ADDIS ABABA UNIVERSITY COLLEGE OF BUSINESS AND ECONOMICS

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ESSAYS ON FIRM-LEVEL INDUSTRY POLICY INCENTIVES AND CAPABILITY BUILDING IN THE CONTEXT OF DEVELOPING COUNTRIES

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Author's Statement

I, **Moges Tufa,** would like to declare that this dissertation entitled **'Essays on Firm-Level Industry Policy Incentives and Capability Building in the Context of Developing Countries**' is my original work and none of the essays has been submitted to any institution elsewhere to award any degree. All sources of information, ideas, and views used in this dissertation are fully acknowledged.

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This is to certify that the dissertation prepared by **Moges Tufa Adinew** ***"Essays on Firm-level Industry Policy Incentives and Capability Building in the Context of Developing Countries"*** and submitted in partial fulfillment of the requirements for the Degree of Doctor of Philosophy in Economics complies with the regulations of the university and meets the accepted standards with respect to originality and quality.

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Atnafu Gebremeskel (PhD)

Dedication

I lovingly dedicate this dissertation to my lovely Father Tufa Adinew whom I lost while in the middle of my PhD journey. It was very extremely traumatic and painful when I remember your death. I remember you afterward in every moment of my life because you left fingerprints of grace on my life. You shan't be forgotten.

May God grant you eternal rest !!!

I love you my Dad!

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ACRONYMS

ADB=Asian Development Bank
AfCFTA=African Continental Free Trade Area
ATE=Average Treatment Effect
ATT=Average Treatment Effect on Treated
CCIIDI=Chemical and Construction Input Industry Development Institute
CIA=Conditional Independence Assumption
CSA= Central Statistical Agency
EAC=East Africa Community
ERCA=Ethiopia Revenue and Customs Authority
ESA=Ethiopian Standard Agency
ESR=Endogenous Switching Regression
ETB=Ethiopian Birr
FDRE=Federal Democratic Republic of Ethiopia
FE=Fixed Effect
FIML= Full Information Maximum Likelihood
FRQ=Financial Reporting Quality
GoE=Government of Ethiopia
GPS=Generalized Propensity Score
GSEM=Generalized Structural Equation Modelling
GTPs =Growth and Transformation Plans
HS =Harmonized System
IMF=International Monetary Fund
IPTW=Inverse Probability of Treatment Weighting
ISO=Organization for International Standardization
KEBS=Kenya Bureau of Standards
LR=Likelihood Ratio
MoFEC=Ministry of Finance and Economic Cooperation
MoFED=Ministry of Finance and Economic Development
MoI=Ministry of Industry
NN=Nearest Neighbor
NTB =Non-Tariff Barriers
OCED=Organization for Economic Cooperation
PSM=Propensity Score Matching
RA=Regression Adjustment
RBV=Resource Based View
RCT=Randomized Controlled Trial
RSB=Rwanda Standards Bureau
SSA=Sub-Saharan Africa
VRIN= Valuable, Rare, Imperfectly imitable and Non substitutable
USD=US Dollar
WB=World Bank
WBI=World Development Indicators
WTO=World Trade Organization

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Moges Tufa
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CHAPTER ONE

1. Introduction and Summary of Dissertation

This chapter of the thesis presents the topics of the dissertation and provides a broad focus on the firm-level impact of industrial policy incentives and firm capability-building efforts on firm performances in the context of developing countries. The section aims to provide a brief background and motivation for the dissertation, followed by defining the research problems and identifying the gaps and contributions to the literature. Then, the general objective and specific objectives are defined. This is followed by a discussion on the nature of the data and methods used followed by the scope and limitations of the study. This dissertation consists of three independent papers that broadly focus on the assessment of the firm-level impact of industrial policy incentives and capability-building efforts on firm performance. Toward the end, this chapter provides a summary and contribution of each of the three papers that constitute the dissertation.

1.1 Background and Motivation of the study

Economists have been sceptical of emerging countries' governments' active economic policies aimed at fostering industrialization and growth (Maio,2009; Freeman, 2004; Rocha, 2018; Cimoli et al., 2010; Kim,1999). However, historical evidence shows that the state has always been crucial in supporting the private sector and facilitating fundamental transformation in all successful economies (Lin & Monga 2010; Chang,2013; Reinert,1999; Lee et al., 2012a). The goal of the industrial policy is to spur economic growth through industrial transformation and structural change as evidenced by the fundamental role it played in East Asian countries (Rodrik et al.,1995; Rocha, 2018; Maio, 2014; Rodrik, 2009b) and in response to the recent financial crises (Lee et al., 2012b; Chang & Andreoni, 2020). A considerable theoretical and empirical literature that supports industrial policy has shaped industrial strategies across the globe (Weiss, 2013; Newman et al., 2016; Hausmann et al., 2007; Vrolijk, 2021; Lane, 2021). Empirical evidence indicated that industrial policy interventions have been widely accepted by African governments towards improving the limited structural transformation (Cimoli et al., 2010; Maio, 2009; Hauge, 2019).

Accordingly, to meet their development objectives, several African nations have included a variety of industrial policy initiatives in their national policies.

For example, Ethiopia's recent development plans1 envisage a pivotal role in the manufacturing sector towards realizing the vision of achieving a middle-income level by 2025. Particularly, the Growth and Transformation Plan (GTP II) envisioned making Ethiopia the hub of light manufacturing industries in Africa and one of the leading countries in the world. According to Vrolijkz (2021b, pp.256), GTP II focuses on structural transformation, as the plan gives due attention to the manufacturing sector's transformation. Nevertheless, the domestic manufacturing sector has been constrained by many interlocked challenges and poor access to intermediate inputs that prevent the sector from operating at its optimal capacity (Ferede & File, 2019; Abreha,2019). For instance, the average intermediate input import intensity in Ethiopia's manufacturing sector is 50%, and that of the chemical manufacturing sub-sector is about 73% (Ethiopia Central Statistical Agency) (CSA, 2018). The heavy reliance on imported inputs is due to the domestic unavailability of the required quantity and quality of these inputs (See the details under Appendix 1A).

Whereas traditional economic development theorists emphasize resource accumulation (propelled by high investment rates), the capabilities framework stresses the importance of enterprise-level entrepreneurship, learning, and strategy (Lall & Teubal, 1998; Teece et al., 1997). Newman et al. (2016) argue that Africa's prospect for industrialization depends on whether its firms can acquire the capabilities needed to match competing producers in the global market. The emerging enterprise-level studies make it clear that firms currently compete in capabilities (Newman et al., 2016; Sutton, 2012; Naldi & Davidsson, 2014) and it is mostly embodied in complex and interrelated working practices in situations that are difficult to codify and measure.

In contrast to conventional theory, which views a firm as a producing unit, contemporary theories such as transaction cost theory place a greater emphasis on understanding the micro analytics within the company as the crucial factor that matters most (Williamson, 1991).

[1] Industry Development Road Map(2013-2025) Growth and Transformation plan I(GTP I)(2010-2015) and Growth and Transformation Plan II(GTP II)(2015-2020)

Conversely, evolutionary capability theory emphasizes choosing new courses of action in doing things (Nelson, 1991) and a firm's choice to enhance its capabilities may arise from its need to meet the concurrency with changing external demands (Chandler & Makers, 1999; Nelson, 1991; Teece, 1986). For instance, with increasing trends of economic globalization, the adoption of Organization for International Standardization (ISO) certification, also referred to as Meta-standards standards became a norm and a pervasive activity by an increasing number of firms (Tayo Tene et al., 2021; Castka et al., 2015; Heras-Saizarbitoria & Boiral, 2013).

ISO-certified companies around the globe are refusing to undertake business with non-certified companies regardless of their size, ownership, and types(Islam et al., 2016; Khan, 2008; Masakure et al., 2009; Guler et al., 2002).

Developing countries lose millions of dollars from rejected and returned consignments due to the absence of quality consciousness on products and service deliverance(Khan, 2008; Fatima, 2014). Africa remains low with about 1% of the total number of ISO 9001 and ISO 14001 certifications worldwide (Tayo Tene et al., 2018) while the continent's adoption of these certificates has grown by 19.4%. The most diffused ISO certifications in Africa are quality management systems (ISO9001 series) and environmental management systems (ISO14001).

1.2 Statement of the Problem

Although industrial policies have returned to the forefront of public policy, there is little empirical evidence about their successes and failures in the context of developing nations (Lane et al., 2021; Gebrewolde and Rockey, 2022; Smirnova and Ponomareva, 2022). Lin and Monga (2010) argued that the government's failure to target industries along their countries' dynamic comparative advantage is the main cause of industrial policy ineffectiveness in emerging nations, and this helps to explain why their attempts to “pick winners” ended up “picking losers."

However, some have argued that the presence of a strong state and institutional capability is necessary for the successful implementation of sector-specific industrial policy, particularly in

Sub-Saharan Africa (SSA) (Rodrik,2009; Gisselquist 2017). Nevertheless, the limitation of state capacity in these countries might affect the choice of an instrument of industrial policy, not whether they should implement it (Chang, 2013; Mkandawire, 2015; Stiglitz, 2017). For instance, Cheru and Rekiso (2019) and Mbate (2017) indicated the vital role of sound industrial policy in reallocating resources for better value-adding activities to accelerate structural transformation and fast-growing industrialization. For instance, empirical evidence has shown that manufacturing can serve as an engine of growth and economic transformation (Vrolijk,2021; Rocha, 2018).

According to Mold (2016), it would be elusive to think about rapid productivity growth and structural transformation without achieving at least a minimum level of manufacturing. Given that the lion's share of technological innovation occurs in manufacturing, it is hard to build a knowledge-based economy in the absence of manufacturing transformation (Aigingr, 2014).

In 2016, the government of Ethiopia (GoE) introduced an industrial policy named the Second Schedule Program (MoFEC, 2016), which has targeted high-value-adding domestic manufacturing firms operating in import-competing industries to facilitate access to foreign intermediate inputs. In the context of this program, these industries are import-competing domestic manufacturing firms that supply their main products for the domestic market by competing with import traders of similar products. The program links to national development plans and the Ethiopia (Industrial Development Strategy) (IDS) (FDRE, 2002) that aim to promote industrialization through selective interventions.

The empirical analysis of the effectiveness of sector-specific industrial policy in Ethiopia is uneven across subsectors and strategic orientations. For example, studies by Gebrewolde and Rockey (2022a) concluded that sector-specific industrial policy was ineffective due to factors attributed to coordination failures in picking winners. Conversely, Oqubay (2015, 2018) and Gebreeyesus (2016) found an uneven impact of these policies on priority manufacturing subsectors. The authors attributed the success of floriculture-manufacturing industries to strong government support in addressing constraints through effective dialogue with firms and sectorial associations. On the other hand, Gebreeyesus (2016), identified a small effect of industrial policy on the Metal and Engineering subsector due to weak support and coordination by the government. Similarly,

Oqubay (2018) associated the small effects of industrial policy on leather and leather products with path dependence and weak value chain development.

The majority of prior firm-level studies conducted in developing nations have concentrated on learning by exporting, viewing exports as a key factor in productivity gains, even though imports play a substantial role in these countries economic development (Bigsten et al., 2004; Bigsten & Gebreeyesus, 2009; Rankin et al., 2006). The other goal of the policy under the investigation(second schedule program) is to facilitate the firm's learning from interactions with global lead firms in the process of accessing foreign inputs. Studies indicated that a significant portion of the firm's technological and learning endeavors remain largely hidden in the Global value chain (Morrison et al., 2007). However, the ability of the firm to assimilate and utilize outside knowledge determines learning performance(Zou et al., 2018; Tu et al., 2006; Lane et al., 2001b; Zahra & George, 2002).

Despite a great reliance on imported intermediaries, firm-level empirical evidence linking industrial strategy to a firm's gain from import participation in developing countries is still scarce (Abreha,2019; Haakonsson,2009; He and Dai, 2017).

In the absence of an understanding of what effects have occurred as a result of development interventions, it is neither possible to keep accountability about development expenditures nor to derive meaningful knowledge from development operations to improve development policies (White & Raitzer, 2017; Lin& Vu, 2008). Further, Landin et al.(2014) indicated that Africa's trade marginalization in the age of globalization may be attributed to the low dissemination of ISO certifications. Little remains known about the implications of this certification in Africa since there is limited research on the impact of ISO certification adoption on businesses in developing countries. When evaluating the impact of ISO certification on firm performance, a significant challenge arises from the fact that the firms that choose to acquire ISO certification are likely different from the firms that choose not to adopt it. Growing methodological innovation evaluates the effectiveness of firm-level policy intervention through causal studies more informative.

This dissertation aims to investigate the effects of sector-specific industry policy incentives and firm capability-building efforts on firm performance in the context of developing countries using

on a mix of survey and secondary data analysis. To this end, the dissertation incorporates studies that focus on the following important questions:

- Do sector-specific industry policy incentives affect the productive capacity utilization of domestic manufacturing firms?
- Do sector-specific industrial policy incentives affect the job creation of domestic manufacturing firms?
- Do internal resource bases affect the firm's likelihood of exploiting external opportunities?
- Do policy-induced input import participation mediate the effect of firm internal resource bases on the firm's likelihood of learning by importing?
- Is there any association between internal resource bases and firm learning by importing?
- Does the adoption of Meta-Standards affect firm performances?

1.3 Objective of the Study

The purpose of the dissertation is to evaluate the impact of sector-specific industry policy incentives and firm capability-building efforts on firm performances in the context of developing countries.

The objectives of each of the three papers included in the dissertation can be summarized as follows:

- The first paper evaluates the impact of a sector-specific industrial policy, linked to the second schedule program, on Ethiopian chemical manufacturing firms' performance. More specifically,
  - The impact of the program on firms' productive capacity utilization.
  - The impact of the program on the firms' employment generation capacity utilization.
- The second paper investigates the role of internal resource bases (absorptive capacity) on firm learning by importing through mediation effects of sector-specific industrial policy on

Ethiopian chemical manufacturing firms. The main interest is to empirically test the following hypotheses:

- Deeper firm internal resource bases will increase the firm's likelihood of exploiting external opportunities.
- Policy-induced input import participation mediates the effect of firm internal resource-bases on the firm's likelihood of learning by importing.
- There is a strong association between firm internal resource bases and firm learning by importing.

- The third paper evaluates how the adoption of meta-standards affects the performance of firms in East Africa. The paper focuses on the following the selected firm performance:
  - The effects of ISO certification adoption on the financial and operational performance of firms.

1.4 Justification and Significance of the Study

This dissertation documents empirical evidence on the impact of industrial policy incentives, and firm self-initiative capability building on firm performance in the context of developing countries. The dissertation's topic and the heterogeneity of the firms are hot issues that have recently attracted fresh attention in academic discourse. Targeted industrial support by East Asian newly industrialized countries has induced domestic firms to enlarge their scale of production and foster innovation(Maio,2009). For instance, Cheru and Rekiso (2019) and Mbate (2017) showed the vital role of sound industrial policy in reallocating resources for better value-adding activities to accelerate structural transformation and fast-growing industrialization.

However, an empirical analysis of the effectiveness of industrial policy is scant in the context of developing countries and hence evidence-based public policy decisions are less practiced. To achieve the objective, a sector-specific industry policy program implemented by the Ethiopian government in 2016 that targeting the manufacturing industries operating in import-competing is chosen for investigation.

Paper one of this dissertation evaluates the impact of sector-specific industrial policy on domestic firms' performance to document the empirical evidence on the effectiveness of such policy in the context of developing countries.

Despite the significant role of imports in the economic development of emerging countries, most of the previous firm-level studies in these countries have focused on learning by exporting, considering exports as an important driver of productivity gain (Bigsten et al., 2004; Bigsten & Gebreeyesus, 2009; Rankin et al., 2006). There is limited empirical evidence to link industrial policy incentives with firm absorptive capacity as it is difficult to measure due to a lack of suitable firm-level data.

Paper two of this thesis aims to examine the role of firm internal resource bases (absorptive capacity) and firm learning by importing through mediation effects of sector-specific industrial policy using firm-level survey and administrative data.

Moreover, regardless of growing trends in the adoption of ISO certification by African firms, little is known about its effects on the financial (e.g., sales) and operational (like productivity) performance of firms in developing countries. Most existing empirical literature is based on case studies that may not be generalizable outside of the specific context studied. The third paper of the thesis evaluates how ISO certification adoption affects the performance of firms in these countries.

1.5 The Data and Method

1.5.1 The Data Types and Sources

The data used in this study is a combination of primary and secondary sources. The primary data used for the study is observational firm-level data obtained from survey and administrative sources. The target population for the survey was Ethiopian domestic large and medium-scale chemical manufacturing firms. We include all targeted chemical manufacturing firms under the support of the Chemical and Construction Input Industry Development Institute (CCIIDI) which are eligible for sector-specific industry policy i.e. the second schedule program. With close

collaboration with CCIIDI, the survey data were collected from target establishments of differing ownership, legal form, and location, from October 2020 to June 2021. For secondary sources, we used the databases of CSA, WDI, and World Bank Enterprise surveys. The details of the discussion on the data are provided in each paper.

1.5.2 The Method

This dissertation broadly employed two methods and a combination of estimation approaches. We used quasi-experimental design and mediation techniques, taking into account the characteristics of the data and objectives of each independent article that constitute the dissertation. For the first paper, we used a quasi-experimental design to account for heterogeneity and selection bias. We used Quantile regression, Propensity Score matching, Endogenous Switching Regression, and Continuous Treatment effects as estimation approaches to address the challenges associated with observational data to establish causal claims. For the second paper, we employed mediation analysis using non-linear Structural Equation Modelling (GSEM) as an estimation technique. For the third paper, we also employed a quasi-experimental design. For this paper, we applied Propensity Score Matching (PSM) and Regression Adjustment (RA) as an estimation technique. Details of the specification and discussion on the technique are provided under the method sections for each paper.

1.6 Scope of the Study

This study is limited to the investigation of the firm-level impact assessment of the sector-specific industrial policy incentives and firm capability building in the context of developing countries.
The first two papers of the dissertation, papers 1 and 2 assess the effects of a sector-specific industry policy incentive that has been implemented by the Ethiopian government since 2016 on the performance of Ethiopian domestic chemical manufacturing firms while the last paper, paper 3, evaluates the effect of meta-standard certification adoption on the performances of firms in East Africa. There could be many types of growth-enhancing industrial policy conceptualizations. In this dissertation, we have adopted an industrial policy definition to mean targeted industrial

support measures, or interventions towards sectors with greater prospects for accelerated growth (Howard and Pack,2002; Maio, 2009). Similarly, for capability building, this study basis on the micro analytics within a firm or capabilities internal to the firm as the crucial factor that matters most (Williamson, 1991) and it is largely tacit, idiosyncratic, and context-dependent (Nelson & Winter, 1982). In this dissertation, the context of developing countries is assumed for a firm competency or capability endowment and empirical analysis.

1.7 Structure of the Dissertation and Summary of Each Paper

There are five chapters in this dissertation. In addition to introducing the subjects, the first chapter gives a quick overview of the dissertation's background and motivation. In addition, it highlights the main contributions of the dissertation and discusses the justification for researching the specific research subject, data, and method of the data analysis. Chapters Two, Three, and Four of the dissertation are distinct articles that are original research investigations prepared as manuscripts for peer-reviewed publication. The dissertation's second and third chapters, respectively, were published and accepted for publishing in reputable field journals that are both listed in RePEc (Research Papers in Economics). The second chapter was published in the Journal of Industry, Competition, and Trade, 23(3), 363-397, while the third chapter has been accepted for publication in the International Journal of Business Forecasting and Marketing Intelligence. Chapter Four is ready for submission for journal publication. Finally, Chapter Five concludes the dissertation by providing a summary of the key findings and policy implications along with limitations and suggestions for future research avenues.

The following section presents a summary of each of the three independent articles that broadly focuses on firm-level industrial policy incentives and capability buildings that constitute the dissertation. For each of the articles, the highlights of the objectives, methods, key findings, and the contribution of the study are discussed.

1.7.1 Paper 1:

The Impact of Sector-Specific Industrial Policy on Manufacturing Firm Performance: Quasi-Experimental Evidence from Ethiopian Chemical Industries

This study evaluates the impact of a sector-specific industrial policy program on the performance of Ethiopian chemical manufacturing firms using a quasi-experimental design. The data for the study come from firm-level field surveys and administrative sources. To account for heterogeneity and selection bias due to observable and unobservable factors, we employ a range of empirical strategies, including Quantile Regression, Propensity Score Matching (PSM), Endogenous Switching Regression (ESR), and Generalized Propensity Score (GPS) models. We also used alternative estimation methods that fit our data and sample size. Our findings show that the program has a positive and significant effect on the productive capacity utilization of beneficiary firms, while there is no evidence of any impact on employment generation. We conclude that the program has mixed effects on the performance of domestic chemical manufacturing firms. This study contributes to the scant literature that provides empirical evidence which informs public policy decisions in the context of developing countries

1.7.2 Paper 2:

The Effect of Firm Absorptive Capacity on Learning by Importing: Mediation Role of Industry Policy-Induced Intermediate Input Import

In this paper, we base our argument on contemporary theories of firms to investigate the link between a firm's absorptive capacity and its effects on utilizing external opportunities. The study also examines the mediation role of sector-specific industry policy in channelling the relationship between firm absorptive capacity (firm internal resource bases) and learning by importing. We applied a non-linear Generalized Structural Equation Model (GSEM) on the mix of administrative and survey data from chemical manufacturing firms in Ethiopia. Our findings support the hypotheses and the results are consistent across analysis steps. The notable finding implies the existence of a positive and significant association between firm internal resource bases and firm learning by importing. This study contributes to the literature on firm-level measure absorptive

capacity using proxy index in the context of Ethiopian chemical manufacturing firms whose generalization can be extended to the cases of many developing countries.

1.7.3 Paper 3.

The Effect of Adopting Meta-Standards on Firms Performance: Quasi-Experimental Evidence from East Africa

This study analyses the impacts of ISO management system adoption on firm performance, leveraging firm-level data from the World Bank Enterprise Survey across selected East African countries. Our results indicate a robust positive correlation between ISO management standards adoption and productivity, as well as notable improvements in both indirect and direct export sales performance for adopting firms. However, a negative effect is observed in the domestic market performance of adopters. These findings remain robust across alternative estimation strategies. Most existing empirical literature is based on case studies that may not be generalizable outside of the specific context studied. This study contributes to the existing less-known effects of the adoption of ISO certification on the performance of firms in developing countries.

REFERENCE

Abreha, K. G. (2019). Importing and Firm Productivity in Ethiopian Manufacturing. World Bank Economic Review, 33(3), 772–792. https://doi.org/10.1093/wber/lhx009

Aiginger, K. (2014). Industrial Policy for a sustainable growth path : WWWforEurope Policy paper series No.13 (Policy Paper no 13 This; Issue Policy paper no 13).

Bigsten, A., & Gebreeyesus, M. (2009). Firm productivity and exports: Evidence from Ethiopian manufacturing. Journal of Development Studies, 45(10), 1594–1614. https://doi.org/10.1080/00220380902953058

Castka, P., Prajogo, D., Sohal, A., & Yeung, A. C. (2015). Understanding firms′ selection of their ISO 9000 third-party certifiers. International Journal of Production Economics, 162, 125-133.. https://doi.org/10.1016/j.ijpe.2015.01.012

Chang, H., & Andreoni, A. (2020). Industrial Policy in the 21st Century. Development and Change, 51(2), 324–351. https://doi.org/10.1111/dech.12570

Chandler, A. D., & Makers, A. (1999). The Dynamic Firm: The Role of Technology, Strategy, Organization, and Regions. In and Ö. S. Chandler, Alfred D., Peter Hagstrom (Ed.), Oxford Scholarship Online (pp. 15–44). Oxford University Press.

Cheru, F., & Rekiso, Z. S. (2019). Ethiopia's 'economic diplomacy' and regional integration. In The Oxford Handbook of the Ethiopian Economy (pp. 113–134). https://doi.org/10.1093/oxfordhb/9780198814986.013.5

Cimoli, M., Dosi, G., Nelson, R., & Stiglitz, J. E. (2010). Institutions and Policies Shaping Industrial Development: An Introductory Note. Industrial Policy and Development: The Political Economy of Capabilities Accumulation. https://doi.org/10.1093/acprof:oso/9780199235261.003.0002

CSA. (2018). The Federal Democratic Republic of Ethiopia Central Statistical Agency Report on Small Scale Manufacturing Industries Survey (Issue November).

Erik, E. R. (1999). The role of the state in economic growth. Journal of Economic Studies 26,4/5, 26(4/5), 268–326. https://doi.org/10.4337/9781800374980.00011

Fatima, M. (2014). Impact of ISO 9000 on business performance in Pakistan: Implications for quality in developing countries. Quality Management Journal, 21(1), 16–24. https://doi.org/10.1080/10686967.2014.11918373

Ferede, T., & File, B. (2019). Rural–Urban Linkages in Ethiopia. In C. C. and O. A. Cheru F (Ed.), The Oxford Handbook of the Ethiopian Economy. (pp. 763–784). Oxford University Press. Oxford.

Freeman, C. (2004). Technological infrastructure and international competitiveness. Industrial and Corporate Change, 13(3), 541–569. https://doi.org/10.1093/icc/dth022

Gebreeyesus, M. (2016). A Natural Experiment of Industrial Policy: Floriculture and the Metal and Engineering Industries in Ethiopia. In The Practice of Industrial Policy.

Gebrewolde, T. M., & Rockey, J. (2022). The effectiveness of industrial policy in developing countries : causal evidence from Ethiopian manufacturing firms. Journal of Development Effectiveness, 00(00), 1–27. https://doi.org/10.1080/19439342.2022.2090997

Gisselquist, R. M. (2017). State Capability and Prospects for Close Coordination. In The Practice of Industrial Policy (pp. 80–100). https://doi.org/10.1093/acprof:oso/9780198796954.003.0005

Guler, I., Guillén, M. F., Muir, J., & Macpherson. (2002). Global competition, institutions, and the diffusion of organizational practices: The international spread of ISO 9000 quality certificates. Administrative Science Quarterly, 47(2), 207–232. https://doi.org/10.2307/3094804

Haakonsson, S. J. (2009). "Learning by importing" in global value chains: Upgrading and South-South strategies in the Ugandan pharmaceutical industry. Development Southern Africa, 26(3), 499–516. https://doi.org/10.1080/03768350903086861

Ha-Joon, C. (2013). Is Industrial Policy Necessary And Feasible In Africa? Theoretical considerations and historical lessons: Working Paper for JICA/IPD Africa Task Force Meeting Yokohama, Japan, June 2-3, 2013 (Working Paper Prepared for JICA/IPD Africa Task Force Meeting,

Hauge, J. (2019). Should the African lion learn from the Asian tigers? A comparative-historical study of FDI-oriented industrial policy in Ethiopia, South Korea, and Taiwan. Third World Quarterly, 40(11), 2071–2091. https://doi.org/10.1080/01436597.2019.1629816

Hausmann, R., Rodrik, D., & Sabel, C. F. (2007). Reconfiguring Industrial Policy: South Africa.

Heras-saizarbitoria, I., & Boiral, O. (2013). ISO 9001 and ISO 14001 : Towards a Research Agenda on Management System Standards. 15, 47–65. https://doi.org/10.1111/j.1468-2370.2012.00334.x

He, Z. and Dai, M. (2017) Learning by Importing, Columbia University [online] http://www. columbia.edu/~zh2178/Learning%20by%20Importing.pdf (accessed 15 September 2022).

Hoces De La Guardia, F., Grant, S., & Miguel, E. (2021). A framework for open policy analysis. Science and Public Policy, 48(2), 154–163. https://doi.org/10.1093/scipol/scaa067

Howard, M., & Pack, H. (2002). Industrial policies and growth: lessons from international experience (Working Papers of the Central Bank of Chile No. 169, Huérfanos 1175, primer piso.).

Islam, M. M., Habes, E., Karim, A., & Syed Agil, S. O. bin. (2016). Quality certification and company performance – the newly developed country experience. Journal of Business Economics and Management, 17(4), 628–644. https://doi.org/10.3846/16111699.2015.1110712

Khan, Z. (2008). Cleaner production: an economical option for ISO certification in developing countries Zahiruddin. Journal of Cleaner Production, 16(1 SUPPL. 1), 22–31.

https://doi.org/10.1016/j.jclepro.2006.06.007

Kim, L. (1999). Building technological capability for industrialization: Analytical frameworks and Korea's experience. Industrial and Corporate Change, 8(1), 111–136. https://doi.org/10.1093/icc/8.1.111

Lall, S., & Teubal, M. (1998). "Market-stimulating" technology policies in developing countries: a framework with examples from East Asia. World Development, 26(8), 1369–1385. https://doi.org/10.1016/S0305-750X(98)00071-0

Landin, G. A., Allur, E., & Heras-Saizarbitoria, I. (2014). Adoption of ISO 9001 Quality Management Standard in Africa. International Journal for Quality Research, 8(1), 61–72.

Lane, N. (2021). Manufacturing Revolutions : Industrial Policy and Industrialization in South Korea Manufacturing Revolutions : Industrial Policy and Industrialization in South Korea *. In Leibniz Information Centre for Economics, Kiel, Hamburg.

Lane, P. J., Salk, J. E., & Lyles, M. A. (2001). Absorptive capacity, learning, and performance in international joint ventures. Strategic management journal, 22(12), 1139-1161.

Lee, J., Clacher, I., & Keasey, K. (2012a). Industrial policy as an engine of economic growth : A framework of analysis and evidence from South Korea (1960 – 96). Business History, 54, 713–740. https://doi.org/10.1080/00076791.2012.683420

Lee, J., Clacher, I., & Keasey, K. (2012b). Industrial policy as an engine of economic growth : A framework of analysis and evidence from South Korea (1960 – 96). Business History ISSN:, 6791. https://doi.org/10.1080/00076791.2012.683420

Lin, J. Y., & Monga, C. (2010). Este documento es una traducción de "Growth Identification and Facilitation— the Role of the State in the Dynamics of Structural Change," World Bank Poilcy Research Paper 5313, maio de 2010 .

Lin, J. Y., & Vu, K. M. (2017). Coordination through an Asian Lens. In J. Page & F. Tarp (Eds.), The Practice of Industrial Policy: Government–Business Coordination in Africa and East Asia (pp. 40–63).

Maio, M. Di. (2009). Industrial Policies in Developing Countries : History and Perspectives. In & J. E. S. M.Cimoli,G.Dpsi (Ed.), Industrial Policy and Development: The Political Economy of Capabilities Accumulation (Issue July, pp. 107–143). https://doi.org/https://doi.org/10.1093/acprof:oso/9780199235261.001.0001

Maio, M. Di. (2014). Industrial Policies in Developing Countries : History and Perspectives Industrial Policies in Developing Countries : History and Perspectives (Issue January 2008). https://doi.org/10.1093/acprof

Masakure, O., Henson, S., & Cranfield, J. (2009). Standards and export performance in developing countries : Evidence from Pakistan. The Journal of International Trade & Economic Development, 8199. https://doi.org/10.1080/09638190902986538

Mbate, M. (2017). Structural change and industrial policy: A case study of Ethiopia's leather

sector. Journal of African Trade, 3(1–2), 85. https://doi.org/10.1016/j.joat.2017.01.001

Mkandawire, T. (2015). Neopatrimonialism and the Political Economy of Economic Performance in Africa: Critical Reflections. World Politics, 67(3), 563–612. https://doi.org/10.1017/S004388711500009X

Mold, A. (2016). Local / Global Encounters Running Up That Hill ? The Challenges of Industrialization in the East African Community. Development, 58(4), 577–586. https://doi.org/10.1057/s41301-016-0045-x

Morrison, A., Pietrobelli, C., & Rabellotti, R. (2007). Global value chains and technological capabilities: A framework to study learning and innovation in developing countries. Oxford Development Studies, 36(1), 39–58. https://doi.org/10.1080/13600810701848144

Naldi, L., & Davidsson, P. (2014). Entrepreneurial growth: The role of international knowledge acquisition as moderated by firm age. Journal of Business Venturing, 29(5), 687–703. https://doi.org/10.1016/j.jbusvent.2013.08.003

Nelson, R. R. (1991). Why Do Firms Differ , and How Does it Matter ? Strategic Management Journal, 12, 61–74.

Newman, C., Page, J., Rand, J., Shemeles, A., Söderbom, M., & Tarp, F. (2016). Made in Africa: Learning to compete in industry. Brookings Institution Press.

Newman, C., Page, J., Rand, J., Shimeles, A., Söderbom, M., & Tarp, F. (2016). The pursuit of industry. In Manufacturing Transformation (pp. 141–164). https://doi.org/10.1007/978-981-16-7045-9_6

Oqubay, A. (2015). Made in Africa: Industrial Policy in Ethiopia. Oxford University Press. Oxford.

Oqubay A (2018) The Structure and performance of the ethiopian manufacturing sector. African Development Bank Group working paper No. 299

Rankin, N., Söderbom, M., & Teal, F. (2006). Exporting from manufacturing firms in Sub-Saharan Africa. Journal of African Economies, 15(4), 671–687. https://doi.org/10.1093/jae/ejk014

Rocha, I. L. (2018). Manufacturing as Driver of Economic Growth. PSL Quarterly Review, 71(June). https://doi.org/http://dx.doi.org/10.13133/ 2037- 3643_71.285_2

Rodrik, D. (2009b). Getting Intervetions Right : How South Korea and Taiwan Grew Rick:NBER Working Papepr Series No.4964 (No. 4964; NBER WOrking Paprt Series).

Rodrik, D., Grossman, G., Norman, V., & Rodrik, D. (1995). how South Korea and Taiwan grew rich Get (Vol. 10, Issue 20). https://www.jstor.org/stable/134453

Smirnova, O. P., & Ponomareva, A. O. (2022). Evaluating the Effectiveness of the Regional Industrial Policy Implementation. Advances in Systems Science and Applications, 22(1), 51–64. https://doi.org/10.25728/assa.2022.22.1.1096

Stiglitz, J. E. (2017). Industrial Policy, Learning, and Development. The Practice of Industrial Policy, 2012, 23–39. https://doi.org/10.1093/acprof:oso/9780198796954.003.0002

Tayo Tene, C. V., & Boiral, O. (2021). Does quality management improve the internalization of environmental practices? An empirical study in Africa. Business Strategy and the Environment, 30(7), 3053–3064. https://doi.org/10.1002/bse.2788

Tayo Tene, C. V., Yuriev, A., & Olivier, B. (2018). Adopting ISO Management Standards in Africa: Barriers and Cultural Challenges. In I. Heras-Saizarbitoria (Ed.), Mapping out ISO 9001, ISO 14001 and other management system standards (pp. 59–83). Springer Nature. https://doi.org/10.1504/IJPQM.2011.041096

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. Knowledge and Strategy, 18(April 1991), 77–116. https://doi.org/10.1093/0199248540.003.0013

Tu, Q., Vonderembse, M. A., Ragu-nathan, T. S., & Sharkey, T. W. (2006). Absorptive capacity : Enhancing the assimilation of time-based manufacturing practices. Journal of Operations Management, 24, 692–710. https://doi.org/10.1016/j.jom.2005.05.004

Vrolijk, K. (2021a). Industrial policy and structural transformation : Insights from Ethiopian manufacturing. Development Policy Review, October 2019, 250–265. https://doi.org/10.1111/dpr.12496

Vrolijk, K. (2021b). Industrial policy and structural transformation : Insights from Ethiopian manufacturing. Development Policy Review, 39, 250–265. https://doi.org/DOI: 10.1111/dpr.12496

Weiss, J (2011) Industrial policy in the twenty-frst century: WIDER Working Paper No. 2011/55 (The United Nations University World Institute for Development Economics Research (UNU-WIDER); No. 2011/55). Retrieved September 25,2022 from http:// hdl. handle. net/ 10419/ 54116

White H, Raitzer DA (2017) Impact evaluation of development intervention: a practical guide. Asian Development Bank(ADB)

Williamson, O. E. (1991). Strategizing, Economizing, and Econmic Organization. Strategic Management Journal, 12(1 991), 75–94.

Zahra, S. A., & George, G. (2002). Absorptive Capacity : A Review , Reconceptualization , and Extension. The Academy of Management Review, 27(2), 185–203

Zou, T., Ertug, G., & George, G. (2018). The capacity to innovate: a meta-analysis of absorptive capacity. Innovation: Management, Policy and Practice, 20(2), 87–121. https://doi.org/10.1080/14479338.2018.1428105

Appendix 1A: Reasons for Heavy Dependence on Imported Inputs

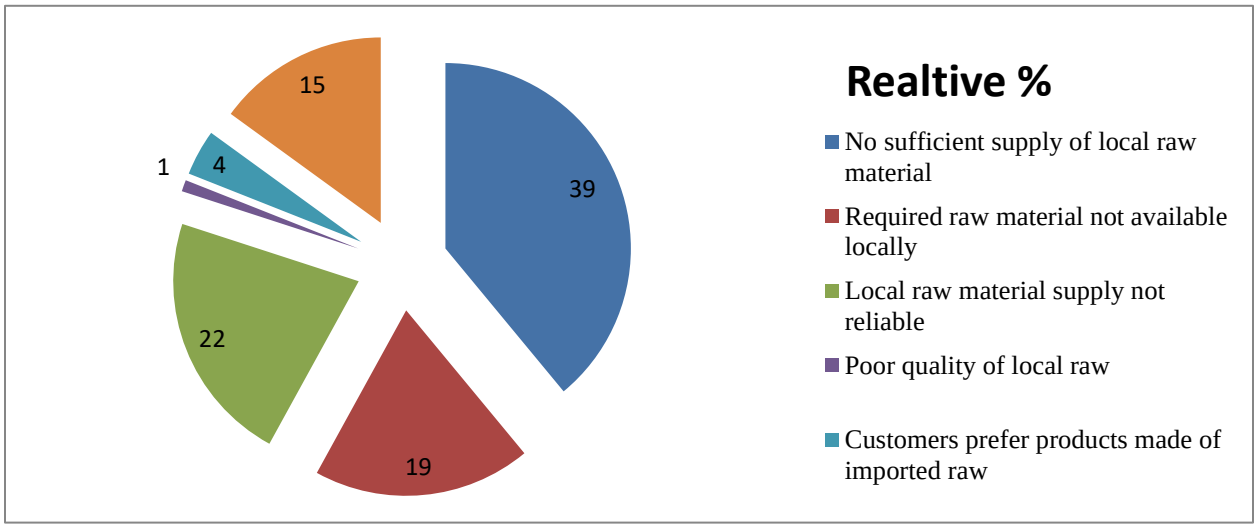

Figure 1-1 Why Domestic Manufacturing Firms Rely on Imported Intermediates

CHAPTER TWO

2. The Impact of Sector-Specific Industrial Policy on Manufacturing Firm Performance: Quasi-Experimental Evidence from Ethiopian Chemical Industries.

Abstract

This study evaluates the impact of a sector-specific industrial policy program on the performance of Ethiopian chemical manufacturing firms using a quasi-experimental design The data for the study come from firm-level field surveys and administrative sources. To account for heterogeneity and selection bias due to observable and unobservable factors, we employ a range of empirical strategies, including Quantile Regression, Propensity Score Matching (PSM), Endogenous Switching Regression (ESR), and Generalized Propensity Score (GPS) models. We also used alternative estimation methods that fit our data and sample size. Our findings show that the program has a positive and significant effect on the productive capacity utilization of beneficiary firms, while there is no evidence of any impact on employment generation. The results show that the program's beneficiary firms utilized an actual productive capacity of 4.5%-7.6% more than non-beneficiaries. We conclude that the program has mixed effects on the performance of domestic chemical manufacturing firms. This study contributes to the scant literature that provides empirical evidence that informs public policy decisions in the context of developing countries.

