



Female entrepreneurs, firm performance, and resource misallocation

Zeinab Elbeltagy

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Zeinab ELBELTAGY

Female Entrepreneurs, Firm Performance, and Resource Misallocation

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À ma mère, qui m'est tellement chère.

À mon chéri, qui me soutient pour vivre les rêves les plus merveilleux.

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Introduction

Why are some countries, which were poor several decades ago, becoming richer today, while others remain poor and their per capita income is not increasing or is even decreasing? One of the fundamental papers in economic growth theory, [Solow \(1957\)](#), shows that the dynamics of a country's production depend mainly on the total productivity of the factors of production (i.e., capital and labor), which have been formalized in subsequent research as total factor productivity (TFP). TFP is considered one of the main determinants of a country's GDP per capita and standard of living. Productivity is the ratio of the quantity produced to the quantity of resources used to obtain it. It is the residual of a production function and captures what is not explained by the increase in the factors of production used.

Since the early 2000s, many developed and developing countries have faced a productivity slowdown. This trend is even more pronounced after the financial crisis of 2008-2009. The decline in productivity may then be a consequence of the slow adoption of advanced technologies and best practices in the production process, or inefficiencies in the allocation of productive resources. Therefore, this thesis aims to understand the impact of financial structure on firm performance through different measures and estimate productivity gains, which are essential for developing countries to move up the ladder of economic development. This is a topic of research interest and important concerns about policy reforms.

Recent empirical evidence on the link between access to credit and firm performance is largely focused on developed countries. We have little evidence on the impact of credit markets on firm performance in developing countries, where financial institutions are less developed. This issue is also particularly relevant for micro, small, and medium-sized enterprises (MSEMS), as small firms are the most vital job creators in developing countries (e.g., [Ayyagari et al. \(2011\)](#); and [Haltiwanger et al. \(2013\)](#)). To address these issues, in Chapter (1), in collaboration with Zenathan Hasannudin, we examine the financial structure of micro and small enterprises (MSEs) on productivity in Indonesia.

In the next Chapter (2), I highlight the importance of the role of the gender of the business owner on business growth and examine it as a determinant of business access to finance in 62 developing countries. In recent years, support programs for women entrepreneurs have gained traction and prominence to create jobs and boost productivity at the national and regional levels. However, disparities in the initial resource endowment of male- and female-led enterprises, sectoral selectivity toward low-productivity activities, social norms, and institutional arrangements limit the growth of female-owned enterprises. In addition, in developing countries, particularly those where discrimination against women is widespread, it is crucial to study the factors that determine gender gaps in firm performance and access to finance.

Given that, the business environment is characterized by a high degree of informality, often involving unpaid family workers and a high percentage of other unpaid temporary workers (ILO, 1993), it is important to distinguish in the sample countries with a large informal sector. This implies underestimating the importance of women entrepreneurs in these countries compared to those with a small informal sector.

Furthermore, the existing literature has identified three main sources of overall TFP growth. The first is technological progress, while the second is the transfer of factors of production from low-productivity sectors, such as agriculture, to higher-productivity sectors, such as manufacturing industry (Nguyen et al., 2016). Finally, the third source is the improved allocation of resources among firms when resources from low-productivity firms shift to high-productivity firms. This will have a positive effect on the growth of TFP aggregation.

Therefore, in the Chapter (3), I focus on the third main determinant of aggregate productivity explored by measuring the misallocation of resources across firms within an industry. The seminal papers in this literature (Restuccia and Rogerson (2008); Hsieh and Klenow (2009); Bartelsman et al. (2013); and Asker et al. (2014)), suggest that high firm-level productivity heterogeneity within an industry may indicate a misallocation of resources across firms, with a sizable effect on aggregate TFP. In this study, I examine the role of resource misallocation in the TFP and output dynamics of the Indonesian manufacturing sector between 1990 and 2015, controlling for the Asian financial crisis (1997-1998) and the World Trade Organization period in 1995.

Outline of the thesis

The thesis is composed of three chapters. They aim to explore various performance measures at the firm level and the aggregate productivity in developing countries. The three chapters can be read independently from one another.

Chapter 1 – Financing Structure, Micro and Small Enterprises’ Performance, and Woman Entrepreneurship in Indonesia

Business performance can be hampered by many factors, including lack of financing, corruption, political instability, and poor infrastructure. In addition, the overall business and institutional environment, particularly the legal environment, is important for firm performance (Beck and Demirguc-Kunt, 2006). Existing empirical evidence specifically suggests that lack of access to finance is one of the biggest problems faced by micro and small enterprises (MSEs) for business performance in most developing countries (Ayyagari et al., 2016). The lack of financial support for MSEs may be due to the high cost of doing business, which implies that enterprises find it too expensive to access external financial sources.

This chapter investigates the relationship between financial structure and firm performance by exploiting a dataset of 59,968 Indonesian MSEs produced by the Indonesian Statistics Agency (BPS) between 2010 and 2015. It uses both descriptive analysis tools and regression models to examine the relationship between productivity and access to finance of MSEs in the manufacturing sector in Indonesia. In this study, we rely on three commonly recognized main sources of financing for MSEs, namely formal external sources (e.g., commercial banks, cooperatives, microfinance institutions (MFIs), credit

unions, government, suppliers), informal external sources (e.g., friends or relatives and moneylenders), and internal sources (e.g., retained earnings, owners' private savings).

Our production function estimates are based on the methodology introduced by [Akerberg et al. \(2015\)](#) that controls for simultaneity bias in the estimation of production functions using firm-level data. This bias is due to the fact that input demand for materials and labor is positively correlated with unobserved productivity. Thus, for inputs, we rely on expenditures on raw materials, energy, and electricity as a proxy for the firm's unobserved productivity.

In the presence of external financing constraints, firms rely more on internal funds to finance their investments. Still, the effect of internal financing on firm productivity decreases when the firm has access to an external bank credit facility. When the external financing constraint is alleviated, the firm relies less on internal funds and turns to external financing as its primary source of growth. Moreover, given the potential problems of reverse causality, this study applied the dynamic panel generalized method of moments (GMM) explored by [Arellano \(2009\)](#) to address the endogeneity problem. The GMM method uses the lagged levels of the endogenous regressors as instruments, which makes the endogenous variables predetermined and, therefore, uncorrelated with the error term.

Furthermore, we recognize that the problems faced by MSEs apply to most enterprises in the country, regardless of gender. However, because MSEs are necessary means for low-income groups to escape poverty, this study examines the role of gender in MSE dynamics in Indonesia. Because micro-level studies and data on Indonesian micro-enterprises, especially those related to gender issues, are still very limited. Therefore, this study will fill the research gap on the impact of gender on the productivity and market access of Indonesian MSE businesses.

Through descriptive analysis, we examine how female-owned firms differ from male-owned firms. The results show that women owners tend to be concentrated in labor-intensive sectors such as textiles, food, and apparel. Women-owned firms also employ a higher percentage of female workers. Further, we enriched the gender analysis by examining how productivity patterns differ between male and female firms. Based on the regression results, this study illustrates that male-owned firms perform better overall than female-owned firms on all performance measures examined in this study.

The evidence suggests that the gender gap in access to financial services may stem from both the supply and demand sides of the credit market. On the bank side, it is difficult for banks to significantly increase lending while meeting lending criteria, as many banks perceive MSEs as a high-risk sector. On the demand hand, the informal sector is overrepresented. Women entrepreneurs are more likely than men entrepreneurs to use internal or informal financing for the following reasons. The conduct of MSE activities does not require as much capital, advanced technology, and formal external credit is not adapted to the reality of these activities due to transaction costs. Thus, this study concludes that the number of women-owned businesses, especially MSEs, in Indonesia should not be viewed solely as the rise of female entrepreneurship in the country. Unemployment or poverty may also have played a role in pushing many women to run their small businesses.

Under Presidential Instruction Number 6 of 2007, the Indonesian government introduced two policies

to improve SMEs' access to finance. These are: (i) strengthening the loan guarantee system for micro and small enterprises, known as microcredit loans (KUR-Kredit Usaha Rakyat). These are government-guaranteed loans for micro and small enterprises, which are productive and feasible but not yet bankable. The KUR is intended to provide working capital and investment credit of up to Rp 500 million. Credit providers are commercial banks designated by the government (Machmud and Huda, 2010); and (ii) leveraging non-bank funds to empower micro and small enterprises.

Given the significant contribution of MSEs to the growth and resilience of the Indonesian economy, the study zoom into the impact of COVID-19 on these enterprises (Roser et al., 2020), with a focus on women-owned MSEs. Women are the hardest hit because they typically earn less than men and their jobs are less secure. Moreover, with a sharp downturn in economic activity, women are particularly vulnerable to losing their livelihoods, especially those working in informal micro and small enterprises.

The use of digital platforms and technologies is one of the most important coping strategies in response to the COVID-19 pandemic. This finding is especially relevant because survey results also indicate that female-owned MSEs are less likely than male-owned MSEs to access financing or use other more traditional coping strategies to offset reduced business revenues. In addition, digital solutions help business owners balance family and work responsibilities. This is particularly relevant for women, who take on a disproportionate share of unpaid care and domestic work.

Chapter 2 – Gender and Access to Finance on Business Development

Although women's business formation rate has increased in recent decades, the prevalence of women's business ownership is only 50%-60% of that of men. Moreover, the low rate of business ownership among women is a global phenomenon (Fairlie and Robb, 2009). Therefore, in the second chapter, I investigate the effect of gender on variables of access to finance and firm growth using firm-level data from 33,971 firms in 62 developing countries, controlling for the effects of different firm sizes, firm age, regions, and country income levels.

This chapter used a rich firm-level dataset from the World Bank Enterprise Survey (WBES) to investigate the performance gaps in firm growth measured by employment and sales growth between female- and male-owned firms in developing countries and compare the results for different regions of the world. I depart from the previous literature by using the gender of the owner, gender of the top manager, and gender as owner and manager at the same time as target variables, which are newly available in the 2016 version of the WBES.

The main results indicate that, on average, women-owned firms do worse than their male-owned counterparts in terms of employment growth. These results have a heterogeneous influence across regions. It is worth noting that using sales growth in the robustness check shows a significant effect of female ownership in the African region and at the low-income country level, but a negative effect in the Latin American region and high-income countries. In sum, this study confirms the mixed results of women-owned firms in terms of firm growth.

I explore the association between gender and the probability of being constrained using the Probit

model. Although the estimated coefficient on the female ownership indicator varies by region, the derived marginal effects show that the probability of being financially constrained is about 1.1 percentage points higher for female-owned firms than for male-owned firms. The study then examines access to finance on firm growth using objective and subjective measures of financing access. The objective measure of access to finance is a variable, which reports the availability of finance as having a line of credit. In comparison, the subjective measure of access to finance is obtained from ranking access to finance as no or severe impediment to business operations. The results show that access to finance in a loan or external financing helps SMEs the most. This result holds not only for the full sample but also for the different regions. Having a loan or overdraft facility and receiving external financing to invest helps firms of all sizes grow in all regions.

However, the question of the potential endogeneity of firm growth with respect to external financing remains. Therefore, I adopt the two-stage least squares (2SLS) regression method. I consider an internal instrument such as the lagged value of the credit and two external instrumental variables correlated with access to finance (e.g., the index of overall supervisory independence from banks and politicians and the degree of creditor rights). The F-test for this instrument is statistically significant, indicating the validity of the chosen instrument. In addition, the Sargan test also supports the validity of the instruments, which means that the null hypothesis of the exogeneity of these instruments cannot be rejected.

Existing approaches to supporting growth-oriented women entrepreneurs are heterogeneous in their design and implementation. Further work is needed to better understand what motivates women's participation in ownership and management and its consequences in order to design appropriate policies. This also requires a robust assessment of existing constraints and the creation of forums for dialogue on women's entrepreneurship across sectors, government, and civil society to encourage reforms.

Chapter 3 – Productivity, Resource Misallocation and Trade Liberalization

Resource misallocation is defined as the consequence of high-productivity firms not obtaining sufficient resources in terms of capital and labor to expand their production, while low-productivity firms continue to employ resources rather than downsize and eventually exit. This may be the result, for example, of politically connected firms having easier access to finance and thus expanding production even though their productivity is lower than that of less connected firms. This phenomenon could significantly reduce a country's total output and productivity, as highly productive firms would be smaller and less productive firms larger than they should be under an optimal allocation.

Our motivation comes from two streams of research. The first is the literature that focuses on the distortions that are reflected between actual and efficient outcomes. These distortions are called "wedges". A seminal paper is [Hsieh and Klenow \(2009\)](#), which estimates that if resource allocation in China and India is eliminated, i.e., if capital and labor are hypothetically reallocated to equalize marginal products to the extent observed in the United States, manufacturing TFP can increase from 30% to 50% in China and from 40% to 60% in India. Using the methodology of [Hsieh and Klenow \(2009\)](#), we find that removing distortions has a significant effect on aggregate TFP in Indonesia. This result is consistent with the several studies that have provided a similar picture of large TFP gains expected from removing

distortions.

This chapter uses the concept of output- and revenue-based total factor productivity (TFPQ and TFPR), respectively, which is presented in (Foster et al., 2008). The differences between the output and revenue bases for calculating TFP allow for different sectors. Thus, TFPQ primarily reflects idiosyncratic components of plant costs, both technological and factor price bases, while TFPR confounds idiosyncratic effects of demand and factor prices on efficiency differences. Accordingly, this chapter provides a framework for calculating TFP as a combination of TFPQ and TFPR.

The other strand is the analysis of the impact of trade liberalization on aggregate TFP. There is strong evidence of the link between trade barriers and aggregate TFP. However, most of these studies have focused on the effect of trade reform based on the TFPR and not on the efficiency of firm productivity as measured by the TFPQ. Moreover, little attention has been paid to the impacts of trade liberalization on misallocation as measured by the variation in wedges. Therefore, we discussed policy reform in terms of trade and financial liberalization on productivity measures (TFPQ or TFPR) and idiosyncratic distortions measured by output or capital distortions.

