all the three survey periods.

5.2 Total Factor Productivity Estimator

The share of the output of a company, industry or country that cannot be explained by the amount of capital, labour and other factors used for production is called total factor productivity (TFP). An increase in Total Factor Productivity represents the contribution to output made possible by more efficient resource use or the adoption of new manufacturing methods.

From our estimation equation (5);

$$log_{TFPi\,t} = log\ Ait = \alpha\ log\ Kit\ \ -\beta log\ Lit - \ log\ \mu\ Mit \qquad (5)$$

where $i=1,2,3,\ldots,16$ represents the manufacturing sub-sectors.

Table 3: Total factor productivity estimator

Variable	Coefficient
LogLabour	0.378** (0.154)
LogCapital	0.030** (0.019)
LogMaterial	0.662* (0.082)
constant	5.186 (1.111)
Sigma_u	0.121
Sigma_e	0.732
rho	0.027

Source: Author's computation using World Bank Enterprise Surveys, 2007, 2013 and 2018

The mean of Total Factor Productivity (TFP) is 5.191, meaning that the average score of TFP for the manufacturing sector in Kenya is 5.19.(SD 0.819) with the minimum being 3.144 and the maximum at 7.900.

Table 4 presents the TFP of the 14 sub-sectors in Kenya's manufacturing industry.

Table 4: Total factor productivity for individual sub-sectors

Sub Sector	Average TFP
Food	5.571
Textile	5.141
Garments	5.322
Leather	4.331
Wood	4.610
Paper	4.292
Publishing and printing	5.231
Refined petroleum products	5.181
Chemicals	4.890
Plastic and rubber	5.430
Non-metallic mineral products	4.511
Basic metals	5.620
Fabricated metal products	5.170
Machinery and equipment	4.951
Electronics	5.421
Furniture	5.140
Average TFP for the sub-sectors	5.771

Basic metals has the highest TFP at 5.620, followed by the food sub-sector's TFP of 5.571, the electronics sub-sector's TFP of 5.421, and the garments sub-sector's TFP of 5.322. The TFP for these sub-sectors is higher than the TFP for all sub-sectors combined (5.771). The lowest TFP is in the paper sub-sector at 4.292, followed by leather at 4.331, and non-metallic minerals products at 4.511. The TFP for the wood sub-sector is 4.610.

5.3 Estimation Results

This section provides the results of pooled OLS. The following results are obtained and are shown in Table 5.

Table 5: Factors affecting total factor productivity in Kenya's manufacturing sector

Variable	Coef.
Intellectual Property Rights	0.032** (0.011)
Access to Credit	0.034* (0.055)
Wage	-0.001*** (0.003)
Research and Development	0.067** (0.012)
Innovation	0.011** (0.011)
Training	0.022** (0.011)
Foreign Direct Investments	0.043** (0.022)
Energy	0. 046** (0.022)
Quality Certification	0.055** (0.022)
Experience	-0.00003*** (0.003)

Source: Author's computation from World Bank Enterprise Survey 2007, 2013 and 2018

Manufacturing firms that used IPR had their total factor productivity (TFP) increase by 3.2 per cent than those firms not holding rights, and was statistically significant in explaining the TFP. This is in line with studies such as Branstetter et al. (2011). IPRs protect innovation of the firms and aid in reaping rewards for all the effects and resources put in creation of new ideas aimed at improving productivity of the firm. IPRs also help firms protect from others using something identical or similar to firm's creation, brand or product, hence securing their market share and revenue.

The role of innovation in explaining the TFP is statistically significant. Firms that innovate have seen a 1.1 per cent increase in total factor productivity (TFP) compared to firms that did not innovate. Higher productivity can be achieved through innovation, in which the same input (raw materials, capital, and labour) yields a higher output. It also boosts the firm's competitiveness, and as productivity rises, more goods and services are produced. Innovation contributes to product

and process improvements, and continuous advancements that aid in business survival, allowing them to expand more rapidly and efficiently.

Research and development is found to be statistically significant in explaining TFP. Firms that conduct R&D had their total factor productivity (TFP) increase by 6.7 per cent than those firms that did not. R&D gives firms a competitive advantage to stay ahead of the market and reap benefits associated with new and productive innovations. R&D generates valuable knowledge and insights, which leads to improvements in current processes, resulting in improved efficiency and lower costs. It also enables companies to create new goods and services to survive and prosper in competitive marketplaces.

Training is statistically significant in explaining TFP. Firms that had their employees trained had their total factor productivity (TFP) increase by 2.2 per cent than those firms that did not. Training cultivates talent, reduces mistakes and improves creativity. Employees have a greater sense of worth because of training. It provides them with the resources they need to accomplish a successful job. Training improves employee skills, knowledge, and ability, which have a major impact on productivity. Employee performance and dedication to the organization improves as a result of the training.

The other factor is energy, which is statistically significant in explaining TFP and it improves it by 4.6 per cent.

Furthermore, firms that received Foreign Direct Investment saw a 4.6 per cent increase in total factor productivity (TFP) compared to firms that did not. This explains the TFP in a statistically significant way. Firms with experienced managers had 0.003 per cent lower TFP than firms with inexperienced managers. This is inconsistent with the study by Yegon, Kibet and Lagat (2015). Firms with quality certification saw a 5.5 per cent increase in TFP, which was statistically significant.

Access to credit had no statistically significant effect on firm TFP; TFP increased by 3.4 per cent for firms that had access to credit.

Wage bill reduces TFP by 0.1 per cent, but is not statistically significant in explaining TFP. This means that firms are not getting better results from their employees in exchange for paying them more. Furthermore, when markets are perfectly competitive, firms have no control over wage settings. This finding is consistent with the findings of studies such as David, Francesco and Agata (2014).