Keywords: sector-specific industrial policy, firms, impact evaluation, quasi-experimental design, dose-response, evidence-based policy

JEL classification L5, L52, O24, L65, O25, L25

2.1 Introduction

Active economic policies by developing countries' governments to promote growth and industrialization have generally been viewed with suspicion by economists (Maio,2009; Freeman, 2004; Rocha, 2018; Cimoli et al., 2010; Kim,1999). However, historical records indicate that in all successful economies, the state has always played an important role in facilitating structural change and helping the private sector (Lin & Monga 2010; Chang,2013; Reinert,1999; Lee et al., 2012a).

The goal of the industrial policy is to spur economic growth through industrial transformation and structural change as evidenced by the fundamental role it played in East Asian countries (Rodrik et al.,1995; Rocha, 2018; Maio, 2014; Rodrik, 2009b) and in response to the recent financial crises (Lee et al., 2012b; Chang & Andreoni, 2020). A considerable theoretical and empirical literature that supports industrial policy has shaped industrial strategies across the globe (Weiss, 2013; Newman et al., 2016; Hausmann et al., 2007; Vrolijk, 2021; Lane, 2021).

Empirical evidence indicated that industrial policy interventions have been widely accepted by African governments towards improving the limited structural transformation (Cimoli et al., 2010; Maio, 2009; Hauge, 2019). Accordingly, many African countries have embraced various industrial policy strategies in their national policy.

Given this, we have adopted an industrial policy definition to mean targeted industrial support measures, or interventions towards sectors with greater prospects for accelerated growth (Howard and Pack,2002; Maio, 2009). Targeted industrial support by East Asian newly industrialized countries has induced domestic firms to enlarge their scale of production and foster innovation(Maio,2009). Similarly, Page and Tarp (2016), Rasiah, Beigpoor, and Yap (2016), and Hausmann et al., (2007) pointed out the importance of industrial policy in identifying constraints of high-productivity firms, and the need for public helping hands to promote enterprise growth. Further, Stiglitz (2017) suggested that industrial policy will help

to build a learning economy and speed up structural transformation, suggesting the need for prioritizing sectors with more significant spillover effects.

Lane (2021) documented that a sector-specific industrial policy that targeted Heavy Chemical and Industry (HCI) has shifted Korean manufacturing into more advanced markets and created durable industrial change. As Behuria (2019) also indicated, the sector-specific industrial policy adopted by the Rwandan government under the Domestic Market Recapture Strategy(DMRS) has improved the performance of apparel and cement industries in the domestic market.

However, studies by Rodrik (2009) and Gisselquist (2017) indicated that successful deployment of sector-specific industrial policy requires the presence of a strong state and institutional capacity, especially in Sub-Saharan Africa (SSA). Further, Lin and Monga (2010) argued that industrial policy ineffectiveness in developing countries is due to the government's inability to target industries along their countries' dynamic comparative advantage, which largely explains why their attempts to "pick winners" resulted in "picking losers". Nevertheless, the limitation of state capacity in these countries might affect the choice of an instrument of industrial policy, not whether they should implement it (Chang, 2013; Mkandawire, 2015; Stiglitz, 2017). For instance, Cheru and Rekiso(2019) and Mbate (2017) indicated the vital role of sound industrial policy in reallocating resources for better value-adding activities to accelerate structural transformation and fast-growing industrialization.

Empirical evidence has shown that manufacturing can serve as an engine of growth (Vrolijk,2021; Rocha, 2018). According to Mold (2016), it would be elusive to think about rapid productivity growth and economic transformation without achieving at least a minimum level of manufacturing. Given that the lion's share of technological innovation occurs in manufacturing, it is hard to build a knowledge-based economy in the absence of manufacturing transformation (Aiginger, 2014).

Against this background, Ethiopia's recent development plans[2] envisage a pivotal role of the manufacturing sector towards realizing the vision of achieving a middle-income level by 2025. Particularly, GTP II envisioned making Ethiopia the hub of light manufacturing industries in Africa and one of the leading countries in the world. According to Vrolijkz(2021b, pp.256), GTP II focuses on structural transformation, as the plan gives due attention to the manufacturing sector's transformation. Nevertheless, the manufacturing sector has been constrained by many interlocked challenges and poor access to intermediate inputs prevents the sector from operating at its optimal capacity (Ferede & File, 2019; Abreha,2019). For instance, the average intermediate input import intensity in Ethiopia's manufacturing sector is 50%, and that of the chemical manufacturing sub-sector is about 73% according to Ethiopia (Central Statistical Agency) (CSA, 2018). The heavy reliance on imported inputs is due to the domestic unavailability of the required quantity and quality of inputs.

In 2016, the government of Ethiopia (GoE) introduced a policy named the Second Schedule Program (MoFEC, 2016), which has targeted high-value-adding domestic manufacturing firms operating in import-competing industries to facilitate the import of intermediate inputs. In the context of this program, these industries are domestic manufacturing firms that supply their main products to the domestic market by competing with import traders of similar products. The program links to national development plans and the Ethiopia Industrial Development Strategy (IDS) (FDRE, 2002) that aim to promote industrialization through selective interventions. Accordingly, Steel and Metal engineering, Chemicals, Pharmaceuticals, Cement, fertilizers, and Non-metallic manufacturing are among the sectors to be developed as import-substituting/import-competing strategic priority sectors. However, other industries could also benefit.

According to the (Ministry of Trade and Industry) (MoTI, 2019), there were 544 program beneficiary firms at the national level, of which about 80% are from metal and Chemicals. The main purpose of the program is to improve the operative performance and competitiveness of these industries in the domestic markets by easing access to foreign inputs at discounted or free

[2] Industry Development Road Map(2013-2025) Growth and Transformation plan I(GTP I)(2010-2015) and Growth and Transformation Plan II(GTP II)(2015-2020)

import tariffs for program participants. Details of the program beneficiary distribution are provided in Appendix 2A.

The selection criterion is a pre-determined threshold for annual value addition. Value addition is the percentage of annual total value added[3] based on the firm's official financial statements verified by a certified external auditor. Program participation is voluntary for eligible firms and withdrawal is free. The main goal of the program is to improve the performance of targeted domestic manufacturing firms. To implement the program including the second schedule, GoE has spent about 229.41 billion Ethiopian Birr (ETB) collectible tax revenue throughout 2016-2018(Ethiopia Revenue and Customs Authority; ERCA, 2019). The purpose of this study is to evaluate the impact of the program introduced in 2016 and to document empirical evidence on the effectiveness of such sector-specific industrial policy.

Whereas industrial policies have re-entered the broader policy arena, empirical evidence surrounding their failures and successes in the context of the developing world is limited (Lane et al., 2021; Gebrewolde and Rockey, 2022; Smirnova and Ponomareva, 2022). However, in the absence of an understanding of what effects have occurred as a result of development interventions, it is neither possible to keep accountability about development expenditures nor to derive meaningful knowledge from development operations to improve development policies (White & Raitz*e*r, 2017; Lin& Vu, 2008; Guardia, Grant & Miguel, 2021).

The empirical analysis of the effectiveness of sector-specific industrial policy in Ethiopia is uneven across subsectors and strategic orientations. For example, studies by Gebrewolde and Rockey (2022a) concluded that sector-specific industrial policy was ineffective due to factors attributed to coordination failures in picking winners. Conversely, Oqubay (2015, 2019) and Gebreeyesus (2016) found an uneven impact of these policies on priority manufacturing subsectors. The authors attributed the success of floriculture-manufacturing industries to strong government support in addressing constraints through effective dialogue with firms and sectorial associations. On the other hand, Gebreeyesus (2016), identified a small effect on the

[3] Value added created in process of manufacturing or the ratio of sales minus value of intermediates used to annual sales

Metal and Engineering subsector due to weak support and coordination by the government. Similarly, Oqubay (2019) associated the small effects of industrial policy on leather and leather products with path dependence and weak value chain development. Growing recognition of heterogeneity, and methodological innovation, makes the evaluation of the effectiveness of policy intervention through causal studies more informative.

Rodrik (2012), Grossman and Helpman(1994), and Dixit, Grossman, and Helpman(1997) have highlighted identification challenges for policy evaluation that are related to the potential endogeneity of policy changes/reforms. However, it can be noted that several previous studies have argued that the endogeneity of trade policy reforms in Ethiopia may not be a serious problem for identification (Jones et al. 2011; Bigsten, Gebreeyesus, and Söderbom 2016; Fiorini, Sanfilippo, and Sundaram 2018; Hernandez 2017; Vrolijk 2021). These scholars emphasize that since the early 1990s the trade policy reforms in Ethiopia have been under considerable influence of international financial institutions, mainly the International Monetary Fund (IMF) and World Bank (WB), to focus reforms on liberalization and privatization. Further, as the program under investigation targets 20 industrial sub-sectors with 115 policy rules (for details see appendix 2A), it is less liable for the capture by certain interest groups as these industries require different input types and operate at different levels of value-adding capacity. Moreover, Ethiopian domestic manufacturing industries are at an infant stage of development and may therefore not be in a position to lobby the government extensively for policy reforms. In this study we evaluate the impact of sector-specific industrial policy (second schedule program) on domestic firms' productive and employment capacity utilization performance. We use comprehensive quasi-experimental techniques and a mix of administrative and firm-level survey data for Chemical manufacturing firms. We exploit the variation introduced by program participation and take into account target firms' characteristics to estimate the impact of the program.

Our results indicate that on average a 9.5% reduction in input import tariff under the program participation had led to 4.7% -7.6% higher annual productive capacity utilization, while it has no significant effect on employment capacity utilization. The results are consistent across alternative estimation methods.

The remaining part of the study is organized as follows. Section two explains the program design and contextual issues underlying the intervention. Section three presents data and identification strategy and model specification. Section four presents a summary of the descriptive and empirical results of the study, while the final section presents a conclusion and puts forward policy recommendations.

2.2 Program Design, Context, and Role and Status of Chemical Industries

2.2.1 Program Description and Implementation Framework

The policy under evaluation is known as the Second Schedule Program and it has been under implementation since 2016. The intervention has aimed at easing input constraints for targeted domestic manufacturing industries so that they can access better quality foreign intermediate inputs at lower costs. It has targeted high-value-adding domestic manufacturing firms in import-competing industries to access foreign intermediate inputs at tariffs that are discounted or completely free. From the tariff books (MoFEC, 2012; 2017), we selected the inputs for Chemical industries both under the regular duty and second Schedule program along with their harmonized system (HS) Condes. The average tariff discount is 9.5% (can be accessed and downloaded from https://soderbom.net/gbg/Appendix%20B%20tariff%20reform.pdf).In addition, the beneficiary firms are also entitled to quick custom services and better access to foreign currency.

The main purpose of the program is to speed up the process of industrialization and structural transformation to meet the ambitious middle-income vision of 2025. More specifically, the goal of the program is to increase domestic manufactured outputs, generate jobs, improve the competitiveness of targeted industries in the domestic market, and strengthen the linkages of domestic firms with established foreign firms for technological transfer and participation in the global value chain (MoFEC, 2016).

Accordingly, 20 industrial sub-sectors were identified with 115 industry-specific thresholds referring to the percentage of annual value added to sales, as specified under the amended policy Directive No.45/2016 (MoFEC, 2016), which replaced Directive No35/2013, which was repealed.

The repealed program required 30% uniform value addition across targeted industries, while under the new program (the one under investigation in this paper) policy rules vary across industry types. The program is administered jointly by ERCA, MoTI, and MoFEC. Specific value-addition requirements are shown in Appendix 2A.

Participation in the program, as well as withdrawal, is voluntary, and changing plant location has no effect. To participate in the program, firms are required to submit to their respective industrial supporting institutes, or any legally mandated implementing authority, an official financial statement approved by an authorized external auditor, an annual input use plan, and an application letter with information about the firm's profiles. At the national level, after five years of implementation, there are 544 beneficiary firms, out of which 80% are from the metal and chemical manufacturing industries (MoTI, 2019).

CCIIDI is an industrial support institution for chemical subsectors that have been legally authorized to process the first round of screening and facilitate program implementation as per the policy rules. On average, the selection process takes 1-2 months. The selected firms are granted a program beneficiary certificate that is valid for three years and that has to be renewed every year. The selection process is transparent and strict, and violation of it has legal implications as indicated in the directive. Although all sub-industries under the chemical manufacturing industries are potentially eligible for program participation as far as they satisfy the required valued added.

However, the compliance and program take-up by targeted firms was only 30%. This is a low participation rate, given that over 90% of chemical industries rely on imported inputs, with an average import input intensity of 73%.

From the preliminary analysis of the pilot survey, we noticed the existence of information asymmetry and low motivation by the target firms to participate and benefit from the program's privileges, based on their perceived cost-benefit analysis. We learned that firms are mostly unwilling to disclose their financial details as the application format warns about the accuracy of the information provided in the application. The other source of reluctance is related to the disclosure of detailed financial data. The fact that eligible firms are less willing to comply indicates

a lack of trust between the government and the private sector. There is also uncertainty among the target firms as to whether the intended benefits are realized as promised, due to other structural problems such as access to foreign currency.

Ethiopia has incurred high costs for these policy-driven incentives. For example, over the period 2016-2018, the country spent about 229.41 billion Ethiopian Birr (ETB) of collectible tax revenue, out of which 105.92 billion ETB (46%) was allocated to incentives to attract private sectors mainly in the manufacturing sub-sector (ERCA,2019). According to the World Development Indicators (WDI, 2020), the manufacturing value-added generated over the period 2016-2018 was about 330.8 billion ETB. This implies that the spending by the government to promote investment and incentives for the private sector corresponds to approximately 32% of manufacturing value added. Although Ethiopia is among the fastest-growing economies in Africa, the goals of structural change have not yet been achieved. For example, the share of manufacturing value added to GDP averaged 6% during 2016-2018. As a comparison, the Sub-Saharan African average was 10% during the same period (WDI, 2020). We evaluate the impact of the program on beneficiary firms' performance during 2016-2020. The timeline is depicted in Figure 2-1. We recognize that the time frame for evaluating the impact of the program is quite short, so all our empirical results are best interpreted as short-run effects. We do believe that the time frame is sufficiently long for it to be possible to learn about such effects.

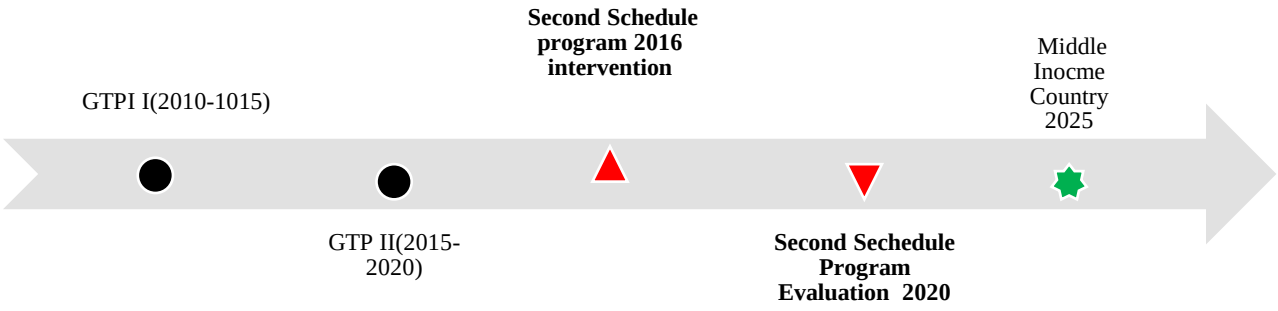

Figure 2-1 Program Implementation Timeline

2.2.2 Ethiopian Chemical Industries

The chemical industry creates a wide range of products. Historically, the transformation of chemical industries is necessary to realize national industrial development targets since the sector provides raw materials and inputs for almost all types of industries and other sectors, including Agriculture. In the Ethiopian case, the goal was to build basic chemical industries that use basic domestic inputs, thereby saving foreign exchange by supplying essential agricultural inputs and industries engaged in export markets. The contribution of the chemical industry sub-sector to GDP is expected to increase from 1% in 2016 to 2.3% by 2025 (MoI, 2013; MoFEC,2016). The success of other manufacturing industries depends on the availability of reasonably priced chemicals and chemical products. This indicates the potential of the sub-sector to stimulate the production and investment of other sectors through backward and forward linkages.

While many of the industry's products are directly purchased by the consumer, much of the sector's output is used for the production of goods by other industries. For instance, the development of manufacturing industries, including textiles, leather, food and beverages, pharmaceutical, automotive, and metal products, is highly dependent on chemical inputs. The government's wish to prioritize and support the development of the chemical industry sub-sector should be viewed in this light. Official statistics produced by CSA (2018) indicate that the chemical manufacturing industries contribute 30% of manufacturing employment and 18% of manufacturing value-added. However, there is variation in value-addition contributions by chemical industry types. As indicated in Figure 2-2, there was a decline in chemical sub-industries value addition before 2015, the time when GTP II was introduced with special attention to manufacturing sectors.

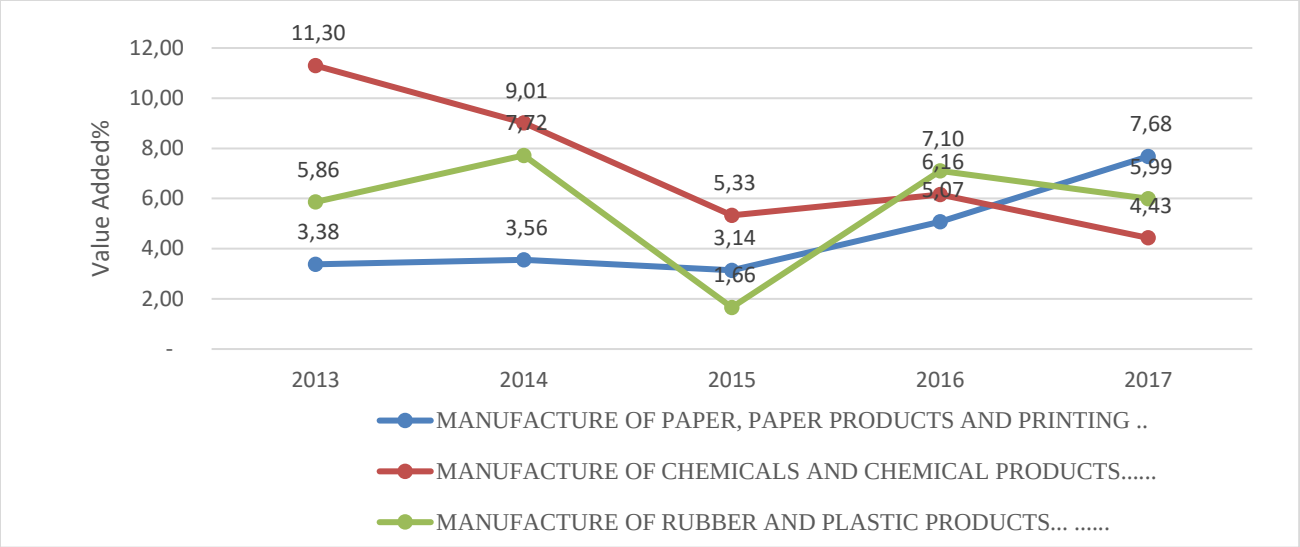

Figure 2-2 Trends of Chemical Manufacturing Value-Added Distribution

Due to shortages and quality issues with domestic inputs, the Ethiopian chemical manufacturing industry sub-sector is heavily dependent on imported inputs. Figure 2-3 shows that the plastic and rubber industries rely the most on imported products, followed by chemical and chemical product industries.

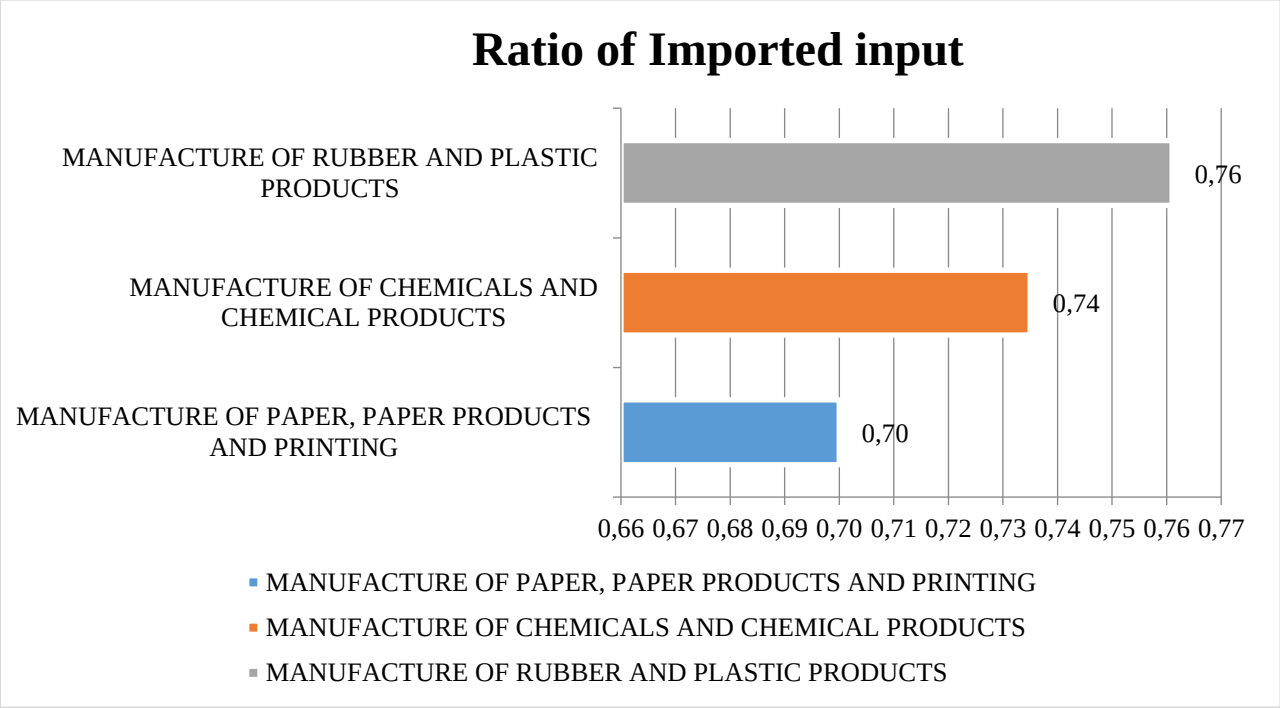

Figure 2-3 Ratio of Imported Inputs to Total Raw Materials

2.3 Data and Method

2.3.1 Data Types and Sources

The data used in this study are observational firm-level data obtained from administrative and survey sources. The target population consists of large and medium-scale chemical firms. We include all target chemical industries under the support of CCIIDI. Our dataset contains a total of 322 enterprises, under four manufacturing industries: basic chemical (48), soap and detergent (86), pulp and paper (63), and plastic and rubber (125). The industries encompass both program beneficiary and non-beneficiary firms. The dataset contains 97 beneficiaries and 225 non-beneficiaries. The survey covered institutional support indicator variables and firm characteristics such as firm size, age, location, ownership, industrial association membership, product market destination, and firm performance indicators. In close collaboration with experts from CCIIDI, the survey data were collected from target establishments of differing ownership, legal form, and location, from October 2020 to June 2021. For firm performance indicators, we use the 2020 values.

The data collection instrument was piloted and revised using the feedback from the pilot and comments from senior experts at CIIDI and MoTI. An administrative checklist and a structured survey instrument were used to gather the data. The instruments we employed include a survey to be completed by enterprise managers or representative persons and structured questionnaires administered using onsite visits, through the mail, link, and telephone. We tried to triangulate the data on firms' profiles against their profiles at CCIIDI. Out of the 322 firms operating under the auspices of CCIIDI, we used 271 firms for the final analysis, of which 96 were program beneficiaries. The response rate of the survey is 84%.

2.3.2 Empirical Strategy and Model Specification

We use Quantile Regression, Propensity Score Matching (PSM), Endogenous Switching Regression (ESR), and Generalized Propensity Score (GPS) as empirical methods for undertaking

the evaluation. We use different estimation techniques to address the challenges posed by the non-experimental design of the data.

2.3.2.1 Quantile Regression

The quantile regression approach helps us to assess the impact of the intervention in the presence of heterogeneous and idiosyncratic factors (Buchinsky, 1998; Koenker & Bassett, 1978). Quantile regression results are robust to outliers and heavy-tailed distributions (Coad & Rao, 2007; Goedhuys & Sleuwaegen, 2010; Powell & Wagner, 2014), and the target firms could be disproportionately impacted by the program. Following Koenker & Bassett's (1978) seminal contribution, the quantile regression model is expressed as:

$Y_i = X_i \beta_\theta + U_{\theta i}$ with $Qunant_\theta(Y_i \mid X_i) = X_i \beta_\theta$ .....(1)

where Y_i is a dependent variable, X_i is a vector of regressors, β a vector of parameters to be estimated, and U is a vector of residuals, which are assumed to satisfy the quantile restriction $Qunant_\theta(U_{\theta i|} \mid X_i) = 0$.

$Qunant_\theta(Y_i \mid X_i)$ denotes the θ^{th} conditional quantile of Y_i given X_i. The θ^{th} regression quantile $0 \prec \theta \prec 1$ solves the following problem:

$$\min_{\beta} \frac{1}{n} \{ \sum_{iy_i \geq x_i\beta} \theta \mid Y_i - X_i\beta \mid + \sum_{iy_i \leq x_i\beta} (1-\theta) \mid Y_i - X_i\beta \mid \} = \min_{\beta} \frac{1}{n} \sum_{i=1}^{n} \rho_\theta U\theta_i \quad \text{.....(2)}$$

where n is the number of observations and, $\rho_\theta(.)$ which is known as the 'check function', is defined as:

$$\rho_\theta(U\theta_i) = \begin{pmatrix} \theta U_{\theta i} & \text{if } U_{\theta i \geq 0} \\ (\theta - 1)U_{\theta i} & \text{if } U_{\theta i \leq 0} \end{pmatrix} \text{.....,(3)}$$

Linear programming methods are used to solve equation (2). The interpretation is as one increases θ continuously from 0 to 1, one traces the entire distribution of Y_i conditional on X_i (Buchinsky, 1994, 1998; Coad & Rao, 2007).

In our context, the outcome of interest (Y_i) can be expressed as:

$Y_i = \tau C_i + Z_i\gamma + X_i\beta + U$ .....(4)

where Z_i is factors affect program participation, X_i is a vector of other covariates, C_i is a dichotomous treatment variable equal to 0 for non-beneficiaries, and 1 for beneficiaries, U_i is an error term and, γ , τ and β are parameters to be estimated. The main objective of our empirical analysis is to estimate and interpret the value of the policy parameter, τ which is the quantile treatment effect of the policy on beneficiaries across the quantile distribution of the productive and employment capacity utilization by the targeted firms. However, the approach does not help to account for potential confounders that would affect the probability of program participation and treatment effects.

2.3.2.2 Propensity Score Matching Estimation Strategy

Propensity Score Matching (PSM) is a widely used method for analyzing quasi-experimental data. A key underlying assumption is that selection can be explained in terms of observable characteristics (Austin, 2011b; Becerril & Abdulai, 2010; Dehejia & Wahba, 1999). One advantage of using PSM is that it matches treatment and control cases on a single index, reflecting the probability of participation. The identifying assumptions for PSM are the Conditional Independence Assumption (CIA) and common support assumptions, under which participants and non-participants are comparable. These assumptions are untestable, and if the CIA holds, the matching process is analogous to creating an experimental dataset in that, conditional on observed characteristics, the selection process is random.

From a participation decision perspective, a given firm will apply for the program if the perceived benefit of participation is positive and not otherwise. Let $C_i = 1$ if the i^{th} firm participates in the program and $C_i = 0$ otherwise. Similarly, let Y_{iB} and Y_{iN} denote the potential observed outcome for beneficiary and non-beneficiary firms, respectively. Then $\triangle = Y_{iB} - Y_{iN}$ is the impact of program participation for the i^{th} firm, usually called the treatment effect. However, we only observe $Y_i = C_i Y_{iB} + (1 - C_i) Y_{iN}$, rather than Y_{iB} and Y_{iN} , and hence we cannot compute the treatment effect for all the units.

In our case, the primary treatment effect of interest is therefore the Average Treatment Effect on Treated (ATT): $\tau = \mathrm{E}(Y_{iB} - Y_{iN} / C_i = 1)$ ……. (5)

Estimation using PSM is done in two steps. First, based on a logit regression, we estimate the propensity score separately for each beneficiary and non-beneficiary firm, following Rosenbaum and Rubin (1984). Observations with the same propensity score have the same probability of assignment to treatment. With $P(X_i)$ representing the propensity score, we assume:

$X_i \perp C_i \mid P(X_i)$ …… (6)

In the second step, given the estimated propensity score, we estimate a univariate nonparametric regression as follows: $E(Y_i \mid C_i) = j, p(X_i))$ for j=0, 1 or

ATT/ATET= $E[Y_{iB} - Y_{iN} \mid\mid C = 1] = \frac{1}{N_i} \Sigma (Y_{iB} - \bar{Y}_{iN})$ ……..(7)

Several methods for matching program beneficiaries and non-beneficiaries have been proposed in the literature. We used Nearest Neighbor (NN) matching and Inverse Probability Weighting (IPW). NN is the most common and widely used matching algorithm. Individuals from the comparison group for which the propensity score is close to a treated case are chosen as matching partners for treated observations. Control cases that are not selected as matches are discarded (Smith & Todd, 2003). Inverse Probability of Treatment Weighting (IPTW) uses weights based on the propensity score to create a synthetic sample in which the distribution of measured participation covariates is independent of treatment assignment. In our case, we used NN 1 and 2 nearest neighbors and IPW as an alternative matching algorithm to estimate the program's impacts.

The limitation of the approach is that it does not deal with unobserved confounders. Therefore, to complement our findings based on PSM, we use Endogenous Switching and Generalized Propensity Score as robustness checks.

2.3.2.3 Endogenous Switching Regression Model Specification

The Endogenous Switching Regression (ESR) estimator, developed by Lee (1981), can be viewed as a generalization of Heckman's selection correction model. As program participation is voluntary

for eligible firms, selection into the program is endogenous. The ESR addresses the endogeneity problem by simultaneously estimating the selection and outcome equations using full information maximum likelihood (FIML)(Di Falco et al., 2011; Lokshin & Sajaia, 2004). We represent the perceived benefits of the program by a latent variable C^*_i, which depends on the observed characteristics Z_i, as follows:

$$C^*_i = \gamma Z_i + \varepsilon_i \quad \text{.....(8)}$$

where, γ is a parameter to be estimated and ε_i is an error term. A firm will apply for the program if the perceived benefit is positive, in which case $C^*_i > 0$. While C^*_i is unobserved, we observe a dummy variable C_i =1 if $C^*_i > 0$, and C_i =0 if $C^*_i \leq 0$. Hence, C_i =1 for beneficiary firms and C_i =0 for non-beneficiaries, In the ESR model framework, the eligible firms face two regimes; regime 0 for non-beneficiaries and regime 1 for beneficiaries of the program:

Regime 0 (Non-Beneficiary): $Y_{iN} = X_i\beta_N + U_{iN}$ if C_i =0 .....(9)

Regime 1(Beneficiary): $Y_{iB} = X_i\beta_B + U_{iB}$ if C_i =1 .....(10)

where Y_{iN} and Y_{iB} are the outcome variables for non-beneficiary and beneficiary status, respectively, and X_i is a vector of firm characteristics that affect firm value addition. The vectors β in equations (9) and (10) are parameters to be estimated. For robust identification, at least one variable included in Z_i does not feature in the vector X_i.

A "Sectorial Association Membership" was used as an identification variable, based on the empirical evidence that highlights its role in industrial policy formulation and implementation. For example, Gebreeyesus (2016), and Gebreeyesus, and Yeshineh (2017) attributed the success of the flower industry to the strong role played by the flower industry association in strengthening interactions between members and the government. The validity/ falsification test of the selected variable was conducted following Di Falco, Veronesi, and Yesuf (2011).

The result shows that the selected identification variable significantly determines program participation ($\chi^2 = 4.19(p = 0.041)$ in the selection equation (8) but not in the outcome function with the F-test ($(F(1,86) = 1.30(p = 0.257)$ and $(F(1,165) = 0.04(p = 0.833)$ for beneficiaries and non-beneficiaries firms, respectively. The three error terms ε_i, U_{iN} and U_{iB} in equations (8), (9), and (10) are assumed to follow a trivariate normal distribution with zero mean and covariance matrix:

$$\Sigma = \begin{pmatrix} \sigma_{\varepsilon}^2 & . & . \\ \sigma_{N\varepsilon} & \sigma_N^2 & . \\ \sigma_{B\varepsilon} & . & \sigma_B^2 \end{pmatrix} \quad \text{.....(11)}$$

where subscripts N= non-beneficiary, B=beneficiary, and σ_{ε}^2 is the variance of the error term in the selection equation (8), which is normalized to 1 since the coefficients are estimable only up to a scale factor. Similarly, σ_N^2 is the variance of the error term in regime zero, and σ_B^2 is the variance of the error term in regime 1, while $\sigma_{N\varepsilon}$ and $\sigma_{B\varepsilon}$ represent the covariance cov (U_{iN}, ε_i) and cov(U_{iB}, ε_i) respectively. Since Y_{iN} and Y_{iB} cannot be observed at the same time, the covariance between U_{iN} and U_{iB} is not defined (Maddala, 1987). An important implication of the error structure is that the error term of the selection model ε_i is correlated with error terms of outcome functions of regime zero (U_{iN}) and regime 1(U_{iB}). Therefore, the expected values of U_{iB} andU_{iN} conditional on ε_i are non-zero:

$$E[U_{iN} \mid C_i = 0] = \sigma_{N\varepsilon} \frac{\phi(Z_{i\gamma})}{\Phi(Z_{i\gamma})} = \sigma_{N\varepsilon}\lambda_{iN} \quad \text{.....(12)}$$

$$E[U_{iB} \mid C_i = 1] = -\sigma_{B\varepsilon} \frac{\phi(Z_{i\gamma})}{1-\Phi(Z_{i\gamma})} = \sigma_{B\varepsilon}\lambda_{iB} \quad \text{.....(13)}$$

where $\phi(.)$ is the standard normal probability density function, $\Phi(.)$ is the standard normal cumulative density function and $\lambda_{iN} = \frac{\phi(Z_{i\gamma})}{\Phi(Z_{i\gamma})}$ and $\lambda_{iB} = -\frac{\phi(Z_{i\gamma})}{1-\Phi(Z_{i\gamma})}$. If the estimated covariances $\hat{\sigma}_{N\varepsilon}$ and $\hat{\sigma}_{B\varepsilon}$are statistically significant, then the decision to apply for participation in the program and productive capacity utilization are correlated, which implies endogenous switching and that the null hypothesis of no sample selection bias is false. Stated differently, λ_{iN} and λ_{iB} are referred to as inverse mills ratio (selectivity terms), and account for selection caused by the unobservable variables.

This model is defined as a "switching regression model with endogenous Switching" (Maddala, 1975). An efficient method to estimate endogenous switching regression models is the Full Information Maximum Likelihood (FIML) estimation (Lokshin & Sajaia, 2004). Given the

assumptions of trivariate normal distribution for the error terms, the logarithmic likelihood function for the system of equations (10) and (11) can be modeled as:

$$LnL_i = \sum_{i=1}^{N} C_i \left[\ln \phi \left\langle \frac{U_{iB}}{\sigma_{B\varepsilon}} \right\rangle - \ln \sigma_{B\varepsilon} + \ln \Phi\left(\theta_{1i}\right) \right] + \left(1 - C_i\right) \left[\ln \phi \left\langle \frac{U_{iN}}{\sigma_{N\varepsilon}} \right\rangle - \ln \sigma_{N\varepsilon} + \ln\left(1 - \Phi\left(\theta_{2i}\right)\right) \right] \ldots\ldots\ldots (14)$$

where $\theta_{ji=} \dfrac{(Z_{i\gamma} + \rho_j U_{ji} / \sigma_j)}{\sqrt{1 - \rho_j{}^2}}$ j =1,2 with ρ_j denoting the correlation coefficient between the error term ε_i of the selection equation (8) and the error terms U_{ji} of equation (9) and (10), respectively. This method estimates the participation and outcome equations simultaneously.

The FIML is used to estimate the treatment and heterogeneity effects of treatment to obtain the parameters of the ESR model. Thus, the ESR model compares the conditional expectation of capacity utilization for policy beneficiary and non-beneficiary firms under four scenarios a) observed capacity utilization for beneficiaries, b) observed capacity utilization for non-beneficiaries, c) expected capacity utilization for non-beneficiaries if they would have benefited and d) expected capacity utilization for beneficiaries if they would not have benefited. Following Heckman(2001), the average treatment effect on treated is the average impact of the program on the capacity utilization of beneficiary firms. The main purpose of this study is to provide evidence of the impact of the program on the beneficiaries.

2.4 Results and Discussion

2.4.1 Description of Variables and Summary Statistics

The selection of variables for this study was guided by the analysis of the program design, contexts, related previous studies, and economic theories. The selected variables include both institutional and firm characteristics. Variable description and measurement are presented in Table 1.

Table 2-1 Description of the Study Variables

Variable name	Description	Unit
Program Participation	A binary choice variable(treatment indicator) indicating if the firm has participated/beneficiary of the program at least for one year during the period(2008-2012 E.C)(2016-2020/1) (yes=1,0 otherwise)	Dummy
Year in the program	Number of years the firm has benefited(stayed in the program)	number
Industry Types	Chemical industries, except for pharmaceutical in the context of Ethiopia's industrial support strategy and second schedule program implementation(1=Basic Chemical, 2= Soap and Detergent, 3=Plastic and Rubber=3 and pulp and paper=4)	Category
Location of the Firms	The administrative location of the plant of the firms (Addis Ababa City=1, Oromia Liyu Zone=2, and others=3)	Category
Ownership Type	Type of business ownership (Domestic=1, Foreign=2 and Joint Venture=3)	Category
Attainable Annual Production Capacity	Attainable production capacity of the firm per year(in tons) if it operates at a full capacity	number
Attainable Annual Employment Capacity	Attainable employment number that the firm can hire if it operates at its full capacity	Number
Actual Production in 2012 E.C(2020)	The actual amount of production that the firm produced in 2012 E.C(2020) in a ton	number
Actual Employment in 2012 E.C(2020)	The actual number of employment by the firms in 2012 E.C(2020)	Number
Number of Product Types	Number of the product types produced by the firm (two & more product type=1 and 0 otherwise)	Dummy
Firms per industry R&D support staff	The number of firms per industry R&D support staff by industry type	number
Ratio of MSc Industry Support Staff	The ratio of MSc R&D support staff out of total R&D support staff by industry types	ratio
Industry Association Membership	If the firm is a member of an industry/sectoral association member(Yes=1, 0 otherwise)	dummy
Expatriate Employment	If the firm has employed expatriate staff for their operation (Yes= 1, 0 otherwise)	dummy
Kaizen Implementation	If the firm has implemented a kaizen system of production (Yes=1, 0 otherwise)	dummy
Firm Age	The number of years the firm has been in operation since established was measured at the 2012 E.C	Number
Firm Size	Natural log of attainable employment numbers by each firm	Number
Credit Constraint	If the firm's first major problem for not operating at full capacity is due to lack of access to credit (yes=1, 0 otherwise)	Dummy

2.4.1.1 Summary Statistics for Selected Key Variables

Table 2-2 presents summary statistics on key characteristics. The annual average attainable productive capacity and employment capacity utilization by these industries is 59.8% and 64.1%, respectively. The values are 62.3% and 58.5% for the beneficiary and non-beneficiary firms for productive capacity utilization, and 64.8% and 63.7% for employment capacity utilization, respectively.