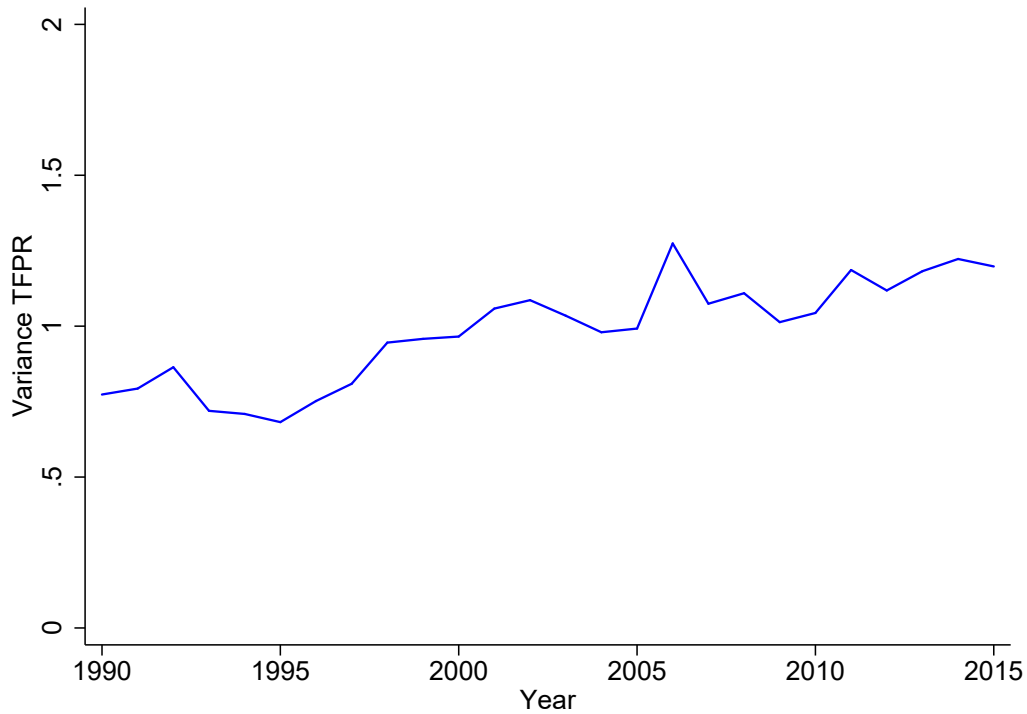
Building upon these two strands of the literature, this chapter attempts to measure the source of resource misallocation to aggregate manufacturing TFP, focusing on Indonesian manufacturing firms from 1990-2015. Our research questions are threefold. (i) To what extent are resources misallocated in Indonesia? (ii) How large would productivity gains have been in the absence of distortions? (iii) The degree of productivity measured by TFPQ or TFPR and the misallocation measured by output or capital wedges after policy reforms in terms of trade and financial liberalization. In answering these questions, this paper goes a step further in providing a deeper understanding of the gain from trade on firm efficiency measured by TFPQ and TFPR.

To achieve these goals, I use the methodology proposed by Hsieh and Klenow (2009), which allows for firm-level distortions on TFP in a monopolistic competition model with heterogeneous firms. By aggregating firm-level productivity to the industry and aggregate levels, we compute potential TFP gains when the distortions are removed. In addition, I perform a decomposition of the distortion variations to account for the sources of resource misallocation.

First, the empirical results show the presence of significant resource misallocation in Indonesia in the form of TFPR variation, which is the main indicator of allocation non-optimality. Figure (0.1) shows the evolution of TFPR dispersion over our period from 1990 to 2015. We see a trend of increasing dispersion of intra-industry TFPR. This result is consistent with the common knowledge that resources in developing countries are not allocated efficiently. Moreover, the dynamics of the TFPR are determined mainly by the distortions in output, with a fairly stable influence of the distortions in the capital.

Second, there would have been a substantial improvement in aggregate TFP in the absence of distortions. When all output and capital distortions are removed, the potential TFP gains in manufacturing would increase between 136% to 292%. This high magnitude of TFP gain could be explained by the misallocation of natural resources in Indonesia and the different degrees of competition and concentration within industries, leading to different distortions. Furthermore, the total share of firms in Indonesia

Figure 0.1: Evolution of the dispersion of TFPR



Source: Author's compilation based on BPS-Statistic Indonesia data.

that are expected to reduce their size is about 89%, compared to 11% for the total share of firms that are expected to increase their size, as some firms have been constrained in their growth due to resource misallocation.

Third, we try to understand the role of firm characteristics with productivity measured by TFPQ or TFPR. A higher TFPQ corresponds to large firms and state-owned enterprises (SOEs). In contrast, small firms have a higher TFPR because they are often credit constrained and cannot borrow to make productive investments, limiting their growth. If lack of access to finance prevents small firms from growing, the allocation of resources will be distorted. As a result, capital and labor will not flow to the most productive area, and growth will suffer.

Finally, government policies can affect overall productivity and efficiency, as they determine firms' decisions about production, investment, and allocation of their scarce resources. For example, policies can prevent factors of production from being allocated to their best use, known as misallocation, which impedes growth at the macro level. These can include barriers to entry and exit, limits on firm capacity, tax and subsidy policies, etc., which can lead to deviations from optimal allocation choices.

Addressing distortionary policies would eliminate resource misallocation and increase overall productivity. Among the various policy distortions, trade barriers appear to be an important source of misallocation because they tend to be higher in developing countries than in developed countries. According to the [Bank \(2014\)](#), the average tariff rates for high, middle, and low-income countries are 3.9, 8.6, and 11.5 percent, respectively. These differences underscore the role played by country conditions

in how firms respond to trade liberalization. [Restuccia and Rogerson \(2013\)](#) also argued that trade barriers could be one of the factors generating misallocation. Trade liberalization is supposed to reduce misallocation by reallocating resources from less productive firms to more productive firms (e.g., [Melitz \(2003\)](#)).

Focusing on Indonesia, this study attempts to measure resource misallocation in Indonesian manufacturing firms during the period 1990-2015. An advantage of using Indonesian data is that the data cover the year 1995 when Indonesia joined the World Trade Organization (WTO). This allows us to estimate the effects of policy reforms in terms of trade liberalization. The results suggest that reductions in input tariffs have positive effects on Indonesian firms' efficiency. In contrast, firms improve the quality of inputs and the scope of products by introducing new products that allow firms to increase their margins.

Furthermore, the results show that the largest productivity gains come from reducing tariffs on output and inputs. A 10-percentage-point reduction in output tariffs, lagged by one year, improves average firm efficiency by nearly 4%, while a 10-percentage-point reduction in input tariffs leads to a 7% increase in TFPQ. This work also investigates how resource misallocation may be related to the Asian financial crisis (1997/1998).

This chapter also separately examines the factors that affect output and capital wedges. Such analysis is useful if the effects on output wedges are offset by those on capital wedges. This study thus contributes to the literature by analyzing the effects of the proposed set of policy tools, potentially reducing resource misallocation. Although there is no significant effect of trade liberalization on output distortions, a reduction in input tariffs increases distortions in capital markets. These results suggest that further capital market reforms could improve overall TFP in Indonesia by reducing resource misallocation.

Introduction en Français

Pourquoi certains pays s'enrichissent-ils aujourd'hui, tandis que d'autres restent pauvres, leur revenu par habitant n'augmentant pas, voire diminuant sur plusieurs décennies ? L'un des articles fondateurs de la théorie de la croissance économique, [Solow \(1957\)](#), met en évidence le fait que la dynamique de la production d'un pays dépend principalement de la productivité globale des facteurs de production (c'est-à-dire le capital et le travail), qui a été formalisée dans les recherches ultérieures sous le nom de Total Factor of Productivity (productivité globale des facteurs). La TFP est considérée comme l'un des principaux déterminants du PIB par habitant et du niveau de vie d'un pays. La productivité est le rapport entre la quantité produite et la quantité de ressources utilisées pour l'obtenir. Elle est le résidu d'une fonction de production et capte ce qui n'est pas expliqué par l'augmentation des facteurs de production utilisés.

Depuis le début des années 2000, de nombreux pays développés et en développement sont confrontés à un ralentissement de la croissance de la productivité. De plus, cette tendance est encore plus prononcée depuis la crise financière de 2008-2009. Il est alors envisageable de considérer que ce déclin de la productivité soit une conséquence d'une certaine lenteur dans l'adoption de technologies plus avancées et de meilleures pratiques en matière de processus de production, ou encore la conséquence d'inefficacités en termes d'allocation des ressources productives. Ainsi, l'objectif de cette thèse est de comprendre l'impact des ressources financières des entreprises sur la performance économique de ces dernières à travers différentes mesures ainsi que d'estimer leurs gains de productivité, ces derniers étant essentiels pour la croissance des pays en développement. De fait, les gains de productivités sont un sujet d'intérêt pour la recherche et de préoccupations politiques.

Les preuves empiriques les plus récentes du lien entre l'accès au crédit et la performance des entreprises sont largement concentrées sur les pays développés et nous avons aujourd'hui encore peu de preuves de l'impact des marchés du crédit sur la performance des entreprises dans les pays en développement où les institutions financières sont moins développées. Cette question est également particulièrement pertinente pour les micros, petites et moyennes entreprises (MPME), car elles sont les créateurs d'emplois les plus importants dans les pays en développement (e.g., [Ayyagari et al. \(2011\)](#); and [Haltiwanger et al. \(2013\)](#)). Pour aborder ces questions, dans le chapitre (1), en collaboration avec Zenathan Hasannudin, nous examinons la structure financière des micros et petites entreprises (MPE) sur la productivité en Indonésie.

Dans le chapitre suivant (2), je souligne l'importance du rôle du genre du propriétaire de l'entreprise sur la croissance de celle-ci et je l'étudie en tant que déterminant de l'accès de l'entreprise au finance-

ment dans 62 pays en développement. Ces dernières années, les programmes de soutien aux femmes entrepreneurs ont gagné en popularité et en importance comme moyen de créer des emplois et stimuler la productivité aux niveaux national et régional. Toutefois, de nombreux facteurs limitent la croissance des entreprises dirigées par des femmes comparées à celles menées par des hommes, comme des dispositions institutionnelles, des normes sociales, une disparité en dotation initiale de l'entreprise selon le genre de la personne qui la dirige ou encore parce que les entreprises dirigées par des femmes tendent à se concentrer dans les secteurs à faible productivité. Ainsi, dans les pays en développement, notamment ceux où la discrimination à l'égard des femmes est répandue, il est crucial d'étudier les facteurs qui déterminent les écarts entre les sexes en matière de performance des entreprises et d'accès au financement.

Étant donné que l'environnement des entreprises est caractérisé par un degré élevé d'informalité, impliquant souvent des travailleurs familiaux non rémunérés et un pourcentage élevé d'autres travailleurs temporaires non rémunérés (ILO, 1993), il est important de distinguer dans l'échantillon les pays ayant un grand secteur informel. Ceci implique de sous-estimer l'importance des femmes entrepreneurs dans ces pays par rapport à ceux ayant un petit secteur informel.

En outre, la littérature existante a identifié trois sources principales de croissance globale de la TFP. La première est le progrès technologique tandis que la deuxième est le transfert de facteurs de production des secteurs à faible productivité, telle l'agriculture, vers des secteurs à plus forte productivité, telle l'industrie manufacturière (Nguyen et al., 2016). Enfin, la troisième source est l'amélioration de l'allocation des ressources entre les entreprises lorsque les ressources des entreprises à faible productivité sont transférées vers les entreprises à forte productivité. Cela aura un effet positif sur la croissance de la TFP.

Par conséquent, dans le chapitre (3), je me concentre sur cette troisième source que j'explore en mesurant la mauvaise allocation des ressources entre les entreprises au sein d'une industrie. Les articles fondamentaux de cette littérature (Restuccia and Rogerson (2008); Hsieh and Klenow (2009); Bartelsman et al. (2013); et Asker et al. (2014)), suggèrent qu'une forte hétérogénéité de la productivité au niveau des entreprises au sein d'une industrie peut indiquer une mauvaise allocation des ressources entre les entreprises, avec un effet important sur la TFP agrégée. Dans cette étude, j'examine le rôle de la mauvaise allocation des ressources dans la dynamique de TFP et de la production du secteur manufacturier indonésien entre 1990 et 2015, en tenant compte de la crise financière asiatique (1997-1998) et de la période de l'organisation mondiale du commerce en 1995.

Organisation de la thèse

La thèse est composée de trois chapitres. Ils visent à explorer diverses mesures de performance au niveau des entreprises et de la productivité globale dans les pays en développement. Les trois chapitres peuvent être lus indépendamment les uns des autres.

Chapitre 1 – Structure de financement, performance des micros et petites entreprises, et entrepreneuriat des femmes en Indonésie

Les performances des entreprises peuvent être entravées par de nombreux facteurs, notamment le manque de financement, la corruption, l'instabilité politique ou encore de mauvaises infrastructures. En outre, l'environnement commercial et institutionnel, en particulier l'environnement juridique, joue un rôle important dans la performance des entreprises (Beck and Demirguc-Kunt, 2006). Les preuves empiriques existantes suggèrent spécifiquement qu'un accès difficile au financement est l'un des plus grands problèmes rencontré par les micros et petites entreprises (MPE) dans la plupart des pays en développement (Ayyagari et al., 2016). Le manque de soutien financier pour les MPE peut être dû au coût trop élevé d'accès à des sources financières externes.

Ce chapitre étudie la relation entre la structure financière et la performance des entreprises en exploitant un ensemble de données de 59 968 MPE indonésiennes produites par l'Agence indonésienne des statistiques entre 2010 et 2015. Elle utilise à la fois des outils d'analyse descriptive et des modèles de régression pour examiner la relation entre la productivité et l'accès au financement des MPE du secteur manufacturier en Indonésie. Dans cette étude, nous nous appuyons sur les trois principales sources de financement communément reconnues pour les MPE, à savoir les sources externes formelles (par exemple, les banques commerciales, les coopératives, les institutions de microfinance, les coopératives de crédit, le gouvernement, les fournisseurs), les sources externes informelles (par exemple, les amis, les parents ou les prêteurs d'argent), et finalement les sources internes (par exemple, les bénéfices non distribués, l'épargne privée des propriétaires).