6. Conclusion and Policy Recommendations.

6.1 Introduction

This section provides the summary of key findings, research conclusions, the limitations of the study and the recommendations for further research.

6.2 Conclusion

This study examined the effect of Intellectual Property Rights (IPRs) on the Total Factor Productivity (TFP) in Kenya. Specifically, it estimates the TFP within the manufacturing sub-sectors in Kenya, and establishes the effect of IPRs on TFP of manufacturing firms in Kenya.

It was found that the average Total Factor Productivity within the manufacturing sub-sectors is 5.771. The TFP levels differ across sub-sectors in the manufacturing industry in Kenya. Basic metals sub-sector had the highest TFP at 5.620 followed by the food sub-sector of TFP at 5.571 and then the electronics sub-sector at 5.421 and garments sub-sector at 5.320. The TFP for these sub-sectors are higher than the average TFP for all the sub-sectors (5.771). The paper sub-sector has the lowest TFP at 4.292, followed by leather sub-sector at TFP of 4.331 and the non-metallic minerals products with TFP of 4.511. The wood sub-sector has a TFP of 4.610.

Kenya needs to capitalize on opportunities in labour-intensive manufacturing. There is a window of opportunity to develop less automated sectors such as food and beverages, basic metals, wood and wood products and paper and paper products; to build industrial capabilities; and then to move into higher-value-added activities. Kenya can therefore continue to focus on boosting traditional manufacturing and addressing the associated challenges – poor infrastructure, lack of reliable power supply and poor customs procedures.

This study also sought to establish the effects of intellectual property rights on TFP in Kenyan manufacturing firms. Other factors influencing TFP in manufacturing forms were incorporated into the model to avoid omission bias. These are age, firm size, credit availability, ownership, energy costs, training, foreign direct investment, exports, experience, quality certification, innovation, R&D, and wage.

Intellectual property rights, research and development, training, quality certification, foreign direct investment, and direct exports were the most important determinants of total factor productivity. These variables had a statistically significant effect on total factor productivity at 5 per cent levels of significance.

Stronger intellectual property rights can help Kenya's manufacturing sector transform while also supporting both intensive and extensive trade margins. The

number of violations and infringements should be reduced to address the issue of illegal trade. Reduced infringement of intellectual property rights necessitates collaboration and collective action from all stakeholders. The Office of the Deputy Head of Public Service, the Multi-Agency Team (Anti-Counterfeit Authority, Kenya Bureau of Standards, Kenya Ports Authority, Kenya Revenue Authority, Kenya Railways Corporation, and others), the Ministry of Industrialization, and the EAC Manufacturers' Network should collaboratively work together on this.

The fight against illicit trade is crucial because its practice denies manufacturers legitimate market shares and adverse implications on reputation. To our country, it catalyses the achievement of development blueprints through improvements in trade.

There should be a rapid completion and implementation of the national Intellectual Property Rights Bill 2020 to ensure that all genuine products on the market are not jeopardized by the influx of counterfeit goods. The Act will provide a legal basis to protect and enforce IP rights and would boost industrialization by fostering the creation and development of micro, small, and medium-sized enterprises (MSMEs), which will provide much-needed work opportunities for the general public.

6.3 Policy Recommendations

The policy recommendations drawn will contribute to policy advise given the Kenya Vision 2030 and the "Big Four" agenda for knowledge-based growth. Additionally, Kenya’s manufacturing sector is an important sector aimed at supporting the country’s economic and growth goals. The study's findings provide a solid foundation for policy recommendations.

Basic metals sub-sector, the food sub-sector, the electronics sub-sector and the garments sub-sector had the highest total factor productivity, the government may consider legislating pro-industry policies that target these sectors to make them more competitive and efficient. Viable policies include tax exemptions, cost subsidies that aim at reducing the cost of production incurred by firms, and policies that protect the industries from excessive external competition.

There is need to promote the uptake of IPRs through sensitization and public awareness aimed at developing ideas, swift registration of rights, protecting innovations, and enforcement of IP protection; to improve total factor productivity in the manufacturing firms; industrial designs, utility models, trademarks and patents.

More attention should be focussed on training, innovation, and R&D. This includes the creation of a well-integrated manufacturing ecosystem with start-ups, innovation hubs, and technological centres, and forward linkage to users of these technologies. Therefore, the National Government may consider increasing funding for research and innovation to ACA, KENIA, KRF, KIRDI, KIPI, NACOSTI, and i-hubs.

Kenya needs to enhance IP rights by strengthening institutions that combat illicit trade by improving their infrastructure (modernized and computerized systems) for tracking and seizing illicit goods, and improving institutional factors (workforce).

Tradefairs and exhibitions are avenues for knowledge exchange and transfer. They should be used to encourage manufacturers to expand their operations. With the support of KIPI, the National Government may consider funding research and innovation costs consistently through KIRDI and encouraging the practice of obtaining IP rights through trademarks, patents, industrial designs, and copyrights.

Universities and institutions of higher learning could consider integrating IP rights and innovation in their curricula. Research and exploring ideas should be encourage among school-going children. It is possible to develop interactive relationships between universities and industry. Strengthening the research and development base will foster innovative efforts and international competitiveness.

6.4 Limitation of the Study

The comparatively small sample size for research model analysis is one of our study's weaknesses. In this circumstance, generalizing our findings should be done with caution. In terms of sample size, a larger sample would lessen the impact of random variation.

Due to scarcity of data, we concentrated on the most important internal drivers of TFP, whereas external related to economic shocks and macroeconomic conditions could also have a role. Integrating external effects could lead to more effective policy outcomes. Further, internal factors such as management and governance issues were not examined.

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