There is a significant mean difference in productive capacity utilization between beneficiaries and non-beneficiaries, but no significant difference in employment capacity utilization. There is no significant difference in firm size, age, ownership type, location, and credit constraints. In contrast, there are significant mean differences in expatriate staff employment, industrial association membership, and kaizen implementation status. There are mixed results in industrial support indicators by industry type.

Table 2-2 Summary Statistics for Selected Variables

	(1) All Sample	(2) Non-Benf.	(3) Benf.	(4) MeanDiff
Productive.Cap.Util.	0.598	0.585	0.623	-0.038*
Employment.Cap.Util	0.641	0.637	0.648	-0.011
Ind. r&d staff	9.453	9.767	8.881	0.886*
Ratio of MSc R&D	0.324	0.327	0.318	0.008
Ind. Asso.Mem	0.328	0.269	0.438	-0.169***
Expatriate Emp.	0.395	0.349	0.479	-0.131**
No.Prod.Typ	0.432	0.383	0.521	-0.138**
Firm Age	12.638	12.46	12.96	-0.495
Firm Size	4.98	4.927	5.076	-0.149
Kaizen. Imp	0.136	0.109	0.188	-0.079*
Credit Constraint	0.041	0.046	0.031	0.014
Location				
Addis Ababa City	0.435	0.446	0.417	0.029
Oromia Liyu Zone	0.325	0.303	0.365	-0.062
Others	0.24	0.251	0.219	0.033
Ownership				
Domestic	0.768	0.783	0.740	0.043
Foreign	0.214	0.206	0.229	-0.023
Joint Venture	0.018	0.011	0.031	-0.020
Observations	271	175	96	271

Note. Column (1) indicates all sample means. Columns (2) and (3) are mean values for the program non-beneficiary and beneficiary sub-samples, respectively. Column (4) shows the mean difference test between non-beneficiary and beneficiaries. *** p<0.01, ** p<0.05, * p<0.1

2.4.1.2 Description of Outcome Variables

The outcome variables of the study are productive and employment capacity utilization by the target firms. Productive capacity utilization is measured as the ratio of actual production in the year 2020 to the attainable production capacity of the firm. Employment Capacity utilization is measured as a ratio of actual employment during 2020 to the firm's attainable employment capacity. Capacity utilization is a widely used firm-specific performance indicator in the literature (Morrison, 1985; Salim, 1997).

As indicated in Figures 2-4 and 2-5, there is variation in both productive and employment capacity utilization across beneficiary and non-beneficiary firms. There is a larger variation between beneficiaries and non-beneficiaries in productive capacity utilization than in employment capacity utilization.

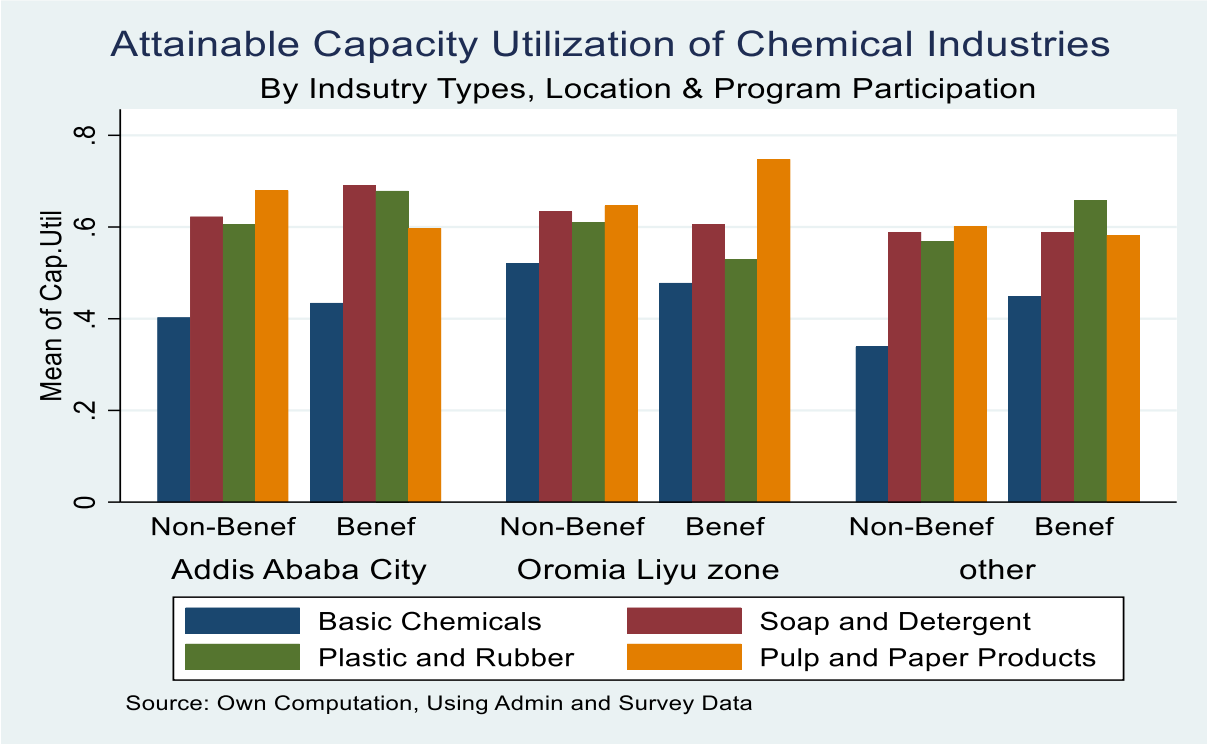

Figure 2-4 Attainable Productive Capacity Utilization by Location and Industry Type

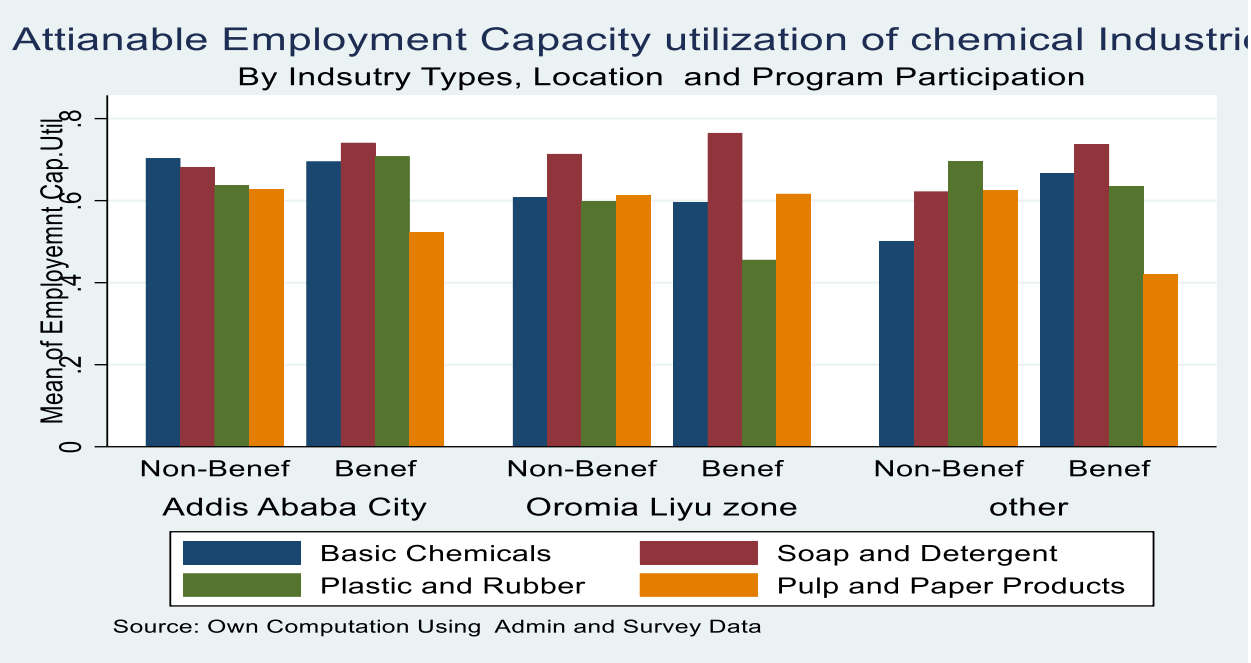

Figure 2-5 Attainable Employment Capacity Utilization by Industry Type and Location

2.4.2 Results from Quantile Regressions

Table 2-3 shows our estimated quantile treatment effects. The results indicate that the intervention has no significant effect on firms' employment capacity utilization. Our finding is consistent with the literature on the jobless growth hypothesis associated with recent African growth episodes (Janneh, 2011; Baah-boateng, 2015). Similarly, the study by Gebrewolde and Rockey (2022b) showed that industrial policy has no effect on employment in Ethiopia's large and medium manufacturing industries. According to the authors, firm owners have no interest in re-investing their additional profit in the expansion of the existing business and prefer diversifying their business portfolio.

However, anecdotal evidence obtained during our data collection suggests that the reasons why owners are unwilling to reinvest are slightly different. The interviewed firm owners explained that they are less motivated to remain in the manufacturing business and that they prefer to move to less challenging businesses such as real estate and import-trading businesses to succeed within a short period. They also cited the increasing challenge of structural problems such as poor infrastructure supply and low-quality state services.

Table 2-3 Quantile Treatment Effect on Employment Capacity Utilization

VARIABLES	(1) q25	(2) q50	(3) q70	(4) q80	(5) q90
Pro_Status	0.024	-0.012	0.028	0.011	-0.000
	(0.026)	(0.038)	(0.030)	(0.024)	(0.019)
Ind. r&d staff	0.022*	0.008	0.005	0.005	0.014***
	(0.012)	(0.011)	(0.006)	(0.006)	(0.004)
Ratio of MSc R&D	-0.669	-0.412	-0.348	-0.486	-1.062***
	(0.529)	(0.484)	(0.365)	(0.429)	(0.271)
Ind. Asso.Mem	-0.025	-0.045	-0.011	-0.005	0.006
	(0.029)	(0.035)	(0.029)	(0.026)	(0.023)
Expatriate Emp.	0.020	0.014	0.007	-0.005	-0.004
	(0.028)	(0.028)	(0.025)	(0.023)	(0.015)
No.Prod.Typ	0.002	0.004	0.025	0.007	-0.006
	(0.032)	(0.029)	(0.027)	(0.025)	(0.021)
Firm age	0.000	0.000	0.001	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Firm size	0.034**	0.042***	0.025*	0.021	0.014
	(0.014)	(0.015)	(0.014)	(0.015)	(0.012)
Credit Constraint	0.068	0.088	0.051	0.027	-0.003
	(0.104)	(0.088)	(0.061)	(0.053)	(0.031)
Kaizen. Imp	0.088	0.108**	0.036	0.015	-0.012
	(0.055)	(0.046)	(0.042)	(0.031)	(0.022)
Constant	0.355***	0.476***	0.630***	0.766***	0.967***
	(0.124)	(0.100)	(0.112)	(0.141)	(0.088)
Observations	270	270	270	270	270

Note. Standard errors obtained using bootstrapping (500 replications) are shown in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 2-4 Quantile Treatment Effect of Program Participation on Productive Capacity Utilization

VARIABLES	(1) q25	(2) q50	(3) q70	(4) q80	(5) q90
Pro_Status	0.043	0.038	0.077**	0.099***	0.118***
	(0.029)	(0.025)	(0.031)	(0.031)	(0.042)
Ind. r&d staff	0.045***	0.022***	0.008	0.006	0.005
	(0.009)	(0.007)	(0.006)	(0.005)	(0.012)
Ratio of MSc R&D	-1.101***	-0.608**	-0.406*	-0.341	-0.663
	(0.353)	(0.248)	(0.227)	(0.260)	(0.442)
Ind. Asso.Mem	0.015	-0.003	-0.024	-0.034	-0.000
	(0.028)	(0.020)	(0.020)	(0.023)	(0.034)
No. Prod.Typ	-0.028	-0.023	0.003	0.016	-0.013
	(0.030)	(0.022)	(0.022)	(0.021)	(0.028)
Firm age	0.001	0.001	0.000	0.001	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Expatriate Emp.	-0.026	-0.009	-0.016	-0.005	-0.003
	(0.029)	(0.023)	(0.021)	(0.020)	(0.029)
Firm size	0.016	-0.000	0.007	0.006	-0.004
	(0.018)	(0.011)	(0.011)	(0.012)	(0.014)
Credit constraint	0.040	0.005	0.037	0.014	-0.041
	(0.075)	(0.078)	(0.076)	(0.063)	(0.078)
Kaizen. Imp	-0.012	0.032	0.040	0.025	-0.016
	(0.038)	(0.039)	(0.034)	(0.030)	(0.036)
Constant	0.338***	0.579***	0.688***	0.700***	0.923***
	(0.121)	(0.078)	(0.063)	(0.082)	(0.109)
Observations	271	271	271	271	271

Note. Standard errors, obtained using bootstrapping (500 replications), are shown in parentheses *** p<0.01, ** p<0.05, * p<0.1.

The quantile regression results show that program participation has a positive and significant effect on productive capacity utilization by treatment firms at higher quantiles of the capacity utilization distribution. This means that the effectiveness of the program is more pronounced for firms operating at higher capacity. This finding is in line with the growing recognition in the literature of firm heterogeneity (eg. Buchinsky, 1998; Coad & Rao, 2007).

The result also indicates a clear association between program effectiveness and productive capacity utilization by the beneficiary firms. As shown in Table 2-4, the effect of the program increases at a higher level of capacity utilization and reaches about 11.8% at the 90^{th} percentile of capacity utilization. The result is consistent with a previous study by Abreha (2019) who found that only productive firms self-select into import markets in Ethiopia due to the higher cost of entry.

2.4.3 Results from Propensity Score Matching

2.4.3.1 Determinants of Program Participation

In this section, we discuss program participation determinants and present results from PSM. Our selection of variables that determine program participation and the outcome variable is informed by analysis of program design, institutional settings, and previous empirical studies. We use financial data only to a limited extent since the contextual analysis indicated an unwillingness of firms to provide accurate financial data.

Ethiopia has not yet fully implemented International Financial Reporting Standards (IFRS), and there is evidence of lower financial reporting quality (FRQ) at the firm level (Asegdew, 2016; Tesfu, 2012). The other difficulty with accessing financial data is related to business secrecy-related issues, as revealed by firms during our pilot survey.

Table 2-5 Logit Model Estimation: Program Participation

VARIABLES	(1) Program Participation	dy/dx	z
Ind_R&D staff	-0.145***	-0.030***	-2.71
Ratio of MSc R&D	5.014	1.05	1.42
Member Ind.Ass	0.629**	0.132**	2.26
No. Prod.Typ	0.505*	0.106*	1.181
Firm Age	-0.008	-0.002	-0.75
Expatriate.Emp	0.548**	0.115**	2.08
Firm Size	0.097	0.024	0.62
Credit cont.	-0.783	-0.164	-1.03
Kaizen.Imp.	0.316	0.066	0.80
Constant	-1.929*		
Observations	271		

Robust standard errors *** p<0.01, ** p<0.05, * p<0.1

We use a logit to model program participation. Our results, shown in Table 2-5, indicate that firm-specific characteristics and industrial support indicators affect program participation. We find that the lower the firms per industry R&D support staff (Ind_r&d staff), the higher the likelihood of program participation. The finding is consistent with studies by Mbate (2017) and Aryeetey and Owoo (2015) that confirm industrial support institutions as a key industrial policy instrument in promoting firm-level production, marketing, and provision of technological as well as support services to firms. In addition, industry R&D support staff serve as a focal point to support firms in facilitating firms' applications for services from other government agencies such as access to utilities, land, foreign exchange, and custom-related issues.

Similarly, industrial association membership (Member Ind.Ass.) positively and significantly affects program participation. This is in line with a previous study by Gebreeyesus and Iizuka (2012) that highlights sectorial association as a pathfinder institution in developing the capacity of members based on evidence from the success of the flower industry in Ethiopia. On the other hand, to create better coordination and pooling of collective resources, the government also promotes the association to improve the design of policies and regulations depending on members' inputs(Qureshi & Velde, 2013). Our results also indicate that firms that produce two or more product types have a higher likelihood of program participation than firms that produce a single product type (No. Prod. Typ). This could be related to the link between product differentiation and the firm’s competitive advantage (Swink & Hegarty, 1998).

Expatriate employment (Expatriate. Emp) by domestic firms is positively and significantly associated with program participation. This could be because chemical industries are relatively "high-tech" (Pavitt 1984; OECD, 2016), hence employment of expatriates will help fill the domestic knowledge gap. The possible mechanisms include employee training, and engaging in R&D activities, both of which are important for value creation by the firms. The selection of the other variables in the model of participation is based on previous empirical work or theory. For example, Söderbom (2012) shows that firm size affects performance positively; Berhe (2022) reports a positive impact of kaizen implementation on firm performance; Guichardaz, Bach, and Penin (2019) and Endale (2011) highlight financial constraints as a major problem that affects manufacturing firms' performance in developing countries.

2.4.3.2 PSM Assumption Tests

Based on the logit results in Table 2-5, we compute the propensity score (i.e. the likelihood that an eligible firm participates in the program). Figure 2-6 shows that there is common support in the data: there is a substantial overlap in the distribution of propensity scores which range from 25% to 90%.

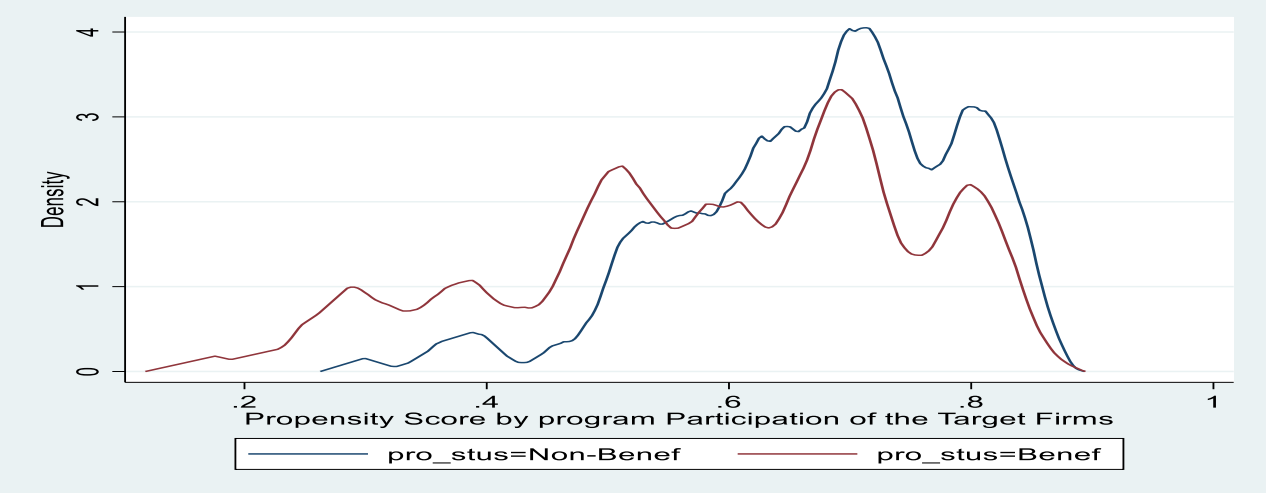

Figure 2-6 PSM Overlap and Common Support of Test

Table 2-6 PSM Covariate Balancing Test

Variables	Standardized mean differences		Variance ratio	
	Raw	Matched	Raw	Matched
Ind_r&d staff	-.2431206	.0880903	1.0555	.7844053
Ratio of MSc R&D	-.1427917	.055217	.8334986	.8967325
Member Ind.Ass	.3576243	.0629783	1.258716	1.020243
No. Prod.Typ	.2788028	0	1.06126	1
Firm age	.0411357	.0449196	.7302482	0.8363873
Expatriate Emp.	.266419	.0415393	1.104296	1.005245
Firm size	.161759	.0891364	.8676117	.8232383
Credit constraint	-.0749599	-.0553081	.6972527	.7581522
Kaizen Imp	.2226712	.05431	1.581544	1.096875

Table 2-6 shows results related to the covariate balancing. The standardized biases across covariates were closer to 0 than unstandardized (raw) biases, which shows that the mean difference approached 0 for matched covariates. In the same way, the variance ratios of matched covariates are closer to 1 than the raw variance ratios. Both standardized mean difference and variance ratios suggest that the covariate balance assumption held.

2.4.3.3 PSM Main Estimation Results

The results from PSM indicate that the program has mixed effects on productive capacity utilization and employment capacity utilization. Estimation results, based on different matching methods, are shown in Table 2-7. We find that, for productive utilization, the Average Treatment Effect on the Treated (ATT) is between 4.7% and 7.6% and statistically different from zero. In contrast, the program has no significant effect on employment capacity utilization. These results are similar to those reported in the above sections on descriptive statistics and quantile regression results. Our findings are also consistent with previous studies on the positive effects of better access to foreign intermediate inputs on firm performance (Ferede, & File, 2019; Gebreyesus, 2019).

Table 2-7 PSM Main Estimation Results

Outcome	ATT/ATE	Matching Algorithms	Coef.	t/z
Productive capacity utilization	ATT	Nearest Neighbor(2)	0.0401	(1.31)
	ATT	Nearest Neighbor(1)	0.0764*	(1.67)
	ATE	Nearest Neighbor(1)	0.069***	(2.44)
	ATT	Inverse-probability weights	0.047*	(1.85)
	ATE	Inverse Probability weights	0.054***	(2.20)
Employment capacity utilization	ATT	Nearest Neighbor(2)	-0.011	(-0.53)
	ATT	Nearest Neighbor(1)	-0.02	(-1.08)
	ATE	Nearest Neighbor(1)	-0.001	(-0,11)
	ATT	Inverse-probability weights	0.002	(0.08)
	ATE	Inverse Probability weights	0.014	(0.80)
		N	271	

t statistics in parentheses for ATT, z for ATE* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The PSM results further indicate that the program positively and significantly improves the capacity utilization of target firms by between 5.4% and 6.9% if implemented upon compliance of target firms, which is the Average Treatment Effect (ATE).

Our results imply that a 1% reduction in input tariff is associated with a 0.65% increase in productive capacity utilization. The result is consistent with previous research on the effect of input tariff reduction on firm performance (Matto, Marco, and Asha,2018; Bigsten et al., 2016).

2.4.4 Heterogeneity Analysis and Robustness Checks

2.4.4.1 Heterogeneity by Firm Ownership Types

Figure 2-7 illustrates the heterogeneous effects of the program productive capacity utilization by firm ownership type. These results indicate that the program benefits mainly firms that operate at higher capacity utilization and firms with some foreign ownership.

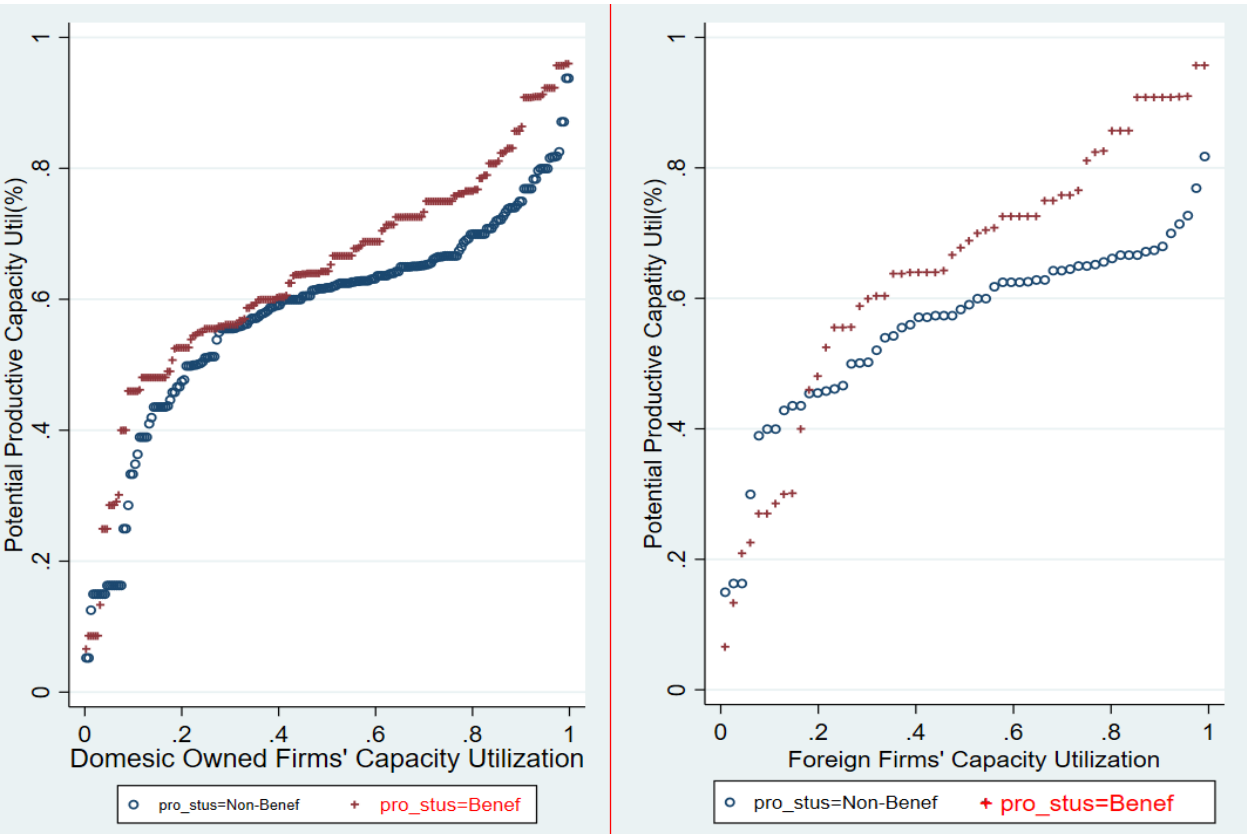

Figure 2-7 Potential Capacity Utilization by Firms' Ownership Types

2.4.4.2 Robustness Checks

2.4.4.2.1 ESR Results on Productive Capacity Utilization

Table 2-8. Endogenous Switching Regression Model Fitness Test

VARIABLES	Program Participation		Program _Benef.		Program Non_Benef.	
	Coef	Se	Coef	Se	Coef	Se
Ind_r&d staff	-0.100***	(0.038)	0.031***	(0.011)	0.026***	(0.005)
Expatriate Emp.	0.341**	(0.164)	-0.087*	(0.047)	0.012	(0.024)
Firm Age	-0.005	(0.007)	0.001	(0.002)	0.000	(0.001)
No. Prod.Typ	0.334*	(0.171)	-0.142***	(0.050)	0.027	(0.024)
Firm Size	0.053	(0.096)	-0.034	(0.029)	0.010	(0.012)
Credit Constraint	-0.425	(0.441)	-0.052	(0.135)	0.046	(0.051)
Kaizen Imp.	0.118	(0.250)	-0.002	(0.069)	0.038	(0.034)
Ratio of MSc.r&d	3.049	(2.314)	-0.914	(0.710)	-0.821***	(0.276)
Member Ind.Ass	0.265	(0.177)				
Constant	-1.003	(0.694)	1.143***	(0.272)	0.526***	(0.077)
lns1	-1.353***	(0.172)				
lns2	-2.018***	(0.053)				
ln ρ_1	-1.395***	(0.469)				
ln ρ_0	0.003	(0.423)				
sigma_1	0.258	(0.045)				
sigma_2	0.133	(0.007)				
ρ_1	-0.884	(0.102)				
ρ_0	-0.003	(0.423)				
Log-likelihood	-29.025					
Wald chi2(8)	23.17***					
LR test of Indep. eqns.: chi2(1)	3.16*					
Observations	271		271		271	

*** p<0.01, ** p<0.05, * p<0.1, Standard errors in parentheses

The estimators used above, quantile regression and PSM – control for selection into the program on observable firm characteristics. If beneficiaries and non-beneficiaries are systematically different across unobservable factors, and such factors are related to selection into the program, PSM estimates will generally be biased. In this section, we consider results from the ESR model, which, under certain assumptions, correct for biases arising from the selection of unobservable. Table 8 shows FIML results from the first stage estimation of selection (equation 11) and production equations (equation 12 &13). The correlation coefficient between error terms in equation 11 and error terms in equation 13 is ρ_1 =-.88, which is negative and significantly different

from zero (Table 2-8), which indicates the presence of selection bias. The likelihood ratio test for joint independence of the two production equations (LR χ^2 = 3.16, p $\leq$0.1) indicated that error terms U_{iN} and U_{iB} in equations 12 and 13, respectively, are correlated, which, if ignored, could lead to biased results. The ESR model could reduce these biases.

Table 2-9 Counterfactual Conditions Estimation and ATT

Sub-Samples	Decision stage		Average Treatment Effect
	To apply for the Program	Not to apply for the program	
Beneficiary	(a) $E(Y_{iB} \mid C=1)$=0.632	(c) $E(Y_{iN} \mid C=1)$=0.578	ATT=0.045***
Non-Beneficiary	(d) $E(Y_{iB} \mid C=0)$=1.02	(b) $E(Y_{iN} \mid C=0)$=0.585	ATU =0.435***
Heterogeneity effect	$BH_{1=}$-0.402***	$BH_{2=}$ -0.006	BH3=-0.395**

Source: Own computations, following Di Falco, Veronesi, and Yesuf (2011)

Table 2-9 shows conditional actual and counterfactual estimates of the average treatment effect of program participation. The results imply a positive and significant effect of the program on the productive capacity utilization of both beneficiary and non-beneficiary firms. The ATT, i.e. the program participation effect on beneficiaries, is obtained by comparing (a) and (c), while the ATU the effect the program would have had on non-beneficiaries had they been beneficiaries - is obtained by comparing (d) and (b). The differences between ATT and ATU are reported as BH1, BH2, and BH3, respectively. Hence, for actual productive capacity utilization, the results imply that program beneficiaries utilized 4.5% more capacity than non-beneficiaries (compare (a) vs. (b) in Table 2-9). This is consistent with earlier results, in the sense that participation has a positive and significant effect.

However, the difference adjusted for the potential sample heterogeneity shows that, if the beneficiaries had not benefited, there would be no significant difference in productive capacity utilization between the beneficiary and non-beneficiary firms (compare (c) vs. (b) in Table 9). Our finding supports the hypothesis that a well-targeted sector-specific industrial policy can help to promote industrial development. For instance, Page and Tarp (2016), Rasiah, Beigpoor, and Yap (2016), and Hausmann, Rodrik, and Sabel (2007) pointed out the importance of industrial policy in identifying constraints of high-productivity firms.

2.4.4.2.2 Estimation of Continuous Treatment Effects

The quantile regression, propensity score matching, and endogenous switching regression methods do not consider the heterogeneity of the program impact across time. The dose-response function is well motivated from an empirical point of view, in the sense that the duration of the program (intensity of program participation) could lead to heterogeneous effects on firm performance. To account for the heterogeneous and incremental impact of program participation on beneficiaries, we used the continuous treatment effects estimation methodology following Hirano and Imbens(2003) to estimate year-specific dose responses. In the first step, we estimate the likelihood of receiving a particular level of treatment. Based on data on the beneficiaries' duration in the program, we divided the treatment distribution by the treatment level into three exclusive groups. This is the estimated Generalized Propensity Score (GPS).In the second stage, after balancing the covariates across the treatment intervals, we estimate the conditional expectation of the potential average outcome variable (productive capacity utilization) using the GPS methodology proposed by Hirano and Imbens. We use a linear approximation of the conditional expectation of the outcome variable. In the last stage, the average expected outcome is averaged at each treatment level using regression coefficients from stage 2 over GPS, which is the average dose-response function. To estimate the entire dose-response function, the GPS of stage 2 is calculated and the confidence intervals of the dose-response functions are determined via bootstrapping of 100 replications. We used the estimation commands developed by Alberto and Mattei(2008) to evaluate the impact of the program at 50% and 70% of productive capacity utilization. Dose responses per year indicate about a 5.9% increment in productive capacity utilization for beneficiary firms, compared to non-beneficiary firms.

The results in Figures 2-8 and 2-9 reveal a positive and increasing treatment effect trend of the program on annual potential average productive capacity utilization as the intensity of program participation increases (number of years in the program increases). The marginal treatment effects results convey a similar story, as depicted in Figures 8 and 9.

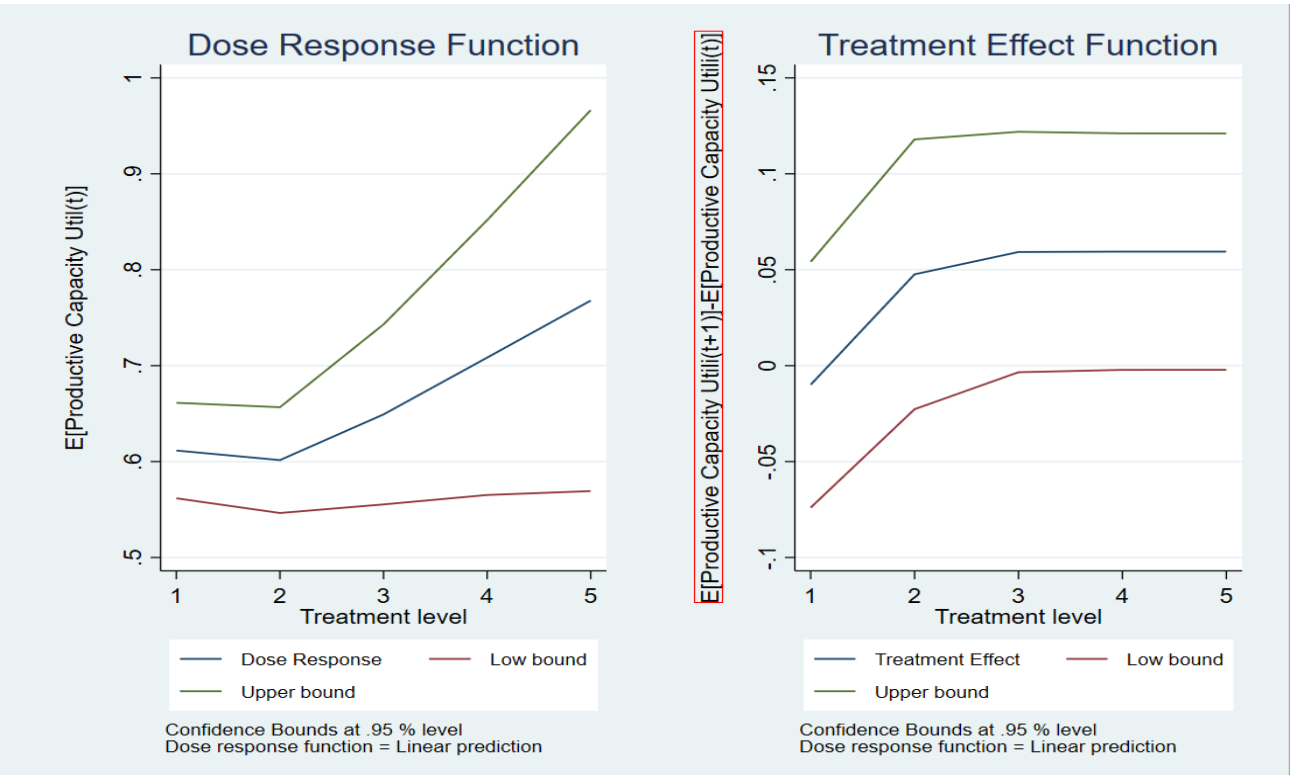

Figure 2-8.Dose Responses of Productive Capacity Utilization for Each Year in the Program (50%)

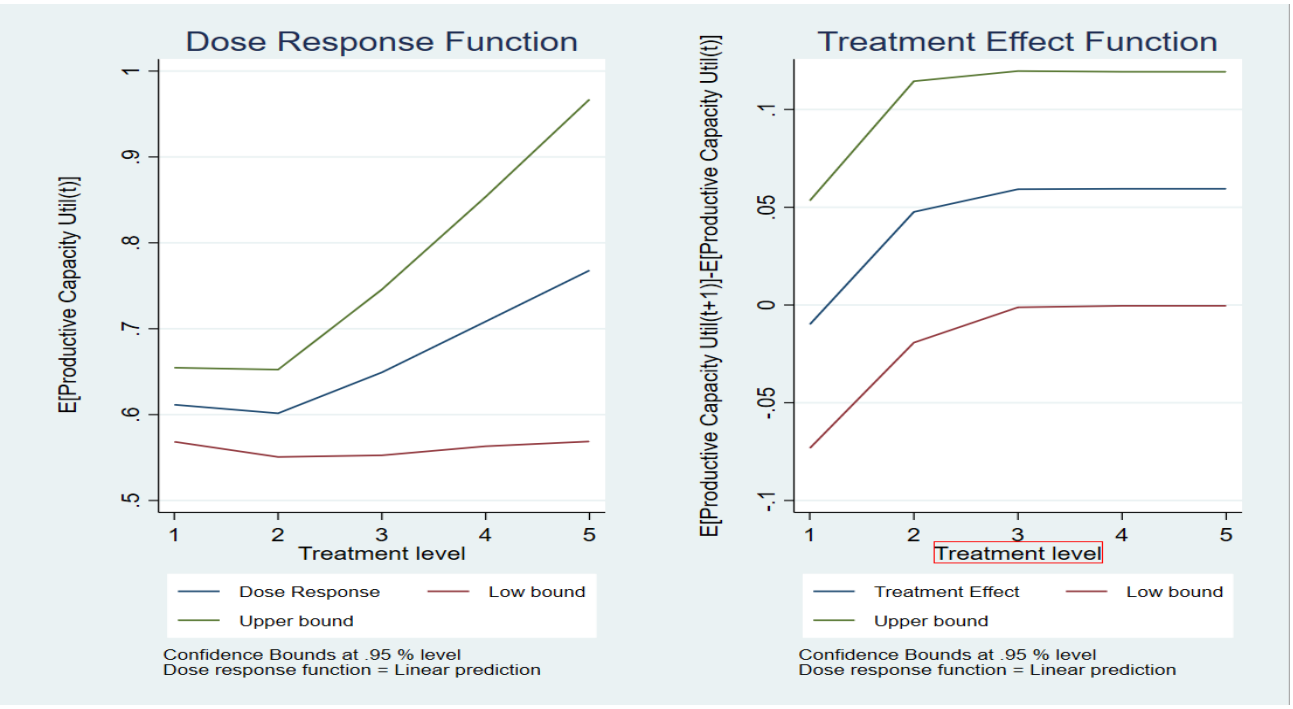

Figure 2-9 Dose Responses of Productive Capacity Utilization for Each Year in the Program (70%)

2.5 Conclusion

This study analyzed the relationship between firm performance and sector-specific industrial policy intervention (second schedule program). The program was implemented to improve the performance of targeted domestic manufacturing firms. We used a mix of administrative and firm-level survey data to document the impact of the program. Our knowledge of the program design and context, and previous empirical and theoretical studies, formed the basis for the selection of relevant variables in our analysis. To account for heterogeneity and selection bias we employed Quantile regression, PSM, ESR, and GPS in supplementary and complementary approaches. Our results indicate a positive and significant effect of the program on productive capacity utilization by beneficiaries, but no effect on employment generation. The results are broadly consistent across the estimation methods.