Nos estimations de la fonction de production sont basées sur la méthodologie introduite par Akerberg et al. (2015) qui contrôle le biais de simultanéité dans l'estimation des fonctions de production utilisant des données au niveau de l'entreprise. Ce biais provient du fait que la demande d'intrants pour les matériaux et la main-d'œuvre est positivement corrélée à la productivité non observée. Ainsi, pour les intrants, nous nous appuyons sur les dépenses en matières premières, en énergie et en électricité comme approximation de la productivité non observée de l'entreprise.

En présence de contraintes de financement externe, les entreprises ont davantage recours à des fonds internes pour financer leurs investissements. Néanmoins, l'effet du financement interne sur la productivité de l'entreprise diminue lorsque l'entreprise a accès à une facilité de crédit bancaire externe. Lorsque la contrainte de financement externe est allégée, l'entreprise s'appuie moins sur les fonds internes et se tourne vers le financement externe comme principale source de croissance. En outre, étant donné les potentiels problèmes de causalité inverse, cette étude a appliqué la méthode des moments généralisés (GMM) du panel dynamique explorée par Arellano (2009) pour traiter le problème de l'endogénéité. La méthode GMM permet d'éliminer la corrélation entre le terme d'erreur et les régresseurs potentiellement endogènes en considérant leurs valeurs à des périodes antérieures comme variable instrumentale.

Ainsi, nous mettons en évidence que les problèmes rencontrés par les MPE s'appliquent à la plupart des entreprises du pays, indépendamment du genre du propriétaire de l'entreprise. De plus, cette étude examine ensuite le rôle du genre dans la dynamique des MPE en Indonésie. Parce que les études et les données au niveau des microentreprises indonésiennes, en particulier celles liées aux questions de genre,

sont encore très limitées, l'étude de l'impact du genre sur la productivité de l'entreprise et l'accès au financement est originale.

Grâce à une analyse descriptive, nous étudions comment les entreprises appartenant à des femmes diffèrent de celles appartenant à des hommes. Nos résultats montrent que les entreprises appartenant à des femmes ont tendance à se concentrer dans les secteurs à forte intensité de main-d'œuvre tels que le textile, l'alimentation et l'habillement. Les entreprises appartenant à des femmes emploient également un pourcentage plus élevé de travailleuses. De plus, nous avons enrichi l'analyse de genre en examinant comment les indicateurs de productivité diffèrent entre les entreprises possédées par des hommes et celles détenues par des femmes. Suite à une analyse statistique, cette étude montre que les entreprises détenues par des hommes sont globalement plus performantes que celles détenues par des femmes pour toutes les mesures de performance étudiées.

Les données suggèrent que l'écart entre les genres dans l'accès aux services financiers peut provenir à la fois du côté de l'offre et de la demande du marché du crédit. Du côté des banques, il est difficile pour elles d'augmenter sensiblement les prêts tout en respectant leurs critères d'octroi ; en effet, de nombreuses banques perçoivent les MPE comme un secteur à haut risque. Concernant la demande, le financement informel est surreprésenté, laissant peu de place au financement externe formel. Les femmes entrepreneurs sont plus susceptibles que les hommes entrepreneurs de recourir au financement interne ou informel pour les raisons suivantes. La conduite des activités des MPE ne nécessite pas autant de capitaux, de technologies avancées, et le crédit externe formel n'est pas adapté à la réalité de ces activités en raison des coûts de transaction. Ainsi, cette étude conclut que la croissance du nombre d'entreprises appartenant à des femmes, en particulier les MPE, en Indonésie ne doit pas être considéré uniquement comme signifiant une montée de l'entrepreneuriat des femmes dans le pays. En effet, le chômage ou la pauvreté peuvent également avoir joué un rôle en poussant de nombreuses femmes à lancer leur petite entreprise.

En vertu de l'instruction présidentielle numéro 6 de 2007, le gouvernement indonésien a introduit deux politiques visant à améliorer l'accès des MPE au financement. Il s'agit de : (i) le renforcement du système de garantie des prêts pour les micro et petites entreprises, connu sous le nom de prêts de microcrédit (KUR-Kredit Usaha Rakyat). Il s'agit de prêts garantis par le gouvernement pour les micros et petites entreprises, qui sont productives mais pas encore bancables. Le KUR est destiné à fournir des fonds de roulement et des crédits d'investissement d'un montant maximal de 500 millions de roupies. Les fournisseurs de crédit sont des banques commerciales désignées par le gouvernement ([Machmud and Huda, 2010](#)); et (ii) la mobilisation de fonds non bancaires pour renforcer les micros et petites entreprises.

Compte tenu de la contribution significative des MPE à la croissance et à la résilience de l'économie indonésienne, l'étude s'intéresse à l'impact du COVID-19 sur ces entreprises ([Roser et al., 2020](#)), en mettant l'accent sur les MPE appartenant à des femmes. Les femmes entrepreneurs sont les plus durement touchées car elles gagnent généralement moins que les hommes et leurs emplois sont moins sûrs. De plus, avec un fort ralentissement de l'activité économique, les femmes sont particulièrement vulnérables à la perte de leurs moyens de subsistance, notamment celles qui travaillent dans des micros et petites entreprises informelles.

Notre étude montre aussi que l'utilisation des plateformes et technologies numériques est l'une des stratégies d'adaptation en réponse à la pandémie de COVID-19 les plus répandues. Ce résultat est d'importance car les résultats de l'enquête indiquent également que les MPE appartenant à des femmes sont moins susceptibles que les MPE appartenant à des hommes d'accéder à des financements ou d'utiliser d'autres stratégies d'adaptation plus traditionnelles pour compenser la réduction des revenus de l'entreprise. En outre, les solutions numériques aident les propriétaires d'entreprises à concilier leurs responsabilités familiales et professionnelles, ce qui est particulièrement pertinent pour les femmes en Indonésie, qui assument une part disproportionnée des soins non rémunérés et du travail domestique.

Chapitre 2 – Le genre et l'accès au financement dans le développement des entreprises

Bien que le taux de création d'entreprises par les femmes ait augmenté au cours des dernières décennies, la prévalence de la propriété d'entreprises par les femmes ne représente que 50%-60% de celle des hommes. De plus, le faible taux de création d'entreprises par les femmes est un phénomène mondial ([Fairlie and Robb, 2009](#)). Par conséquent, dans le deuxième chapitre, j'étudie l'effet du genre sur l'accès au financement et la croissance des entreprises à l'aide de données au niveau de l'entreprise provenant de 33 971 entreprises dans 62 pays en développement, en contrôlant les effets des différentes tailles d'entreprise, de l'âge des entreprises, des régions et des niveaux de revenu des pays.

Ce chapitre a utilisé un riche ensemble de données au niveau de l'entreprise provenant de l'enquête sur les entreprises de la Banque mondiale pour étudier les écarts de performance en matière de croissance des entreprises, mesurés par la croissance de l'emploi et des ventes, entre les entreprises détenues par des femmes et celles détenues par des hommes dans les pays en développement, et, finalement comparer les résultats pour différentes régions du monde. Je m'écarte de la littérature publiée jusqu'ici en utilisant comme variables cibles le genre du propriétaire, le genre du dirigeant principal de l'entreprise, et les deux variables précédentes en même temps, qui sont désormais disponibles dans la version 2016 de la base de données de la Banque mondiale.

Les principaux résultats que nous obtenons montrent qu'en moyenne, les entreprises détenues par des femmes font moins bien que leurs homologues détenues par des hommes en termes de croissance de l'emploi. Ces résultats présentent par ailleurs une hétérogénéité selon les régions. Il convient de noter que la détention d'une entreprise par une femme a un impact positif sur la croissance des ventes en Afrique et dans les pays à faible niveau de revenu tandis que cet effet est négatif en Amérique Latine et dans les pays à revenu élevé. En somme, cette étude confirme les résultats mitigés des entreprises détenues par des femmes en termes de croissance des entreprises.

J'explore l'association entre le genre du propriétaire et la probabilité pour une entreprise d'être soumise à des contraintes en matière d'accès au financement en utilisant le modèle Probit. Bien que le coefficient estimé de l'indicateur de propriété féminine varie selon la région, les effets marginaux dérivés montrent que la probabilité d'être soumis à des contraintes financières est d'environ 1,1 point de pourcentage plus élevée pour les entreprises détenues par des femmes que pour les entreprises détenues par des hommes. L'étude examine ensuite l'accès au financement sur la croissance des entreprises en utilisant des mesures objectives et subjectives de l'accès au financement. La mesure objective de l'accès

au financement est une variable, qui rapporte la disponibilité du financement à l'existence d'une ligne de crédit. La mesure subjective de l'accès au financement est obtenue en classant l'accès au financement comme n'étant pas un obstacle ou un obstacle grave aux opérations commerciales. Les résultats montrent que l'accès au financement sous forme de prêt ou de financement externe aide le plus les MPE. Ce résultat est valable non seulement pour l'échantillon complet mais aussi pour les différentes régions. Le fait de disposer d'un prêt ou d'une facilité de découvert et de recevoir un financement externe pour investir aide les entreprises de toutes tailles à se développer dans toutes les régions.

Cependant, la question de l'endogénéité potentielle de la croissance des entreprises par rapport au financement externe reste posée. Par conséquent, j'adopte la méthode des doubles moindres carrés. Je considère une variable instrumentale interne telle la valeur du crédit à une période précédente et deux variables instrumentales externes corrélées avec l'accès au financement (par exemple, l'indice d'indépendance globale de la supervision vis-à-vis des banques et des politiciens et le degré de droits des créanciers). Le F-test pour cet instrument est statistiquement significatif, impliquant la validité de l'instrument choisi. En outre, le test de Sargan soutient également la validité des instruments, ce qui signifie que l'hypothèse nulle de l'exogénéité de ces instruments ne peut être rejetée.

Les approches existantes pour soutenir les femmes entrepreneurs orientées vers la croissance sont hétérogènes dans leur conception et leur mise en œuvre. Des travaux supplémentaires sont nécessaires pour mieux comprendre ce qui motive la participation des femmes à la propriété et à la gestion et ses conséquences, afin de concevoir des politiques appropriées. Cela nécessite également une évaluation solide des contraintes existantes et la création de forums de dialogue sur l'entrepreneuriat féminin entre les secteurs, le gouvernement et la société civile afin d'encourager les réformes.

Chapitre 3 – Productivité, mauvaise allocation des ressources et libéralisation du commerce

La mauvaise allocation des ressources est définie comme la conséquence du fait que les entreprises à forte productivité n'obtiennent pas suffisamment de ressources en termes de capital et de travail pour développer leur production, alors que les entreprises à faible productivité continuent d'employer des ressources plutôt que de réduire leur taille et finalement de se retirer. Cela peut être le résultat, par exemple, d'entreprises politiquement connectés ayant un accès plus facile aux financements et développant ainsi leur production malgré le fait que leur productivité soit inférieure à celle d'entreprises moins connectées. Ce phénomène pourrait réduire considérablement la production et la productivité totales d'un pays, car les entreprises hautement productives seraient plus petites et les entreprises moins productives plus grandes qu'elles ne devraient l'être dans le cadre d'une allocation optimale.

La motivation de notre étude se fonde sur deux approches. La première est la littérature qui se concentre sur les distorsions qui se reflètent entre les résultats réels et efficaces. Ces distorsions sont appelées "wedges". Un article fondateur est [Hsieh and Klenow \(2009\)](#), qui estime que si la mauvaise allocation des ressources en Chine et en Inde est éliminée, c'est-à-dire si le capital et le travail sont hypothétiquement réalloués pour équilibrer les produits marginaux dans la mesure observée aux États-Unis, La TFP manufacturière peut augmenter de 30% à 50% en Chine et de 40% à 60% en Inde. En utilisant la méthodologie de [Hsieh and Klenow \(2009\)](#), nous constatons que la suppression des distorsions

a un effet significatif sur La TFP agrégée en Indonésie. Ce résultat est cohérent avec plusieurs études qui ont fourni une image similaire de gains considérables de TFP suite à la suppression des distorsions.

Ce chapitre utilise le concept de la productivité globale des facteurs basée sur la production et sur les revenus (TFPQ et TFPR), respectivement, qui est présenté dans (Foster et al., 2008). Les différences entre les bases de calcul de TFP fondées sur la production et sur les recettes permettent de tenir compte des différents secteurs. Ainsi, la TFPQ reflète principalement les composantes idiosyncratiques des coûts de l'usine, qu'il s'agisse de la base technologique ou de la base des prix des facteurs, tandis que la TFPR confond les effets idiosyncratiques de la demande et des prix des facteurs sur les différences d'efficacité. En conséquence, ce chapitre fournit un cadre pour le calcul de la TFP comme une combinaison de la TFPQ et de la TFPR.

L'autre thème est l'analyse de l'impact de la libéralisation du commerce sur la TFP globale. Il existe des évidences solides du lien entre les barrières commerciales et la TFP agrégée. Cependant, la majorité de ces études se sont concentrées sur l'effet de la réforme commerciale basée sur la TFPR et non sur l'efficacité de la productivité des entreprises telle que mesurée par la TFPQ. De plus, peu d'attention a été accordée aux impacts de la libéralisation du commerce sur la mauvaise allocation telle que mesurée par la variation des wedges. Par conséquent, nous avons examiné la réforme des politiques en termes de libéralisation commerciale et financière sur les mesures de productivité (TFPQ ou TFPR) et les distorsions idiosyncratiques mesurées par les distorsions de production ou de capital.

S'appuyant sur ces deux volets de la littérature, ce chapitre tente de mesurer la source de la mauvaise allocation des ressources sur la TFP manufacturière agrégée, en se concentrant sur les entreprises manufacturières indonésiennes pour la période 1990-2015. La recherche s'articule autour de trois questions. (i) Dans quelle mesure les ressources sont-elles mal allouées en Indonésie ? (ii) Quelle aurait été l'ampleur des gains de productivité en l'absence de distorsions ? (iii) Le degré de productivité mesuré par la TFPQ ou la TFPR et la mauvaise allocation mesurée par les wedges de production ou de capital après les réformes politiques en termes de libéralisation commerciale et financière. En répondant à ces questions, cette thèse apporte une analyse plus approfondie du gain du commerce sur l'efficacité des entreprises mesurée par la TFPQ et la TFPR.