We conclude that the program has mixed effects on targeted domestic chemical manufacturing firms' performance. Our findings will contribute to the scant empirical evidence on context-specific industrial policy evaluation in developing countries. Our results suggest that carefully designed interventions that mitigate major obstacles for firm operations – in the present case access to high-quality imported inputs – can improve firm performance. Central to the current policy program is the role played by the institutions involved in it. Almost certainly, a strong institutional capacity is required for programs of the type considered in this paper to work. Our results also speak to the importance of targeting. The program appears to have reached firms in the target population, but at the same time, we note that take-up rates have been relatively low. We have discussed the importance of building relationships between the state and the business sectors that all parties have some faith in.

Finally, even though the empirical evidence in this paper indicates certain positive effects of the program on firm performance, we have also noted that the program has been associated with high costs. We do not take a view on whether the positive effects of the program on firm performance are sufficiently strong to justify the costs of the program, but we note that exploring this issue further could be an interesting area for future research.

Conflict of Interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

REFERENCES

Abreha, K. G. (2019). Importing and Firm Productivity in Ethiopian Manufacturing. *World Bank Economic Review*, *33*(3), 772–792. https://doi.org/10.1093/wber/lhx009

Aiginger K (2014) Industrial policy for a sustainable growth path: WIFO working papers no.469 Austrian Institute of Economic Research (WIFO): Available at http://hdl.handle.net/10419/129024

Alberto, C. C., & Mattei, A. (2008). *A Stata package for the estimation of the Dose–response fu*nction through adjustment for the generalized propensity score. 3, 354–373.

Asegdew, K. (2016). Determinants of Financial Reporting Quality: Evidence from Large Manufacturing Share Companies of Addis Ababa (Issue May).

Austin, P. C. (2011a). A tutorial and case study in propensity score analysis: An application to estimating the effect of in-hospital smoking cessation counseling on mortality. Multivariate Behavioral Research, 46(1), 119–151. https://doi.org/10.1080/00273171.2011.540480

Austin, P. C. (2011b). An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research, 46(3), 399–424. https://doi.org/10.1080/00273171.2011.568786

Baah-Boateng, W. (2014). Youth employment challenges in Africa: policy options and agenda for future research: AERC Biannual Conference in Lusaka, Zambia, December 2014

Becerril, J., & Abdulai, A. (2010). The impact of improved maize varieties on poverty in Mexico: A propensity score-matching approach. *World Development*, *38*(7), 1024–1035. https://doi.org/10.1016/j.worlddev.2009.11.017

Behuria, P. (2019). Twenty-first Century Industrial Policy in a Small Developing Country : The Challenges of Reviving Manufacturing in Rwanda. *Development and Change*, *50*(4), 1033–1062. https://doi.org/10.1111/dech.12498

Berhe, H. H. (2022). *Application of Kaizen philosophy for enhancing manufacturing industries ' performance : exploratory study of Ethiopian chemical industries*. 204–235. https://doi.org/10.1108/IJQRM-09-2020-0328

Bigsten, A., Gebreeyesus, M., & Söderbom, M. (2016). Tariffs and Firm Performance in Ethiopia. *Journal of Development Studies*, *52*(7), 986–1001. https://doi.org/10.1080/00220388.2016.1139691

Buchinsky, M. (1994). Changes in the U.S. wage structure 1963-1987: application of quantile regression Published by The Econometric Society Changes in the US Wage 1963-1987: structure of quantile regression application of Wages In the 1980s. Econometrica 62(2):405–458

Buchinsky, M. (1998). Recent Advances in Quantile Regression Models: A practical guideline for empirical research. *The Journal of Human Resources*, *33*(1), 88–126.

Chang, H., & Andreoni, A. (2020). Industrial Policy in the 21st Century. *Development and Change*, *51*(2), 324–351. https://doi.org/10.1111/dech.12570

CCIIDI (2018) Annual news booklet volume 2 no.4, Chemical and Construction Input Industry Development Institute, Ministry of Trade and Industry, Federal Democratic Republic of Ethiopia, Addis Ababa

Cheru, F., & Rekiso, Z. S. (2019). Ethiopia's 'economic diplomacy' and regional integration. In *The Oxford Handbook of the Ethiopian Economy* (pp. 113–134). https://doi.org/10.1093/oxfordhb/9780198814986.013.5

Cimoli, M., Dosi, G., Nelson, R., & Stiglitz, J. E. (2010). Institutions and Policies Shaping Industrial Development: An Introductory Note. *Industrial Policy and Development: The Political Economy of Capabilities Accumulation*. https://doi.org/10.1093/acprof:oso/9780199235261.003.0002

Coad A, Rao R (2007) Innovation and Firm growth in high-tech sectors: a quantile regression approach. LEM Working Paper Series 2006/18

CSA. (2018). *The Federal Democratic Republic of Ethiopia Central Statistical Agency Report on Small Scale Manufacturing Industries Survey* (Issue November).

Dehejia, R. H., & Wahba, S. (1999). Causal Effects in Nonexperimental Studies: Reevaluating the Evaluation of Training Programs. *Journal of the American Statistical Association*, *94*(448), 1053–1062. https://doi.org/10.1080/01621459.1999.10473858

Di Falco, S., Veronesi, M., & Yesuf, M. (2011). *Does adaptation to climate change provide food security? A micro-perspective from Ethiopia* (Vol. 93, Issue 3, pp. 423–426). https://doi.org/10.1093/ajae/aar006

Dixit, A., Grossman, G. M., & Helpman, E. (1997). Common agency and coordination: General theory and application to government policy making. *Journal of Political Economy*, *105*(4), 752–769. https://doi.org/10.1086/262092

Endale, K. (2011). Investment Climate and Manufacturing Perfiormance in Ethiopia. *EJBE*, *2*(1), 1–35.

ERCA (2019). Unpublished reports on tax incentive distribution, Ethiopian Revenue and Customs Authority. Federal Democratic Republic of Ethiopia, Addis Ababa

Erik, E. R. (1999). The role of the state in economic growth. *Journal of Economic Studies 26,4/5*, *26*(4/5), 268–326. https://doi.org/10.4337/9781800374980.00011

Federal Democratic Republic of Ethiopia (FDRE). (2002). 'The Industrial Development Strategy of Ethiopia' Addis Ababa, Ethiopia.

FDRE MOI. (2013). *Ethiopian Industrial Development Strategic Plan (2013-2025)*. *September*, 125.

Ferede, T., & File, B. (2019). Rural–Urban Linkages in Ethiopia. In C. C. and O. A. Cheru F (Ed.), *The Oxford Handbook of the Ethiopian Economy.* (pp. 763–784). Oxford University Press. Oxford.

Fiorini, M., Sanfilippo, M., & Sundaram, A. (2018). *Input tariffs, Roads and Firm Performance : Evidence from Ethiopia* * (IGC Working Paper No. F-32403-ETH-1, Issue February 15,).

Freeman, C. (2004). Technological infrastructure and international competitiveness. *Industrial and Corporate Change*, *13*(3), 541–569. https://doi.org/10.1093/icc/dth022

Galindo-Rueda, F., & Verger, F. (2016). OECD taxonomy of economic activities based on R&D intensity. *OECD Science, Technology and Industry Working Papers*, *4*, 24.

Gebreeyesus, M. (2016). A Natural Experiment of Industrial Policy: Floriculture and the Metal and Engineering Industries in Ethiopia. In *The Practice of Industrial Policy*.

Gebreeyesus, M., & Iizuka, M. (2012). Discovery of Flower Industry in Ethiopia: Experimentation and Coordination. *Journal of Globalization and Development*, *2*(2). https://doi.org/10.1515/1948-1837.1103

Gebreeyesus, M., & Yeshineh, A. K. (2017). *Ethiopia 's export promotion and the misalignment of the tariff and exchange rate regimes EDRI Working Paper 19 Ethiopia 's export promotion and the misalignment of the tariff and Mulu Gebreyesus and Alekaw Kebede* (Issue December).

Gebrewolde, T. M., & Rockey, J. (2022). The effectiveness of industrial policy in developing countries : causal evidence from Ethiopian manufacturing firms ABSTRACT. *Journal of Development Effectiveness*, *00*(00), 1–27. https://doi.org/10.1080/19439342.2022.2090997

Gebreyesus, M. (2019). The Private Sector in Ethiopia s Transformation. In *The Oxford Handbook of the Ethiopian Economy.*

Gisselquist, R. M. (2017). State Capability and Prospects for Close Coordination. In *The Practice of Industrial Policy* (pp. 80–100). https://doi.org/10.1093/acprof:oso/9780198796954.003.0005

Goedhuys, M., & Sleuwaegen, Æ. L. (2010). *High-growth entrepreneurial firms in Africa : a quantile regression approach*. 31–51. https://doi.org/10.1007/s11187-009-9193-7

Grossman, B. G. M., & Helpman, E. (1994). "Protection for Sale." *The American Economic Review*, *84*(4), 833–850.

Guichardaz, R., Bach, L., & Penin, J. (2019). Music industry intermediation in the digital era and the resilience of the Majors' oligopoly: the role of transactional capability. *Industry and Innovation*, *26*(7), 843–869. https://doi.org/10.1080/13662716.2018.1561357

Ha-Joon, C. (2013). Is industrial policy necessary and feasible in Africa? Theoretical considerations and historical lessons. Working paper for JICA/IPD Africa Task Force Meeting Yokohama, Japan

Hauge, J. (2019). Should the African lion learn from the Asian tigers? A comparative-historical study of FDI-oriented industrial policy in Ethiopia, South Korea, and Taiwan. *Third World Quarterly*, *40*(11), 2071–2091. https://doi.org/10.1080/01436597.2019.1629816

Hausmann R, Rodrik D, Sabel CF (2007) Reconfiguring industrial policy: a framework with an application to South Africa. Development Working Paper No.168, Harvard University Center for International

Heckman JJ (2001) Microdata, heterogeneity, and the evaluation of public policy: Nobel lecture. J Political Econ 109(4):673–748

Hernandez, D. (2017). Are ‘‘ New ” Donors Challenging World Bank Conditionality ? *World Development*, *96*(2007), 529–549. https://doi.org/10.1016/j.worlddev.2017.03.035

Hirano K, Imbens WG, Ridder G (2003) Efficient estimation of average treatment effects using

the estimated propensity score. Econometrica 71(4):1161–1189. https:// doi. org/ 10. 1111/ 1468- 0262. 00442

Hoces De La Guardia, F., Grant, S., & Miguel, E. (2021). A framework for open policy analysis. *Science and Public Policy*, *48*(2), 154–163. https://doi.org/10.1093/scipol/scaa067

Howard, M., & Pack, H. (2002). *Industrial policies and growth: lessons from international experience* (Working Papers of the Central Bank of Chile No. 169, Huérfanos 1175, primer piso no. 169).

Janneh A (2011) Industrial policies for the structural transformation of African economies: options and best practices. UNECA Policy Research Paper No. 2

Kim, L. (1999). Building technological capability for industrialization: Analytical frameworks and Korea's experience. *Industrial and Corporate Change*, *8*(1), 111–136. https://doi.org/10.1093/icc/8.1.111

Koenker, R., & Bassett, G. (1978). Regression Quantiles. *Econometrica*, *46*(1), 33. https://doi.org/10.2307/1913643

Lane, N. (2021). Manufacturing revolutions: industrial policy and industrialization in South Korea. ZBW – Leibniz Information Centre for Economics, Kiel, Hamburg. Available at: http:// hdl. handle. net/ 10419/ 235845

Lee, J., Clacher, I., & Keasey, K. (2012a). *Industrial policy as an engine of economic growth : A framework of analysis and evidence from South Korea (1960 – 96). 6791*. https://doi.org/10.1080/00076791.2012.683420

Lee, J., Clacher, I., & Keasey, K. (2012b). Industrial policy as an engine of economic growth : A framework of analysis and evidence from South Korea (1960 – 96). *Business History ISSN: 6791*. https://doi.org/10.1080/00076791.2012.683420

Lee, L . (1981). Some approaches to the correction of selectivity bias. Research, Discussion Paper No.81–141, *Center for Economic Research Department of Economics University of Minnesota Minneapolis, Minnesota*

Lin JY, &Monga, C (2010). Este documento es una traducción de Growth identifcation and facilitation—the role of the state in the dynamics of structural change. Research Paper 5313, World Bank Policy

Lin JY, Vu, KM (2017) Coordination through an Asian lens. In: Page J, Tarp F (eds) The practice of industrial policy. Government–Business Coordination in Africa and East Asia, pp 40–63

Lokshin, M., & Sajaia, Z. (2004). Maximum Likelihood Estimation of Endogenous Switching Regression Models. *The Stata Journal: Promoting Communications on Statistics and Stata*, *4*(3), 282–289. https://doi.org/10.1177/1536867x0400400306

Maddala, G. S., and F. D. N. (1975). Switching Regression Models with Exogenous and Endogenous Switching. *Proceeding of the American Statistical Association*, *15*(1), 423–426.

Maddala. (1987). Limited-Dependent and Qualitative Variables in Econometrics. In *Social Science Computer Review*. https://doi.org/10.1177/089443938700500215

Maio, MD. (2009). Industrial policies in developing countries: history and perspectives. In & J. E. S. M.Cimoli,G.Dpsi (Ed.), Industrial policy and development: the political economy of capabilities accumulation (Issue July, pp. 107–143). https:// doi. org/ 10. 1093/ acprof: oso/ 97801 99235 261. 001. 0001

Maio, M. Di. (2014). *Industrial Policies in Developing Countries : History and Perspectives Industrial Policies in Developing Countries : History and Perspectives* (Issue January 2008). https://doi.org/10.1093/acprof

Mbate, M. (2017). Structural change and industrial policy: A case study of Ethiopia's leather sector. *Journal of African Trade*, *3*(1–2), 85. https://doi.org/10.1016/j.joat.2017.01.001

Mkandawire, T. (2015). Neopatrimonialism and the Political Economy of Economic Performance in Africa: Critical Reflections. *World Politics*, *67*(3), 563–612. https://doi.org/10.1017/S004388711500009X

Ministry of Finance and Economic Cooperation(MoFEC).2012. Customs Tariff version based on a version of the 2012 harmonized system: volume i&2, Addis Ababa, Ethiopia

Ministry of Finance and Economic Cooperation (MoFEC).2016. 'Second Schedule Custom Tariff Utilization Guiding Directive No.45/2008 E.C (2016 G.C)' .Addis Ababa, Ethiopia

Ministry of Finance and Economic Cooperation (MoFEC).2017. Customs Tariff version based on a version of the 2017 harmonized system: volume i&2, Addis Ababa, Ethiopia

Ministry of Finance and Economic Development (MOFED) (2010). 'Growth and Transformation Plan 2010/11-2014/15 (GTP I). Addis Ababa, Ethiopia.

Ministry of Industry (MoI).2013. Ethiopia Industrial Development Roadmap (2013-2025). Addis Ababa, Ethiopia

Mold, A. (2016). Local / Global Encounters Running Up That Hill ? The Challenges of

Industrialization in the East African Community. *Development*, *58*(4), 577–586. https://doi.org/10.1057/s41301-016-0045-x

Morrison, C. J. (1985). Primal and Dual Capacity Utilization : An Application to Productivity Measurement in the U.S. Automobile Industry. *Taylor & Francis, Ltd. on Behalf of American Statistical Association*, *3*(4), 312–324.

MoTI (2019) Unbapliched report on second schedule beneficiary firms. Federal Democratic Republic of Ethiopia, Ministry of Industry and Trade

Newman, C., Page, J., Rand, J., Shimeles, A., Söderbom, M., & Tarp, F. (2016). The pursuit of industry. In *Manufacturing Transformation* (pp. 141–164). https://doi.org/10.1007/978-981-16-7045-9_6

NPC (2016) Growth and Transformation Plan II (GTP II) (2015/16-2019/20). Federal Democratic Republic of Ethiopia, Addis Ababa, National Plan Commission

Oqubay, A. (2015). *Made in Africa: Industrial Policy in Ethiopia*. Oxford University Press. Oxford.

Oqubay, A. (2018). The Structure and performance of the Ethiopian manufacturing sector. African Development Bank Group working paper No. 299

Page J, Tarp F (2017). Overview and insights. In: Page J, Tarp F (eds) The practice of industrial policy: government–business coordination in Africa and East Asia. Oxford University Press, pp 1–23

Pavitt, K. (1984).Sectoral patterns of technical change: towards a taxonomy and a theory. Research Policy 13(6):343–373

Powell, D., & Wagner, J. (2014). *The exporter productivity premium along the productivity distribution : evidence from quantile regression with nonadditive firm fixed effects*. 763–785. https://doi.org/10.1007/s10290-014-0192-7

Qureshi, M. S., & Velde, D. W. T. E. (2013). State-business relations, investment climate reform and firm productivity in sub-Saharan Africa. *Journal of International Development J.*, *25*(March 2012), 912–935. https://doi.org/10.1002/jid.2823

Rasiah, R., Beigpoor, R., & Yap, X. (2016). Technological Forecasting & Social Change Institutional support, innovation capabilities, and exports : Evidence from the semiconductor industry in Taiwan. *Technological Forecasting & Social Change*. https://doi.org/10.1016/j.techfore.2016.05.015

Rocha, IL. (2018). Manufacturing as a driver of economic growth. PSL Quarterly Review, 71(June). https:// doi.org/ 10. 13133/ 2037- 3643_ 71. 285_2

Rodrik, D. (1995). Getting Interventions Right: How South Korea and Taiwan Grew Rich. Econ Pol 20(20):53–107. https:// doi. org/ 10. 2307/ 344538

Rodrik, D. (2012).Why We Learn Nothing from Regressing Economic Growth on Policies. Seoul Jornal Economics 25(2):137–151

Rodrik, D., Grossman, G., Norman, V., & Rodrik, D. (1995). *How South Korea and Taiwan grew rich Get* (Vol. 10, Issue 20). https://www.jstor.org/stable/134453

Rosenbaum, P. R., & Rubin, D. B. (1984). Reducing bias in observational studies using subclassification on the propensity score. *Journal of the American Statistical Association*, *79*(387), 516–524. https://doi.org/10.1080/01621459.1984.10478078

Saeed Qureshi, Mahvash, and D. W. T. V. (2013). State-Business Relations, Investment Climate Reform and Firm Productivity in Sub-Saharan Africa. *Journal of International Development*, *168*(10–13), 1–30. https://doi.org/10.1002/jid

Salim, R. A. (1997). Alternative Approach of Measuring Capacity Utilization. *Bangladesh Institute of Development Studies*, *25*(3), 219–228.

Smirnova, O. P., & Ponomareva, A. O. (2022). Evaluating the Effectiveness of the Regional Industrial Policy Implementation. *Advances in Systems Science and Applications*, *22*(1), 51–64. https://doi.org/10.25728/assa.2022.22.1.1096

Smith JA,& Todd, P. (2005). Does matching overcome Lalonde's critique of nonexperimental estimators? Journal of Econometrics 125:305–353. https:// doi. org/ 10. 1016/j. jecon om. 2004. 04. 011

Söderbom, M. (2012). Firm size and structural change: A case study of Ethiopia. *Journal of African Economies*, *21*(SUPPL.2). https://doi.org/10.1093/jae/ejr046

Stiglitz, J. E. (2017). Industrial Policy, Learning, and Development. *The Practice of Industrial Policy*, *2012*, 23–39. https://doi.org/10.1093/acprof:oso/9780198796954.003.0002

Swink, M., & Hegarty, W. H. (1998). *Core manufacturing capabilities and their links to product differentiation*. *18*(4), 374–396.

Tesfu. (2012). The Adoption of International Financial Reporting Standards (IFRS) in Ethiopia : Benefits and Key Challenges. In *Addis Ababa University*.

Vrolijk, K. (2021a). Industrial policy and structural transformation : Insights from Ethiopian

manufacturing. *Development Policy Review*, *October 2019*, 250–265.

https://doi.org/10.1111/dpr.12496

Vrolijk, K. (2021b). Industrial policy and structural transformation : Insights from Ethiopian manufacturing. *Development Policy Review*, *39*, 250–265. https://doi.org/DOI: 10.1111/dpr.12496

WDI (2020) Sub-saharan Africa development statistics, World Development Inductors 2020. World Bank

Weiss, J (2011) Industrial policy in the twenty-first century: WIDER Working Paper No. 2011/55 (The United Nations University World Institute for Development Economics Research (UNU-WIDER); No. 2011/55). Retrieved September 25, 2022 from http:// hdl. handle. net/ 10419/ 54116

White H, Raitzer DA (2017) Impact evaluation of development intervention: a practical guide. Asian Development Bank(ADB)

APPENDICES

Annex 2A: Policy Rule and Beneficiary Firms by Each Sub-Industry Types

S/N	Selected Import-Competing Industry Types for Policy(Program) Intervention under Second Schedule	Number of Program Targeted sub-Industry Types	Policy Rule on Expected Average Value added	Number of Program Beneficiary Firms at the National level by Industry Types	Broad Categories of Identified Industry Types
1	Manufacture Food Products and Beverage	14	24.8	51	Food and Beverage
2	Manufacture Tobacco Products	1	32	0	Tobacco
3	Manufacture of Textiles	3	18.33	4	Textile
4	Manufacture Wearing Apparel	1	22	49	Apparels
5	Manufacture of Leather and Products of Leather	2	22	2	Leather
6	Manufacture Wood and Products of wood	1	13	2	Wood and cork
7	Manufacture of Furniture	1	15	10	Furniture
11	Manufacture of Non-Metallic Mineral Products	5	36.5	3	Non-Metallic Minerals
8	Manufacture of Paper, Paper Products and Printing	2	29	34	Chemicals
9	Manufacture of Chemical and Chemical products *	7	24.3	63	Chemicals
10	Manufacture of Rubber and Plastic Products	2	22.5	33	Chemicals
12	Manufacture of Basic Metals	5	10	80	Metal and Engineering
13	Manufacture of Fabricated Metals	7	13.71	10	Metal and Engineering
14	Manufacture of Machinery and Equipment	17	15	11	Metal and engineering
15	Manufacture of Motor Vehicles &Trailers	3	13.33	32	Metal and Engineering
16	Manufacture of Other Transport Equipment	10	14.29	9	Metal and Engineering
17	Manufacture of Other Manufacturing (medical equipment, jewelry, etc).	7	14.29	8	Metal and Engineering
18	Repairs and Installation of Machinery and Equipment	8	8.13	1	Metal and Engineering
19	Manufacture of Computer, Electronics and Optical	10	5.2	94	Metal and Engineering
20	Manufacture of Electrical Equipment	9	10.6	48	Metal and Engineering
Total/ Average	20	115	18.23	544	

Source; Source: Second Schedule Directive No.45/2016 (MoFEC, 2016) and (MOTI, 2019)..*Chemical and Chemical products include pharmaceuticals, soap and detergent, and basic chemicals

Annex 2B: Questionnaire and checklist

Firm /Enterprise level Questionnaire
Dear Respondents, Good Morning/Good Afternoon!

My Name is _____and I am from Addis Ababa University College of Business and Economics, Department of Economics. I am here on behalf Mr. Moges Tufa, a PhD Candidate in Development Economics to collect data for his PhD Dissertation preparation. The purpose of this survey is to evaluate the impact of industrial policy on domestic manufacturing firms and to assess the industrial capability of these firms. This survey is voluntary and it will take a maximum of half an hour. The information you give will be confidential and will only be used to prepare a PhD thesis. It will not include any specific name of the respondent and there will be no way to identify that you gave this information. Do you have any questions? You may ask questions about this study at any time by phone (0911-02-57-82 or mail: mogest2@yahoo.com). We highly appreciate your willingness to participate as a respondent in this survey.

- May I begin the interview now? Yes ☐ No ☐

Questionnaire No. : |__|__|__|

Name of the Firm/Enterprise (Optional) _____

1.01	What is the Legal status of your enterprise	1 = sole proprietor/ partnership; 2 = Share company; 3=Private Limited Company(PLC);4=Joint Venture; 5=State owned; 6=others	|__|
1.02	Type of Ownership	1= private/co-operative; 2= Joint Venture; 3= Public	|__|
1.03	Is the factory's ownership transferred from public to private	1=Yes; 2=No	|__|
1.04	What is the citizenship of the owner of the largest share of this enterprise?	1=Ethiopian 2=Foreigner	|__|
1.05	What is the sex of the executive CEO of the enterprise?	1=Male; 2=Female	|__|
1.06	What is the current education level of the General manager of the enterprise?	1=PhD; 2=MB.A/MSc; 3=Diploma; 4=Certificate; 5=others	|__|
1.07	How long the manager has been working in their current position?	1=less than 1years; 2= 1-3 years; 3 =3-5 year ;4 =more than 5 years	|__|
1.08	Has the manager participated in any further formal training over the last three years (2010-2012 E.C? (specify types _____)	1=Yes; 2= No	|__|
1.09	Is your enterprise part of an enterprise group?	1= Yes; 2= No	|__|
1.10	Provide the year of establishment in the Ethiopian Calendar. _____E.C./_____G.C		__
1.11	Initial paid-up capital in Ethiopian Birr. _____ETB.		__
1.12	Current paid-up capital in Ethiopian Birr. _____ ETB		__
1.13	Source of funds for start-up	1=Self ;2=Form loan ;3= Foreign Source; 4= others	|__|

1.14	Ownership of non-residential buildings	1=Privately Owned; 2=Rented; 3= Others	|__|
1.15	Current administrative location of your enterprise. (Specify Sub city/city_____	1=Addis Ababa; 2=Oromia Liyu zone 3=others	|__|
1.16	Your firm's current capacity utilization in %_____		___
1.17	No active working forces	1=Production workers _____; 2= Non -production workers_____; 3= Total 1+2= _____	___
1.18	No current working forces by employment type	1=Permanent =_____; 2= Temporary =_____: 3=Total =_____	
1.19	Does your firm employ expatriate staff?	1= Yes; 2 = No	|__|
1.20	Is yes to question 1.19, in which position?	1=Technical; 2=Managerial 3= Research and Development, 4 =Others	|__|
1.21	Is your firm represented by a national or local Industrial/business association?	1=Yes; 2=No	|__|
1.21	Is your firm represented in the Regional/National Chamber of Commerce?	1=Yes; 2=No	|__|
1.22	How long has your firm been supported by a government industrial support institute in years?	1=Less 1 year ;2 =1-3 years; 3=3-5 years; 4=more 5 years	|__|
1.23	Has your firm received any incentives for its operation from the government during the period 2009-2011 E.C	1=Yes ,2=No	|__|
1.24	If yes to question 1.23, what are the types of incentives/support? (Specify if others_____	1= Second Schedule program; 2= Training 3=Quality/Testing Facility, 6=Franko-valuta;4=others	
1.25	Has your firm has received any industrial incentives on operation from the Non-Governmental Organizations during the period 2008-2010 E.C	1=Yes; 2=No	|__|
1.26	Has your firm participated in any government policy discussion/dialogue in design or evaluation?	1=Yes ;2= No	|__|
1.27	If No to question 1.26 above, what are the reasons do you think?	1=Not invited 2= Not interested ;3=Through representation;4= others	|__|

1.26	Does your firm have a separate department for Research and Development?	1=Yes 2= No	|__|
1.27	Does your firm have a separate budget for R&D?	1=Yes; 2=No	|__|
1.28	Does your firm have a separate department working on technology adoption/upgrading?	1=Yes; 2 =No	|__|
1.29	Is the firm complying with quality standards?	1=Yes; 2=No	|__|
1.30	If yes to question 1.29 above, which quality standard? (Specify its type_____ _____)	1=International;2=nation al ;3=both; 4= others	|__|
1.31	Does your firm have any awareness/information about the ongoing fourth industrial/technology revolution? (Can you name the current revolution? _____	1=Yes; 2= No	|__|
1.32	Has your firm ever received any certification for product/ process excellence?	1=Yes ; 2= No	|__|
1.33	Has your firm received any patent rights in any one of your products?	1=Yes ; 2=No	|__|
1.34	Has your firm signed any collaborative agreement/memorandum of understanding with external organizations during the last three years? (specify if any_____	1=Yes;2 No	|__|
1.35	Has your firm received any budget support/grant from the government for either R and D or Technology development?	1=Yes;2 No	|__|
1.36	If yes to question 1.35, what are the purposes?	1=Technology;2=R and D;3=Bail out;3=Environmental protection; 4=Others	|
1.37	How long the current inventory stock of foreign inputs will be used for your operation months? (Please explain more ……)	_____	_____
1.38	Has your firm received/given any input from/to similar firms to smooth manufacturing operations?	1=Yes; 2=No	|__|
1.39	Does your firm have any sister company engaged in export?	1=Yes; 2= No	|__|

Checklist Forms 1: Recent status of manufacturing Firm's Physical Performance

Name of Support Industrial Institute: _____

Name of Directorate: _____

Name of Sub Sector/Sub-Industries _____

Name of specific sub-sector (Cluster/'Zerfi)_____

Name of the Firms/Enterprise (optional)_____

Year of Establishment in Ethiopian calendar_____

Location of the Firms_____

Questionnaire No. of the firm in a survey (to be filled after the survey) _____

Participation in Second Schedule (Benefited=1/Non-Benefited=2) _____

Checklist to be filled

	Items	**2011 E.C**	**2012. E.C**
A	Design capacity (Ideal capacity) in Ton		
B	Attainable Capacity (Potential capacity) in a ton		
C	Actual Production in Ton		
D	Employment at Design Capacity(total)		
E	Employment at Potential capacity(total)		
F	Actual Employment(total)		

CHAPTER THREE

3. The Effect of Firm Absorptive Capacity on Learning by Importing: Mediation Role of Industry Policy-Induced Intermediate Input Import

Abstract

A growing body of evidence from studies on firms suggests that firm-level capability building is important for a firm's sustained competitiveness and national growth. In this paper, we base our argument on contemporary theories of firms to investigate the link between a firm's absorptive capacity and its effects on utilizing external opportunities. The study also examines the mediation role of sector-specific industry policy in channeling the relationship between firm absorptive capacity (firm internal resource bases) and Learning by Importing. We applied a non-linear Generalized Structural Equation Model (GSEM) on the mix of administrative and survey data from 271 chemical manufacturing firms in Ethiopia. We estimate direct, indirect, total effects, and mediation path tests. Our findings support the hypotheses and the results are consistent across analysis steps. The notable finding implies the existence of a positive and significant association between firm internal resource bases and firm learning by importing. Heterogeneous and marginal analyses were discussed.

Keywords: industry policy-induced, learning by importing, open innovation, absorptive capacity, GSEM, mediation, Ethiopia

3.1 Introduction

Firm-level theory of capabilities has gained an appropriate lens for economic development as the growth of firms is a proximate cause of economic development and inequalities across countries(Nelson & Pack, 1999; Sutton, 2012). Whereas traditional economic development theorists stress resource accumulation (propelled by high investment rates), the capabilities framework stresses the importance of enterprise-level entrepreneurship, learning, and strategy (Lall & Teubal, 1998; Teece et al., 1997). The organizational learning process extends existing or new competencies at multilevel (Crossan et al., 1999; Lall & Teubal, 1998; Takahashi & Sander, 2017; Naldi & Davidsson, 2014). According to Teece et al. (1997), Winter (2007), and Crossan et al. (1999), a firm can renew its competencies to acquire congruency with environmental changes and emphasizes the key role of strategic management in adapting, integrating, and reconfiguring internal and external resources.

Further, the ongoing advances in technology have intensified global competition, which puts the need to learn at the center of firms' survival in both developed and developing countries (Fernández & Gavilanes, 2017; Crossan et al., 1999). Newman et al. (2016) argue that Africa's prospect for industrialization depends on whether its firms can acquire the capabilities needed to match competing producers in the global market.

The emerging enterprise-level studies make it clear that firms currently compete in capabilities (Newman et al., 2016; Sutton, 2012; Naldi & Davidsson, 2014) and it is mostly embodied in complex and interrelated working practices in situations that are difficult to codify and measure. The sources of the considerable variation in productivity of the same industries across firms can be attributed to differences in capabilities internal to the firm that grow larger as one moves from high to low-income countries (Becerril, 2010; Sutton, 2012; Newman, al., 2016; Naldi & Davidsson, 2014; Mcmillan et al., 2014).

The fact that a firm's capability is built, not bought, emphasizes the crucial role of a firm's internal resource bases as capabilities become embedded in routines (Nelson & Winter, 1982; Teece, 2019; Winter, 2007; Harris & Yan, 2019). For example, Zahra and George(2002, pp. 191) stated

that a ‘ firm cannot possibly exploit knowledge without first accruing it’ to emphasize the importance of a firm’s prior absorptive capacity to utilize external opportunities.

On the other hand, Newman et al. (2016) and Lema et al. (2018) indicated that firms in developing countries could learn from repeated contractual relationships with global suppliers. For instance, Fernández and Gavilanes (2017) and He and Dai (2017) documented the evidence of firm learning by importing from Ecuador and Chinese firms, respectively. Similarly, Haakonsson (2009) found out that firms in the Uganda pharma industry have upgraded by learning processes through importing from the global lead firms.

However, learning performance depends on the firm’s capacity to absorb and exploit external knowledge (Zou et al., 2018; Tu et al., 2006; Lane et al., 2001b; Zahra & George, 2002). Absorptive capacity plays a pivotal role in facilitating a firm’s learning from the external environment through knowledge identification, assimilation, and exploitation (Cohen &Levinthal, 1989, 1990). Nonetheless, for firms to utilize such opportunities beyond their boundaries requires prior capability (Fagerberg et al., 2018; Ruggie, 2018; 2016; Naldi & Davidsson, 2014).

Conversely, Zahra and George (2002) and Todorova and Durisin (2007) explained absorptive capacity as it is embedded in a firm’s routine and strategic process that would enable it to create multiple resources of competitive advantage. However, for these resources to be used for this purpose, they are assumed to be valuable, rare, imperfect mobility, and heterogeneously distributed across the firms (Barney 1991; Peteraf, 1993; Teece et al., 1997; Wernerfelt, 1984).

For example, Okafor et al. (2017) found that reducing import tariffs has created an enabling environment for Ghanaian manufacturing firms and suggested the need for complementary investment in absorptive capacity like human capital formation and subsidized R&D expenditures to benefit from technologies embodied in foreign inputs. Similarly, by taking Ethiopian manufacturing firms, Fiorini et al. (2018) indicated the positive impact of a reduction in tariff on intermediate inputs on firm productivity improvement while Abreha (2019) documented a productivity gain of 3.5-4.9% and evidence of learning by importing. The latter author also showed evidence of self-selection into import participation and a lack of complementary absorptive capacity to exploit learning potential from advanced trade partner countries.

However, studies by Veugelers (1997) and Mahnke et al.(2005) pointed out that empirical work to identify specific firm characteristics to generate absorptive capacity is limited due to a lack of constructs suitable to measures and/or the absence of appropriate firm-level data. Consequently, several proxies have been used in the literature to capture absorptive capacity. For example, Cohen & Levinthal (1989) used an organization's R&D efforts while Zahra and George (2002) used organizational routines and strategic processes to construct organizational absorptive capacity. Others, such as Abreha(2019) and Lane et al. (2006), used human capital whereas Vu(2018) used the gap in persistent efficiency between the firm and the best foreign firm in the same industry. This implies that little consensus has been reached on common constructs to measure absorptive capacity to analyze its effect on firm performance.

Despite the significant role of imports on national economic development, most previous firm-level studies in Ethiopia have focused on learning by exporting, considering exports as an important driver of productivity gain (Bigsten et al., 2004; Bigsten & Gebreeyesus, 2009; Rankin et al., 2006). According to Abreha(2019), in Ethiopia, importing by the manufacturing subsector accounts for 70% of merchandise trade in contrast 9% of exporting; 50-70% of the manufacturing firm depends on imported intermediate inputs sourced mainly from advanced countries. Shortage of intermediate inputs is at the top of all the problems and the major factor that limits the productive capacity of domestic manufacturing firms in Ethiopia (Abreha, 2019; Ferede & File, 2019). According to the Ethiopian (Central Statistical Agency) (CSA, 2018), the average import intensity by the Ethiopian chemical manufacturing industry is about 73%, against the manufacturing subsector's average of 50%. This indicates that the subsector relies extensively on import inputs for its operation.

The reason for such heavy reliance would be associated with the fact that chemical industries are labeled as complex science-based and technology-driven subsectors according to industry classification (Pavitt, 1984). In the Ethiopian context, chemical industries were identified as strategic priority subsectors under the import-competing industry and have been given more attention for the realization of national industrialization development goals. In line with this, in 2016 Ethiopian government implemented, a sector-specific industrial policy incentive named as Second Schedule Program to enable high-value-adding domestic industries to access foreign

intermediates relatively free of import duty or at a discounted rate. An important goal of the Program is to ease raw material constraints by targeting local manufacturing firms to enhance their competitiveness in the domestic market using the privilege of accessing better quality foreign inputs and interactive learning from global suppliers. According to studies, learning and technological efforts at the firm level remain largely hidden in the Global value chain(Morrison et al., 2007). Context-specific industrial policy measures have gained increasing acceptance to enhance national competitiveness (Aiginger & Rodrik, 2020; Weiss, 2011; Janneh, 2011; Te Velde et al., 2011; Newman et al.,2016; Chang, 2013; Rodrik, 2009).

In this study, we contribute to the literature by using a firm-level survey complemented with administrative data to build proxy index to capture firm absorptive capacity in the context of Ethiopian manufacturing firms whose generalization can be extended to the cases of many developing countries. To this end, we used firm internal resource bases that include expatriate employment, having a separate unit for R&D, and product quality controls to generate an index that is used as proxy for absorptive capacity (firm internal resource bases). The study also investigates the role of sector-specific industry policy-induced intermediate input import participation in mediating the effect of firm absorptive capacity on learning by importing. With increasing recognition of heterogeneity, such context-specific studies will generate better evidence on how a firm's internal resource bases will help to learn from the international market through repeated interaction with global suppliers in the course of intermediate input imports.

The empirical results from GSEM estimation indicate the firm's absorptive capacity has positively affected participation in the program and facilitates the firm's learning by importing.

This paper is structured as follows. First, we introduce the context and sector-specific policy-induced intermediate import program, which we use as a mediator for firms learning by importing. After that, we explain the theoretical bases and conceptual framework underlying our hypotheses. The third section is about the data and the analytical approach used to conduct data analysis, followed by the results and discussions. Finally, we end with a conclusion and implications.

3.2 The Context and Conceptual Framework of the Study

3.2.1 An Overview of Ethiopian Import Competing Strategy and Related Incentives

Ethiopia has attempted to hasten the process of industrialization through selective interventions, and efforts are being made to emulate the strategies followed by East Asian countries, particularly Taiwan and Korea. The Ethiopian government has emphasized an import-competing strategy in selected strategic priority subsectors during Growth and Transformation Plans[4] in addition to the existing export orientation strategy.