Pour réaliser ces objectifs, j'utilise la méthodologie proposée par Hsieh and Klenow (2009), qui permet de tenir compte des distorsions de TFP au niveau des entreprises dans un modèle de concurrence monopolistique avec des entreprises hétérogènes. En agrégeant la productivité au niveau de l'entreprise au niveau du secteur et au niveau global, nous calculons les gains potentiels de TFP lorsque les distorsions sont supprimées. En outre, je réalise une décomposition des variations de la distorsion pour rendre compte des sources de mauvaise allocation des ressources.

Premièrement, les résultats empiriques montrent la présence d'une importante mauvaise allocation des ressources en Indonésie sous la forme de la variation de TFPR, qui est le principal indicateur de la non-optimalité de l'allocation. La figure (0.2) montre l'évolution de la dispersion de TFPR sur notre période de 1990 à 2015. Nous observons une tendance à l'augmentation de la dispersion de TFPR intra-industriel. Ce résultat est cohérent avec la connaissance commune que les ressources dans les pays en développement ne sont pas allouées efficacement. De plus, la dynamique de TFPR est déterminée

principalement par les distorsions de la production avec une influence assez stable des distorsions du capital.

Deuxièmement, il y aurait eu une amélioration substantielle de la TFP agrégée en l'absence de distorsions. Lorsque toutes les distorsions de la production et du capital sont supprimées, les gains potentiels de TFP dans le secteur manufacturier augmenteraient de 136% à 292%. Cette ampleur élevée du gain de TFP pourrait s'expliquer par la mauvaise allocation des ressources naturelles en Indonésie et les différents degrés de concurrence et de concentration au sein des industries, entraînant différentes distorsions. En outre, la part totale des entreprises en Indonésie qui devraient réduire leur taille est d'environ 89%, contre 11% pour la part totale des entreprises qui devraient augmenter leur taille, car certaines entreprises ont été limitées dans leur croissance en raison de la mauvaise allocation des ressources.

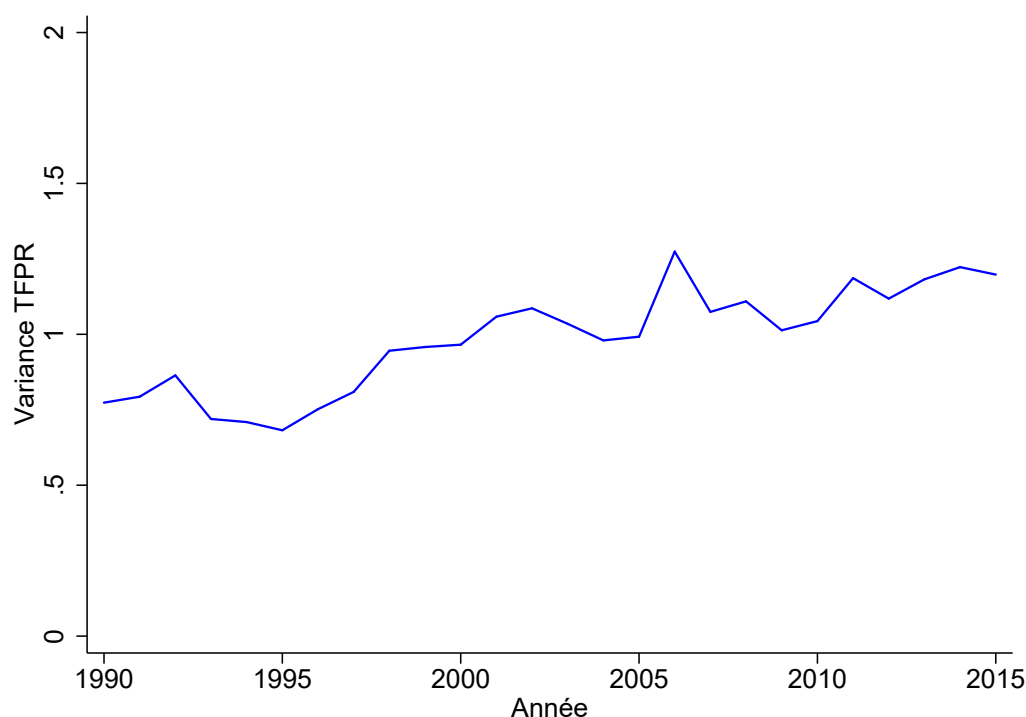
Troisièmement, nous essayons de comprendre le rôle des caractéristiques des entreprises avec la productivité mesurée par la TFPQ ou la TFPR. La TFPQ plus élevée correspond aux grandes entreprises et aux entreprises d'État. En revanche, les petites entreprises ont la TFPR plus élevée car elles sont souvent soumises à des contraintes de crédit et ne peuvent pas emprunter pour réaliser des investissements productifs, ce qui limite leur croissance. Si le manque d'accès au financement empêche les petites entreprises de se développer, l'allocation des ressources sera faussée. En conséquence, le capital et la main-d'œuvre n'iront pas vers le secteur le plus productif, et la croissance en souffrira.

Enfin, les politiques gouvernementales peuvent affecter la productivité et l'efficacité globales, car elles déterminent les décisions des entreprises en matière de production, d'investissement et d'allocation de leurs ressources limitées. Par exemple, les politiques peuvent empêcher que les facteurs de production soient affectés à leur meilleure utilisation, ce que l'on appelle une mauvaise affectation, ce qui entrave la croissance au niveau macroéconomique. Il peut s'agir d'obstacles à l'entrée et à la sortie, de limites à la capacité des entreprises, de politiques fiscales et de subventions, etc. qui peuvent conduire à des déviations par rapport aux choix d'allocation optimale.

S'attaquer aux politiques génératrices de distorsions permettrait d'éliminer la mauvaise affectation des ressources et d'accroître la productivité globale. Parmi les diverses distorsions politiques, les barrières commerciales semblent être une source importante de mauvaise allocation car elles ont tendance à être plus élevées dans les pays en développement que dans les pays développés. Selon le [Bank \(2014\)](#), les taux tarifaires moyens des pays à revenu élevé, moyen et faible sont respectivement de 3,9, 8,6 et 11,5 pour cent. Ces différences soulignent le rôle joué par les conditions nationales dans la façon dont les entreprises réagissent à la libéralisation du commerce. [Restuccia and Rogerson \(2013\)](#) a également fait valoir que les barrières commerciales pourraient être l'un des facteurs générant la mauvaise allocation. La libéralisation du commerce est censée réduire la mauvaise allocation en réaffectant les ressources des entreprises moins productives aux entreprises plus productives (par exemple, [Melitz \(2003\)](#)).

En se concentrant sur l'Indonésie, cette étude tente de mesurer la mauvaise allocation des ressources dans les entreprises manufacturières indonésiennes au cours de la période 1990-2015. L'avantage d'utiliser des données indonésiennes est qu'elles couvrent l'année 1995, lorsque l'Indonésie a rejoint l'Organisation mondiale du commerce (OMC). Cela nous permet d'estimer les effets des réformes politiques en termes de libéralisation du commerce. Les résultats suggèrent que les réductions des tarifs des intrants ont des

Figure 0.2: Évolution de la dispersion de TFPR



Source: Compilation de l'auteur basée sur les données de BPS-Statistic Indonesia.

effets positifs sur l'efficacité des entreprises indonésiennes. En revanche, les entreprises améliorent la qualité des intrants et l'étendue des produits en introduisant de nouveaux produits qui permettent aux entreprises d'augmenter leurs marges.

En outre, les résultats montrent que les gains de productivité les plus importants proviennent de la réduction des droits de douane sur la production et les intrants. Une réduction de 10 points de pourcentage des droits de douane sur la production, décalée d'un an, améliore l'efficacité moyenne des entreprises de près de 4%, tandis qu'une réduction de 10 points de pourcentage des droits de douane sur les intrants entraîne une augmentation de 7% de la TFPQ. Ce travail étudie également comment la mauvaise allocation des ressources peut être liée à la crise financière asiatique (1997/1998).

Ce chapitre examine séparément les facteurs qui affectent les wedges de production et de capital. Une telle analyse est utile si les effets sur les wedges de production sont compensés par ceux sur les wedges de capital. Cette étude contribue donc à la littérature en analysant les effets de la série d'outils politiques proposés, réduisant potentiellement la mauvaise allocation des ressources. Bien qu'il n'y ait pas d'effet significatif de la libéralisation du commerce sur les distorsions de la production, une réduction des tarifs des intrants augmente les distorsions sur les marchés des capitaux. Ces résultats suggèrent que de nouvelles réformes du marché des capitaux pourraient améliorer la TFP globale en Indonésie en réduisant la mauvaise allocation des ressources.

Une extension naturelle de ce travail serait d'étudier l'effet de la mauvaise allocation des ressources dans le secteur des services. Une analyse plus approfondie des facteurs de distorsion du marché dans

ce secteur par rapport au secteur manufacturier et un calcul du gain de TFP associé à la libéralisation seraient intéressants à étudier. En outre, certains sujets de recherche future ont été mis en évidence, comme l'identification de la nature et des sources de la mauvaise allocation et la manière dont les distorsions affectent le mouvement des entreprises entre les industries.

Chapter 1

Financing Structure, Micro and Small Enterprises' Performance, and Woman Entrepreneurship in Indonesia¹

Access to finance is crucial in influencing firms' actual activities and economic performance. This paper investigates the relationship between financing structure and firm performance by exploring a unique panel dataset of 59,968 micro and small enterprises (MSEs) operating in the manufacturing sector in Indonesia over the period 2010-2015. We collected a rich set of information on the source of loans to assess firm performance using annual total factor productivity (TFP) and labor productivity for each firm. We then examined whether more financing options available to women entrepreneurs improve firm performance. Our results show that financial factors are highly determinant of firms' TFP and labor productivity. MSEs that have access to formal external financing directly improve firm-level productivity. Moreover, we find evidence that women-owned firms are less likely to obtain a bank loan relative to their male counterparts. They are more likely than male entrepreneurs to rely on internal or informal financing. In addition, our analysis reveals significant underperformance of firms owned by female entrepreneurs compared to those owned by male entrepreneurs. Nevertheless, we find that women entrepreneurs who have access to formal financing improve their firm's performance. The effects of financing on productivity are also related to firm ownership, education, size, and age. Our results are robust, as demonstrated by the use of different approaches. These results support policymakers to ease credit constraints to improve micro and small enterprise productivity and, notably, women's entrepreneurship in Indonesia. Besides, these results suggest that addressing gender discrimination in the micro enterprise credit market could partially close the performance gap between male- and female-owned firms.

JEL classification numbers: G21, J16, L25, L26, N65

Keywords: Total factor productivity, inclusive financing, women entrepreneurship.

¹This chapter is the product of joint work with Zenathan Hasannudin.

1.1 Introduction

The financing of micro and small enterprises (MSEs) has attracted a great deal of interest from policy-makers and academic researchers. This is because of the important role that MSEs play in the private sector in driving the economy (Berrell et al., 2008). The literature shows that MSEs find it challenging to meet the standards of formal financial institutions to obtain funds, especially because of the higher costs and relatively high risk of loans. As a result, the lack of access to formal financing provides an opportunity for informal institutions to fill the gap.

It is well documented that financial conditions have a significant influence on firm productivity. For example, Carlin et al. (2006) reported that a high cost of finance negatively affects firms' output and Nguimkeu (2016) revealed that lack of access to credit has a negative impact on the gross margins of retail firms in Cameroon. On the other hand, the repressed financial system hinders economic growth because financial distortions can misallocate resources. Hsieh and Klenow (2009) show that the decline in total factor productivity (TFP) of developing countries can be explained by a misallocation of resources among manufacturing establishments in China and India. Specifically, they find that the calculated gains in TFP of the manufacturing sector are 25-40% in China and 50-60% in India when capital and labor are reallocated to equalize marginal products to the same extent as observed in the United States (U.S.).

Indonesia is an interesting case to study the impact of different financing structures on business performance across provinces for the following reasons: (i) according to data from the Ministry of Cooperatives in 2014, the micro, small, and medium enterprise (MSME) sector accounts for more than 95% of industrial units², and contributes 58% to 61% of gross domestic product (GDP) (Tambunan, 2019). Furthermore, in terms of employment, according to data from the Indonesian Statistics Agency (BPS), in 2013, 57.9 million businesses in the sector employ 114.1 million workers. Therefore, MSMEs, especially MSEs, play a key role in creating jobs and promoting industrialization in the Indonesian economy. Besides, (ii) policymakers in Indonesia emphasize the need to encourage MSMEs and provide favorable treatment to them by offering credits and tax incentives for investments (Japhta et al., 2016).

With the onset of economic reforms, new policy initiatives have further supported this sector by launching a series of initiatives such as government credit guarantee schemes (CGS)³; the reduction of KUR interest rates from 22% to 12% (Indonesia, 2016), and the promotion of women entrepreneurs to accelerate the growth of this sector; (iii) overall, Indonesia's economic growth has been impressive, but the economic situation varies by province, with the western regions generally more developed than their eastern counterparts.

This study improves on previous research in several ways. *First*, most similar studies have focused on measuring the impact of credit and access to finance on a single outcome variable, such as economic growth, poverty reduction, or income inequality. Thus, their analysis has been limited to partial effects.

²There were 98.75% micro enterprises, 1.15% small enterprises, and 0.1% medium enterprises based on the MSME definition.

³In 2007, the Indonesian government launched a non-collateral CGS as an essential alternative instrument to meet their financial needs, namely the Community Business Credit (KUR – Kredit Usaha Rakyat). The KUR is a government program that supports MSEs in the form of a credit policy for productive individuals or groups who do not yet have collateral or have insufficient collateral. In addition, most of these small businesses, mainly in the trade sector, are owned or managed by women.