Accordingly, sectorial strategic goals were developed to promote priority subsectors with more potential for job creation, significant local markets, broad linkages with the rest of the economy, and contribution to rapid technology transfer (Ministry of Finance and Economy Development) (MoFED,2010) and (Ministry of Industry)(MoI,2013). Chemical industries are among the strategic priority subsectors identified under the import-competing industries and have given more attention to attaining national industrialization goals.

The targets set under this subsector are to build chemical industries to satisfy the domestic market and save foreign currency by supplying domestically produced essential chemical inputs for agriculture and industries that engage in export by developing the capability of the subsector (MoFED, 2010). As cases for the other priority subsectors, the Government of Ethiopia (GoE) established the Chemical and Construction Input Industries Development Institute (CCIIDI) in 2013 under the Ministry of Industry (MoI) by councils of ministry regulation No.288/2013 to lead and foster the development of chemical and construction input manufacturing industries. CCIIDI is an autonomous federal industrial institute with mandates of formulating policies, strategies, and programs to promote and solve the challenges of manufacturing firms under its jurisdiction using its human and industrial infrastructure. Furthermore, CCIIDI is also mandated to serve as a key facilitator and administrator of sector-specific industrial policy incentives in collaboration with other policy stakeholders.

[4] Ethiopian Growth and Transformation Plan I(2010-2015) and Growth and Transformation Plan II(2015-2020)

Ferede and File (2019) suggest that the selection of a strategic sector has to be grounded on the potential of the subsectors' linkage to the rest of the domestic economy to optimize welfare gain from investment in that specific sector.

Consistent with the national industrialization strategy, the manufacturing target of GTP II is to realize the vision of becoming the hub of African light manufacturing by 2025 by increasing the share of manufacturing to GDP from 5% in 2015 to 12% in 2020 and 17% in 2025 (NPC,2016, MoI,2013).

To realize such ambitious industrial goals, the GoE has implemented various industrial policy instruments tailored to export promotion and import-competing industries. Accordingly, in 2016, a sector-specific industry policy incentive program that targeted import-competing industries was implemented under directive no 45/2016 (MoFED, 2016). The intervention was designed to enable high-value-adding domestic industries in import-competing priority sectors to access higher quality foreign intermediate inputs at cheaper cost with accelerated custom services to use the privilege, special industrial technical support, and relatively better access to foreign currency. The main goal of the program is to enhance the competitiveness of import-competing industries in the domestic market performance and increase their exposure to learning from interaction with global suppliers.

Such policy measure has strong empirical ground as intermediate import tariff reduction will encourage firms to use higher quality inputs that could lead to improved performance (Okafor et al., 2017; Fernández & Gavilanes, 2017; Tu et al., 2006; Zaclicever & Pellandra, 2012). Studies by Hanlin et al. (2019) and Haakonsson (2009) confirmed that learning by importing would help firms in developing countries through insertion into global value chains. Moreover, well-designed industrial policy guides resource allocation through better coordination. For instance, Mbate (2017) argued for the key role of sound industrial policy in the reallocation of resources to relatively better value-adding activities to accelerate the structural transformation and fast-growing industrialization using evidence from Ethiopian apparel firms.

3.2.2 Theoretical Basis and Conceptual Framework

We base our arguments on a combination of related contemporary theories of firms. Accordingly, we used the insights of the resource-based view theory of the firm, the evolutionary theory of the firm, and open innovation approaches. These theories will provide a theoretical framework suitable for addressing our research question on the effects of a firm's absorptive capacity on learning by importing.

Resource-Based View (RBV) theory of the firm: According to Penrose (1959), economic rent differences across firms are attributed to heterogeneity in the firm's internal resource bases. However, to serve this purpose, the resource owned by the firm has to be valuable, rare, imperfectly imitable, and strategically non-substitutable (VRIN). According to this view, the firm's sustainable competitive advantage depends on the accumulation of VRIN (Wernerfelt,1984; Barney, 1991, 2001; Peteraf, 1993; Teece et al., 1997). The fundamental assumption underlying the resource-based view is the heterogeneity and the imperfect mobility of such resources. Firms with such resources will exploit external environment advantages compared to their counterpart part current and potential competitors. Several studies have confirmed that a resource portfolio consisting of VRIN would lead to better company performance (Derfus et al., 2008; Takahashi & Sander, 2017).

Evolutionary theory of the firm: According to Nelson & Winter(1982) a firm's capability building is a decision-making process that relies on the experience of innovative alternatives to past behavior after actively exploring its environment. Evolutionary theory characterizes firms as an explorer and creators rather than a strict maximizer and hence pay more attention to the process of learning through changes in the routines of firms (Nelson & Pack, 1999; Nelson & Winter, 1982; Winter, 2007). This view complements the RBV via the claim of the existence of heterogeneity among firms in competency or capability endowment. It considers knowledge as largely tacit, idiosyncratic, and context-dependent that embedded in the organizational routines and firms can replicate through imitation, and personal mobility (Nelson & Winter, 1982).

However, unlike the RBV, the evolutionary theory of the firm acknowledges the room for public policy to influence business performance through institutional frameworks. According to Nelson & Winter(1982), Rodrik(2000), and Khan et al. (2016), the market does not have a mechanism to entirely provide a conducive environment for learning due to externalities.

The state can provide incentives by distorting the market through redistributing resources in favor of specific industries to achieve national development targets (Rodrik, 2004; Chang, 2013; Do et al., 2013). Industrial policy often engages in redistributing resources in favor of specific industries, firms, or regions. Such targets are chosen by 'picking winners' or 'helping losers' (Rodrik, 2004; Lee et al., 2012). To this end, the state provides some preferred conditions, access to resources, or incentives based on specific contexts.

Open Innovation Approach: Chesbrough(2003) explained open innovation as an alternative firm's strategy to leverage external knowledge and technology to reduce cost and time spent on R&D expenditure. Open innovation will improve the permeability of a firm's boundary and new technologies allow new ways to collaborate across geographical distances. A firm starts engaging with different types of partners to acquire ideas and resources from the external environment (Dahlander et al., 2021; Felin & Zenger, 2014; Laursen & Salter, 2006). The practicality of this approach depends on whether the firm recognizes and internalizes the existence of many key stakeholders and expertise outside to complement or supplement its internal capabilities. However, the realization of open innovation benefits depends on the firm's internal resource bases as external actors can leverage a firm's investment in internal capabilities for collaboration.

The key argument is that a firm can exploit external knowledge by leveraging its absorptive capacity to identify and assimilate. Schmidt(2010) showed that absorptive capacity is path-dependent, and it influences firms' ability to exploit external knowledge while Zahra and George (2002) argued for incorporating absorptive capacity by firms into their operational activities to benefit. The latter author promotes a self-reliance view of the firms for absorptive capacity.

In summary, all three contemporary theories of the firms will converge on the importance of the absorptive capacity for a firm's exploitation of external opportunity as it enhances a firm's learning capability.

Several studies have confirmed the importance of the absorptive capacity for organizational learning orientation (Cimoli, Mario & Stiglitz, 2009; Lane et al., 2001; Derfus et al., 2008; Lyles & Salk, 1996). The most critical issue is whether the state's involvement through industrial policy or other mechanisms could help a firm's effort to learn. For example, for firms to fully exploit economies of scale, complementary institutional support has to be associated with financial support (Fagerberg et al., 2018; Lundvall, 2016).

Learning may be costly and public policy would play a vital role in facilitating learning by complementing the firm's efforts. However, there is limited empirical evidence to link industrial policy with firm resource bases as it is difficult to measure absorptive capacity due to a lack of suitable firm-level data. Naldi and Davidsson, (2014) proposed the relevance of survey-based measures for assessing the effectiveness of such interventions taking into account local contextual issues.

This study aims to examine the role of firm internal resource bases (absorptive capacity) and firm learning by importing through mediation effects of sector-specific industrial policy, using insights of contemporary theories of the firm.

We want to empirically test the following hypotheses:

Hypothesis 1(H1): Deeper firm internal resource bases will increase the firm's likelihood of exploiting external opportunities.

Hypothesis 2(H2): Policy-Induced Input Import participation mediates the effect of firm internal resource bases on the firm's likelihood of learning by importing

Hypothesis 3(H3): There is a strong association between firm internal resource bases and firm learning by importing.

Our conceptual framework mainly claims the mediating role of the sector-specific policy-induced intermediate input import participation in channeling the effect of the firm's absorptive capacity on learning by importing, as depicted in Fig 3-1.

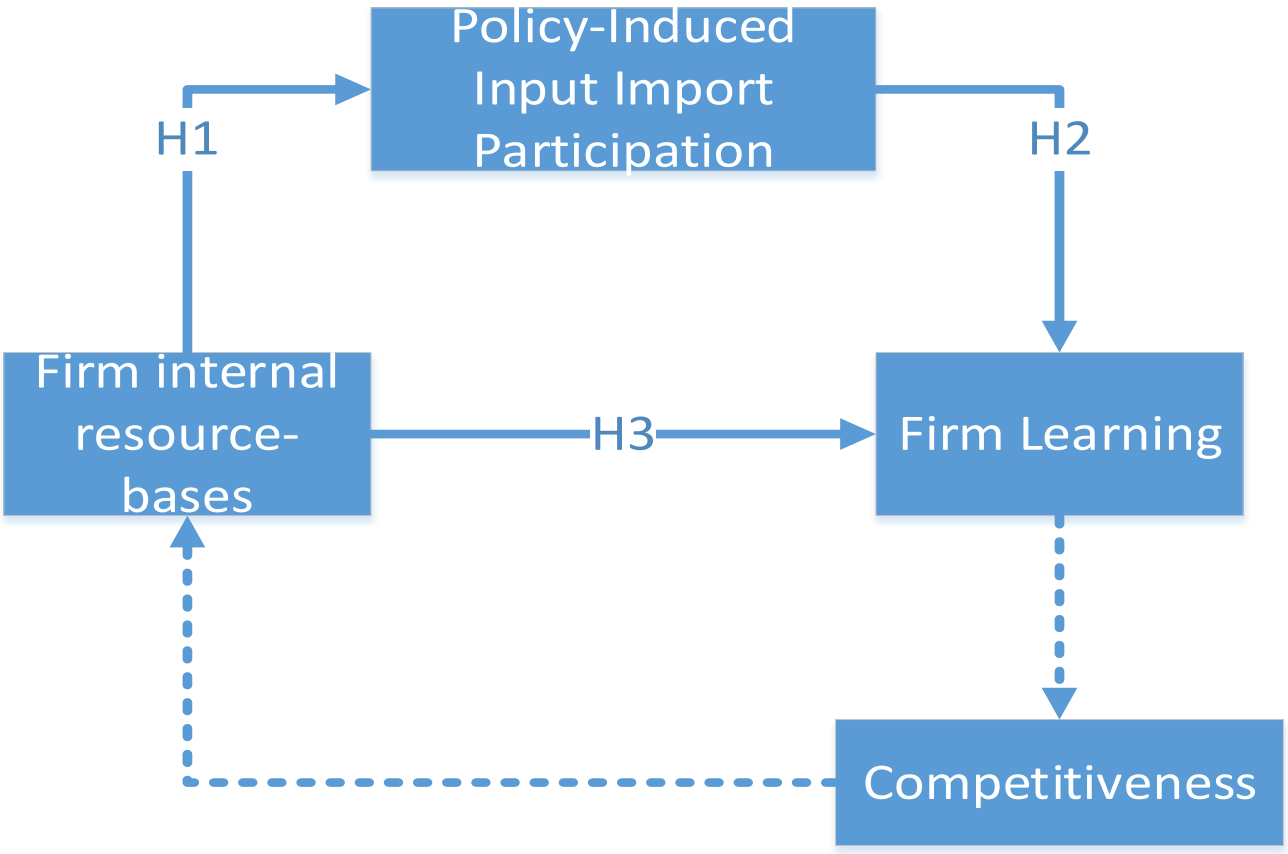

Figure 3-1 Conceptual Framework of the Study

In our framework, an internal resource base is used interchangeably with firm absorptive capacity and firm learning is through learning by interacting with the external environment and learning by doing (compliance to avoid non-conformance with standards in the context of this study). According to (Stiglitz, 2012, 2018), learning by doing refers to the capability of a firm to improve its performance through practice. Similarly, (Lundvall, 2016: p, 239) referring learning as a process of adaptation and competence building emphasizing that the former takes place through learning by doing and learning by interacting.

3.3 Data and Methods

3.3.1 Data Source and Measurement

The study used observational data that are sourced from an administrative and firm-level survey of the target population, large and medium manufacturing chemical industries, under the support of CIIDI for both program beneficiary and non-beneficiary firms. For administrative sources, we rely on the administrative sources of CCIIDI to generate institutional support indicators and firm profiles by chemical industry type. The unit of analysis for this study is firm/enterprise. We include 322 manufacturing firms based on CCIIDI (2018) administrative databases that include 97 program beneficiaries and 225 non-beneficiaries. These industries are sub-divided into four manufacturing sub-industry types that include Basic Chemical (48), Soap and Detergent (86), Pulp and paper (63), and Plastic and Rubber (125), which combines the number of both programs beneficiates and non-beneficiary firms.

To complement the administrative data, a firm-level survey was administered. This survey covers firm characteristics such as firm size, firm age, location, ownership, industrial association membership, product market destination, and firm performance indicators. The survey data were collected from establishments of all ownership types, legal forms, and locations in close collaboration with experts of CCIIDI from October 2020 to June 2021. Regarding firm performance, we used 2020/21 fiscal year values for analysis. The data collection instrument was piloted and revised using feedback from the pilot and comments from senior experts. An administrative checklist and structured survey instrument were also used to gather the required data. The surveys were completed by enterprise managers or representatives based on a checklist and structured questionnaires using all possible means, including onsite visits, through the mail, link, and telephone. We tried to triangulate the data against firms' profiles with respective industry types at CCIIDI. Out of 322 firms operating under the support of CCIIDI (CCIIDI, 2018), we used 271 for the final analysis, of which 96 are program beneficiaries with response rates of 84.16%. Regarding missing data, we managed to minimize using the input from the pilot survey used in variable selection and questionnaire revision. We assumed that there was no systematically missing data as the instruments used to collect the data are less sensitive to the business secrecy of firms.

Measurement

Dependent (outcome) Variable: *Firm Learning*

For this study, we employed the firm's voluntary compliance with national or international product quality standards certification as a proxy for firm learning performance measurement. The key assumption is, that firms that have benefited from policy-induced import will appreciate the value of product certification (learning) in the process of interaction with global suppliers. Studies by Hanlin et al. (2019), Lema et al. (2018), and Haakonsson (2009) argued that learning by importing would help firms in developing countries for their insertion into global value chains and linkage creation that could help for future capability building.

To measure policy participation, we used a binary variable (Policy Induced Intermediate Import participation) equal to 1, if the firm has participated (the beneficiary of the program) for at least one year during the period of five years (2016-2020) and 0 otherwise. The product quality standard variable is a binary response to the survey question if the firm has received quality standard certification to comply with its product. For example, Tan et al.,(1999) and Walker(2014) confirmed that learning occurs following compliance with the standards, and in the process of obtaining certification. In our target population, applying for product certification is voluntary compliance by firms. Ethiopian standard bodies do not impose any regulation restriction on the firms to adopt such certification except for specific standards where compliance with them is compulsory for reasons related to safety, health, and environment.

In the Ethiopian context, adopting product certification is a good indicator of a firm's voluntary learning. To apply for product quality standard certification, the firm must meet the minimum required preparation, such as training, and assessment as per the Ethiopian Standard Agency (ESA) rules and regulations. The other learning aspect of product quality certification is non-conformance to the rules and regulation of the holding the certification. In addition, compliances with certification has cost implications due to consistency of standards and upgrading of the product standards following changes in production technology. In summary, obtaining and maintaining

product certification involves much of interaction between internal and external experts and quality infrastructure authorities that exposes the firm to interactive learning.

Independent variable: ***Absorptive capacity/Firm Internal Resource Base***

Although there is no consensus on the concept of absorptive capacity construct, there are two widely used approaches to how it should be measured in the literature as a latent concept (Harris and Yan, 2019). The strategic management approaches or business strands of the literature that use a range of aspects of the often tacit processes underlying how a business operates benchmarked against competitors using case studies (Camisón & Forés, 2010).

On the other hand, economists preferred to use more extensive, nationally representative data, which is more objective for the generalizability of findings (Harris & Li, 2009). To this end, surveyed firms are asked to state if certain activities occur to empirically identify the construct. We adopted the latter approach to measuring firm internal characteristics that we assume better proxy absorptive capacity in the context of our study population. Accordingly, we used firm-level survey data to identify three proxy measures that include whether the firms have; a separate department of R&D, a quality department, and expatriate employment to generate indices for each firm as proxy for absorptive capacity indicator. The indices are defined from zero, where the firm has no any, to three, where the firm possessed all three types of proxy variables to identify absorptive capacity by the firm.

Controls

In addition to our measures of absorptive capacity, we controlled in our regression for the potential effects of other firm characteristics. These include firm size, firm age, credit constraint, location factor, ownership, and kaizen system implementations as defined under the variable definitions section. In addition, we use institutional and industrial support indicators such as the number of firms per R&D support staff and the number of MSc holders in support staff by each industry type.

3.3.2 Analytical Framework and Empirical Strategy

We use a Generalized Structural Equation model (GSEM) estimating approach that considers the issues of selectivity source of endogeneity and multiple interrelationships among the study variables (Kumar & Upadhaya, 2017; Lombardi et al., 2017). Unlike the two steps, that do not exploit the cross-equation correlations, GSEM is estimated using full-information maximum-likelihood (FIML) to overcome the limitation of the two-step approaches.

Since the main interest of this study is to test the mediating role of sector-specific industry policy-induced import participation on firm learning, it requires generating the direct and indirect effects through which firm learning by importing occurs. The GSEM technique is appropriate for testing for mediation relationships among variables with smaller standard error compared to the standard regression approach (Brown, 1997; Baron & Kenny, 1986; Kumar & Kumar, 2015; Kline, 2015; Iacobucci et al., 2007; Preacher & Zyphur, 2010).

Hence, to investigate the link between firm internal resource bases, policy-induced intermediate import participation, and firm learning, we use the following specification procedures.

First, we estimate the selection equation to establish the likelihood that a firm will become a policy beneficiary:

$$M_i = \alpha + \delta frb_i + \beta X_i + \varepsilon_i \quad \text{.....(1)}$$

Where M_i is a dummy if the firm is a beneficiary of the policy program, frb_i is our measure of the firm's internal resource bases, X_i and other controls, α δ β are structural parameters to be estimated, and ε_i is an iid error term.

According to Wernerfelt(1984), Barney(1991), and Peteraf (1993), internally controlled firm resources-bases include all kinds of assets, capabilities, processes, and knowledge that improve their sustainable competitiveness, and these resources are assumed to be valuable, rare, imperfectly imitable, and strategically non-substitutable. Thus, internal resource bases are expected to enable firms to exploit external opportunities, including government incentives. The main interest is to estimate and interpret δ which indicates the firm's internal resource base coefficient to establish a mediation association.

Second, we estimate the association between a firm's internal resource bases and firm learning, specified as follows:

$$Y_i = \sigma + \eta\, frb_i + \beta X_i + \nu_i \text{ ....(2)}$$

Where Y_i is a measure of a firm's learning by importing defined as a dummy variable that indicates whether the firm has obtained a product quality standard certification from a national or international standard agency and zero otherwise; σ , η and β are parameters to be estimated while ν_i is an iid error term of the equation. Here, the parameter of interest is η which indicates the relationship between the firm internal resource bases and firm learning after accounting for other control variables. Since program participation in the policy-induced intermediates' input import is voluntary, it could be self-selection biases in the Ethiopian manufacturing context (Abreha, 2019).

To account for simultaneity and endogeneity from selection biases, we estimate a single system of equations, which consists of equations (1) and (2):

$$Y_i = \mu + \eta'\, frb_i + \tau M_i + \beta X_i + \varsigma_i \text{ ....(3)}$$

Where Y_i is a measure of firm learning, μ , η' , τ are structural parameters to be estimated and ς_i is an error term that is assumed iid. Equation 3 η' indicates the same relationship between firm resource bases and firm learning as in equation 2 above after accounting for policy effect and other controls. Similarly, τ represents the relationship between policy-induced import participation and firm learning after controlling for the firm internal resource base and other controls.

The main effect of interest is to estimate and test the significance of η' , τ and the product of these two terms (δ x τ) to claim the mediation effects. The mediation effect requires the significance of the product of two structural parameter estimates($\delta * \tau$) (Kline, 2015; Iacobucci et al., 2007; Mackinnon et al., 2000; Baron & Kenny, 1986b).

3.3.3 Identification Assumption and Estimation Approach

To use GSEM, the following theoretical assumption has to be met. The sample size needs to be determined by the number of parameters to be estimated and the observations used in the model. Kline(2015) states that the recommended ratio ranges from 5:1 to 20:1, and the minimum number of observations of applying the structural model is approximately 150-200. However, according to Iacobucci(2010, p.92), the folklore rule of thumb for sample size has to be > 200.

Other scholars suggested the use of the 10-times rule for GSEM to determine the minimum sample size (Goodhue et al., 2012; Tanaka, 1987; Priyanath et al., 2020). According to this rule, 10 observations per parameter of the study are required for the identification of the model. The data used in this study met this requirement with a ratio of 9.34: 1, which is within the normal identification range. We exploit firm heterogeneity in the internal resource base of the firms as a source of variation and structural estimate parameters of the selection and main GSEM models using FIML with robust standard errors. In GSEM, results work to our benefit in being more likely to detect existing mediation patterns, being truer to the known population structural characteristics, and giving the elegance of the simultaneous estimation. The other advantage is it allows specifying a different distribution family for the dependent variable.

3.3.4 Definition of study variables

Table 3-1 Definition of the Study Variables

Variable name	Description	Unit
Program Participation	A binary choice variable(Policy Induced Intermediate Import) if the firm has participated/beneficiary of the program at least for one year during a period(2016-20120) (yes=1,0 otherwise)	Dummy
Product quality Certification/comply	If the firm has received product quality standard certification to comply with for its product (Yes=1,0 otherwise)	Dummy
Industry Types	Chemical industries, except for pharmaceutical in the context of Ethiopian industrial support strategy and second schedule program implementation(1=Basic Chemical, 2= Soap, and Detergent, 3=Plastic and Rubber=3 and pulp and paper=4)	Category
Location of the firms	The administrative location of a plant of the firms (Addis Ababa City=1, Oromia liyu zone=2, and others than 1&2=3)	Category
Ownership Type	Type of business ownership the firm belongs to (Domestic=1, Foreign=2 and joint Venture=3)	Category
Firm per industry R&D support staff	The number of firms per industry R&D support staff personnel by industry type	number
Percentage of MSc Industry staff	Percentage of MSc R&D support Staff out of total R&D support staff by industry types	ratio
Internal R&D	If the firm has an internal R&D department(Yes=1,0 otherwise)	dummy
Internal Quality Control	If the firm has a separate department for quality control (Yes=1, 0 otherwise)	dummy
Expatriate Employment	If the firm has employed expatriate staff for their operation (Yes= 1, 0 otherwise)	dummy
Kaizen implementation	If the firm has implemented a kaizen system of production (Yes=1, 0 otherwise)	dummy
Firm Age	The number of years the firm has been in operation since its establishment.	Number
Firm size	Natural log of actual employment	Number
Credit Constraint	If the firm's first major problem not to operate at full capacity is access to credit (Yes=1, 0 otherwise)	Dummy

3.4 Results and Discussion

3.4.1 Summary Descriptive Statistics

3.4.1.1 Means, Standard Deviations, and Correlations Analysis

Descriptive statistics for the variables used in this study are presented in Table 2. About 13% of surveyed target firms across all chemical industries replied they comply with product quality standard certification and 35% of the firms are beneficiaries of sector-specific industry incentive programs. There is a positive and significant pairwise correlation between program participation and product quality standard compliance (28%), firm internal resource bases, and product quality standard compliance (51%), and between firm internal resource bases and program participation (23%). The result also indicates a significant correlation between components of a firm's internal resource- bases such as firm R&D activities, expatriate employment, and internal quality control with product quality standard certification. As indicated in Table 3-2, the average number of firms per industry R&D support staff is about 10 firms, while only 32% of R&D industry support staff have an educational attainment of an MSc degree.

On the other hand, about 40%, 41%, and 9% of surveyed firms engaged in expatriate employment own a separate internal quality control department, and internal R&D department activities respectively, for their operation. Furthermore, the average combined indices constructed firm internal resource-bases (Frim Int_rb) is about 0.88 out of the maximum 3 when the firm replied that it has owned all of the aforementioned three internal resource-bases. About ownership, 77 % of the firms belong to domestic ownership and 21% foreign ownership, while the remaining 2% belongs to joint ventures. About 44% of the surveyed firms are located in Addis Ababa City Administration, 32% in the Oromia Liyu-Zone surrounding Addis Ababa city, while the remaining, 24% operates in other parts of the country. Regarding industry types, chemical industries are dominated by plastic and rubber (37%), followed by soap and detergent (25%), pulp and paper (22%), and basic chemicals account for (16%). Details of the relationship among study variables are indicated in Table 2.

Table 3-2 Means, Standard Deviations, and Correlations

Variable	Mean	Std.	1	2	3	4	5	6	7	8	9	10	11
1. Product qul_cert.	0.13	0.34											
2. Policy par. status	0.35	0.48	0.28***										
3, Firm Int_rb	0.90	0.85	0.51***	0.23***									
4. Inter qul. dept	0.41	0.49	0.40***	0.18***	0.72***								
5. Inter rd_dept	0.09	0.29	0.44***	0.14**	0.58***	0.30***							
6.Exptriate_emp	0.40	0.49	0.22***	0.13**	0.65***	0.06	0.11**						
7. Kaizen Imp.	0.14	0.34	0.26***	0.11*	0.27***	0.28***	0.32***	-0.01					
8. Firm per rd_staff	9.45	3.65	-0.34***	-0.12*	-0.27**	-0.40**	-0.08	-0.01	-0.10*				
9. Msc rd_staff	32.37	5.93	-0.23***	-0.07	-0.23**	-0.38**	-0.07	0.03	-0.17**	0.77***			
10. Firm Size	4.51	1.02	0.17***	0.07	0.12	0.06	0.24***	-0.01	0.23***	0.15**	0.05		
11. Firm Age	12.64	12.30	0.14**	0.02	0.06	0.09	0.13*	-0.05	0.24***	-0.05	-0.06	0.34***	
12. Credit Constraint	0.04	0.20	-0.08	-0.03	0.07	0.09	0.12*	-0.05	0.02	-0.23***	-0.11*	-0.02	0.05
Ownership													
Domestic	0.77	0.42											
Foreign	0.21	0.41											
Joint Venture	0.02	0.14											
Location													
Addis Ababa.City	0.44	0.50											
Oromia Liyu zone	0.32	0.47											
Others	0.24	0.43											
Industry Types													
Basic Chemicals	0.16	0.36											
Soap& Detergent	0.25	0.44											
Plastic and Rubber	0.37	0.48											
Pulp and Paper	0.22	0.41											
Observation	271	271	271										

Note: the correction here is one-tailed pairwise correction and *correlation is significant at 0.10, ** Correlation is significant at 0.05 ***correlation is significant at 0.01.

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3.4.1.2 Status of Product Standard Certification Adoption by Industry Types

As indicated under the descriptive statistics, only 13% of surveyed chemical manufacturing has complied with product quality standards. Of those firms with product quality standard certification, about 41% are adopted by Basic Chemical, 36% by Pulp and Paper and the remaining 14% and 8% are adopted by Soap and Detergent and Plastic and Rubber industries, respectively.

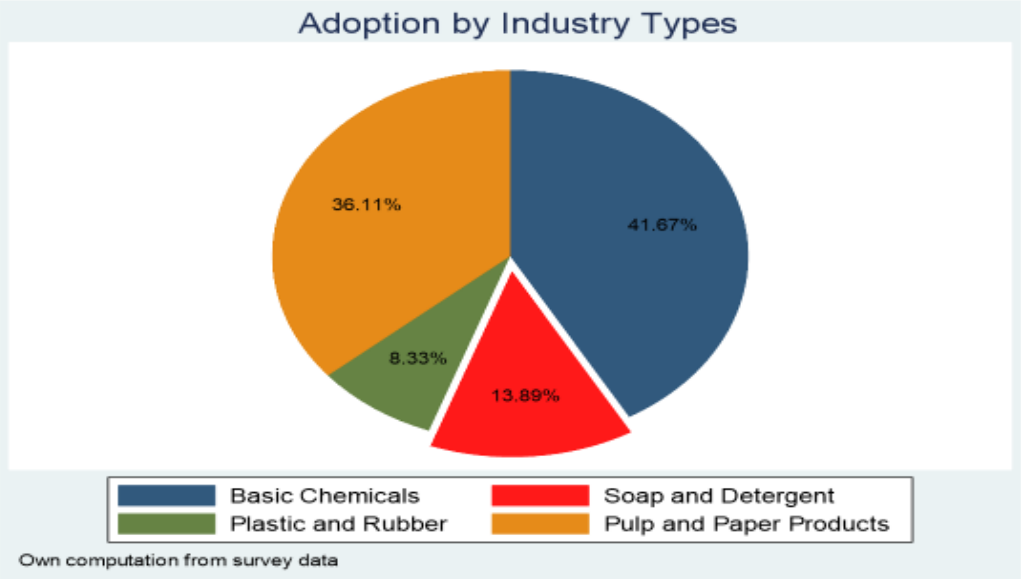


Figure 3-2 Distribution of Product Standard Certification by Industry Types

Low product quality certification might be due to the sub-sector's non-mandatory standards requirements (except for satisfying minimum product specifications). The other explanation could be related to the industries belonging to the import-competing industries that are predominantly operating in the domestic market where the relevance of quality standards is low due to low pressure from consumers/ buyers for reasons related to awareness or price sensitivity of domestic consumers. It could also be an indication of a low level of competition and consumer protection practices. This is one of the grounds, why we consider complying with product quality standards to serve as a proxy for learning by domestic firms.

On the other hand, the current initiatives and ongoing negotiation for an intra-Africa free trade agreement and accession to the (World Trade Organization) (WTO) will help firms to adopt

proactively to benefit as it assists them in reducing technical trade barriers. The other perspective to consider complying with product quality standards could be related to the firm's plan for collaboration along the global value chain by singling the global players their learning capability or surviving the possible technological disruption.

3.4.2 GSEM Result on Effect of Firm Internal Resource-Bases

3.4.2.1 Effects of Firm's Resource Bases on Program Participation and Learning

The results of the GSEM are presented in Table 3-3 (Equations 1 and 2). Columns 1 and 2 reported the outcomes of the selectivity equation (GSEM Probit(1), and the structural effects of a firm resource based on firm learning (GSEM Probit (2), respectively. The results of selectivity (Equation 1) addressed the 'selectivity' bias that shows the positive and significant likelihood of a firm's resource bases (absorptive capacity) on policy-induced import participation.

Our results also confirm the compliance by eligible firms to the policy targets by better value-adding import-competing industries as per the intention of the program(MoFEC,2016). This finding is consistent with previous empirical studies that support the self-selection of firms into import participation (Abreha, 2019; Zaclicever & Pellandra, 2018; Fernández & Gavilanes, 2017; He & Dai, 2017; Vogel & Wagner, 2010). Similarly, the GSEM results under column 2 of Table 3-3 (direct effect) indicate a positive and significant association between firm absorptive capacity and firm learning after accounting for potential confounders. That means that firms with better absorptive capacity have a higher likelihood of learning by importing. The simultaneous positive and significant effect of internal resource bases on program participation and firm learning shows the mediating role of policy-induced imports in channeling the effect of firm resource bases on firm's learning by importing. In other words, a firm's internal resource bases affect firm learning in two channels; directly, as predicted by the absorptive capacity literature (Cohen &Levinthal (1990), Lyles & Salk(1996), Lane et al.,(2001), Lane et al.,(2006), Tu et al.,(2006)T and indirectly through import participation. The latter is also supported by the new strand of the literature on learning by importing (Zaclicever & Pellandra, 2012; Edwards,2016; Newman et al.,2016; Lema et al., 2018; Abreha, 2019; Hanlin et al., 2019; Haakonsson, 2009).

The mechanism for firm learning potential is probably associated with repeated interactions with the global supplier and would be labeled as interactive learning. In our case, complying with the quality standard plays as a proxy for firm learning by doing and learning from external sources such as suppliers. In addition, it also serves as a key indicator for future collaboration along the supply value chain by signaling better performance to global suppliers. The details of the results are presented in Table 3-3.

Table 3-3 GSEM Policy-Induced Import Participation and Firm Learning

VARIABLES	(1) Policy (Policy par. status)	(1) Learning (Product qul_cert)
Firm Int_rb	0.335***	1.003***
	(0.110)	(0.225)
MSc rd_staff	0.025	0.038
	(0.021)	(0.050)
Firm per rd_staff	-0.064*	-0.236***
	(0.035)	(0.071)
Kaizen Imp	0.137	0.141
	(0.248)	(0.319)
Firm size	0.085	0.423**
	(0.088)	(0.173)
Firm age	-0.004	0.009
	(0.007)	(0.009)
Credit constraint	-0.530	-6.283***
	(0.422)	(0.471)
Oromia Liyuzone	0.008	0.060
	(0.192)	(0.359)
Others	-0.197	-0.708**
	(0.219)	(0.356)
Foreign Ownership	-0.159	0.233
	(0.222)	(0.351)
Joint Venture	0.217	-0.555
	(0.592)	(0.619)
Constant	-1.156*	-3.642**
	(0.616)	(1.747)
Observations	271	271

Robust standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1, include bases

3.4.3 GSEM Structural Effect of Firm Internal Resource Bases on Firm Learning

To account for selectivity bias and simultaneity, we used full information maximum likelihood GSEM technique which is the superior method in testing for mediation relationships by estimating a single GSEM with two dependent variables. Based on separate results of the GSEM regression under Table 3, further analysis of the structural effects of a firm internal resource base through the mediation effect of program participation is presented in Table 3-4. Firm internal resource (firm Int_rb) has three types of effects on firm learning: direct effect, indirect (mediation effect), and the total effect or the combined effects.

Table 3-4 Main GSEM Result of Firm Internal Resource Bases on Firm Learning

VARIABLES	(1) Coefficient	Robust Sd	dy/dx	z
Product qul_cert: Dependent 1				
Policy Part. status	0.522**	(0.251)	0.055**	2.29
Firm Int_rb	0.969***	(0.223)	0.102***	6.04
MSc rd_staff	0.040	(0.054)	0.004	0,81
Firm per rd_staff	-0.233***	(0.075)	-0.025***	-4.42
Kaizen Implementation	0.106	(0.325)	0.011	0.33
Firm age	0.009	(0.009)	0.001	0.97
Firm size	0.372**	(0.165)	0.039**	2.55
Credit constraint	-6.200***	(0.557)	-0.655***	-6.28
Oromia Liyuzone	-0.065	(0.353)	-0.007	-0.18
Others	-0.800**	(0.352)	-0.075**	-2.16
Foreign ownership	0.221	(0.341)	0.024	0.63
Joint Venture	-0.617	(0.576)	-0.054	-1.25
Constant	-3.619*	(1.876)		
Policy Part.status: Dependent 2				
Firm Int_rb	0.335***	(0.110)	0.117***	3.20
MSc rd_staff	0.025	(0.021)	0.009	1.20
Firm rdstaf	-0.064*	(0.035)	-0.022*	-1.85
Kaizen Implementation	0.137	(0.248)	0.048	0.55
Firm age	-0.004	(0.007)	-0.001	-0.56
Firm size	0.085	(0.088)	0.030	0.96
Credit constraint	-0.530	(0.422)	-0.185	-1.26
Oromia Liyuzone	0.008	(0.192)	0.003	0.04
Others	-0.197	(0.219)	-0.067	-0.92
Foreign ownership	-0.159	(0.222)	-0.054	-0.73
Joint Venture	0.217	(0.592)	0.079	0.36
Constant	-1.156*	(0.616)		
Observations	271			

Note *** p<0.01, ** p<0.05, * p<0.1 for ownership the domestic is base, for location Addis Ababa is used as a base

As illustrated in Table 3-4, the GSEM result reveals a positive and significant association between firm internal resource bases and firm learning. Since we used the probit link function, at the margin, the effect of one more unit of firm internal resource will increase the probability of policy participation and learning by importing by 5.5%, and 11.7% respectively. These results are consistent with the correlation results and separate regression results. The result also shows a positive and significant effect on a firm size on the likelihood of learning by importing.

This result is consistent with studies such as Zhu et al. (2012), Hudson and Orviska (2013), and Fikru (2014b), who found a positive effect of firm size on the likelihood of adopting international standards that could lead to firm learning. Similarly, the government's industrial support (Firm rd_Staff) plays a significant role in firm learning as there is a negative and significant association between the number of firms per industry R&D support staff. If the ratio of firms per R&D decreases, the intensity of support will increase; hence, more technical support improves the firm's likelihood of policy participation and learning. The following picture depicts all three structural effects of firm resources bases on firm learning.

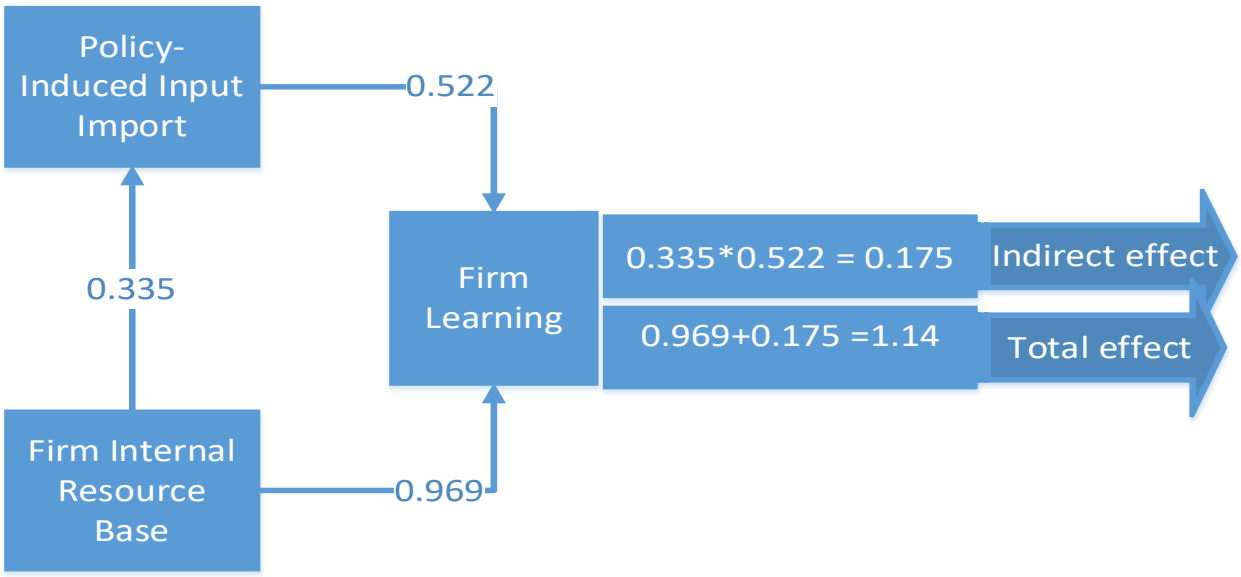


Figure 3-3 Structural Effect of Firm Internal Resource-bases on Learning by Importing

3.4.3.1 The Direct Effect of Firm Internal Resources Based on Firm Learning

Based on the GSEM results, depicted in Fig 3, there is a positive and significant association between the firm internal resource bases (Firm int_rb) and the firm's likelihood of learning (Product qul_crt). This result is consistent with contemporary theories of the firm as predicted by the (resource-based view) (RBV) Barney (1991) and Wernerfelt (1984) and the evolutionary theory of the firm Nelson & Winter (1982). According to these theoretical views, firm learning performance is path-dependent and highly driven by the firm's internal capability, which is heterogeneously distributed across the firms. Empirically, many studies have suggested a critical role of firm absorptive capacity for the firm's learning as implied by the open innovation approach.