In contrast, our study analyzes the impact of formal external financing on different microeconomic outcomes such as firm productivity, sales, employment, and wages, because they are closely related in the real economy. *Second*, contrary to previous studies that explore cross-sectional variation (i.e., the static effect), we analyze the nature of credit over time to trace the evolution of the impact of financing on the external economy in Indonesia. In addition, this allows us to mitigate the unobserved effect on the productivity measure due to similar cultural and economic characteristics, thus providing a better estimate. *Third*, we use a large and unique dataset on Indonesian micro enterprises to analyze gender differences in firm performance, making a significant contribution to the existing literature on MSMEs, particularly MSEs, and women empowerment in developing countries. *Lastly*, there is a lack of studies showing how microcredit financing contributes to the performance of MSEs in the specific context of Indonesia. In addition, studies on Indonesian women entrepreneurs are scarce.

We used an unbalanced panel dataset of 249,688 observations of MSE firms provided by Indonesia’s central statistics agency (Badan Pusat Statistik, BPS). Our empirical results indicate that credit plays a critical role in the community to improve the productivity of MSE firms. Furthermore, we found a significant positive effect of MSE financing on sales and employment within the supported firm. Our results suggest that male entrepreneurs perform better than female entrepreneurs. Therefore, this result is consistent with the fact that women-owned firms are disadvantaged in the market for small-business credit. However, obtaining a formal loan reduces the performance gap between female and male-owned firms. This result suggests that inclusive finance, which targets micro and small enterprises and women entrepreneurs, tends to be associated with economic and social gains, leading to overall progress toward the sustainable development goals (SDGs) through gender equality and decent employment.

This paper is structured as follows: Section (1.2) presents a review of the literature on MSEs and the link between financial structure and firm performance. In the Section (1.3), we provide stylized facts on the factors affecting MSEs’ access to formal finance and the market structure of the Indonesian manufacturing sector. Additionally, we provide the distribution of MSE and TFP using cross-provincial data. Section (1.4) details the methodology, data construction and descriptive statistics. In the Section (1.5), we present our empirical strategy, the estimation of firm productivity, and the model specifications. The main results of this study and the robustness check are presented in Section (1.6). Finally, a conclusion is provided in Section (1.7).

1.2 Related Literature

The MSE sector is an essential component of economic growth for two main reasons. The first is their potential to grow into a more productive unit. Chaston and Mangles (1997) conducted an empirical study of small manufacturing firms to identify the relationship between capabilities and growth. They concluded that there is no single strategy for firm growth; therefore, the likelihood of achieving growth by prioritizing different capabilities depends on the firm’s stage of development. A second reason is a fact that MSEs constitute a significant share of employment in the economic growth component, as shown by Ayyagari et al. (2007). They presented comprehensive statistics on the contribution of SMEs to total employment in 76 other developed and developing economies. They found that, on average, SMEs account for nearly 60% of manufacturing employment.

Moreover, it appears that firm characteristics (such as size, age, and ownership) may have a more complex relationship with growth. For instance, [Niskanen and Niskanen \(2007\)](#) investigated the determinants of growth in a sample of Finnish SMEs and found that close lending relationships promote growth for all firms. However, only the larger firms in their sample benefit from more competitive banking markets. Their database also highlighted the fact that young firms have higher growth rates than older firms.

Considering the role of MSEs in the economy, access to finance is a crucial element in supporting their growth. For example, [Brown et al. \(2005\)](#) used detailed information from start-up data in Romania through 2001. They used panel data techniques to evaluate a survey of 297 new small businesses. They showed that access to external finance induces employment and sales growth, while taxes appear to limit growth. Furthermore, several experimental studies are worth examining in detail, as they precisely measure the overall effect of microcredit expansion. [Kaboski and Townsend \(2012\)](#) assess the short and long term impact of Thailand's '*Million Baht Village Fund*' program. The results show an increase in short-term credit, consumption, agricultural investment, and income growth but a decrease in overall asset growth. In another example, exploiting a natural experiment created by the opening of 800 new Banco Azteca branches in Mexico in 2002, [Bruhn and Love \(2014\)](#) evaluated the impact of increased access to finance for low-income individuals on entrepreneurial activity, employment, and income.

Several theoretical models focus on understanding the potential long-term effects of particular credit facility programs on development, which is illustrated by [Ahlin and Jiang \(2008\)](#), using the model of [Banerjee and Newman \(1993\)](#), who was the first to model the long-term effects of microcredit on development. Their results showed that an improved credit market for agents could potentially help them to become entrepreneurs through two channels: (i) it creates self-employment opportunities, and (ii) it facilitates the transition from a low-income to a high-income category through savings. The model is extended by [Yusupov \(2012\)](#), and its predictions also suggest that access to credit can promote development in low-income countries. Both models argue that graduation alone could not sufficiently promote economic growth. Therefore, [Yusupov](#) endogenizes the graduation probability of microentrepreneurs as a function of the aggregate pool of entrepreneurs. Thus, according to their models, credit to MSEs is one of the key determinants of development.

As a further point, [Buera et al. \(2017\)](#) have developed an essential general and partial equilibrium framework of the macroeconomic effects of credit. They provide a quantitative assessment of the overall impact of finance, including macroeconomic indicators such as output, capital, TFP, wages, interest rates, and redistribution. The model implies that introducing specific microfinance programs can have such large aggregate impacts that the redistributive effect of microfinance would be stronger in general equilibrium than in partial equilibrium. Output, capital, and TFP are positively affected by microfinance loans in both partial and general equilibrium, with the exception of TFP, which is negatively affected in partial equilibrium. Wages and interest rates increase inversely.

On a practical level, using panel data for 67 countries for the period 2001-2011, [Lacalle-Calderón et al. \(2015\)](#) employed the [Arellano and Bond \(1991\)](#) Generalized Method of Moments (GMM) estimator to analyze the causal transmission of microcredit for economic growth. Controlling for country and time effects, the authors show that microcredit has a positive and statistically significant impact on economic

development and that the channel is through private investment and consumption (Khandker, 2005). Using standardized Microfinance Information eXchange (MIX) data for 2,382 microfinance institutions (MFIs) in 119 countries for the period 1995-2012, Lopatta and Tchikov (2016) explored the direct link between microfinance and economic growth through the value that MFI performance adds to purchasing power. The authors found an indirect impact from improved capital accumulation and employment rates. In their subsequent study, Lopatta et al. (2017) employed the Granger approach and found a statistically significant relationship between social and financial indicators of MFIs and economic development.

A large body of literature shows gender differences in the composition of financing sources used by male- and female-owned firms. Women-owned firms are financially fragile and face greater difficulties in accessing capital than male-owned firms. In addition, women-owned firms make more intensive use of the entrepreneur's personal funds and less use of bank loans (Coleman and Robb, 2009). Despite the significant increase in the share of female entrepreneurs in new start-ups in Indonesia, the empirical evidence on the effect of female entrepreneurship on firm performance is quite mixed. On the one hand, Sabarwal and Terrell (2008) provide an aggregate view of the performance gap between female and male-owned firms, where firm performance is measured in terms of sales and profits. They show that female entrepreneurship has a significant negative impact on sales and is less efficient in productivity than male-owned firms. Furthermore, other authors point out that financial barriers significantly explain why women-owned firms are smaller and have lower economic performance in terms of profits and growth than male-owned firms (Rosa et al., 1996; Fairlie and Robb, 2009). Conversely, some studies (Kepler et al., 2007; Watson, 2002) found no significant difference between male- and female-owned firms in business performance. Nevertheless, Coleman (2007) found that female-owned firms had significantly higher sales growth than male-owned firms.

This strand of the literature has grown steadily and mainly explores the overall effect of credit on macroeconomic development indicators, such as economic growth, productivity, and financial sector development. In summary, based on these theoretical and empirical studies, we argue that credit programs for MSEs could have a significant effect on output, capital, wages, interest rates, TFP, and poverty.

1.3 MSEs & financing sources in Indonesia: stylized facts

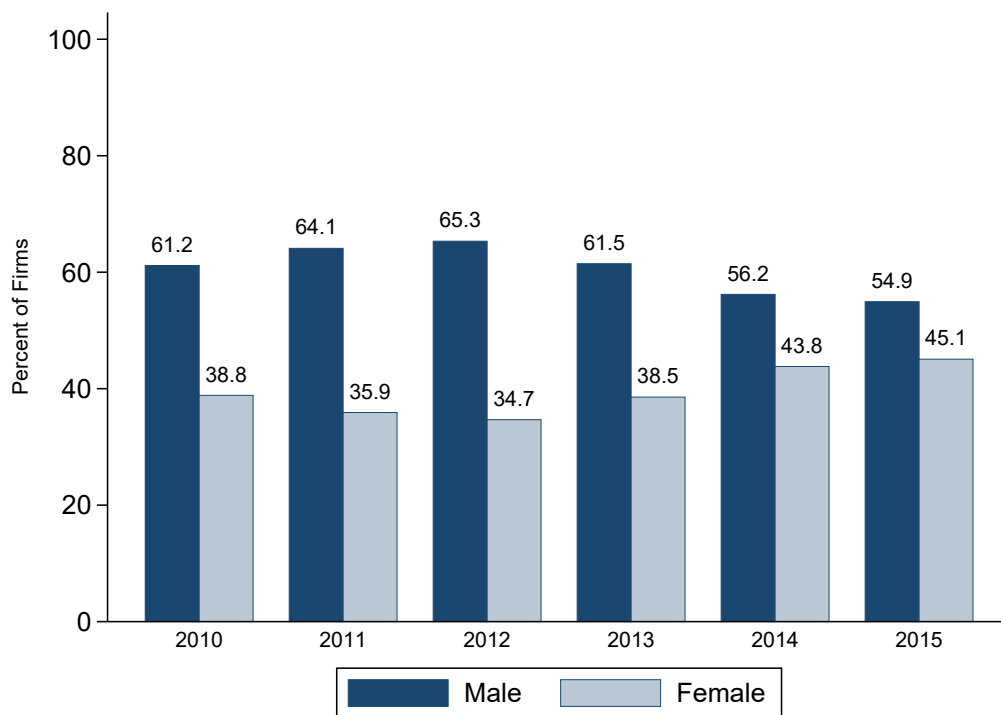
According to the IMF Access to Finance Survey, the financing gap in Indonesia, between the amount of financing needed and the amount of loans provided, is Rp. 1,32 trillion for Indonesian SMEs. Serving this type of business is often a challenge from a risk management perspective due to their limited or no credit history. Therefore, there are many ambitious strategies to address this problem and stimulate potential growth. One of the best-known institutions is the micro enterprise division of Bank Rakyat Indonesia (BRI) (hereafter referred to as "BRI units"), which are considered highly commercial due to their formality and dependence on deposits as their primary source of funds. According to Charitonenko and Afwan (2003), by the end of 2001, the state-owned BRI had served approximately 30 million customers (27.0 million savers and 2.8 million borrowers) through its 3,823 BRI units and 240 branches. In 2001, BRI accounted for about 43.5% of the total value of outstanding loans in Indonesia. On the other hand, several non-bank financial institutions (NBFIs) are also important microcredit providers at the district and village levels. In addition, since 2008, the government has begun to increase the use of

guarantees to channel credit to SMEs that tend to be financially constrained.

1.3.1 Development of women entrepreneurs in Indonesia

The Figure (1.1) shows the distribution of firm ownership by gender in Indonesia over time. In the manufacturing industry, more than half of the total MSEs are owned by men, and women's participation rate as business owners is low compared to men. The figure also shows that the percentage of firms in the manufacturing industry owned by women varies by year. During the period 2010-2015, it reached its highest level in 2014 and 2015, accounting for 43.8% and 45.1% of total MSEs, respectively. The increase in the female ownership rate in 2014 and 2015 could be since the absolute number of female-owned businesses grew faster than the number of male-run businesses or some male-run businesses closed or died in those particular years.

Figure 1.1: Total MSE in the manufacturing industry by gender of the owner, 2010-2015 (%)



Source: Authors' calculation based on Indonesian Statistics Agency (BPS).

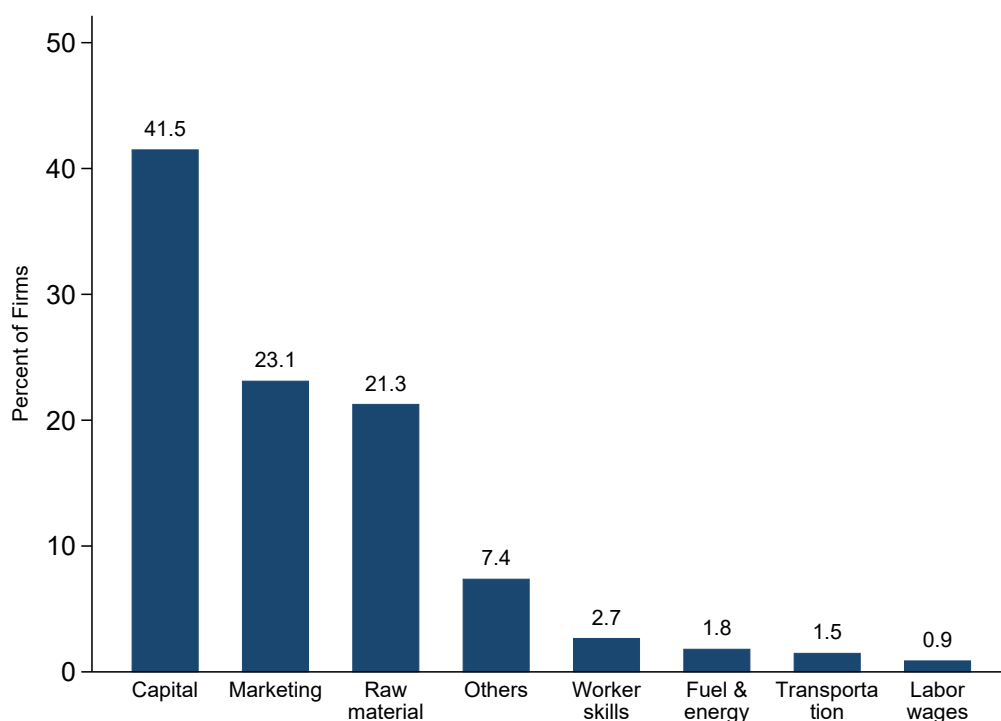
Existing studies in other countries, [Rosa and Sylla \(2016\)](#) provide similar evidence that the number of MSEs by women owners is lower than that of male owners. These studies confirm that women are more likely than men to work in the informal sector or vulnerable income-generating activities, either as own-account workers or as contributing family workers, characterized by low income and productivity. In addition, women's lack of education, experience, and time flexibility due to other obligations such as family care and domestic work are important reasons why the proportion of women-owned SMEs is lower than that of men-owned enterprises.

1.3.2 Main difficulties experienced by manufacturing MSEs

There are a number of constraints that hinder MSE performance in Indonesia. These constraints may vary from province to province, between different sectors, or even between individual enterprises within the same sector. Previous studies have listed constraints common to all MSEs (e.g., [Roy and Wheeler \(2006\)](#); [Bekele and Worku \(2008\)](#); [Thapa \(2013\)](#); [Das and Mohiuddin \(2015\)](#); [Oyelana and Adu \(2015\)](#); and [Moustafa and Santos \(2016\)](#)), which include lack of capital, marketing difficulties, government policies or regulations that often generate an unfavorable business environment⁴, access to modern technology, skilled workers, and institutional support.

As shown in the Figure (1.2), most MSE owners reported many difficulties in running their business. These difficulties are concentrated in three main areas: difficulty in (i) obtaining funds, which accounts for 41.5%, either for working capital or for purchasing new machinery; (ii) marketing, which accounts for 23%; and (iii) obtaining raw materials (21%). The difficulty in obtaining funds, especially from formal sources, is due to a variety of factors, such as unstable business types, poor credit history, and lack of valuable assets as sufficient collateral. This lack of accessible capital for these businesses threatens their sustainability ([Abe et al., 2015](#)). This is followed by marketing difficulties, which can be due to many causes, such as expensive rents, difficulty in finding a strategic location, insufficient capital for promotion, intense competition, especially from goods imported from China at very low prices ([Navarro, 2006](#)), and transportation costs, which are a key factor in strengthening a market entry strategy.

Figure 1.2: Main difficulties experienced by Indonesian manufacturing MSEs (%)



Source: Authors' calculation based on Indonesian Statistics Agency (BPS).

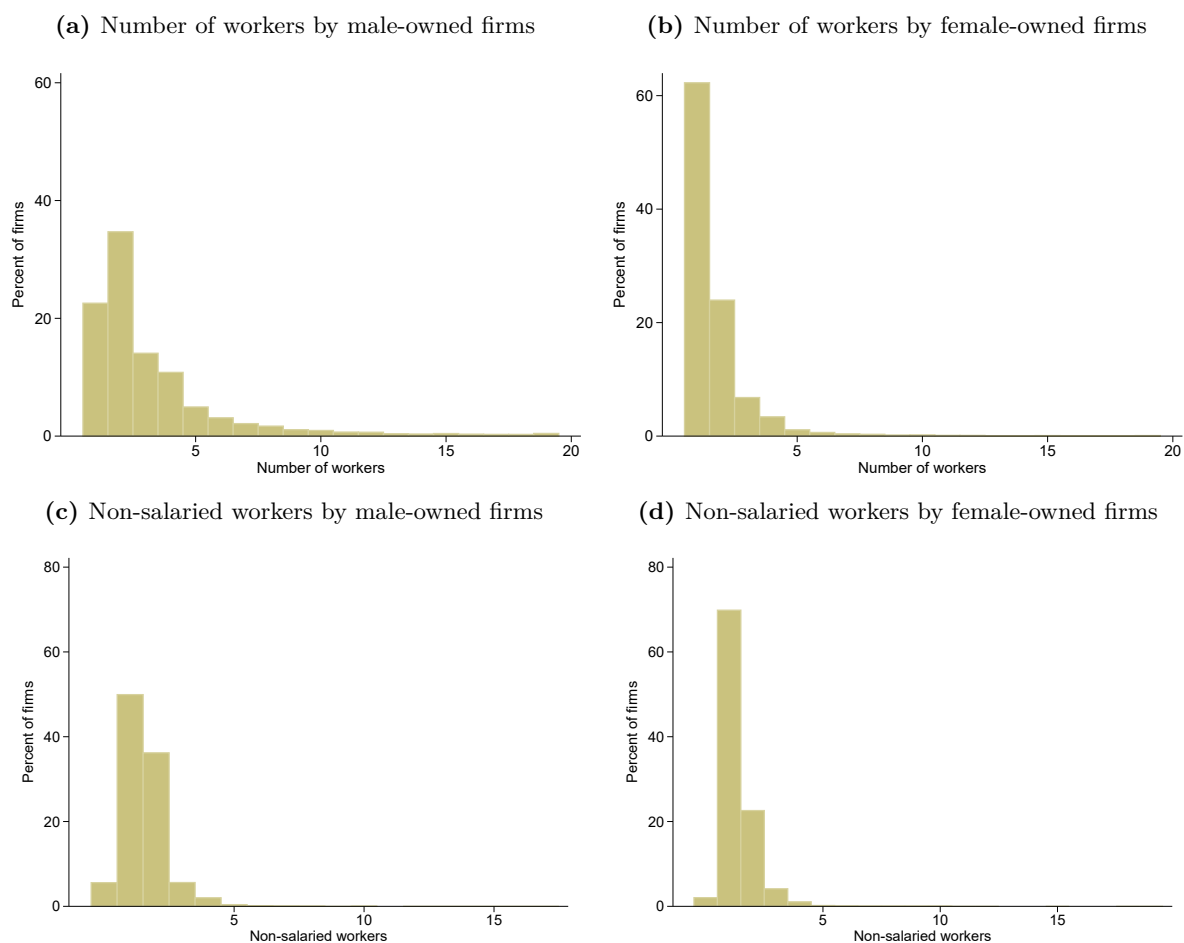
⁴For instance, energy policies on fuel and electricity tariffs or regulations on raw material imports have a substantial impact on the production costs in MSEs and thus on their price competitiveness and profits.

There are various reasons why it is difficult to obtain raw materials, namely the inability to access the required raw materials locally, the high price of raw materials (in particular, fluctuations in the value of the Indonesian rupiah against the U.S. dollar have led to a significant increase in the bill for imported raw materials since the end of the 1997/1998 Asian financial crisis at (Aimon and Satrianto, 2014), as well as the remoteness of the place of sale of the raw materials, which often results in high transportation costs. Besides, most of the enterprises interviewed have never received support from their government or the private sector.

1.3.3 Employment structure and average wage by the gender

In this section, we shed new light on informality, using Indonesia as a case study. The Figure (1.3) presents descriptive statistics on the distributions of the number of workers and, more specifically, on non-salaried workers by gender of the owner. After pooling the 2010-2015 waves of the IMK survey, the Figures (1.3a) and (1.3b) show that more than two-thirds of micro and small firms had no more than two employees in male-owned firms. If we focus only on small firms with more than four but fewer than 20 employees, more than 40% of these firms had only five to six employees. On the other hand, the histogram confirms that the vast majority of women-owned businesses are concentrated in micro firms⁵.

Figure 1.3: Distribution of workers by gender of the owner, 2010-2015



Source: Authors' calculation based on Indonesian Statistics Agency (BPS).

⁵Micro firms are those with fewer than 5 employees.

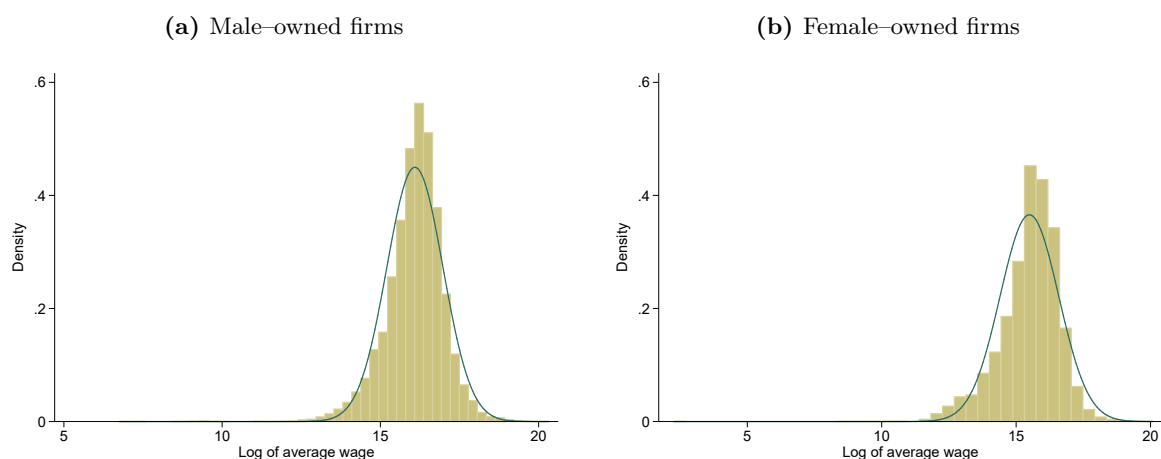
Despite recent positive employment trends, most Indonesians continue to work in the informal sector. In Indonesia, based on labor force surveys, researchers have found that the informal sector employs between 61% and 70% of the total workforce (Firdausy, 2000; Bank, 2010). The Figures (1.3c) and (1.3d) measure informal jobs as those attributed to individuals who are unpaid workers. Although informal jobs are preferred by women entrepreneurs because they offer greater flexibility, they earn less and do not enjoy the benefits associated with formal sector employment. Figure (1.3) reveals that the distribution of employment sizes in Indonesia remains highly skewed, and these very small firms also tend to be informal. This result is consistent with existing studies (e.g., Hsieh and Olken, 2014; Rothenberg et al., 2016).

Another interesting finding of the survey is that female-owned MSEs in Indonesia are more likely to employ women than men in their firms. The Table (1.10) presents the differences in employment structure between male- and female-owned MSEs. The number of female employees in female-owned firms is, on average, about 1.4, compared to 0.89 for male-owned firms. On the other hand, on average, male-owned firms tend to employ more men, with a ratio of 2.4.

As explained, the MSE business scene in Indonesia is characterized by a high degree of informality, often involving unpaid family workers and a high percentage of other unpaid temporary workers. The average wage, as illustrated in the Figure (1.4), is considerably low at 16 and varies by gender of the owner. Compared to male-owned firms, the average wage is considerably lower in female-owned firms. The average log average wage for women-owned firms is 15.5, compared to 16.1 for men-owned firms.

This situation deserves greater policy attention. While unpaid workers dominate the formal sector, they have little voice in the development of labor policies and regulations. Thus, Indonesian policy-makers face the challenge of representing the concerns and interests of these workers by improving their employment prospects and income security.

Figure 1.4: Distribution of average wage by gender of the owner, 2010-2015



Source: Authors' calculation based on Indonesian Statistics Agency (BPS).

1.3.4 Market structure of the Indonesian manufacturing sector

According to [Tijaja and Faisal \(2014\)](#), the manufacturing industry has long been recognized as the backbone of the Indonesian economy. The manufacturing sector makes a major contribution to overall output, reaching 24% of GDP in 2013. The MSE survey data covers firms in 24 manufacturing sectors⁶. However, because the number of observations in some industries was small, we divided them into six broad categories.

The Table (1.1) shows the classification of manufacturing industries. Most of these industries are labor-intensive and require low levels of technology. However, the structure of the manufacturing sector has changed over the past 15 years. This change involves an increase in the importance of natural resource-based industries, such as food, beverages, tobacco, fertilizers, chemicals, and rubber, and a decrease in the importance of labor-intensive sectors, such as textiles, leather, and footwear, and wood products, over time.

Table 1.1: Employment and output by activity (% of total manufacturing)

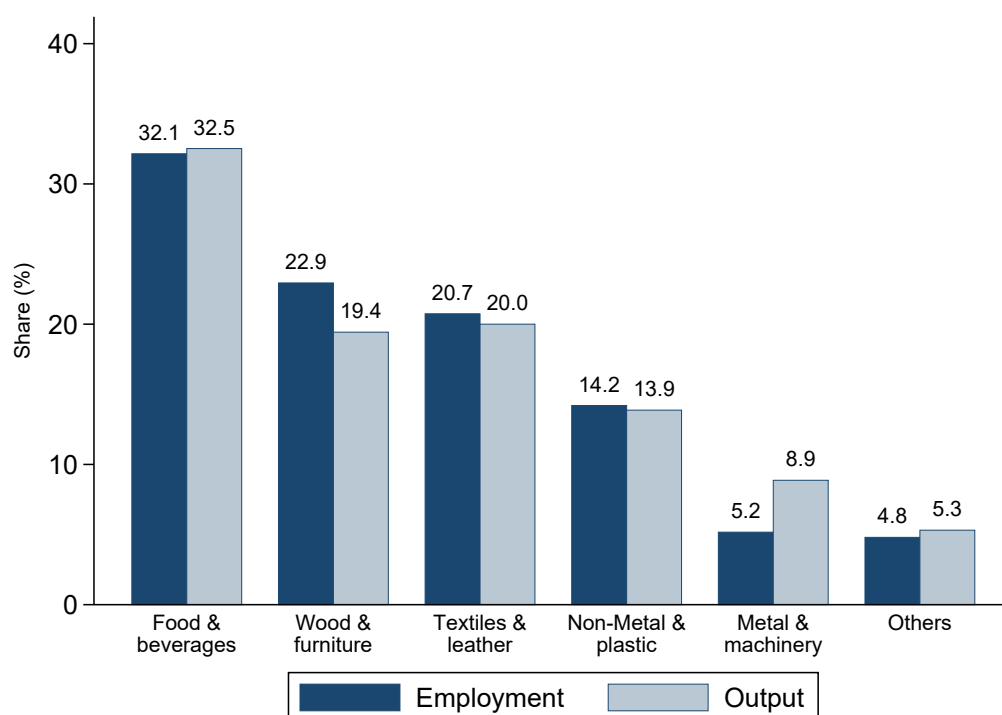
Activity	Employment						Output					
	2010	2011	2012	2013	2014	2015	2010	2011	2012	2013	2014	2015
Food & beverages	28.90	27.39	24.95	31.70	36.01	35.30	30.28	20.08	21.8	30.8	37.1	36.11
Wood products& furniture	22.83	20.62	20.52	20.82	24.20	24.66	17.11	17.2	15.25	15.15	18.82	25.87
Textiles & leather products	22.12	20.70	20.95	20.96	19.79	20.12	21.19	25.27	24.97	21.53	17.04	18.73
Non-metal & plastic products	15.47	17.64	19.16	15.11	12.06	11.99	15.05	18.71	14.17	14.17	12.47	11.89
Metal & machinery products	5.72	7.45	7.28	6.06	3.93	3.96	11.04	12.49	11.65	13.43	8.32	3.49
Others	4.97	6.21	7.14	5.36	4.01	3.97	5.3	6.2	7.59	4.89	6.2	3.87

Source: Authors' calculation based on Indonesian Statistics Agency (BPS).