3.4.3.2 The Indirect Effect (Mediation Effect)

From Fig.3-3, there is a positive and significant association between a firm's internal resource bases and policy-induced import participation, which in turn has a positive and significant effect on firm learning by importing. Thus, the mediation effect of policy-induced imports on firm learning is the product of the two coefficients, which are also positive and significant. Figure 3 summarizes these effects.

3.4.3.3 The Total Effect of Firm Absorptive Capacity on Firm Learning

As indicated in Fig 3, the total effect of firm internal resource bases on firm learning is the sum of direct and indirect effects, which is 1.14(0.969+0.175). Thus, policy-induced import participation positively and significantly mediated the role of firm internal resources bases on firm learning by importing. It has improved the likelihood of learning by focal firms from 0.969 to 1.14 and the statistical test for the results of the structural paths also confirms the results.

3.4.3.4 **Statistical Test of the Mediation Effect Analysis**

We used a nonlinear combination of the GSEM to test for each structural path coefficient's significance. We found that all the statistical tests supported our hypotheses, as indicated by the conceptual framework in Fig 3-1. The statistical tests confirmed the positive and significant role of the firm's internal resources bases on its participation in policy-induced imports and learning by importing (H1 and H2) respectively. Similarly, policy-induced import participation has positively and significantly mediated the effects of firm internal resource bases on firm learning by importing (H3).

Table 3-5 Mediation Path Effect Test

	Coefficient	Std. err.
Paths		
Firm internal resource on policy	0.335***	0.109
Policy on firm learning	0.522**	0.250
Indirect effect	0.174*	0.100
Direct effect	0.969***	0.222
Total effect	1.14***	0.250

3.4.4 Marginal and Heterogeneous Analysis

In this section, we discuss the marginal effect of firm-based resources on the firm probability of learning for marginal changes in firm-based resources and the effect of the location on the likelihood of firm learning

3.4.4.1 Marginal Effect of Firm Resource Bases

We hypothesized that firms with deeper internal resource bases would be more likely to learn or exploit external opportunities, and thus learn by importing. From Fig 3-4, a unit increase in the firm-based resource will increase the probability of the firm's policy participation (pro_stus) and learning (quac_cert) by 11.67% and 10.23%, respectively, while policy-induced intermediate input imports participation will increase firm learning by importing by 5.51% for policy beneficiary firms. This result is consistent with our previous findings and discussions that firm resources are key to exploiting knowledge from external partners for successful future business activities and collaboration. The marginal effect of the firm internal resource base effect is depicted in Fig.3-4.

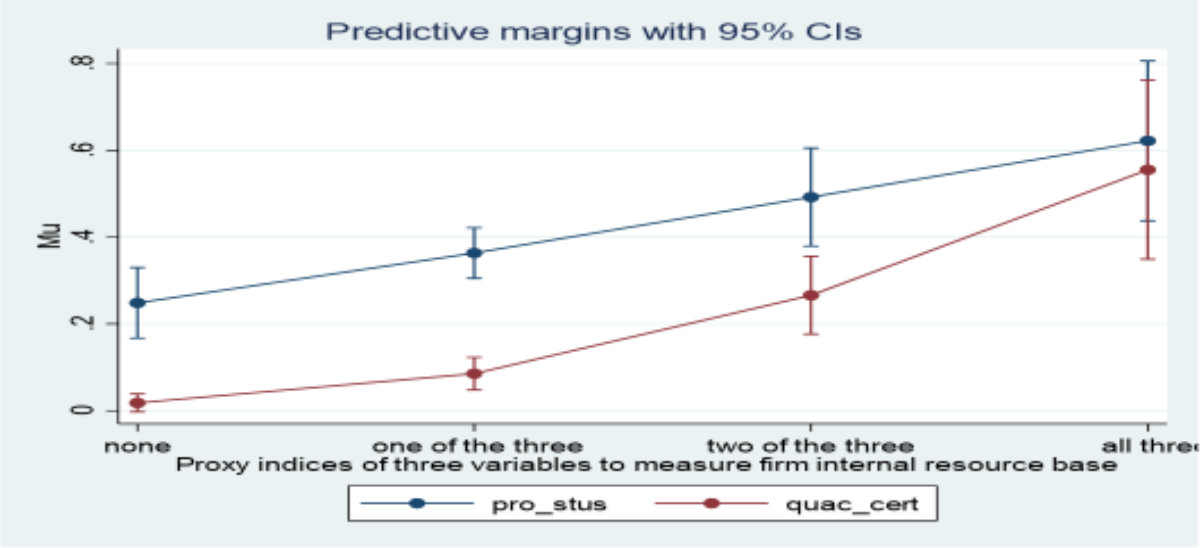


Figure 3-4 Marginal Effects

Our findings are consistent with previous studies that support the positive impact of firm internal resource bases on sustained competitiveness in a new economic environment with greater integration and dependence on the world market(Peteraf, 1993; Haakonsson,2009; Mahnke et al.2005; Okafor et al., 2017; Vogel & Wagner, 2010; Gereffi & Memedovic,2003; Arend, 2006; Ray et al., 2004; Morris & Staritz, 2017). According to these scholars, firms differ in their internal resource bases that serve as a primary source of sustained competitive advantage.

3.4.4.2 Frim Location and Firm Learning

In the case of location, the marginal effect of being in Addis Ababa and Oromia Liyu- Zone has no difference. These two regions are almost share similar in basic facility access and institutional support from the government due to their proximity to the capital city of the country.

However the marginal effect of location on learning is negative for firms located in other regions compared to the capital city. The probable reason could be less accessibility to skilled workforces and infrastructures as one moves away from the capital city.

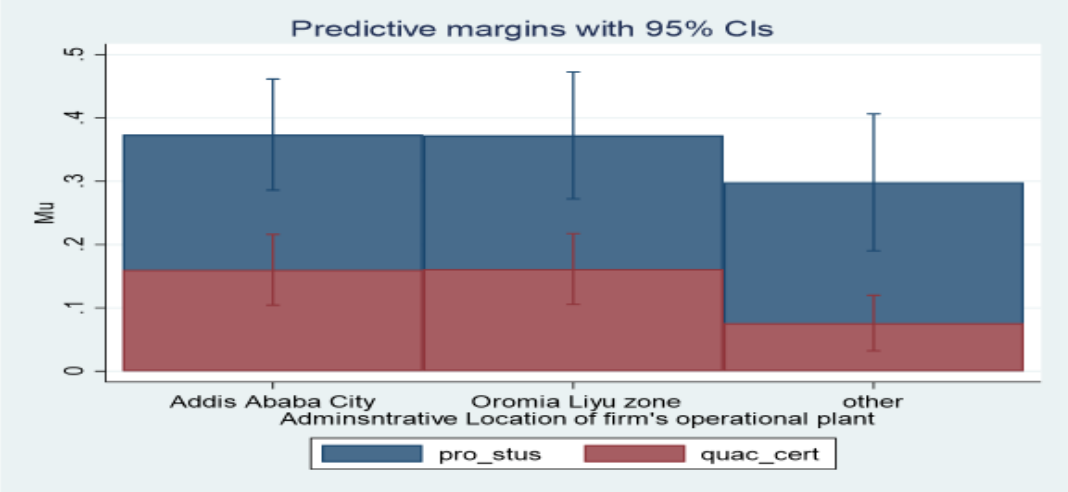


Figure 3-5 Effect of Location on Firm Learning

3.5 Conclusion and Policy Implication

This article attempts to measure a firm's internal resource bases to investigate its effects on learning by importing, using a mix of administrative and field survey data. Firm-level indices proxy for firms' absorptive capacity were generated, based on previous empirical studies. We used insights from contemporary theories of firms as a conceptual basis to analyze the association between the firm's absorptive capacity and learning by importing. We developed and tested hypotheses on the effects of the firm's absorptive capacity and the mediation role of sector-specific industry policy-induced import participation on the firm's learning by importing. We used the Generalized Structural Equation Model (GSEM) as an empirical model to test the hypotheses.

The results show that the firm's absorptive capacity has positively affected participation in the program and facilitates the firm's learning by importing. We found an increasing marginal effect of the firm's resource base on the firm's learning by importing. Firm size and government institutional support have positively and significantly contributed to firm learning by importing. This indicates that firms have to improve their absorptive capacity in continuous ways for better utilization of external opportunities, and that strengthened institutional support enhances a firm's capacity. We conclude that differences across firms in the utilization of external opportunities can be attributed to the prior deepening of capabilities internal to the firm and institutional support by the government.

The findings of our study can help policymakers and business leaders devise effective strategies and policies that foster external knowledge acquisition, skill development, and technology adoption. The government has to provide incentives by prioritizing a firm's absorptive capacity to speed up structural transformation and maximize the value of public resources. Overall, the findings suggest the importance of building the strong absorptive capacity of firms in designing evidence-based policy. Thus, policymakers need to understand the developmental processes inside the firm in strategy formulation, particularly in public resource allocation.

REFERENCE

Abreha, K. G. (2019). Importing and Firm Productivity in Ethiopian Manufacturing. World Bank Economic Review, 33(3), 772–792. https://doi.org/10.1093/wber/lhx009

Aiginger, K., & Rodrik, D. (2020). Rebirth of Industrial Policy and an Agenda for the Twenty-First Century. Journal of Industry, Competition and Trade, 20, 189–207. https://doi.org/https://doi.org/10.1007/s10842-019-00322-3

Arend, R. J. (2006). Tests of the resource-based view : do the empirics have any clothes ? Strategic Organization Vol, 4(4), 409–422. https://doi.org/10.1177/1476127006070309

Barney, J. B. (2001). Resource-based theories of competitive advantage: A ten-year retrospective on the resource-based view. Journal of Management, 27(6), 643–650. https://doi.org/10.1016/S0149-2063(01)00115-5

Baron, R. M., & Kenny, D. A. (1986a). The Moderator-Mediator Variable Distinction in Social Psychological Research : Conceptual, Strategic, and Statistical Considerations. Journal of Personaliy and Social Psychology, 6, 1173–1182.

Baron, R. M., & Kenny, D. A. (1986b). The Moderator-Mediator Variable Distinction in Social Psychological Research. Conceptual, Strategic, and Statistical Considerations. Journal of Personality and Social Psychology, 51(6), 1173–1182. https://doi.org/10.1037/0022-3514.51.6.1173

Becerril, J. (2010). The Impact of Improved Maize Varieties on Poverty in Mexico : A Propensity Score-Matching Approach. World Development, 38(7), 1024–1035. https://doi.org/10.1016/j.worlddev.2009.11.017

Bigsten, A., & Gebreeyesus, M. (2009). Firm productivity and exports: Evidence from Ethiopian manufacturing. Journal of Development Studies, 45(10), 1594–1614. https://doi.org/10.1080/00220380902953058

Bigsten, A., Collier, P., Dercon, S., Fafchamps, M., Gauthier, B., Gunning, J.W., Oduro, A., Oostendorp, R., Pattillo, C., Söderbom, M., Teal, F. and Zeufack, A. (2004) 'Do African manufacturing firms learn from exporting?', Journal of Development Studies, Vol. 40, No. 3, pp.115–141, DOI: 10.1080/0022038042000213229

Brown, R. L. (1997). Assessing specific mediational effects in complex theoretical models. A Multidisciplinary Journal, 4, 142–156. https://doi.org/10.1080/10705519709540067

Camisón, C., & Forés, B. (2010). Knowledge absorptive capacity: New insights for its conceptualization and measurement. Journal of Business Research, 63(7), 707–715. https://doi.org/10.1016/j.jbusres.2009.04.022

Central Statistical Agency (CSA) (2018) Report on Medium and Large Manufacturing and Electricity Industries Survey, Addis Ababa, Ethiopia.

Chang, H.J. (2013) 'Industrial policy: can Africa do it?', in The Industrial Policy Revolution II: Africa in the 21st Century, pp.114–132, Palgrave Macmillan, London, UK.

Chemical and Construction Input Industry Development Institute (CCIIDI) (2018) Annual News Booklet, Vol. 2 No. 4, Addis Ababa, Ethiopia.

Chesbrough, H.W. (2003) Open Innovation: The New Imperative for Creating and Profiting from Technology, Harvard Business Press, Boston, Massachusetts.

Cimoli, Mario, G. D., & Stiglitz, J. E. (2009). The Political Economy of Capabilities Accumulation: the Past and Future of Policies for Industrial Development (Laboratory of Economics and Management, Sant'Anna School of Advanced Studies).

Cohen &Levinthal. (1989). Innovation and Learning : The Two Faces of R & D. The Economic Journal, 99, 569–596.

Cohen &Levinthal. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation. Administrative Science Quarterly, 35(1), 128–152. https://doi.org/10.2106/00004623-195840030-00002

Crossan, M. M., Lane, H. W., & White, R. E. (1999). An organizational learning framework: From intuition to institution. Academy of Management Review, 24(3), 522–537. https://doi.org/10.4271/2003-01-3138

Dahlander, L., Gann, D. M., & Wallin, M. W. (2021). How open is innovation ? A retrospective and ideas forward. Research Policy, 50(4), 104218. https://doi.org/10.1016/j.respol.2021.104218

Derfus, P. J., Maggitti, P. G., Grimm, C. M., & Smith, K. G. (2008). The Red Queen effect: Competitive actions and firm performance. Academy of Management Journal, 51(1), 61–80. https://doi.org/10.5465/AMJ.2008.30708624

Edwards, L. (2016). Importing and firm performance : New evidence from South Africa WIDER Working Paper 2016 / 39 Importing and firm performance New evidence from South Africa

Fagerberg, J., Lundvall, B. Å., & Srholec, M. (2018). Global value chains, national innovation systems, and economic development. European Journal of Development Research, 30(3), 533–556. https://doi.org/10.1057/s41287-018-0147-2

Felin, T., & Zenger, T. R. (2014). Closed or open innovation ? Problem-solving and the governance choice ☪. Research Policy, 43(5), 914–925. https://doi.org/10.1016/j.respol.2013.09.006

Ferede, T., & File, B. (2019).Rural–Urban Linkages in Ethiopia. In C. C. and O. A. Cheru F (Ed.), The Oxford Handbook of the Ethiopian Economy. (pp. 763–784). Oxford University Press. Oxford.

Fernández, J., & Gavilanes, J. C. (2017). Learning-by-importing in emerging innovation systems: evidence from Ecuador. Journal of International Trade and Economic Development, 26(1), 45–64. https://doi.org/10.1080/09638199.2016.1205121

Fikru, M.G. (2014) 'Firm-level determinants of international certification : evidence from Ethiopia', World Development, Vol. 64, pp.286–297,

https://doi.org/10.1016/j.worlddev.2014.06.016.

Fiorini, M., Sanfilippo, M., & Sundaram, A. (2018). Input tariffs, Roads and Firm Performance : Evidence from Ethiopia * (IGC Working Paper No. F-32403-ETH-1, Issue February 15,).

Gereffi, G., & Memedovic, O. (2003). The Global Apparel Value Chain : What Prospects for Upgrading by Developing The Global Apparel Value Chain : What Prospects for Upgrading by Developing Countries ? (Issue May 2014).

Goodhue, D. L., Lewis, W., Thompson, R., & Thompson, R. (2012). Does RLS Have Advantages for Small Sample Size or Non-Normal Data? MIS Quarterly, 36(3), 981–1001.

Ha-Joon, C. (2013). IS INDUSTRIAL POLICY NECESSARY AND FEASIBLE IN A FRICA ? Theoretical considerations and historical lessons (Issue February).

Haakonsson, S. J. (2009). "Learning by importing" in global value chains: Upgrading and South-South strategies in the Ugandan pharmaceutical industry. Development Southern Africa, 26(3), 499–516. https://doi.org/10.1080/03768350903086861

Hanlin, R., Okemwa, J., & Gregersen, C. (2019). Building competencies and capabilities through projects: examples from Kenya's renewable energy sector (Issue 8). https://www.irekproject.net/wp-content/uploads/IREKPaper8.pdf

Harris, R., & Li, Q. C. (2009). Exporting, R&D, and absorptive capacity in UK establishments. Oxford Economic Papers, 61(1), 74–103. https://doi.org/10.1093/oep/gpn011

Harris, R., & Yan, J. (2019). The Measurement of Absorptive Capacity from an Economics Perspective : Definition, Measurement And Importance. Journal of Economic Surveys, 33(3), 729–756. https://doi.org/10.1111/joes.12296

He, Z. and Dai, M. (2017) Learning by Importing, Columbia University [online] http://www. columbia.edu/~zh2178/Learning%20by%20Importing.pdf (accessed 15 September 2022).

Iacobucci, D. (2010). Structural equations modeling: Fit Indices, sample size, and advanced topics. Journal of Consumer Psychology, 20(1), 90–98. https://doi.org/10.1016/j.jcps.2009.09.003

Iacobucci, D., Saldanha, N., & Deng, X. (2007). A Meditation on Mediation : Evidence That Structural Equations Models Perform Better Than Regressions. JOURNAL OF CONSUMER PSYCHOLOGY, 17(2), 139–153. https://doi.org/10.1016/S1057-7408(07)70020-7

Jay Barney. (1991). Firm Resource and Sustained Competitive Advantage. Journal of Management, 99–120.

Khan, Z., Lew, Y. K., & Akhtar, P. (2016). The influence of industrial policy and national systems of innovation on emerging economy suppliers ' learning capability. Industry and Innovation, 23(6), 512–530. https://doi.org/10.1080/13662716.2016.1189811

Kline, R. B. (2018). Principles and practice of structural equation modeling. Canadian Studies in Population, 45, 188–195. https://doi.org/10.25336/csp29418

Kumar, Sunil, & Kumar, S. (2015). Structure Equation Modeling Basic Assumptions and Concepts : A Novices Guide. QR Code for Mobile users. 03(07), 25–28.

Kumar, Sunlil, & Upadhaya, G. (2017). STRUCTURE EQUATION MODELING BASIC ASSUMPTIONS AND CONCEPTS: A NOVICES GUIDE. International Journal of Quantitative and Qualitative Research Methods, 5(4), 10–16.

Lall, S., & Teubal, M. (1998). "Market-stimulating" technology policies in developing countries: a framework with examples from East Asia. World Development, 26(8), 1369–1385. https://doi.org/10.1016/S0305-750X(98)00071-0

Lane, P. J., Koka, B. R., & Pathak, S. (2006). The reification of absorptive capacity: A critical review and rejuvenation of the construct. Academy of Management Review, 31(4), 833–863. https://doi.org/10.5465/AMR.2006.22527456

Lane, P. J., Salk, J. E., & Lyles, M. A. (2001a). Absorptive capacity, learning, and performance in international joint ventures. Strategic Management Journal, 22(12), 1139–1161. https://doi.org/10.1002/smj.206

Lane, P. J., Salk, J. E., & Lyles, M. A. (2001b). Absorptive Capacity, Learning, And Performance In International Joint VentureS. Strategic Management Journal, 1161(August 1998), 1139–1161. https://doi.org/10.1002/smj.206

Laursen, K., & Salter, A. (2006). OPEN FOR INNOVATION : THE ROLE OF OPENNESS IN EXPLAINING INNOVATION PERFORMANCE. 150(March 2004), 131–150. https://doi.org/10.1002/smj.507

Lee, J., Clacher, I., & Keasey, K. (2012). Industrial policy as an engine of economic growth : A framework of analysis and evidence from South Korea (1960 – 96). 6791. https://doi.org/10.1080/00076791.2012.683420

Lema, R., Hanlin, R., Elmer, U., & Nzila, C. (2018). Renewable electrification and local capability formation : Linkages and interactive learning. Energy Policy, 117(February), 326–339. https://doi.org/10.1016/j.enpol.2018.02.011

Lombardi, S., Santini, G., Marchetti, G. M., & Focardi, S. (2017). Generalized structural equations improve sexual selection analyses. PLOS ONE, i, 1–20.

Lundvall, B.Å. (2016) The Learning Economy and the Economics of Hope, Anthem Press, London SW19 7ZG, UK.

Lyles, M., & Salk, J. (1996). Knowledge Acquisition from Foreign Parents in International Joint Ventures : An Empirical Examination in the Hungarian Context. Journal of International Business Studies, 27(5), 877–903. http://www.jstor.org/stable/155573

Mackinnon, D.P., Krull, J.L. and Lockwood, C.M. (2000) 'Equivalence of the mediation', Confounding and Suppression Effect, Vol. 1, No. 4, pp.173–181.

Mahnke, V., Pedersen, T., & Venzin, M. (2005). The impact of knowledge management on MNC subsidiary performance: the role of absorptive capacity. In MIR: Management International Review. https://doi.org/10.1007/978-3-322-91003-5

Mbate, M. (2017). Structural change and industrial policy: A case study of Ethiopia's leather sector. Journal of African Trade, 3(1–2), 85. https://doi.org/10.1016/j.joat.2017.01.001

Mcmillan, M., Dc, W., & Rodrik, D. (2014). Globalization, Structural Change, and Productivity Growth, with an Update on Africa. World Development, 63, 11–32. https://doi.org/10.1016/j.worlddev.2013.10.012

Ministry of Finance and Economic Cooperation (MoFEC) (2016) Second Schedule Custom Tariff Utilization Guiding Directive No.45/2008 E.C (2016 G.C), Addis Ababa, Ethiopia.

Ministry of Finance and Economic Development (MoFED) (2010) Growth and Transformation Plan (GTP I) 2010/11–2014/15, Addis Ababa, Ethiopia.

Ministry of Industry (MoI) (2013) Ethiopia Industrial Development Roadmap (2013–2025), Addis Ababa, Ethiopia

Morris, M., & Staritz, C. (2017). Industrial upgrading and development in Lesotho's apparel industry : global value chains, foreign direct investment, and market diversification. Oxford Development Studies, 1–18. https://doi.org/10.1080/13600818.2016.1237624

Morrison, A., Pietrobelli, C., & Rabellotti, R. (2007). Global value chains and technological capabilities: A framework to study learning and innovation in developing countries. Oxford Development Studies, 36(1), 39–58. https://doi.org/10.1080/13600810701848144

Naldi, L., & Davidsson, P. (2014). Entrepreneurial growth: The role of international knowledge acquisition as moderated by firm age. Journal of Business Venturing, 29(5), 687–703. https://doi.org/10.1016/j.jbusvent.2013.08.003

National Plan Commission (NPC) (2016) Growth and Transformation Plan (GTP II)

2015/16–2019/20, Vol. 1, Addis Ababa, Ethiopia.

Nelson, R. R., & Pack, H. (1999). The Asian miracle and modern growth theory. Economic Journal, 109(457), 416–436. https://doi.org/10.1111/1468-0297.00455

Nelson, R. R., & Winter, S. G. (1982). The Schumpeterian Tradeoff Revisited. The American Economic Review, 72(1), 114–132.

Newman, C., Page, J., Rand, J., Shemeles, A., Söderbom, M., & Tarp, F. (2016). Made in Africa: Learning to compete in industry. Brookings Institution Press.

Okafor, L. E., Bhattacharya, M., & Bloch, H. (2007). Absorptive capacity: Valuing a reconceptualization. Academy of Management Review, 32(3), 774–786.

Okafor, L. E., Bhattacharya, M., & Bloch, H. (2017). Imported Intermediates, Absorptive Capacity and Productivity: Evidence from Ghanaian Manufacturing Firms. World Economy, 40(2), 369–392. https://doi.org/10.1111/twec.12467

Pavitt, K. (1984). Sectoral patterns of technical change : Towards a taxonomy and a theory. Research Policy, 13(1984), 343–373.

Penrose, E. T. (1959). (1959). The Theory of the Growth of the Firm. In John Wiley (Vol. 41, Issue 1). https://doi.org/10.1111/j.1467-6486.2004.00427.x

Peteraf, M. A. (1993). The Cornerstones of Competitive Advantage: A Resource-Based View. Strategic Management Journal, 14, 179–191.

Preacher, K. J., & Zyphur, M. J. (2010). A General Multilevel SEM Framework for Assessing Multilevel Mediation. Psychological Methods, 15(3), 209–233. https://doi.org/10.1037/a0020141

Priyanath, H. M. S., RVSPK, R., & RGN, M. (2020). Methods and Rule-of-Thumbs in The Determination of Minimum Sample Size When Appling Structural Equation Modelling: A Review. Journal of Social Science Research, 15(March), 102–107. https://doi.org/10.24297/jssr.v15i.8670

Rankin, N., Söderbom, M., & Teal, F. (2006). Exporting from manufacturing firms in Sub-Saharan Africa. Journal of African Economies, 15(4), 671–687. https://doi.org/10.1093/jae/ejk014

Ray, G., Barney, J. A. Y. B., & Muhanna, W. A. (2004). Capabilities, Business Processes, And Competitive Advantage : Choosing The Dependent Variable In Empirical Tests Of The Resource-Based View. Strategic Management Journal, 37(July 2003), 23–37. https://doi.org/10.1002/smj.366

Rodrik, D. (2004) Industrial Policy for the Twenty-First Century, Discussion paper series.

Rodrik, D. (2009). Getting Intervetions Right : How South Korea and Taiwan Grew Rick (No. 4964; NBER WOrking Paprt Series).

Ruggie, J. G. (2018). Multinationals as a global institution: Power, authority and relative autonomy. Regulation and Governance, 12(3), 317–333. https://doi.org/10.1111/rego.12154

Schmidt, T. (2010). Absorptive Capacity } One Size Fits All ? A Firm-level Analysis of Absorptive Capacity for Different Kinds of Knowledge. 18(May 2009), 1–18. https://doi.org/10.1002/mde

Stiglitz, J.E. (2012) 'Macroeconomic fluctuations, inequality, and human development', Journal of Human Development and Capabilities, Vol. 13, No. 1, pp.31–58.

Stiglitz, J.E. (2018) From Manufacturing-Led Export Growth to a Twenty-First-Century Inclusive Growth Strategy: Explaining the Demise of a Successful Growth Model and what to do about it, No. 2018/176, WIDER Working Paper.

Sutton, J. (2012) Competing in Capabilities: The Globalization Process, OUP Oxford, Oxford University Press, UK.

Takahashi, A. R. W., & Sander, J. A. (2017). Combining institutional theory with resource-based

theory to understand processes of organizational knowing and dynamic capabilities. European Journal of Management Issues, 25(1), 43–48. https://doi.org/10.15421/191707

Tan, K. C., Kannan, V. R., Handfield, R. B., & Ghosh, S. (1999). Supply chain management: An empirical study of its impact on performance. International Journal of Operations and Production Management, 19(10), 1034–1052. https://doi.org/10.1108/01443579910287064

Tanaka, J. S. (1987). " How Big Is Big Enough ?": Sample Size and Goodness of Fit in Structural Equation Models with Latent Variables Author (s): J . S . Tanaka Published by : Wiley on behalf of the Society for Research in Child Development Stable URL : http://www.jstor.org/. Child Development, 58(1), 134–146.

Te Velde, D. W., Lin, J., Monga, C., Tendulkar, S. D., Amsden, A., Amoako, K. Y., Pack, H., & Lim, W. (2011). DPR debate: Growth identification and facilitation: The role of the state in the dynamics of structural change. Development Policy Review, 29(3), 259–310. https://doi.org/10.1111/j.1467-7679.2011.00534.x

Teece, D.J. and Kay, N. (2019) 'The evolution of the theory of the firm', British Journal of Management, Vol. 20, No. 1, pp.9–24.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. Knowledge and Strategy, 18(April 1991), 77–116. https://doi.org/10.1093/0199248540.003.0013

Tu, Q., Vonderembse, M. A., Ragu-nathan, T. S., & Sharkey, T. W. (2006). Absorptive capacity : Enhancing the assimilation of time-based manufacturing practices. Journal of Operations Management, 24, 692–710. https://doi.org/10.1016/j.jom.2005.05.004

Veugelers, R. (1997). Internal R&D expenditures and external technology sourcing. Research Policy, 26(3), 303–315.

Vogel, A., & Wagner, J. (2010). Higher productivity in importing German manufacturing firms: Self-selection, learning from importing, or both? Review of World Economics, 145(4), 641–665. https://doi.org/10.1007/s10290-009-0031-4

Vu, H. D. (2018). Firm's Absorptive Capacity: The Case of Vietnamese Manufacturing Firms. Review of Economic Perspectives, 18(3), 301–325. https://doi.org/10.2478/revecp-2018-0015

Walker, C. (2014). Organizational learning: The role of third-party auditors in building compliance and enforcement capability. International Journal of Auditing, 18(3), 213–222. https://doi.org/10.1111/ijau.12026

Weiss, J. (2011). WIDER Working Paper No. 2011/55 Industrial Policy in the Twenty-First Century (The United Nations University World Institute for Development Economics Research (UNU-WIDER); No. 2011/55).

Wernerfelt, B. (1984). A Resource-based View of the Firm. Exploration and Exploitation That, 5(April 1983), 171–180.

Winter, S. G. (2007). Dynamic Capability as a Source of Change (N. B. and A. Ebner (ed.); pp. 40–65). The Institutions of the Market: Organizations, Social Systems, and Governance.

Zaclicever, D., & Pellandra, A. (2018). Imported inputs, technology spillovers, and productivity: firm-level evidence from Uruguay. Review of World Economics, 154(4), 725–743. https://doi.org/10.1007/s10290-018-0323-7

Zahra, S. A., & George, G. (2002). Absorptive Capacity : A Review, Reconceptualization, and Extension. The Academy of Management Review, 27(2), 185–203.

Zou, T., Ertug, G., & George, G. (2018). The capacity to innovate: a meta-analysis of absorptive capacity. Innovation: Management, Policy and Practice, 20(2), 87–121. https://doi.org/10.1080/14479338.2018.1428105

CHAPTER FOUR

4. The Effect of Adopting Meta-Standards on Firms Performance: Quasi-Experimental Evidence from East Africa.

Abstract

The global business environment is witnessing a growing trend in the adoption of management system standards, exemplified by ISO 9001 (quality management series) and ISO 14001 (environmental management). This study analyses the impacts of ISO management system adoption on firm performance, leveraging firm-level data from the World Bank Enterprise Survey across selected East African countries. Our results indicate a robust positive correlation between ISO management standards adoption and productivity, as well as notable improvements in both indirect and direct export sales performance for adopting firms. However, a negative effect is observed in the domestic market performance of adopters. We propose that the positive outcomes are linked to signaling mechanisms, technology lock-in effects, and an augmented awareness and learning curve among employees. Conversely, the adverse impact on domestic market performance may be attributed to the quality preferences of local buyers and deficiencies in local competitive practices. These findings remain robust across alternative estimation strategies. Our empirical results suggest that there may be potential benefits in considering government involvement to complement firms' efforts in the adoption of management standards and addressing instances of potentially unfair local competition. Moreover, proactive measures aimed at promoting product quality standardization among stakeholders in the East African region could better position firms to gain from global market participation and the African Continental Free Trade Area (AfCFTA).

Keywords: ISO adoption, indirect export, Africa, evolutionary capability, information asymmetry

JEL Classification: L15, L25, O57, P45, O55, L14

4.1 Introduction and Background

The adoption of various management system standards, also known as meta-standards, such as the quality management system (ISO9001) series or the environmental management system (ISO14001) has become a crucial aspect of the current commercial environment worldwide.[5] Exporting firms need to disclose information on traded product characteristics to comply with quality standards enforced by the destination country, and ISO-certified companies often refuse to do business with non-certified companies.[6] The adoption of meta-standards is therefore considered a key factor in international trade participation for companies from emerging economies.

The driving force behind the popularity and acceptance of the wide diffusion of meta-standards is the involvement of independent, externally accredited certification bodies in certification awards after a detailed review and documentation of the firm's production and service process (Javorcik & Sawada, 2018; Tuczek et al., 2018). The certification is reviewed periodically for compliance and renewed every 3 years with a full audit (Javorcik & Sawada, 2018; Castka & Corbett, 2016) and regarded as self-regulatory company practices in many areas, including quality, corporate social responsibility, and environmental protection (Orcos et al., 2018). Management system standards cover all sectors of business, industry, and technology to promote the global exchange of goods and services (Ikram et al., 2020).

Despite the widespread adoption of ISO certification, little is known about its effects on the financial (e.g., sales) and operational (like productivity) performance of firms in developing countries. Most existing empirical literature is based on case studies that may not be generalizable outside of the specific context studied.

[5] See e.g. Javorcik & Sawada, 2018; Ochieng et al., 2015; Nurcahyo et al., 2021; Ikram et al., 2020.
[6] See Islam et al., 2016; Khan, 2008; Masakure et al., 2009; Guler et al., 2002.

In the present study, we evaluate how ISO certification adoption affects the performance of firms in East Africa. We consider the effects on firms' annual sales, distinguishing between export and domestic sales, and sales per worker. Export sales are categorized as direct or indirect, depending on whether the firm directly engages in exports or indirectly supplies to exporting firms. ISO adoption is measured using a binary dummy variable to categorize firms as adopters or non-adopters. We use firm-level observational data obtained from the World Bank Enterprise survey for Ethiopia, Kenya, and Rwanda and employ a quasi-experimental design.

We account for self-selection by using the observed characteristics of non-adopters to create a comparison group for the adopted firms. Our results show that the adoption of ISO certification has a higher and statistically significant positive effect on export sales and sales per worker on adopters, while it has the reverse effect on domestic sales of adopter firms. The results are stable and consistent with alternative estimation strategies.

Ethiopia, Kenya, and Rwanda share many common and varying features, making them interesting cases for the present study. While ISO certifications have gained popularity in many developing countries, Africa has not embraced them as much as other regions. According to a study by Tayo Tene et al. (2018), Africa only accounts for about 1% of the total number of ISO certifications. Low dissemination of these certificates has resulted in Africa's trade marginalization (Landin et al., 2014). Little remains known about the implications of ISO certification in East Africa.[7]

There is limited research on the impact of ISO certification adoption on businesses in developing countries, and the results are mixed. For example, Masakure et al. (2009) found that ISO adoption by manufacturing firms in Pakistan resulted in increased export sales for late export entrants, but did not affect incumbent exporting firms. Wang & Zhao (2020) discovered that the effects of ISO

[7]Ethiopia, Kenya, and Rwanda are all members of the Organization for International Standardization (ISO) and have their own nationally recognized standard bodies: the Kenya Bureau of Standards (KEBS), the Ethiopian Quality and Standards Authority, and the Rwanda Standards Bureau (RSB). These countries ratified the African Continental Free Trade Area (AfCFTA).

adoption on Chinese firms' performance varied depending on the local economic development status of the manufacturing firms' locations. Wu & Wu (2019) and Mangula (2013) found that ISO certification improves firm performance by reducing information asymmetry and guiding the purchase decisions of overseas buyers. Conversely, Jang and Lin (2008), Sampaio et al. (2012), and Tarí et al. (2012) reported that adopting ISO leads to stronger operational performance by improving process efficiency, reducing waste, and decreasing product defect rates. Lakhal (2014), Chow-Chua et al. (2003), and Fatima (2014) found positive effects of ISO certification on financial performance for firms in Tunisia, Singapore, and Pakistan, respectively. Additionally, Nurcahyo et al. (2021) concluded that obtaining standards has a positive effect on the performance of firms in Indonesia. However, Ochieng et al. (2015) found no effect of ISO adoption on the financial performance of companies listed on the Nairobi Securities Exchange (NSE) in Kenya.

When evaluating the impact of ISO certification on firm performance, a significant challenge arises from the fact that the firms that choose to acquire ISO certification are likely different from the firms that choose not to adopt it. For instance, a large firm that intends to market its products abroad may have a stronger incentive to adopt ISO certification than a small firm that focuses solely on the local market. To overcome this issue, we employ matching techniques to ensure that firms in the non-adopter control group closely resemble those in the ISO adopter treatment group.

The remaining of the study is organized as follows. Section two explains the context and conceptual framework of the study, section three covers the data and method, while sections four and five discuss the findings and conclude and draw policy implications respectively.

4.2 The Context and Conceptual Framework

4.2.1 The Context

In empirical research, context provides useful information about the likelihood of effect (Angrist, 2004). The adoption of ISO certifications has grown worldwide rapidly including many developing countries in absolute terms. According to recent data, ISO has published a portfolio of over 24,776

standards in 169 member counties with a goal of zero using standards by 2050 (International Organization for Standardization) (ISO, 2023).

Africa remains low with about 1% of the total number of ISO 9001 and ISO 14001 certifications worldwide (Tayo Tene et al., 2018) while the continent's adoption of these certificates has grown by 19.4%. The most diffused ISO certifications in Africa are quality management systems (ISO9001 series) and environmental management systems (ISO14001) (Fikru, 2014). Landin et al.,(2014) indicated that Africa's trade marginalization in the age of globalization may attributed to the low dissemination of these certifications.

On the other hand, the diffusion of ISO management standards in Africa is highly unbalanced and mostly concentrated in South and North Africa(Landin et al., 2014). South Africa, Egypt, Tunisia, and Morocco account for 72% of ISO 9001 and 81% of ISO 14001 certificates found in Africa (Tayo Tene et al., 2018). This suggests that there is less research done in East Africa on ISO certification.

We selected Ethiopia, Kenya, and Rwanda as our study sample nations because they have a lot in common that is pertinent to the research question. These countries share common and varying features about social and economic development status. According to the World Bank (WB, 2023) country classification report, Ethiopia and Rwanda are categorized as low-income economies while Kenya is a lower middle-income country. Further, all these countries are members of the Organization for International Standardization(ISO) and have their own internationally recognized national standard bodies namely, Kenya Bureau of Standards (KEBS) and Ethiopian Quality and Standards Authority since1969 while Rwanda Standards Bureau (RSB) became a member in 2000(ISO, 2016). According to Orcos et al.(2018) and Tayo Tene & Boiral(2021), national-level institutional pressures affect the diffusion of ISO management standards by shaping firms' and stakeholders' behaviors. Furthermore, Kenya and Rwanda are members of supranational institutions, the East Africa Community (EAC), and the World Trade Organization (WTO). Ethiopia and Rwanda are landlocked countries. Furthermore, Ethiopia and Kenya are countries with large populations that share administrative boundaries, while Rwanda is a small country with the highest Easy Business Doing from East Africa.

These countries already ratified the African Continental Free Trade Area (AfCFTA), touted as a game-changer, began operations on January 1, 2021, largest free trade area in the world, involving 1.2 billion people covering 55 countries, with US$2.5 trillion in terms of GDP (Cissé et al., 2020). AfCFTA has entered into force with the potential to transform African economies and diversify the sources of growth and exports in a region (Fofack et al., 2021) and will stimulate trade in all African countries with a 24.07% increase in intra-African trade. AfCFTA also aims for Africa to be a significant partner in global trade negotiations and participation (Cissé et al., 2020).