To provide additional evidence, we also assessed the share of employment and production, which varies by sector. In the Figure (1.5), employment is dominated by the food and beverage industry, which absorbs a workforce of 80,274 people (32%), followed by the wood, wood, and cork manufacturing, including furniture, by about 23%. Next, textiles and leather products account for 20.7%, and finally, the non-metallic mineral products industry and plastic products account for 14.2%. The industries that absorb the least labor are the metal and electrical equipment industry with 5.2% and other manufacturing with 4.8%. MSE employment by province remains concentrated in Java Island as an industrial district, with 39% and 23% for Sumatra Island. In addition, the output of MSEs between 2010 and 2015 accounted for 32.5% of food and beverage, 19.4% of wood and furniture, 20% of textile, and 14% of non-metal products.

⁶This study uses the two-digit ISIC (the Indonesian Standard Industrial Classification) with codes from 10 to 33, as represented in Table (1.12).

Figure 1.5: Share of employment and output between (2010-2015) in MSEs



Source: Authors' calculation based on Indonesian Statistics Agency (BPS).

1.3.5 Heterogeneity of geographical attributes

In this section, we provide a snapshot of the distribution of MSEs using cross-provincial data from all 34 provinces of Indonesia. We follow the research of [Blalock and Gertler \(2008\)](#), who grouped the provinces of Indonesia into geographical units. We, therefore, combined the provinces into five major island groups, namely Java, Sumatra, Kalimantan, Sulawesi, and Outer Island.

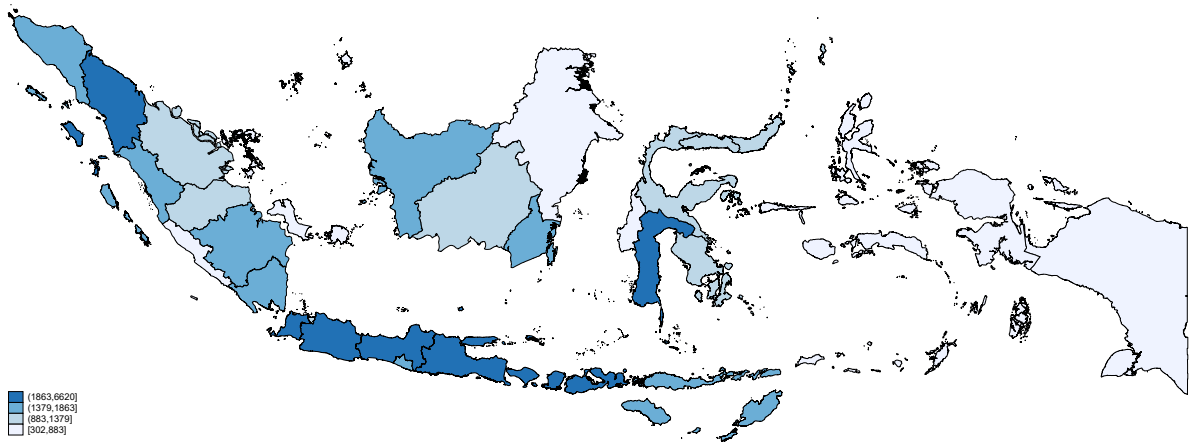
In the Figure (1.6), we can see that the number of MSEs is relatively centralized in the western and more developed part of the county with darker colors. This includes the island of Java, Sumatra, the southern and western part of Kalimantan. Meanwhile, in the eastern area of Indonesia, we could observe a lighter color that shows a relatively small number of MSEs. For example, Maluku and Papua, the least developed regions in Indonesia, account for only 1.53% and 0.97% of total MSEs in Indonesia, respectively.

The predominance of MSEs in this western part of Indonesia can be explained from various angles, including the demand side in the context of the goods and services market and the supply side in the context of the labor market. From the demand side of the market, the availability of infrastructures, such as roads, railroads, port facilities, and financial services, encourages people to start their businesses.

Nevertheless, the lack of support in the eastern part of the country has inhibited investment in this region. From a labor supply perspective, population density is highly concentrated on these islands with abundant natural resources, attracting companies to establish themselves and access more workers. As a result, the western part of Indonesia has become a center of economic activity and has seen an increase

in small and medium-sized enterprises.

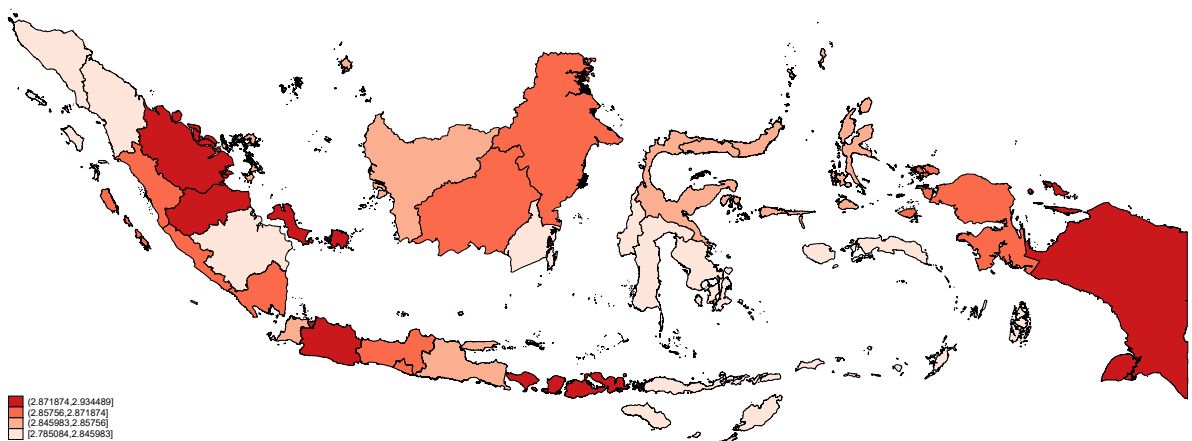
Figure 1.6: Number of MSEs based on province, 2015



Source: Authors' compilation based on Indonesian Statistics Agency (BPS).

Using TFP as an indicator of firm productivity, we see from the Figure (1.7) that a majority of high-productivity firms are located on the islands of Java, Sumatra, and Kalimantan. This finding shows that MSEs in these provinces have benefited from better infrastructure and demographic factors that drive firms to be more competitive and productive. We can also explain the different causes of high productivity in these islands for Sumatra and Kalimantan by the fact that the productivity of MSEs can be attributed mainly to the production of palm oil, cocoa, rubber, and other plantation products are abundant in these islands. Meanwhile, MSEs in the Java islands focus more on the manufacture of consumer goods to meet the demand of their dense population.

Figure 1.7: Firm productivity (Ln TFP), 2015



Source: Authors' compilation based on Indonesian Statistics Agency (BPS).

Interestingly, we also observe an abnormality for the island of Papua with unusually high productivity in the same Figure (1.7). Infrastructure and demand factors are still poorly developed in Papua, but at least two factors can explain the high productivity. First, it is notable that the province is a resource-

abundant island, with minerals such as gold and copper. This provides additional funds for the local government and large private companies to support MSEs by building their technical capacity and providing financial support to improve productivity. Second, the province attracts migrants from the eastern part of Java, better equipped with skills and networks to establish MSEs as entrepreneurs in Papua. We observe that these two factors contribute to the unusually high level of MSE productivity.

In the analytical part of this paper, we try to avoid this heterogeneity problem with different island characteristics. As suggested by [Amiti and Cameron \(2012\)](#), we introduce the control variable islands times year as a fixed effect to account for variation across islands over time.

1.4 Data and variables of interest

This section describes the data and variable construction. The detailed firm-level data allow us to address endogeneity and reverse causality issues to analyze the effect of financing structure on firm-level performance. Thus, we can identify the underlying channels through which changes in firm-level characteristics affect their overall performance.

1.4.1 Data description

We used the Micro and Small Industries Survey (IMK) data provided by the BPS as the primary data source for this analysis⁷. This survey designed by BPS is a comprehensive annual census of micro and small enterprises. In addition, ISIC level information is available in the published summary of the survey, while enterprise-level data can be obtained from BPS electronically. Furthermore, we follow the 2016 Indonesian Economic Census definition to identify MSEs, which uses an employment-based classification that micro enterprises employ 1 to 4 employees, and small enterprises employ 5 to 19 employees.

This study has an unbalanced panel dataset of 59,968 firms scattered over six years during 2010-2015. Each firm in the survey is assigned a unique code that allows us to generate a panel dataset using the firm's unique identifier. On average, the panel data contains information on 249,688 observations. Industries are classified according to the 2-digit ISIC (ISIC rev. 4), resulting in 24 industries represented in the sample (see Table 1.12 in the Appendices). This firm-level data set on manufacturing establishments contains detailed information, including firm identification, sectoral classification, ownership type, labor force structure (number of paid, unpaid, male, and female workers), workers' payrolls, and financial characteristics MSEs. Among other things, firms are also asked about their production, output, value-added, capital, and labor. All monetary variables are deflated using the consumer price index (CPI) with 2010 = 100.

A drawback of this dataset is that it does not cover all information on the amount of loan and the cost of interest incurred on these loans over time. In addition, in undertaking the data analysis, it was observed that some of the variables that make up the inputs and outputs of the production function were not available for all firms each year. As a result, some steps had to be taken to clean up the data.

⁷The Indonesian Manufacturing Census is part of a decennial economic census that uses the Indonesian Standard Industrial Classification (ISIC) for all economic activities.

1.4.2 Descriptive statistics

The Table (1.2) presents summary statistics for the variables used in this study; moreover, the Table (1.10) compares the mean values of our main variable of interest, by gender of the owner and disaggregates the characteristics of the firms by gender. The table clearly shows that there are considerable differences between the characteristics of male and female-owned firms. The definitions of the variables used in our empirical research are also represented in the Table (1.11).

1.4.2.1 Dependent variables: firm performance

We measure the performance of MSEs using two leading indicators, namely TFP and labor productivity. The paper also tests other indicators that can help explain firm performance through sales, employment and wages. In this paper, we use TFP as calculated by [Akerberg et al. \(2015\)](#) production function estimation. Based on our descriptive analysis, we find that the average TFP of Indonesian firms is 2.85, which is consistent with the research of [Şeker and Saliola \(2018\)](#), who conducted a cross-sectional analysis of the TFP performance of manufacturing firms in 69 emerging economies. Within the Southeast Asian region, these figures are slightly lower than those for Vietnam (average TFP ranges from 1.16 to 4.01) but ahead of Thailand (1.06 to 2.78) and Malaysia (1.14 to 3.37).

Further, we analyze the differences in productivity between firms of different sizes and different source of finance. Figure (1.11a) illustrates the link between formal financing and economic growth through TFP, which clearly shows that firms with access to formal financing have higher productivity compared to firms with access to informal financing. Figure (1.11b) shows the estimated log TFP kernel density by firm size. Unsurprisingly, the distribution for small firms is relatively skewed to the right for micro firms, demonstrating that, on average, larger firms have a higher level of productivity.

Moreover, let's look at the Figure (1.11d). Loan collateral is a dummy variable that takes the value of 1 if the line of credit is secured by a real guarantee and 0 otherwise. When a loan is secured, the lender has established a lien on an asset to the borrower. This asset becomes collateral, and it can be seized or liquidated by the lender in the case of default. A secured line of credit typically has a higher credit limit and a significantly lower interest rate than an unsecured line of credit, which could support a higher TFP compared to unsecured loans in other businesses. Although the lender assumes greater risk by extending an unsecured line of credit, these loans are only considered if the company is well established and has an excellent reputation. Even then, lenders compensate for the increased risk by limiting the amount that can be borrowed and charging higher interest rates, leading to a lower TFP compared to secured loans.

We also calculate labor productivity as the ratio between the value of output and the number of workers involved⁸. Ideally, a measure of firm productivity that is represented by labor productivity is used because it is an informative measure of the unit cost of labor of firms, which entrepreneurs use to make decisions about profitable opportunities. Moreover, it indicates whether firms are using and allocating resources most efficiently for productive uses ([Hsieh and Klenow, 2010](#)). The average log labor productivity for male-owned firms is 16.8 and for female-owned firms is 15.9.

⁸The more traditional approach of using value-added as the numerator is not adopted because information on value-added is not available in our database. However, the use of output is acceptable and more appropriate because the output is measured at the firm level.

It is apparent that sales revenue is a good indicator for overall performance, revealing how much a company earns, and they can help companies manage their budgets effectively⁹. Compared to male-owned firms, the average sales are significantly lower in female-owned firms. The average log sales for women-owned firms is 9.8, compared to 10.9 for men-owned firms.

Additionally, employment and wages can also be critical factors in firm performance. Average employment is also much lower in women-owned firms than in men-owned firms. Most MSEs, especially micro enterprises, are family-owned. Thus, according to our dataset, the total number of workers between 2010 and 2015 includes as many as 249,688 people, including 82,959 paid workers (33.22%) and as many as 166,729 unpaid workers (66.78%)¹⁰. However, this percentage varies by industry group, suggesting that industries with more complicated production processes are required to employ highly skilled labor from non-family members.

1.4.2.2 Independent variables: financing structure

From our data, we find that internal sources of funding (77%) are preferred as a means of obtaining financing for MSEs in Indonesia, especially during the start-up phase. In contrast, only 23% of the firms surveyed have access to an external source of financing. Furthermore, with respect to formal credit, male business owners are more likely to obtain credit (47%) than women (25.7%). These results reflect the inadequate access to credit sources for Indonesian micro and small businesses. Moreover, as reported in [Abe et al. \(2015\)](#), small businesses use internal sources of financing in the start-up phase, and then they substitute it with external funding when their business grows.