However, studies indicated that intra-Africa Trade has been challenged by supply-side constraints as well as tariff and Non-Tariff Barriers(NTB) (Tayo Tene & Boiral, 2021). The primary barrier to realizing the untapped potential benefits of AfCFTA is acknowledged to be the current higher NTB (Cissé et al., 2020; Fofack et al., 2021). The absence of mutual recognition of standards will impede global competition, as it can be used to promote efficiency (Grossman et al., 2021). The fewer NTBs through the adoption of meta-standards, the deeper the integration by reduced trading costs (Maggi & Ossa, 2021). To avoid the unnecessary erecting of technical trade barriers, national and regional standards need to be harmonized and aligned with pertinent international standards (ARSO, 2021).

Additionally, the ISO adoption as a technical standard can be used to lower non-tariff barriers and strengthen a company's internal capacity in the context of developing nations. We discuss how our findings are applicable, recognizing the role they can play in the harmonization of standards to enhance the African Continental Free Trade Area (AfCFTA) implementation.

4.2.2 Conceptual Framework

We employ the concepts of behavioral economics and evolutionary capability theories of the firm as theoretical lenses. Different decisions taken by business enterprises in the same economic environment are shown by the increasing recognition of the heterogeneity of the firms(Nelson, 1991). Adoption of the ISO standard may have been prompted by firm discretionary decisions in anticipation of some results.

Transaction Cost Theory of the Firm: Contrary to conventional theory, which views a firm as a producing unit, transaction cost places a greater emphasis on understanding the micro analytics within the company as the crucial factor that matters most (Williamson, 1991). The author claims that by putting in place effective governance mechanisms, information asymmetry can be aligned to lower transaction costs, and variations in a firm's success are attributed to the alignment of the stakeholder interface.

Business insiders for instance managers know more about internal business operations compared to external stakeholders such as investors, customers, and creditors for reasons associated with information asymmetry (Ullah et al.,2014; Heras-Saizarbitoria & Boiral, 2015). Information asymmetry has transaction cost implications and signaling is a mechanism to reduce the cost of information asymmetry (King et al., 2005; Anne-Célia et al., 2006). That is to mean firms can signal desirable yet unobservable firm characteristics to external stakeholders by adopting meta-standards. Studies by Wu & Wu (2019) and Mangula (2013) found that ISO certification will improve developing countries' firm performance by reducing information asymmetry in guiding the purchase decisions of potential overseas buyers. However, the implementation of ISO to gain legitimacy from outside forces like clients offers minimal advantages to internal performance improvement (Tayo Tene et al., 2018).

Evolutionary capability theory of the Firm: Against the general equilibrium orientation that sees economic problems as allocating economic resources efficiently, evolutionary process theory emphasizes choosing new courses of action in doing things (Nelson, 1991). According to Chandler and Makers (1999), evolutionary capability is a strategic firm-specific ability that emanates from a complex interaction between the firm and its environment. The source of the discretionary decision for capability building could be concurrency with external pressures (Chandler & Makers, 1999; Nelson, 1991; Teece, 1986). However, Nelson (1991) mentioned firm's capabilities are constrained by the skills, experiences, and knowledge of the firm's personnel in

the decision-making process. For example, Teece(1986), a firm's capability includes control over complementary assets or capability for appropriation from innovation activities.

In this study, we used Transaction Cost Theory and Evolutionary Theory of the firms as inseparable for interpretation of our results. However, government support is also an indispensable influence on the adoption by firms through providing quality infrastructure (e.g. standard bodies such as conformity assessment, and standardization) and other assistance in the process of certifications. For example, Estrin et al.,(2016) indicated that a firm's strategy choice depends on how national institutions exert normative, regulatory, and governance control towards a firm's internationalization practices. Firms within the same industry will choose different strategic options depending on the national institutional context, which in turn influences management behavior (Nelson & Sampat,2001). If national institutions, such as legal frameworks are inadequate, company insiders like managers may prioritize their objectives over the success of the company (Nelson & Sampat, 2001; Williamson, 1991).

4.3 Data and Methods

4.3.1 Data and Measurement

The latest available data were utilized in this investigation for firm-level for Ethiopia (2015), Kenya (2018), and Rwanda (2019), obtained from the Enterprise Surveys of the World Bank. These surveys include data for establishments of all sizes in manufacturing and service industries. The data sets contain information on firm performance indicators, firm internal characteristics, and the business environment. Behavioral firm theories provide a guide for variable selection, assuming that adopting such certification is a company discretionary decision made for strategic objectives. The World Bank Development Indicator database is used to transform quantitative measurements of a company's performance, like sales, into US dollars. We include both service and industrial companies in our analysis.

Variables and measures

The dependent variables of this study include firm sales in domestic and international markets. Sales per employee are included to assess the firm's internal performance or productivity. As covariate, we included firm characteristics in line with the empirical literature and theory. Quality upgrading decisions depend on firms' specific characteristics (Doan & Zhang, 2023). For example, managerial experience, access to finance, and external audit practice have induced the adoption of management standards (Castka et al., 2015).

Other firm characteristics such as firm age, size, ownership, business operational environmental factors such as competition from informal sectors, and firm activities like R&D, training, managerial experiences, access to finance, standardization measures, etc. were included as indicated under the variables description section (Appendix 4A).

4.3.2 Empirical Strategy and Model Specification

In causal studies based on observation data, it is recommended to use a combination of estimation techniques(Li, 2013). As an empirical estimation strategy, we employ Propensity score Matching (PSM) and Regression Adjustment in complementary approaches.

4.3.2.1 PSM as Estimation Strategy

To analyze the effects of ISO certification on firm performance, we start with the baseline specification that pools observations and includes the treatment dummy as follows:

$$Y_i = \alpha + \delta X_i + \tau D_i + U_i \quad \text{.....(1)}$$

Where Y_i is a measure of firm performance(e.g. sales), X_i is a vector of firm characteristics that are assumed to determine performance, D_i is a dummy variable taking the value of 1 if the firm has adopted an ISO certificate and 0 otherwise, U_i is an error term, and σ, δ, and τ are parameters to be estimated. Our main interest is τ, the coefficient that captures the effect of ISO certification on the firm's performance controlling for other confounders.

However, the adoption of ISO certification is an endogenous firm decision and thus τ is biased to measure the effect of ISO adoption on firm performance. We assume that the firm's decision to obtain ISO certification depends on the perceived net advantages of adoption based on cost-benefit analysis. To account for the underlying bias, we specify a selection model for ISO adoption where firms choose to implement ISO certification if they generate net benefits. Let D_i* be a latent variable that captures the expected net benefit from adopting ISO for not adopting.

We specify the latent variable as:

$$D_i* = \gamma Z_i + \varepsilon_i \quad \text{.....(2)}$$

Where Z_i is a set of observable variables that affect the expected benefit of adoption, γ is parameters to be estimated and ε_i is an unobserved error term. The firm selects D_i =1 if D_i* > 0 and D_i =0 if $D_i* \leq 0$, where, D_i is a dummy variable that equals 1 for ISO-certified and 0 for non-certified firms. For instance, the financial capacity and size of the firm will affect the decision to adopt ISO certification (Fikru, 2014).

In a situation when selection or adoption is based on observable variables, it is possible to recover the causal effect once imbalances along the observable characteristics are managed (Rubin, 1977; Rosenbaum & Rubin, 1983). The key identification assumption is the holding of the Conditional Independence Assumption (CIA) and common support assumptions that make adopters and non-adopters comparable(Rosenbaum & Rubin, 1983). PSM is superior to regression with the misspecified econometric model for observation data analysis, as the latter method cannot tell the distribution overlaps (Li, 2013). Conditional on observable covariates, X_i, firms with similar covariates have a comparable probability of adopting or not adopting ISO (Imbens & Wooldridge, 2009), which is to mean overlap assumption. In empirical terms, the predicted probability of treatment or propensity Scores $e(x)$ is values of $F(\hat{\gamma} Z_i)$, where $\hat{\gamma}$ is an estimate of γ and F is a cumulative density function based on the selection equation. The overlap assumption is the foundation for the similarity of both groups, which means that given observed covariates X_i, firms with the same X_i values have a positive and equal likelihood of adopting or not adopting i.e. $e(x)$

$= 0 < pr(D_i = 1 | X_i < 0)$. The goal of the matching process is to create balanced groups of treatment and control cases, mimicking the balance achieved in randomized controlled trials.

Following Rubin's causal model Rubin(2004), Y_{i1} and Y_{i0} are potential performances for ISO adopter and non-adopter firms respectively.

We can estimate average treatment effects as:

$$ATE = \mathrm{E}(Y_{1i} \mid D_i = 1) - \mathrm{E}(Y_{01} \mid D_i = 0) \quad \text{.....(3)}$$

Similarly, the Average treatment effect on treated (ATT) is given as:

$$ATT = \mathrm{E}\{Y_{1i} \mid D_i = 1, e(x)) - \mathrm{E}(Y_{01} \mid D_i = 0, e(x)\} \quad \text{.....(4)}$$

Little advice is available in the literature regarding which functional form of propensity score model to choose and applying the logit and probit models yields similar results (Smith, 1997; Smith & Todd, 2005). We used a propensity-score matching estimator with a logit matching outcome model Cattaneo, 2010). PSM method assumes "Unconfoundedness " that states unbiased estimates can be obtained after controlling for observed characteristics (Imbens & Wooldridge, 2009).

4.3.2.2 Regression Adjustment

Using observations with nearly similar covariate values, Regression Adjustment on matched subsamples has superior estimate precision (Vansteelandt & Daniel, 2014; Rubin, 1979; Li & Ding, 2017). Regression adjustment, also referred to as regression-adjusted matching is robust to misspecification of PS and regression models (Grieve et al., 2013). Applying regression adjustment requires strong balancing property of matched sample (Li & Greene, 2013) and holding of ignorance assumption (Vansteelandt & Daniel, 2014; Rubin, 1977,1979, 1983).

However, the problem in generating the matched subsample method in practice is that it is rare to find controls with similar values of covariates with treatments (Rubin, 1979). PS matching is used as a technique for producing matched subsamples (Dehejia & Wahba, 2002), reweighting observation covariates, and generating a balanced subsample (Li, 2013; Imbens & Wooldridge, 2009). Using full matching is the best alignment of comparable treated and control subjects by

making fuller use of covariate information(Hansen, 2004). Applying propensity score weights to select potential matches reduced post-match mean differences for covariates (Dagostino, 1998), and frequency weights from the matching are used to reweight the observation characteristics (Grieve et al., 2013). Using regression adjustment on balanced data can reduce bias (Ho et al., 2007). We match ISO-adopters and non-adopters along observed covariates to create a matched observation for each adopter firm following the method that relies on the standardized mean difference (Grieve et al., 2013; D'agostino, 1998; Garrido et al., 2014).

In the empirical analysis, we estimate the treatment effects using regression adjustment on the sub-sample of matched firms; that is, control cases that are not matched to a treatment case are excluded before estimating the treatment effects. Let Y_{i1} denote the potential outcome under treatment (ISO adoption), and let Y_{i0} denote the potential outcome under non-treatment (no adoption), for a firm *i*. Assume that the potential outcomes can be modelled as follows:

Potential outcome1 (Adopted): $Y_{i1} = X_i\beta_1 + U_{i1}$ if D_i =1 …… ….. (5)

Potential Outcome 0 (Non-Adopted) $Y_{i0} = X_i\beta_0 + U_{10}$ if D_i =0 …… (6)

Where, Y_{i1} and Y_{i0} are the outcome variables (firm performance) by ISO-certified and non-certified firms respectively, and X_i is a vector of matched subsample firms characteristics that affect firm performance. Under the assumption that actual treatment status D_i is independent of the potential outcomes $(Y_{i0,}Y_{i1})$ conditional on observables (X_i), we can use semi-parametric regression adjustment/OLS to estimate the $\mathrm{E}(Y_{i0} \mid X_i)$ and $\mathrm{E}(Y_{i1} \mid X_i)$ from the subsamples of non-treated and treated firms, respectively.[8] That is, regress the outcome variable on the vector of explanatory variables X_i for the subsamples with $D_i = 1$ and $D_i = 0$ separately, and let $\hat{\beta}_1$ and $\hat{\beta}_0$ denote regression adjustment estimates from equations 5 and 6 respectively. Further, let $\hat{m}_1(X_1) = X_i\hat{\beta}_1$ denotes our estimate of $\mathrm{E}(Y_{i1} \mid X_i)$ while $\hat{m}_0(X_1) = X_i\hat{\beta}_0$ is our estimate of $\mathrm{E}(Y_{i0} \mid X_i)$.

The estimated average treatment effects of adopting an ISO certificate can be evaluated as the averages of the differences between $\hat{m}_1(X_i)$ and $\hat{m}_0(X_i)$ for the entire subsample (yielding the

[8] This assumption is sometimes called unconfoundedness or conditional independence (see Wooldrigde, 2010, chapter 21).

average treatment effect; ATE) and for the Treated subsample (the average treatment effect on the treated; ATT). This procedure ensures that the estimation is performed on a subsample or reweighted observations using semi-parametric approaches (Cattaneo, 2010).

4.4 Result and Discussion

4.4.1 Study Variable Description

The outcome variables of the study are firm performance indicators which include, annual domestic and export sales and sales per worker measured in the natural log. The key variable of interest is the adoption of ISO-certification which is measured as binary variable 1 for adopters and zero for non-adopters. Other covariate variables are described and measured using the standard method. Selected firm performance indicators are converted to common US dollars using local currency units of each country using WDI databases. Details of variable description and measurements are appended under 4B.

4.4.2 Distribution of ISO and its Effect on Selected Firm Performance

This section presents an overview of the comparison of ISO-certified and non-certified firms' performance across various aspects of performance by industry types and country categories.

4.4.2.1 ISO Adoption and Firm Sales and Sales per Worker by Industry Types

As indicated in Fig 4-1 the sales performance of ISO adopters in all three countries is higher except for Rwanda's retail firms. Services. ISO-certified firms have also higher sales per labor in all three countries. In Fig 4-1 below ETH, KEY and RWA stand for shorthand names of Ethiopia, Kenya, and Rwanda.

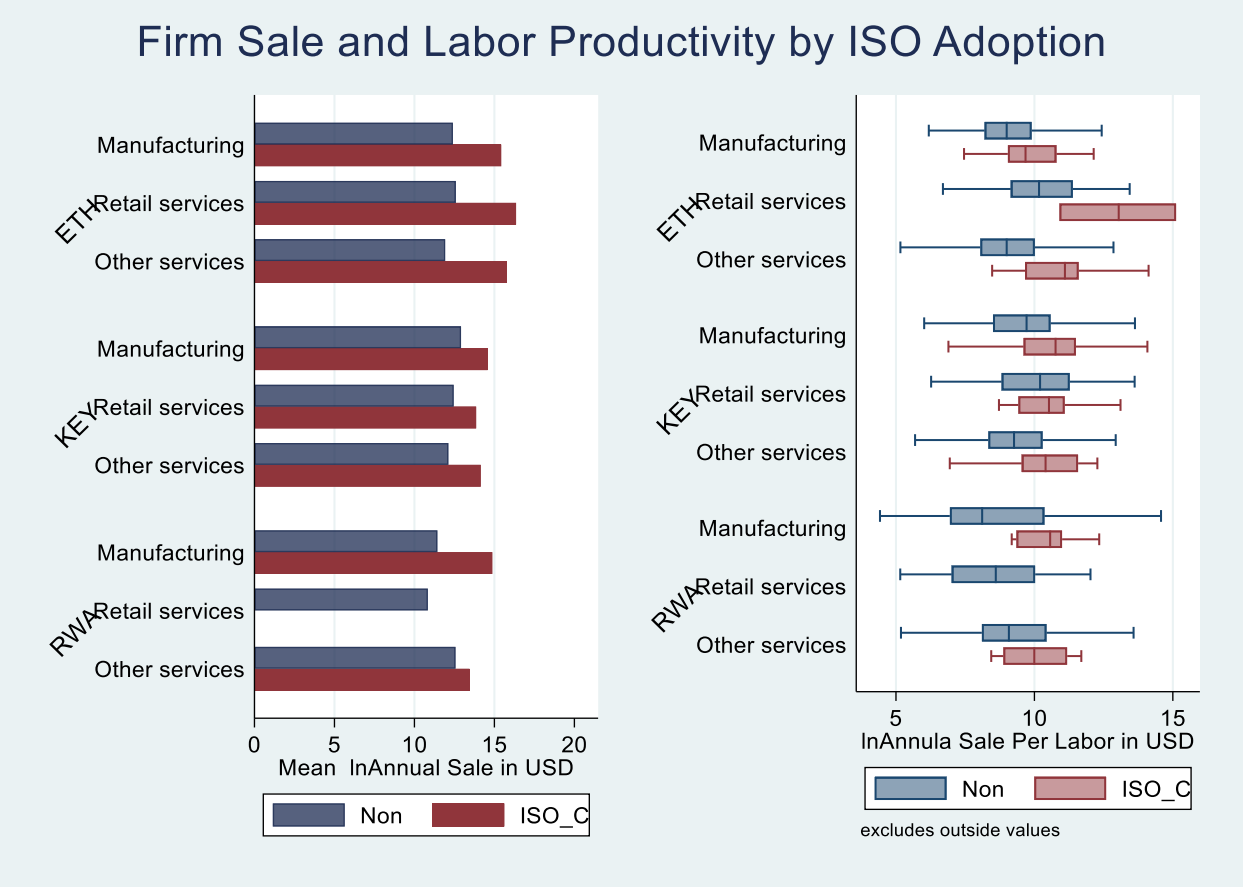


Figure 4-1 ISO Adoption, Sales, and Productivity by Country and Sectors

4.4.2.2 ISO-Adoption and Firm Sale Performance by Industry Type

A comparison of sales performance of ISO adoption at the sector level indicates, that ISO adopter has higher export sales performance while lower domestic sales for all industry types except retail services in Rwanda. As shown in Fig 4-2 there is a positive association between the percentage of total export sales and ISO adoption though it varies by industry and country. In all three countries, ISO-certified firms in all industry types have higher total exports than non-adopter firms. As depicted the percentage share of domestic sales for ISO adopters is lower for all industry types.

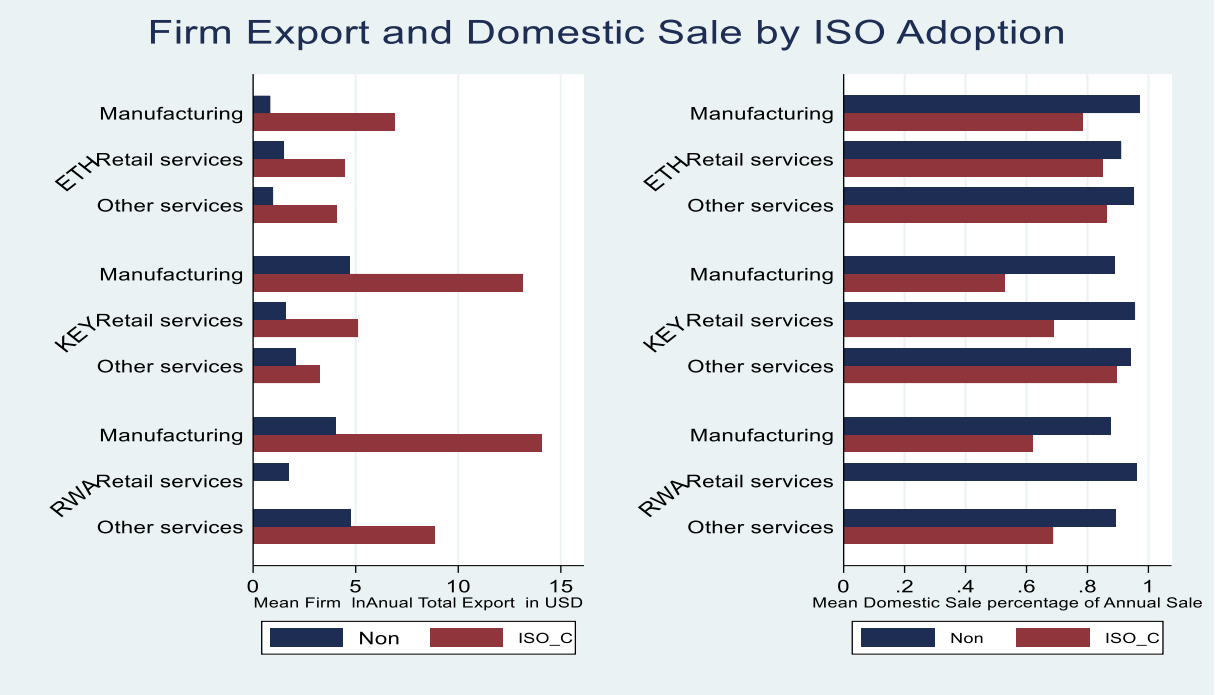


Figure 4-2 ISO Adoption, Export and Domestic Sale by Country and Sector

In all three countries, ISO has no effect on domestic sales value for all types of establishments. However, it was expected to serve as a mechanism to enhance the functionality of Regional integration as well as Africa Continental Free Trade Area (AfCFTA) implementation in addition to the existing export participation.

4.4.3 Matching Techniques and Summary of Descriptive Statistical Analysis

4.4.3.1 Matching Techniques and Rationale of Selection of covariates

We relied on the theoretical and previous empirical study results to choose variables for analysis as explained in the data and measurement section. A probit regression and linear regression model were used to select the variables that determine the ISO adoption decision of the firms and the effect of the chosen variables on the key outcome variable which is aggregate annual sales.

Accordingly, 11 covariates are identified and included as the key determinant of firm-level ISO adoption. From the regression model, we found covariates are jointly statistically significant $Chi-Square(chi2)(11) = 157.73$ with Prob>chi2 =0.000 . However, the coefficient estimate and marginal effect results show the heterogeneous effect of selected variables on the likelihood ISO adoption of adoption. For the effect on the outcome, we also confirmed the joint significance of all covariates with the F-Test $F(11,1877) = 57.76$ with Prob>F =0.000 . The determinants of ISO adoption and the effect of chosen covariates on the outcome of the study are depicted as follows in Figure 4-3. For details of the coefficient, numerical values see Appendix A2.

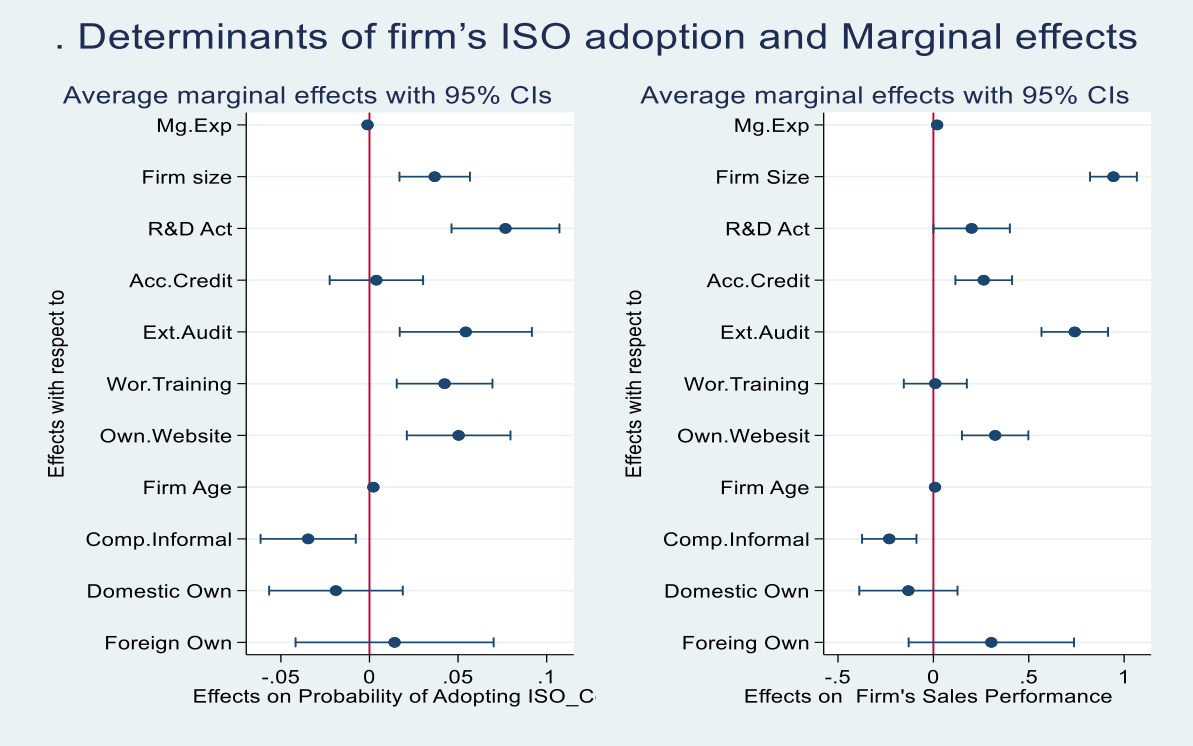


Figure 4-3 Determinants of ISO Adoption and Marginal Effects

As indicated in Figure 4-3 most of the covariates are significantly affect the probability of ISO certification (and positively related to firm performance variables regardless of sign and the magnitude of the marginal effects. The results confirm the selection of the variables is well aligned with the conditions to apply Propensity Score Matching as an estimation method to evaluate the mean difference in the outcomes of the matched pair (Smith & Todd, 2005; Garrido et al., 2014).

4.4.3.2 Summary of Descriptive Statistical Analysis

Table 2 presents summary statistics results that describe selected firm performance indicators and important covariates that are assumed to determine the adoption of ISO certification. As presented, there is a large reduction in standardized mean difference between pre and post-matched observation characteristics both in value terms and percentage standardized mean differences of study variables after matching.

The results show the means of every covariate were more balanced across the adopters and non-adopters firms. This could be attributed to the selection of the more similar non-adopter observations to ISO-adopter observations that led to the reduction in observation from a pre-match of 2187 to a matched subsample of 509. This is achieved through using PS frequency weighting to select 219 non-adopter firms from pre-match observation of 1897 non-adopters adjusting for similar observable characteristics of 290 adopters.

On the other hand, reweighting the observation improved the percentage of ISO-adopter from about 13% of all samples to 56% of matched observations. The calculated PS matching frequency weight ranges from a weight of 1-9 and about 94.63% post-matched falls in the weight range of 1-3. The details of the weighting distribution of 219 observation subsamples are appended under Appendix A3.

Summary results compare selected the pre-match and post-matched observation characteristics for ISO-certified and non-certified establishments are shown in Table 4-1.

Table 4-1 Summary of Pre-match and Matched Sample

	Pre-Match Sample Chartertics				**Matched Sample Chartertics**			
	All Sample	ISO Adopter	Non-Adopter	Standardized	All Subsample	ISO Adopter	Non-Adopter	Standardized
Variable	Mean All	Mean (ISO=1)	Mean (IS0=0)	Mean Differ.	Mean All	Mean (ISO=1)	Mean (ISO=0)	Mean Differ
Lnsale	12.630	14.679	12.293	0.996	14.284	14.678	13.798	0.39
Lndirex	2.173	5.566	1.608	0.807	4.775	5.566	3.738	0.272
lnindexp	1.180	3.760	0.780	0.812	2.819	3.760	1.823	0.046
lndom	11.984	12.237	11.922	0.084	12.515	12.237	12.724	-0.097
Lnsale_lab	9.486	10.364	9.347	0.603	10.056	10.364	9.705	0.403
direxper	0.062	0.161	0.047	0.591	0.146	0.161	0.132	0.101
indexer	0.041	0.168	0.022	0.829	0.108	0.168	0.035	0.472
domper	0.896	0.671	0.931	-1.016	0.745	0.671	0.832	-0.432
ISO_adoption	0.133	1	0	-	0.56	1	0	-
Man_expr	15.332	17.561	14.968	7.649	18.01	17.561	18.662	-2.224
Firm size	3.132	4.322	2.936	1.001	4.225	4.322	4.092	0.15
R&D	0.127	0.328	0.095	0.7	0.296	0.327	0.242	0.187
Acce_Credit	0.395	0.497	0.378	0.243	0.474	0.496	0.447	0.098
External Audit	0.689	0.921	0.653	0.579	0.930	0.921	0.959	-0.149
Work. Training	0.311	0.593	0.267	0.704	0.583	0.593	0.594	-0.002
Own Website	0.428	0.738	0.376	0.731	0.728	0.738	0.708	0.061
Firm Age	18.534	30.322	16.627	0.863	29.094	30.322	27.667	0.122
Compt,Informal	0.442	0.374	0.452	-0.157	0.415	0.374	0.466	-0.187
Ownership								
Domestic	0.854	0.714	0.879	-0.467	0.711	0.714	0.726	-0.026
Foreign	0.058	0.117	0.047	0.299	0.115	0.117	0.105	0.038
Countries								
Ethiopia	0.384	0.224	0.41	-0.383	0.229	0.224	0.237	-0.03
Kenya	0.453	0.7	0.413	0.576	0.702	0.7	0.708	-0.017
Rwanda	0.163	0.076	0.177	-0.273	0.068	0.076	0.055	0.083
Enterprise Type								
Manufacturing	0.431	0.679	0.393	0.578	0.702	0.679	0.758	-0.172
Retail Services	0.208	0.096	0.227	-0.323	0.077	0.096	0.05	0.172
Other Services	0.36	0.224	0.38	-0.325	0.022	0.224	0.192	0.077
E Size Category								
Micro	0.018	0.003	0.139	2.659	0.004	0.003	0.004	-0.016
Small	0.459	0.2	0.393	0.574	0.202	0.2	0.21	-0.025
Medium	0.334	0.307	0.227	-0.275	0.326	0.307	0.351	-0.094
Large	0.189	0.489	0.38	0.278	0.469	0.489	0.434	0.11
Observation	2187	290	1897	2187	509	290	219	509

4.4.3.3 Balancing Diagnosis Density for Matched Subsamples

To supplement the mean difference between pre-matched and matched observation characteristics analysis, we assessed the improvements in covariate balance.

However, the investigation of mean difference comparison even under standardized mean difference only shows improvement in balance relative to the covariate in the 'pre-matching' state since the analysis does not have an associated p-value (Drph & Drive, 2015).To complement the numeric balancing analysis, we use kernel density plot to assess covariate balance for all selection variables for a degree of distribution overlaps between adopters and non-adopters.

The results from all the graphic displays of the density plots indicate that there is a huge improvement in the overlaps for each distribution of the covariate between ISO-certified and non-certified firms for matched subsamples. These results imply that ISO-adopter and non-adopter firms are visibly comparable on the observed covariates. Observed covariate balance is an essential criterion for helping to ensure that treatment effects are valid (Drph & Drive, 2015). The details of each covariate density balance plot are appended (See Appendix A4, A5, and A6).

4.4.3.4 PSM Assumption Test

As indicated in Figure 4-4&4-6 below, there is clear evidence of fulfillment of PSM balancing and overlapping assumption tests. Both pictures convey the same message of confirming the evidence that the matching assumption of identification is satisfied. As indicated, both ISO-certified and non-certified firms exhibited a wide range of propensity score overlaps and improved covariate balancing. Hence, we can use the PSM approach to evaluate the effect of adopting ISO on firm performance and can attribute the differences in performance to the adoption of certification.

However, we remain left with the assumption that unobservable confounders are assumed to be randomly distributed across both groups.

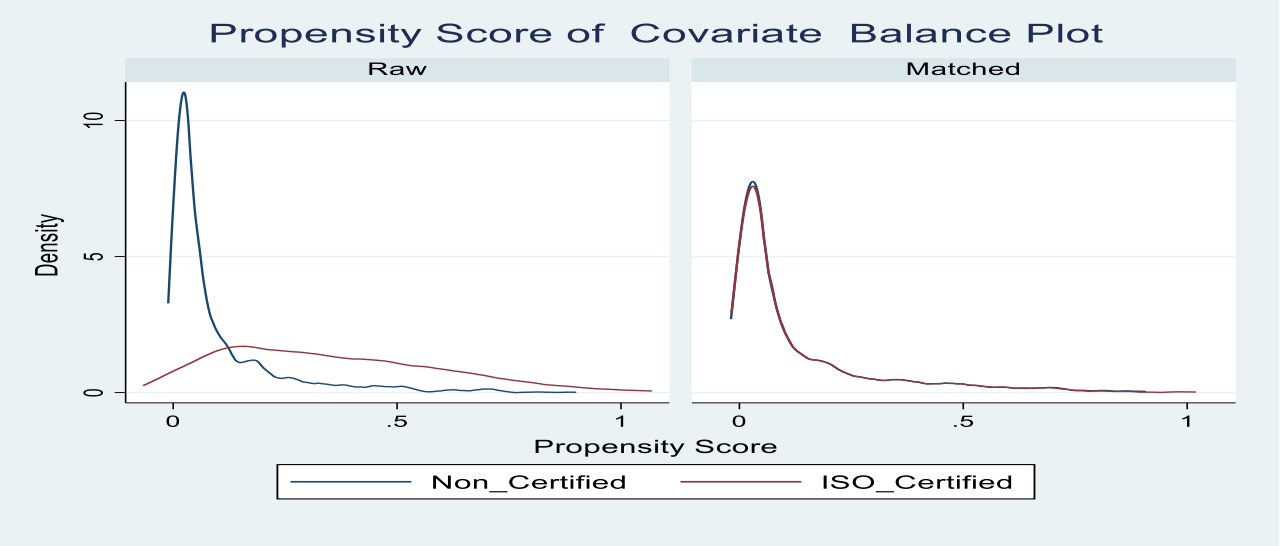


Figure 4-4 Covariate Balance Density Plot

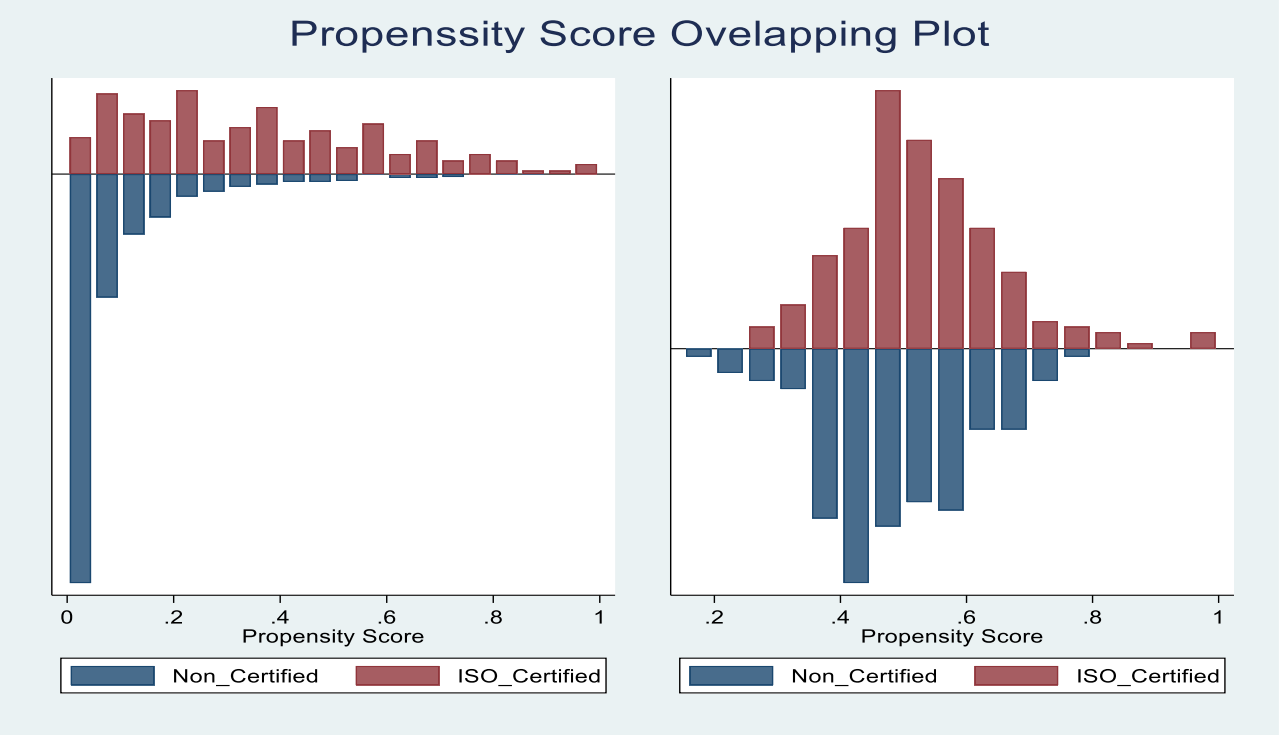


Figure 4-5 Propensity Score Overlapping Plot

4.4.4 PSM Estimation Results

The results from the propensity score indicate that ISO certification adoption has a higher and significant effect on firms' annual sales and productivity improvement. Findings in Table 4-2 show that ISO-certified firms have 0.76 and 0.64 higher and significant natural log of total annual and sales per worker performance than non-adopter firms respectively. Furthermore, compared to non-adopter firms, ISO adopter firms have a 24.9 percent decrease in domestic sales and an 8.2 and 14.8 percent rise in direct and indirect share of export annual selling performance, respectively. The likely cause of the beneficial impact could be linked to the ISO's signaling role in reaching wider foreign buyers and improvements to internal operating procedures.

Conversely, adverse effects could result from low awareness of product quality or unfair competition from lower-quality producer enterprises in the domestic market.

Table 4-2 Propensity Score Matching (PSM) Estimation Results

	(1)	(2)	(3)	(4)	(5)
Outcomes	lnsale	lnsapl	direxper	inexper	domper
ATT	0.756***	0.638***	0.082***	0.148***	-0.245***
	(0.213)	(0.177)	(0.025)	(0.02)	(0.03)
ATE	1.781***	1.484***	0.032*	0.056***	-0.091***
	(0.253)	(0.226)	(0.019)	(0.009)	(0.021)
Observation	1720	1720	1853	1852	1852

Note: Table 4-2 presents the impact of ISO certification adoption on firms' performance measured in USD. Columns 1 and 2 show a natural log of annual sales and sales per worker. Columns 3, 4, and 5 indicate the effect of ISO adoption on the percentage of direct export, indirect export, and domestic sales of annual sales respectively. Controls used include manager experience, firm size, R&D, external audit, access to credit, worker training, firm age, own website, competition against the informal sector, domestic and foreign ownership, industry types, country, and sectors. In all estimations standard errors in and * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4.4.5 Main regression adjustment results and discussion

Our analysis indicates that ISO adoption has a positive and significant effect on firms' annual sales and sales-per-worker performance. The results presented in Table 4-3 show that ISO-certified firms have 0.58, and 0.56 higher and significant natural log annual sales and sales per worker than non-certified firms respectively. Further, ISO adopters have 5.4 and 14.3 percent higher annual direct and indirect export sales than non-adopter firms, respectively, while 19.7 percent lower domestic sales than non-adopters.

The results from regression adjustment indicate that the reduction in domestic sales and the gain from export sales is equal which the case for the subsample with the same characteristics. Applying Regression on a matched subsample reduced biases (Ho et al., 2007). The signaling functions of ISO certification could account for better outcomes resulting in lower sales expenses and scale efficiencies from higher export sales volumes are linked to a potential mechanism for improved performance (Dick, 2008) and commitment of top management, employee participation, and teamwork for internal productivity gains formatted citation (Wahid & Corner, 2009).

Internal process improvements, such as those involving technology, inventory control, and worker efficiency, may provide a different justification for improved performance. Conversely, the negative effects of adoption on domestic sales could be attributed to low consumer preferences for high-quality products because of their high price and lack of competition, as well as a lax regulatory environment and more competition from unofficial businesses, especially in the retail industry.

Table 4-3 Main Regression Adjustment Result

	(1)	(2)	(3)	(4)	(5)
Outcomes	lnsale	lnsapl	direxper	inexper	domper
ATT	0.578***	0.559***	0.054**	0.143***	-0.197***
	(0.157)	(0.155)	(0.025)	(0.023)	(0.033)
ATE	0.621**	0.598***	0.047*	0.143***	-0.188***
	(0.143)	(0.144)	(0.025)	(0.020)	(0.030)
County FE	yes	yes	yes	yes	yes
Industry FE	Yes	yes	yes	yes	yes
Controls	yes	yes	yes	yes	yes
N	479	479	495	495	495

Note: Table 4-3 presents the impact of ISO management standard adoption on firms' internal and external performance measured in USD. Columns 1and 2 show a natural log of annual sale and sales per labor. Further, columns 3, 4, and 5 indicate the effect of ISO adoption on the percentage of direct export, indirect export, and domestic sales of annual sales respectively. Controls used include manager experience, firm size, R&D, external audit, access to credit, worker training, firm age, own website, competition against the informal sector, and domestic and foreign ownership In all estimations robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

4.4.6 Heterogeneous Analysis

It is expected that the adoption of ISO will have a heterogeneous effect due to the heterogeneity of firms about adopting and also benefiting from adoption, as it is a discretionary firm decision motivated by anticipated potential outcomes and subject to various constraints such as institutions and firms' external stakeholders. We consider country level, industry types, and firm sizes for the heterogeneous analysis. In empirical research that focuses on causal study, analysis of various subsamples is informative in the presence of self-select treatment based on anticipated treatment effects (Angrist, 2004; Zhou & Xie, 2020).

4.4.6.1 Heterogeneity Analysis at Country level

Table 4-4 shows the impact of adopting ISO certification on the performance of firms by country of their operation. The findings indicate that adopter firms in Ethiopia, Kenya, and Rwanda have annual natural logs of 0.545, 0.845, and 3.0 greater than non-adopter firms, respectively. However, the effect of adoption on yearly sales per worker is only significant and higher for adopter firms in Kenya, with a natural log of 0.666. Analysis conducted at the national level reveals that Kenya is the driver of the results of ISO adoption impact. The probable reason for this result is that being a

middle-income economy, Kenya has a more industrialized basis and a higher labor productivity gain in manufacturing businesses, which is likely the cause of the higher number of adopter enterprises in the country. However, as mentioned in the context subsection, Ethiopia and Rwanda are landlocked nations with lower incomes that face more logistical costs when engaging in international trade.

Table 4-4 The Effects of ISO by Country Types

Countries	Ethiopia		Kenya		Rwanda	
Outcomes	(1) lnsale	(2) lnsalab	(3) lnsale	(4) lnsalab	(5) lnsale	(6) lnsalab
ATT	0.545** (0.265)	0.259 (0.261)	0.845*** (0.218)	0.663*** (0.193)	3.003** (1.169)	0.133 (0.713)
ATE	0.552** (0.250)	0.482** (0.233)	0.797*** (0.196)	0.635*** (0.187)	1.655* (0.855)	-0.345 (0.526)
Industry FE	yes	yes	yes	yes	yes	yes
Other controls	yes	yes	yes	yes	yes	yes
Observations	113	113	332	332	34	34

Notes: Table 4-4 shows the effect of ISO certification on the firms' performance at the country level. Columns 1 and 2 show the effect of ISO adoption on Ethiopian firms' annual sales and sales per worker measured in natural log respectively. Similarly, columns 3 and 4 are for Kenyan, and columns 5 and 6 show the effect of ISO adoption on Rwandan firms. All controls under the main regression are included. In all estimations robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

4.4.6.2 Heterogeneity Analysis by Industry Types

Adoption of ISO has positive and significant on firms in manufacturing and other service while it does not affect retail business. This result may be related to how retail firms operate in their home markets, where ISO adoption either has no effect or a negative impact, as our main result explains. The result also demonstrates that adopting ISO certification has a significant positive impact on businesses engaged in manufacturing and other services like lodging, transportation, and telecommunication. Our results align with earlier studies by Sampaio et al., (2012) that indicated manufacturing enterprises' operating performance was enhanced by ISO certification.

On the other hand, the possible explanation for the negative effect of ISO adoption on retail business might be associated with competition from informal sectors. Informal sectors coexist with

formal sectors, and retail services are inherently susceptible to the informal sector's competition. From summary statistics, competition against information sectors in these countries is about 44%.

Table 4-5 The Effect of ISO adoption by Sub-Industry Type

Industry types	Manufacturing		Retail Services		Other Services	
	(1)	(2)	(3)	(4)	(5)	(6)
Outcomes	lnsale	lnsalab	lnsale	lnsalab	lnsale	lnsalab
ATT	0.444**	0.435**	-2.594**	-0.423	0.798**	0.850***
	(0.195)	(0.193)	(1.147)	(1.132)	(0.334)	(0.292)
ATE	0.502***	0.486***	-1.450	0.049	0.999***	1.016***
	(0.171)	(0.172)	(0.898)	(0.865)	(0.278)	(0.274)
Country FE	yes	yes	yes	yes	yes	yes
Other controls	yes	yes	yes	yes	yes	yes
Observations	347	347	37	37	95	95

Notes: Table 4-5 shows the effect of adopting ISO certification on the firms' performance by industry type. Column 1 and 2 shows the effect of ISO adoption on firms in manufacturing sectors' annual sales and sales per worker performance measured in natural log respectively. Similarly, columns 3 and 4 are for firms in Retail services and the last 5 and 6 columns show the effect of ISO adoption on firms operating in other services. All controls under the main regression are included. In all estimations robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

4.4.6.3 Heterogeneity Analysis by Firm Size

As indicated in Table 4-6 the effect of the ISO certification on firm size reveals that small and medium-sized adopter has higher and significant annual sales and sales per worker while it does not affect the performance of large-sized adopter firms. The results show that small and medium-sized adopter has higher natural log annual sales of 1.26 and 0.52 than non-adopters firms respectively while adopters firms also have higher and significant natural log of sales per worker of 1.25 and 0.68. The possible explanation for this result is small and medium firms need more signaling compared to established large firms to sell their products. This finding is consistent with previous studies that support the provision of technical assistance to small and medium exporters firms has an indispensable effect in complying with international standards (Cissé et al., 2020) as these firms may lack experience, legitimacy, and external connections compared to large firms (Wang & Zhao, 2020). For example, India supports the adoption of ISO 9001/14001/HACCP by SMEs through sharing the financial burden of reimbursing up to 75% of expenditures associated with obtaining these certifications which is about Rs 75000($1370) to foster its uptakes (Singh et al., 2014).

Table 4-6 Effects of ISO Adoption on Firm Performance by Firm Size

Firm Sizes	Small Size		Medium Size		Large Size	
Outcomes	(1) lnsale	(2) lnsalab	(3) lnsale	(4) lnsalab	(5) lnsale	(6) lnsalab
ATT	1.259*** (0.455)	1.251*** (0.448)	0.519** (0.246)	0.684*** (0.224)	0.056 (0.241)	-0.007 (0.237)
ATE	1.039*** (0.346)	1.033*** (0.346)	0.724*** (0.207)	0.777*** (0.209)	0.107 (0.222)	0.059 (0.224)
Country FE	yes	yes	yes	yes	yes	yes
Industry FE	yes	yes	yes	yes	yes	yes
Other controls	yes	yes	yes	yes	yes	yes
Observations	100	100	154	154	233	233

Notes: Table 4-6 shows the effect of adopting ISO certification on the performance of firms of different sizes. Column 1 and 2 shows the effect of ISO adoption on small-size firms' annual sales and sales per worker performance measure natural log respectively. Similarly, columns 3 and 4 are for medium size firms and the last 5 and 6 columns show the effect of ISO adoption on large-size firms. All controls under the main regression are included. In all estimations robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

4.5 Conclusion and Policy Implications

This study evaluates the effect of meta-standards adoption on various aspects of firm performance using firm-level observation data for East African countries obtained from World Bank Enterprise Survey data. We applied propensity score matching techniques and regression adjustment estimation strategies.

Our results show that ISO-certified firms have higher and significant export sales and sales per worker than non-certified firms, but adopters' domestic sales performance was found to be significantly lower than non-adopter firms. Furthermore, depending on the industry types, size, and country of origin, we found that ISO adoption has heterogeneous effects on a firm's performance.

Our findings imply that adopting ISO certification in developing countries is motivated by satisfying export market destination requirements and improving internal productivity gains if implemented. However, appropriation of internal benefits of adoption requires other

complementary investments. The unique feature of our finding is a negative effect of adoption on domestic sales performance that may constrain the ongoing AfCFTA implementation since firms have no incentive to adopt ISO to benefit from the domestic market, hence the African market.

The results of the study have implications for enterprise managers and policymakers. Business leaders have to pay due attention to the ongoing quality revolutions and the global competition environments proactively. Policymakers have to complement firms' efforts to adopt ISO since it enhances firm productivity and participation in international business. Strengthening the capacity of domestic quality institutions and regulatory bodies is required. On the other hand, domestic buyers' or consumers' awareness of product quality has to be raised for ISO adoption to gain favorable conditions in the domestic market.

The cross-sectional nature of our data limits the discussion on the time lag /dynamic effects. The other shortcoming related to the data is unclear whether a given firm has adopted more types of ISO certifications. Further study on the intensity and dynamic effects of adopting ISO will add more value in the context of developing countries.

REFERENCES

Angrist, D. J. (2004). Treatment Effect Heterogeneity in Theory and Practice. *The Economic Journal*, *114*(494), C52–C83.

Anne-Célia, D., Gaigné, C., & Herghelegiu, C. (2006). Do Standards Improve the Quality of Traded Products? *AgEcon Search*, *1*(3), 11.

Castka, P., Prajogo, D., Sohal, A., & Yeung, A. C. L. (2015). Int. J . Production Economics Understanding fi rms ' selection of their ISO 9000 third-party certi fi ers. *Intern. Journal of Production Economics*, *162*, 125–133. https://doi.org/10.1016/j.ijpe.2015.01.012

Cattaneo, M. D. (2010). Efficient semiparametric estimation of multi-valued treatment effects. *Journal of Econometrics*, *155*(2), 138–154. https://doi.org/10.1016/j.jeconom.2009.09.023

Chandler, A. D., & Makers, A. (1999). The Dynamic Firm: The Role of Technology, Strategy, Organization, and Regions. In and Ö. S. Chandler, Alfred D., Peter Hagstrom (Ed.), *Oxford Scholarship Online* (pp. 15–44). Oxford University Press.

Cissé, F., Kurtz, J., & Odjo, S. P. (2020). Intra-African Trade Integration. *Africa Agriculture Trade Monitor*, 41–77. https://www.wto.org/english/docs

D'agostino, R. B. (1998). Propensity Score Methods for Bias Reduction in The Comparison Of a Treatment To A Non-Randomized Control Group. *STATISTICS IN MEDICINE*, *84*(17), 2265–2281. https://doi.org/10.1063/1.450443

Dehejia, R. H., & Wahba, S. (2002). Propensity score-matching methods for nonexperimental causal studies. *Review of Economics and Statistics*, *84*(1), 151–161. https://doi.org/10.1162/003465302317331982

Dick, G. P. M. (2008). *Shedding light on causation between ISO 9001 and improved business performance*. *28*(7), 687–708. https://doi.org/10.1108/01443570810881811

Doan, H. T. T., & Zhang, H. (2023). Technical barriers to trade, product quality and trade margins: firm-level evidence. *Review of World Economics*, *0123456789*. https://doi.org/10.1007/s10290-023-00514-4

Drph, A. L., & Drive, N. B. (2015). Graphical displays for assessing covariate balance in matching studies. *Journal of Evaluation in Clinical Practice*, *21*, 242–247. https://doi.org/10.1111/jep.12297

Estrin, S., Meyer, K. E., Nielsen, B. B., & Nielsen, S. (2016). Home country institutions and the internationalization of state owned enterprises: A cross-country analysis. *Journal of World*

Business, *51*(2), 294–307. https://doi.org/10.1016/j.jwb.2015.11.002

Fikru, M. G. (2014). Firm Level Determinants of International Certification : Evidence from Ethiopia. *World Development*, *64*, 286–297. https://doi.org/http://dx.doi.org/10.1016/j.worlddev.2014.06.016

Fofack, H., Dzene, R., & Hussein, O. A. M. (2021). *Estimating the Effect of AfCFTA on Intra-African Trade using Augmented GE-PPML*. *8*, 62–76.

Garrido, M. M., Kelley, A. S., Paris, J., Roza, K., Meier, D. E., Morrison, R. S., & Aldridge, M. D. (2014). Methods for constructing and assessing propensity scores. *Health Services Research*, *49*(5), 1701–1720. https://doi.org/10.1111/1475-6773.12182

Grieve, R., Radice, R., & Sekhon, J. S. (2013). *methods for estimating average treatment effects in health economic evaluation*. 174–202. https://doi.org/10.1007/s10742-013-0109-2

Grossman, G. M., Mccalman, P., & Staiger, R. . (2021). The "new" economics of trade agreements: from trade liberalization to regulatory convergence? *Econometrica*, *89*(1), 215–249. https://doi.org/10.3982/ECTA17536

Guler, I., Guillén, M. F., Muir, J., & Macpherson. (2002). Global competition, institutions, and the diffusion of organizational practices: The international spread of ISO 9000 quality certificates. *Administrative Science Quarterly*, *47*(2), 207–232. https://doi.org/10.2307/3094804

Hansen, B. B. (2004). Full matching in an observational study of coaching for the SAT. *Journal of the American Statistical Association*, *99*(467), 609–618. https://doi.org/10.1198/016214504000000647

Heras-Saizarbitoria, I., & Boiral, O. (2015). Symbolic adoption of ISO 9000 in small and medium-sized enterprises : The role of internal contingencies. *International Small Business Journal*, *33*(3), 299–320. https://doi.org/10.1177/0266242613495748

Ho, D. E., Imai, K., King, G., Stuart, E. A., Ho, D., & Stuart, E. A. (2007). Matching as Nonparametric Preprocessing for Reducing Model Dependence in Parametric Causal Inference Matching as Nonparametric Preprocessing for Reducing Model Dependence in Parametric Causal Inference. *Political Analysis*, *15*(3), 199–236. https://doi.org/10.1093/pan/mpl013

Ikram, M., Sroufe, R., Rehman, E., Shah, S. Z. A., & Mahmoudi, A. (2020). Do Quality , Environmental , and Social (QES) Certifications Improve International Trade ? A

Comparative Grey Relation Analysis of Developing vs . Developed Countries. *Physica A*, *545*, 123486. https://doi.org/10.1016/j.physa.2019.123486

Imbens, G. W., & Wooldridge, J. M. (2009). Recent developments in the econometrics of program evaluation. *Journal of Economic Literature*, *47*(1), 5–86. https://doi.org/10.1257/jel.47.1.5

Islam, M. M., Habes, E., Karim, A., & Syed Agil, S. O. bin. (2016). Quality certification and company performance – the newly developed country experience. *Journal of Business Economics and Management*, *17*(4), 628–644. https://doi.org/10.3846/16111699.2015.1110712

Javorcik, B., & Sawada, N. (2018). The ISO 90 0 0 certification : Little pain , big gain ? *European Economic Review*, *105*, 103–114. https://doi.org/10.1016/j.euroecorev.2018.03.005

Khan, Z. (2008). Cleaner production: an economical option for ISO certification in developing countries Zahiruddin. *Journal of Cleaner Production*, *16*(1 SUPPL. 1), 22–31. https://doi.org/10.1016/j.jclepro.2006.06.007

King, A. A., Lenox, M. J., & Terlaak, A. (2005). The strategic use of decentralized institutions: Exploring certification with the ISO 14001 management standard. *Academy of Management Journal*, *48*(6), 1091–1106. https://doi.org/10.5465/AMJ.2005.19573111

Landin, G. A., Allur, E., & Heras-Saizarbitoria, I. (2014). Adoption of ISO 9001 Quality Management Standard in Africa. *International Journal for Quality Research*, *8*(1), 61–72.

Li, L., & Greene, T. (2013). A weighting analogue to pair matching in propensity score analysis. *International Journal of Biostatistics*, *9*(2), 215–234. https://doi.org/10.1515/ijb-2012-0030

Li, M. (2013). Using the Propensity Score Method to Estimate Causal Effects: A Review and Practical Guide. *Organizational Research Methods*, *16*(2), 188–226. https://doi.org/10.1177/1094428112447816

Maggi, G., & Ossa, R. (2021). The Political Economy of Deep Integration. *Annual Review of Economics*, *13*, 19–38. https://doi.org/121020-032425

Mangula, M. S. (2013). Effect of Quality Management Systems (ISO 9001) Certification 0n Organizational Performance In Tanzania : A Case of Manufacturing Industries In Morogoro. *International Journal of Technology Enhancements and Emerging Engineering Research*, *1*(1), 14–19.

Masakure, O., Henson, S., & Cranfield, J. (2009). Standards and export performance in developing countries : Evidence from Pakistan. *The Journal of International Trade & Economic Development*, *8199*. https://doi.org/10.1080/09638190902986538

Nelson, R. R. (1991). Why Do Firms Differ , and How Does it Matter ? *Strategic Management Journal*, *12*, 61–74.

Nelson, R. R., & Sampat, B. N. (2001). Making sense of institutions as a factor shaping economic performance. *Journal of Economic Behavior and Organization*, *44*(1), 31–54. https://doi.org/10.1016/S0167-2681(00)00152-9

Nurcahyo, R., Zulfadlillah, & Habiburrahman, M. (2021). Relationship between ISO 9001:2015 and operational and business performance of manufacturing industries in a developing country (Indonesia). *Heliyon*, *7*(1), e05537. https://doi.org/10.1016/j.heliyon.2020.e05537

Ochieng, J., Muturi, D., & Njihia, S. N. (2015). The impact of ISO 9001 implementation on organizational performance in Kenya. *TQM Journal*, *27*(6), 761–771. https://doi.org/10.1108/TQM-06-2015-0071

Orcos, R., Pérez-aradros, B., & Blind, K. (2018). Why does the di ff usion of environmental management standards di ff er across countries ? The role of formal and informal institutions in the adoption of ISO 14001. *Journal of World Business*, *53*(6), 850–861. https://doi.org/10.1016/j.jwb.2018.07.002

Rosenbaum, P. R., & Rubin, D. B. (1983). *The central role of the propensity score in observational studies for causal effects*. *1083*, 41–55.

Rubin, D. (1979). Observational Studies Using Multivariate Matched Sampling and Regression Ad justment to Control Bias in Observational Studies. *Journal of the American Statistical Association*, *74*(366), 318–328.

Rubin, D. B. (1977). Assignment to Treatment Group on the Basis of a Covariate. *Journal of Educational Statistics*, *2*(1), 1–26.

Rubin, D. B. (2004). Teaching Statistical Inference for Causal Effects in Experiments and Observational Studies. *Journal of Educational and Behavioral Statistics*, *29*(3), 343–367.

Sampaio, P., Saraiva, P., & Monteiro, A. (2012). ISO 9001 certification pay-off: Myth versus reality. *International Journal of Quality and Reliability Management*, *29*(8), 891–914. https://doi.org/10.1108/02656711211270351

Singh, M., Brueckner, M., & Kumar, P. (2014). Insights into the state of ISO14001 certi fi cation

in both small and medium enterprises and industry best companies in India : the case of Delhi and Noida. *Journal of Cleaner Production*, *69*, 225–236. https://doi.org/10.1016/j.jclepro.2014.01.040

Smith, H. (1997). “Matching with Multiple Controls to Estimate Treatment E®ects in Observational Studies,.” *Sociological Methodology*, *27*, 325{353.

Smith, J. A., & Todd, P. E. (2005). Does matching overcome LaLonde ’ s critique of nonexperimental estimators ? *Journal of Econometrics*, *125*, 305–353. https://doi.org/10.1016/j.jeconom.2004.04.011

Tayo Tene, C. V., & Boiral, O. (2021). Does quality management improve the internalization of environmental practices? An empirical study in Africa. *Business Strategy and the Environment*, *30*(7), 3053–3064. https://doi.org/10.1002/bse.2788

Tayo Tene, C. V., Yuriev, A., & Olivier, B. (2018). Adopting ISO Management Standards in Africa: Barriers and Cultural Challenges. In I. Heras-Saizarbitoria (Ed.), *Mapping out ISO 9001, ISO 14001 and other management system standards* (pp. 59–83). Springer Nature. https://doi.org/10.1504/IJPQM.2011.041096

Teece, D. J. (1986). Profiting from Technological Innovation: Implication for Integration,Collabration, Licensing and Publics Policy. *Research Policy*, *15*, 285–305.

Ullah, B., Wei, Z., & Xie, F. (2014). ISO certification, financial constraints, and firm performance in Latin American and Caribbean countries. *Global Finance Journal*, *25*(3), 203–228. https://doi.org/10.1016/j.gfj.2014.10.003

Vansteelandt, S., & Daniel, R. M. (2014). *On regression adjustment for the propensity score*. *281*(May). https://doi.org/10.1002/sim.6207

Wahid, R. A., & Corner, J. (2009). Critical success factors and problems in ISO 9000 maintenance. *International Journal of Quality and Reliability Management*, *26*(9), 881–893. https://doi.org/10.1108/02656710910995073

Wang, J., & Zhao, M. (2020). Economic impacts of ISO 14001 certi fi cation in China and the moderating role of fi rm size and age. *Journal of Cleaner Production*, *274*, 123059. https://doi.org/10.1016/j.jclepro.2020.123059

Williamson, O. E. (1991). Strategizing, Economizing, and Econmic Organization. *Strategic Management Journal*, *12*(1 991), 75–94.

Wu, J., & Wu, Z. (2019). ISO certification and new product success in an emerging market.

Asian Business and Management, *18*(1), 51–71. https://doi.org/10.1057/s41291-018-0046-6

Zhou, X., & Xie, Y. (2020). Heterogeneous Treatment Effects in the Presence of Self-Selection: A Propensity Score Perspective. In *Sociological Methodology* (Vol. 50, Issue 1). https://doi.org/10.1177/0081175019862593

APPENDICES

Annex 4A:Study Variable Description

Table A1 Study Variable Description

Variable name	**Description of variables**	**Measurement unit**
Lntotal Sale	Natural log Total annual sale in Us dollar	Numeric
Lndiret Export	Natural log of annual sale direct export share in us dollar	Number
Lnindire Export	Natural log of annual sale indirect export share in Us dollar	Number
Lndom Domestic	Natural log of annual sale domestic market share in Us dollar	Number
Lnsale Labor	Natural log of sale per labor in Us dollar	Number
Direct Export (%)	Natural log of direct export share of annual sale	Percentage
Indirect Export (%)	Natural log of direct export share of annual sale	Percentage
Domestic Sale (%)	Natural log of domestic market share of annual sale	Percentage
ISO Status	If an establishment has adopted ISO(Yes =1, 0 otherwise)	Dummy
Managerial Exp	Managerial experiences(Number of years in that sector)	Number
Firm size	Natural log of total number Full employment	Number
R&D Activity	Firms R&D activity (Yes=1 ,0 otherwise)	Dummy
Access Credit	If an establishment has an access to credit loan(Yes,1,0Otherwise)	Dummy
External Audit	If an establishment external audits service is used(Yes=1,0 otherwise)	dummy
Emp. Training	If an establishment provide training for workers(Yes=1,0 otherwise)	dummy
Own Website	If an establishment has own website(Yes=1,0 Otherwise)	Dummy
Firm Age	Number of the years since an Establishment is on operation	Number
Informal sector	If the firm is competing with informal sector(Yes=1,0 Otherwise)	
Domestic	If the an establishment is domestic owned (Yes=1,0 otherwise)	Dummy
Foreign	If the firm is owned by Foreign (Yes=1, 0 Otherwise	Dummy
Country Name	Countries Includes(Ethiopia=1, Kenya=2, Rwanda=3)	Categorical
Industry/Est Type	Establishment Type(Manufacturing=1, Services=2, Other Services=3)	Categorical
Firm size category	Firm Size sub classification (Micro<5, small, 5-20, Medium(20-99) and Large>100 employees)	Categorical

Annex 4B: Determinates of Firm ISO Adoption and Marginal Effects

VARIABLES	(1) ISO-Adp	(2) dydx	(3) lnsale	(4) dydx
Manger Exper.	-0.007*	-0.001*	0.019***	0.019***
	(0.004)	(-1.76)	(0.004)	(5.31)
Firm size	0.241***	0.037***	0.944***	0.944***
	(0.067)	(3.63)	(0.063)	(15.08))
Firm R&D	0.502***	0.077***	0.201**	0.201**
	(0.103)	(4.94)	(0.102)	(1.97)
Access to Cred.	0.025	0.004	0.264***	0.264***
	(0.088)	(0.29)	(0.076)	(8.32)
External Audit	0.356***	0.054***	0.741***	0.741***
	(0.124)	(2.86)	(0.089)	(8.32)
Work. Training	0.277***	0.042***	0.010	0.010
	(0.091)	(3.08)	(0.084)	(0.12)
Own Website	0.329***	0.05***	0.324***	0.324***
	(0.097)	(3.37)	(0.089)	(3.65)
Firm Age	0.014***	0.002***	0.009***	0.009***
	(0.003)	(5.66)	(0.003)	(3.33)
Compt. Informal	-0.226**	-0.035***	-0.231***	-0.231***
	(0.091)	(-2.52)	(0.073)	(-3.18)
Domestic Own	-0.124	-0.019	-0.131	-0.131
	(0.126)	(-0.98)	(0.131)	(-1.00)
Foreign Own	0.093	0.014	0.394	0.304
	(0.186)	(0.50)	(0.221)	(1.38)
Industry FE	yes	-	yes	-
Country FE	yes	-	yes	-
Observations	2,043	2043	1896	1896

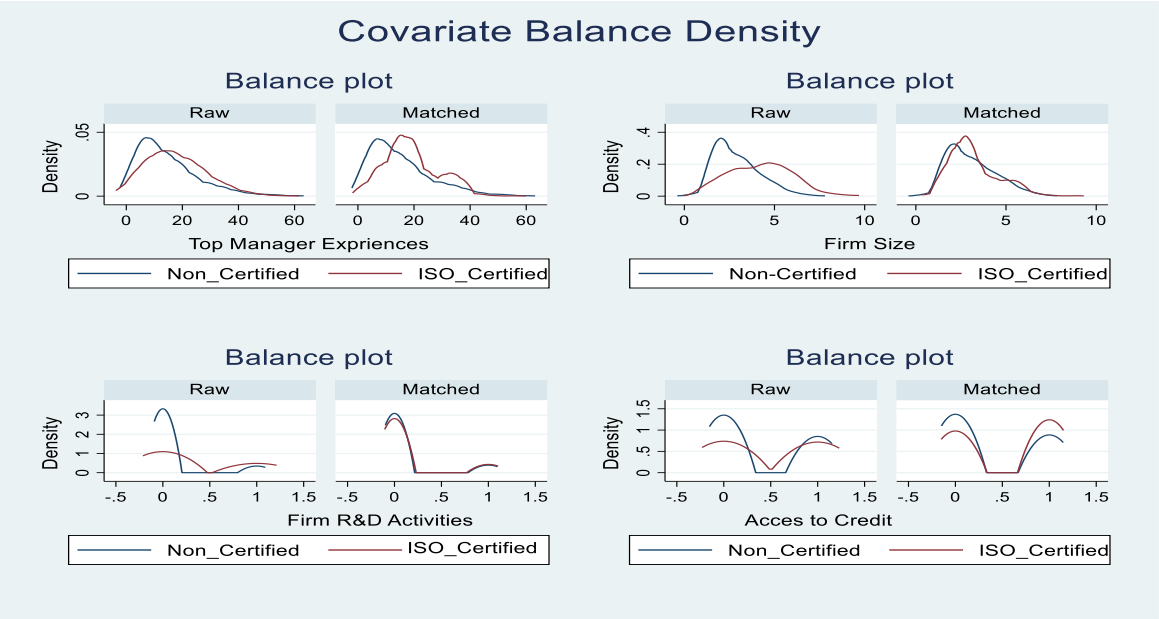
Note: In this table, column 1 shows probit estimation that shows the likelihood of firm ISO adoption, and column 2 indicates the marginal effect of each included determinant of ISO. Clun 3 and 4 Show the linear regression results that indicate the effect of each selected variable on firm annual sales performance and column 4 shows the marginal effects of linear regression. In parentheses of column 2 report z values and column 4 is t values while column 1 and 3 are standard errors. For both estimations robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Annex 4C: PS Matching Frequency Weighting Distribution

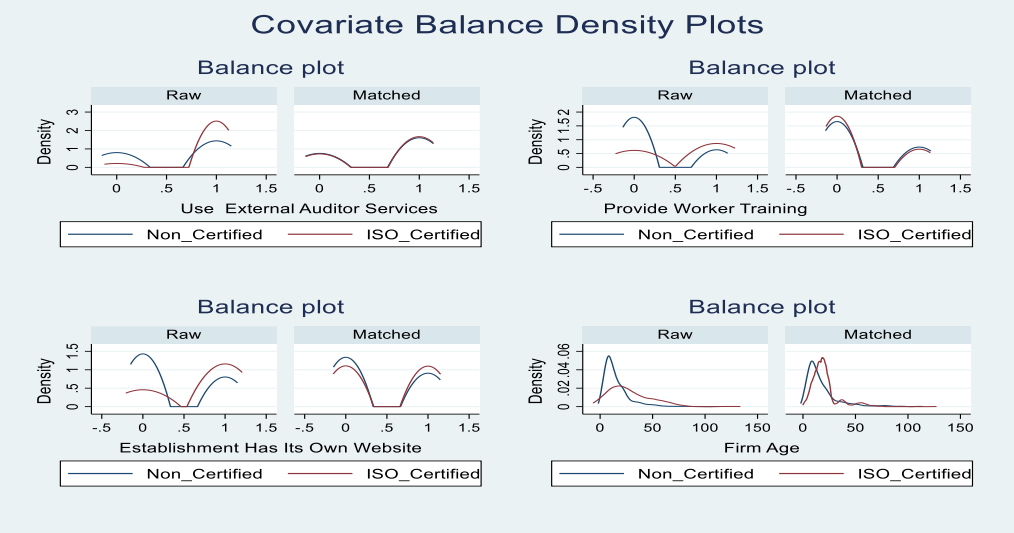
Weight	Frequency	Observations	Percentage	Cumulative
1	115	115	77.18	77.18
2	16	32	10.74	89.92
3	10	30	6.71	94.63
4	3	12	2.01	96.64
5	3	15	2.01	98.66
6	1	6	0.67	99.33

9	1	9	0.67	100
Total	149	219	100	

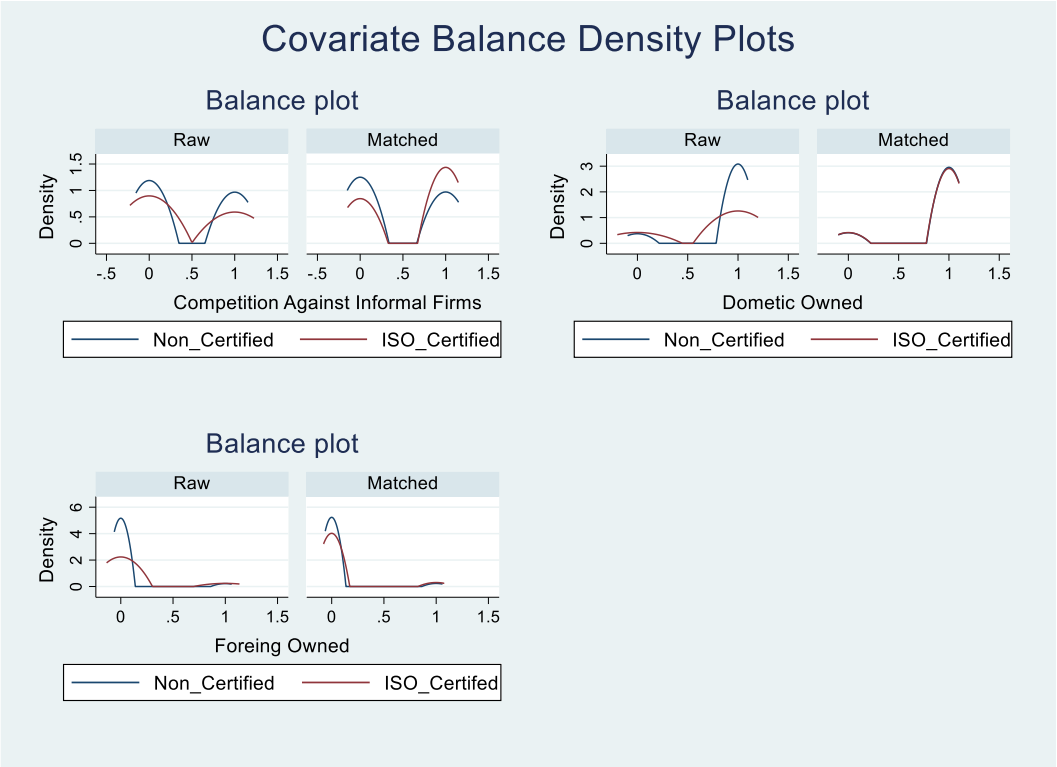
Annex 4D**:** Balance plot of Manager Experience, Firm Size, R&D, and Credit



Annex 4E: Balance Plot of Ext.Audit, Wor.Training, Website, and Firm Age



Annex 4F: Balance Plot of Inf. Comp.Domestic owned, and Foreign Own



CHAPTER FIVE

5. CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Summary of Key findings

The aim of this dissertation is to examine the effects of industry policy incentives and firm capability initiatives on the performance of the firms within the developing countries context. This purposed is achieved in three independent but interlinked papers included in the dissertation. For the convenience of the readers, this chapter gives the important results summary of each study in chronological order that are presented as follows.

Chapter two assessed the impact of sector-specific industrial policy intervention (second schedule program) on firm performance Administrative and firm-level survey data was used to assess the impacts the program. Our results indicate a positive and significant effect of the program on productive capacity utilization by beneficiaries, but no effect on employment generation.

Chapter three examined the role of firm internal resource-bases (absorptive capacity) and firm learning by importing through mediation effects of sector-specific industrial policy using a mix of administrative and field survey data. The results show that the firm's absorptive capacity has positively affects participation in the program and facilitates firm's learning by importing. We find an increasing marginal effect of the firm's resource base on firm's learning by importing. We conclude that differences across firms in the utilization of external opportunities can be attributed to prior deepening of capabilities internal to firm and institutional supports by the government.

Chapter four evaluated how ISO certification adoption affects the performance of firms in East Africa. We used firm-level observational data obtained from the World Bank Enterprise survey for Ethiopia, Kenya, and Rwanda. Our findings show that ISO-certified firms have higher and significant export sales and sales per worker than non-certified firms, but adopters' domestic sales performance was found to be significantly lower than non-adopter firms.

5.2 Policy Implications

The findings of the specific empirical investigations that make up this dissertation suggest a number of policy implications. We organized the policy implication remarks of for each chapter below.

Our results from Chapter two suggest that carefully designed interventions that mitigate major obstacles for firm operations in developing counties – in the present case access to high-quality imported inputs – can improve firm performance. Central for the current policy program is the role played by the institutions involved in it. Almost certainly, a strong institutional capacity is required for programs of the type considered in this paper to work. Our results also speak to the importance of targeting. The program appears to have reached firms in the target population, but at the same time we note that take-up rates have been relatively low. We have discussed the importance of building relationships between the state and the business sectors that all parties have some faith in.

Similarly, the findings of Chapter three can help policymakers and business leaders to devise an effective strategies and policies that foster external knowledge acquisition, skill development, and technology adoption. Government has to provide incentives by prioritizing firm's absorptive capacity to speed up structural transformation and maximize the values of public resources. The result of the study suggest importance of building strong absorptive capacity of firms in designing evidence-based policy. Thus, policymakers need to understand the developmental processes inside the firm in strategy formulation, particularly in public resource allocation.

Finally, the results of Chapter four have key implications for enterprise managers and policymakers. Business leaders have to pay due attention to the ongoing quality revolutions and the global competition environments proactively. Policymakers have to complement firms' efforts to adopt ISO since it enhances firm productivity and participation in international business. Strengthening the capacity of domestic quality institutions and regulatory bodies is required. On the other hand, domestic buyers' or consumers' awareness on product quality has to be raised for ISO adoption to gain favorable conditions in the domestic market.

5.3 Limitation of the Study

As is the case with most empirical studies, this study also has a number of limitations .The following limitations were identified for future investigation, An empirical evidence under paper one indicates certain positive effects of the program on firm performance, we have also noted that the program has been associated with high costs. We do not take a view on whether the positive effects of the program on firm performance are sufficiently strong to justify the costs of the program. In addition, we do not have a randomized treatment and control firms related to program implementation and there could be selection biases in the program assignment. However, we used program design, context knowledge and estimation strategies to try to overcome these challenges.

In paper 2, from the 'theoretical framework' perspective, there is no ideal construct or proxy variables to capture firm-level absorptive capacity. The latent nature of absorptive capacity would make it difficult to capture the unobserved factors that might explain absorptive capacity. In this paper, we relied on previous empirical studies and context, to construct a proxy variable for absorptive capacity.

In paper 3, it is unclear from the data whether a given firm has adopted more types of ISO certifications and specific time period when that the firm adopted. Hence, data nature limits the discussion on intensity and the dynamic effects of adoption on the firm's performances in the context of developing countries.

The other common limitation for all three papers in this dissertation is that they rely on self-reported observational data that could subjected to biases. Further, the confounding nature of variables used in the study makes it difficult to fully disentangle the impacts of the treatments (policy incentives/capability building initiatives) from other firm characteristics.

5.4 Avenues for Future Research

The concluding and limitations sections briefly highlight a number of new avenues that could be explored in further advance on some of the research ideas developed in this dissertation. From empirical results on paper 1, we have also noted that the program has been associated with high costs. Exploring further policy cost-benefit analysis could be an interesting area for future research.

Similarly, in paper 2, we used a proxy index to measure firm absorptive capacity based on firm-level constructs in the context of Ethiopian manufacturing firms. However, there has been no validation on the conceptual definition of absorptive capacity due to the intangible nature of the construct to arrive at the specific constructs for empirical analysis. Thus, more empirical study is needed on the conceptualization of absorptive capacity in the context of developing countries.

Moreover, in paper 3, further studies on the intensity and dynamic effects of adopting ISO on firm performance add more value in the context of developing countries. For example, which types or combinations of the Meta-standards has to be prioritized for adoption by the firms operating in these countries to enhance their performance.

Finally, to overcome the shortcoming associated with observational data and challenges related with selection biases and confoundedness, conducting Randomized Controlled Trial (RCT) study will help to document more accurate magnitude of intervention effects as an evidence for policy decisions. However, implementing RCT is difficult in practice for government support interventions since it require random allocation of incentives/treatments which is not the case in reality as the sources of these funds are public taxation.