Formal sources of financing represent 40% of the sample, which includes bank loans (28%), cooperative loans (5.5%), non-bank financial institutions (3.3%), and venture capital (0.5%). While about 60% of MSEs use informal financing such as individual loans (26%), family loans (14.3%), and other loans (22.2%) (see Figure 1.8a for detailed information). However, most of the male-owned firms in the Figure (1.8b) indicate that they use banks as their primary source for operations, but some firms are not qualified to apply for a loan. In contrast, women-owned businesses report that other informal sources and individual loans are the frequent sources of their operations.

We also observe that there is no single, dominant reason why firms do not borrow from formal financial institutions. The Figures (1.8c and 1.8d) demonstrate the constraints facing borrowing. One of the main reasons that MSEs do not apply for bank loans is that 55% of owners do not want to loan from commercial banks, with 29.6% of male-owned firms and 25.7% of female-owned firms. Part of the reason they do not apply for loans may be due to religious factors, as mentioned by [Al-Mahrouq \(2003\)](#). He explains that loans from commercial banks carry interest, which is forbidden in Islam. Similarly, [Demirgüç-Kunt et al. \(2008\)](#) points out that the religious factor is one of the internal reasons why owners do not seek any type of formal external financing.

Followed by the banks require high collateral (notably in Java, Bali, and Sumatra), on average, nearly 84.7% of our borrowers must provide real collateral, as shown in the Table (1.2). Furthermore, the other

⁹We used indirect taxes as an indicator of sales because the more goods or services consumers buy, the more revenue the firm earns.

¹⁰Unpaid workers who work less than 1/3 applies of regular working hours (a week) in a company/firm is not included as a worker.

main reasons for not applying for a formal loan include transaction costs, which can be attributed to 13.5% of respondents. Others indicate, for example, the cost of information, the cost of funding, and the complexity of procedures, which amount to 12.3%, 9.8%, and 8%, respectively.

1.4.2.3 Control variables: firm characteristics

Having obtained our measure and access objective for the structure-finance variables, it is essential to control for firm characteristics because they reflect the creditworthiness and resources of a firm that the lender may consider when making its lending decision. Accordingly, we find that firm heterogeneity in terms of access to credit may be due to firm characteristics such as owner gender, firm size, firm age, legal structure, and owner education.

In line with previous research, recent studies have shown that firm size and age appear to significantly affect access to bank financing (e.g., [Chavis et al. \(2011\)](#); [Mac an Bhaird and Lucey \(2010\)](#); [Huyghebaert and Van de Gucht \(2007\)](#)). This means that young firms rely more on other sources of financing (e.g., loans from family and friends, internal or government-subsidized financing)¹¹; in contrast, more mature firms use more formal sources of financing, including bank loans, equity, and retained earnings, because they already have a track record, credit history, and established relationships, which reduces information asymmetries for capital providers ([Berger and Udell, 2002](#)). In our sample, there is a wide range of age and size among the firms. The majority of the firms surveyed are micro firms (88%), while about 12% are small businesses. On average, women-owned businesses are significantly smaller than those owned by men. In addition, businesses are on average 14 years old, but some are over 100 years old.

On the legal front, in our sample, MSEs are classified into four main categories, namely sole proprietorships, private limited company, limited partnerships, and cooperatives. The most common legal form of MSEs is the sole proprietorship, accounting for 95% of the total sample. As for women-owned businesses, 96% of them are organized as sole proprietorships (see Table 1.10). Nevertheless, we observed that a sole proprietorship also hires workers, mostly unpaid. Paying attention to the gender of the business owner, we noted that men own most of the MSEs in our data, 59% of the total sample. Nevertheless, we observe that the number of businesses owned by women (or women entrepreneurs) increases over our observation period, from 2010 to 2015.

Within education categories, although education is the most effective tool for human development ([Wamaungu, 2011](#)) and can help strengthen or improve financial inclusion and financial literacy ([Abdu, 2014](#)), the majority of MSEs in Indonesia is owned by less-educated individuals. We observe that 59% of business owners have a low level of education, have not attended school, or have only completed primary school. On the other hand, only 19.5% of owners have completed high school, and only 3% have obtained a university degree.

It is interesting to see the relationship between education level and gender, as depicted in the Figure (1.9a). This figure shows that female entrepreneurs have, on average, lower levels of education. For example, women entrepreneurs accounted for 41% of all micro and small businesses. Still, nearly 27% of

¹¹Formal capital providers such as banks are more likely to provide short-term debt to young firms because they are more flexible and the contract is easier to terminate in case the firm does not grow as planned ([Huyghebaert and Van de Gucht, 2007](#)).

Table 1.2: Summary statistics

Variables	Observation	Mean	Standard deviation	Minimum	Maximum
<i>Firm characteristics</i>					
Size	249,688	1.122	0.327	1	2
Small	249,688	0.122	0.327	0	1
Micro	249,688	0.878	0.327	0	1
Firm age	249,687	14.023	11.053	0	115
Women entrepreneur	249,688	0.409	0.492	0	1
Sole proprietorship	249,688	0.950	0.219	0	1
Not finished primary school	249,688	0.216	0.412	0	1
Primary school	249,688	0.372	0.483	0	1
Junior high school	249,688	0.187	0.390	0	1
Senior high school	249,688	0.195	0.396	0	1
Diploma or higher	249,688	0.030	0.170	0	1
<i>Number of workers</i>					
Salaried workers	249,688	1.190	2.574	0	19
Non-salaried workers	249,688	1.437	0.790	0	19
Male Workers	249,688	1.515	2.083	0	19
Female Workers	249,688	1.113	1.496	0	19
Workers	249,688	2.628	2.605	1	19
<i>Wage of workers</i>					
Wage male(log)	69,336	16.947	1.201	9.2	23
Wage female(log)	33,513	16.258	1.195	3	22
Real wage(log)	83,257	16.930	1.273	3	23
Average wage(log)	82,803	15.991	0.951	2.3	20
<i>Sources of capital</i>					
Fully internal capital	249,688	0.774	0.418	0	1
External financing ratio	172,190	0.150	0.274	0	1
Formal financing	56,386	0.398	0.489	0	1
Collateral	8,021	0.847	0.360	0	1
Reasons for not borrowing	224,433	4.453	1.891	1	6
<i>Performance Indicators & others</i>					
TFP_ACF(log)	215,884	2.846	0.087	2.6	3.2
Labor productivity(log)	218,902	16.488	1.322	9.4	22
Electricity(log)	122,082	12.585	1.989	1.9	21
Interest expense(Log)	18,442	14.469	1.633	3.2	21
Sales(log)	137,553	10.507	1.920	2.4	21
Consumer price index	249,688	117.007	12.143	100	132

them had not completed school, compared to only 18% of male owners who had not completed primary school. Moreover, 16% of female entrepreneurs have a senior high school diploma, compared to 22% of male owners in the same category. This confirms the results presented in the Table (1.10).

Furthermore, as can be seen in the Figure (1.9b), well-educated entrepreneurs are more likely to access formal finance than entrepreneurs with low education. For example, entrepreneurs with a high school education are more likely to have formal financing (31%) than entrepreneurs who have not finished primary school (12%). These differences in educational attainment suggest that more educated entrepreneurs, particularly men, have relatively better access to formal financial institutions for their financing needs.

1.5 Empirical strategy

As highlighted in the introduction, this paper investigates the impact of financing structure on MSEs performance and economic outcomes at the firm level. Moreover, by examining firm characteristics, this paper highlights the role of entrepreneurs' gender and education, affecting the relationship between financing structure and firm performance. Our empirical strategy follows a two-step analysis. First, we estimate firms' TFP, and second, TFP is treated as a dependent variable with respect to a set of explanatory financial and economic variables.

1.5.1 Estimation of Total Factor Productivity (TFP)

Productivity is a key driver of long-run economic growth and indicates the performance of a firm's use of scarce resources (Isik and Hassan, 2003). It also accounts for much of the difference in per capita income between countries (Hsieh and Klenow, 2010). We have two main methodologies for estimating TFP: non-parametric approaches (TFP index such as the Malmquist index and data envelopment analysis - DEA), and parametric approaches (production function estimation and stochastic frontier analysis - SFA).

In our study, we measure TFP estimates by fitting a Cobb Douglas production function to firm-level data. It was derived as the ratio of output produced to an index of composite inputs¹². This definition is consistently applied and has been accepted in a large number of studies (Syverson, 2011). In other words, TFP is the part of firm productivity that is not explained by the quantity of inputs used. Accordingly, the relative TFP index for each firm i at time t can be generally defined as follows:

$$\theta_{it} = \frac{Y_{it}}{f(K_{it}, L_{it})} \quad (1.1)$$

Where Y_{it} is the output of firm i at time t , K_{it} is the capital input of firm i at time t , L_{it} is the labor input of firm i at time t . and θ_{it} indicates the central tendency of TFP. If a firm's θ is greater than 1, it indicates high TFP relative to other firms, while a value less than 1 indicates low TFP. Rearranging

¹²Output can be quantified either by revenue or by an estimator of value-added (Balk, 2009). We used the revenue in the TFP estimate because information on value-added is not available in our database.

(1.1) as an equation of Y_{it} , we have:

$$Y_{it} = f(K_{it}, L_{it}) \theta_{it} \quad (1.2)$$

The next feature in (1.2) is the production technology, which can be explained by different assumptions. Among others, translogarithmic production and Cobb-Douglas functions are the two most commonly used methods. It is argued that both approaches have good mathematical properties. However, the elasticity of output with respect to inputs in the Cobb-Douglas function allows for easier interpretation than the translogarithmic output. To be more specific, the translogarithmic technique generally suffers from a collinearity problem between the regressors. Thus, in this study, we assumed that the production technology follows the Cobb-Douglas production function. Therefore, we can write the equation (1.2) as follows:

$$Y_{it} = AK_{it}^{\alpha} L_{it}^{\beta} \theta_{it} \quad (1.3)$$

from the equation (1.3), the inputs were aggregated by taking the exponent of each factor from its respective production elasticity. Syverson (2011) argued that this is more generally valid as a first-order approximation of any production function. Transforming the equation (1.3) into a linear expression by taking the logarithm of both sides of the equation, we have:

$$\ln Y_{it} = \ln A + \alpha \ln K_{it} + \beta \ln L_{it} + \ln \theta_{it} \quad (1.4)$$

assuming $\theta_{it} = e^{u_{it}}$, So, we can write equation (1.4) as:

$$\ln Y_{it} = \ln A + \alpha \ln K_{it} + \beta \ln L_{it} + u_{it} \quad (1.5)$$

According to equation (1.5), the natural logarithm of the TFP index is equal to the residual term u_{it} in the econometric production function. In practice, this equation can be estimated using the OLS estimation technique. However, the major econometric problem in estimating production functions is the possibility that there are determinants of production that are not observed by econometricians but observed by the firm. In this case, firms may use asymmetrically observed shocks to maximize their profits or minimize their costs. More precisely, firms are expected to respond to positive (negative) productivity shocks by increasing (decreasing) their output, thereby increasing the quantity and/or quality of production inputs. Thus, estimating the equation (1.5) by OLS can lead to biased estimates, as the inputs to the production function are likely to be related to the residuals.

We now turn to the control of the endogeneity problem. To this end, we decompose the residual as $u_{it} = \omega_{it} + \epsilon_{it}$, thus, we presented the production function in the equation (1.5) as follows:

$$y_{it} = a + \alpha k_{it} + \beta l_{it} + \omega_{it} + \epsilon_{it} \quad (1.6)$$

as described above, in the equation (1.6), the residual has been divided into two components where ω_{it} is productivity, and ϵ_{it} is unpredicted shocks. In other words, this means that the efficiency of the firm is decomposed into a part that can be predicted by the firm, although not observable in the data, and a part due to a productivity shock that cannot be predicted either by the firm or by econometricians:

(Giang et al., 2019).

In dealing with these issues in this estimation, there are three main approaches in the literature, namely instrumental variables (IV), fixed effects (FE), and control function (CF). Among the various alternatives, the standard technique for estimating the production function is the Olley and Pakes (1996) estimation (hereafter, OP). Specifically, the OP framework uses the level of investment as a proxy for unobserved productivity to control for the endogeneity problem that arises due to the correlation between observable input levels and unobservable productivity shocks. However, an important limitation of the OP approach is that investments are not decided at every point in time. Therefore, such a delay violates the monotonicity assumption (Eberhardt et al., 2010).

To address this concern, one of the most common frameworks for estimating firm-level productivity is the control function approach of Levinsohn and Petrin (2003) (hereafter, LP). LP proposes to overcome this problem by exploiting the cost of an intermediate input or electricity instead of investment as an alternative proxy for controlling knowledge of a firm's efficiency. This proxy not only uses intermediate inputs that can be easily adjusted for productivity shocks and addresses concerns about the monotonicity assumption, but it is also easier to implement since it takes advantage of available data for intermediate inputs. They propose the following modified model:

$$y_{it} = a + \alpha k_{it} + \beta l_{it} + \gamma m_{it} + \omega_{it} + \epsilon_{it} \quad (1.7)$$

On the one hand, LP performs a two-step estimation, in which the first step is to estimate the coefficient of labor β . However, we can see that there is a problem with LP, which is functional dependence. To be more precise, all variables are supposed to occur simultaneously using unconditional demands of intermediate inputs; this could lead to collinearity. However, in reality, the material M_{it} would normally be chosen after the L_{it} (Akerberg et al., 2015) (hereafter, ACF). On the other side, ACF proposed the corrected function approach, which uses moment conditions very similar to those used by OP and LP, but they avoid the functional dependence problem that can occur in LP. Specifically, OP and LP assume that firms can adjust certain inputs instantaneously and without cost when subject to productivity shocks. However, ACF has shown that the optimal allocation of labor is also a deterministic function of TFP, and thus the elasticity of labor is not identified.

The main idea of these methodologies is that an intermediate input ($\ln M_{it}$) such as expenditures on raw materials, energy, and electricity. It can be used as a proxy for the firm's unobserved productivity, and unbiased production function estimates. The demand function for the intermediate input is given by :

$$m_{it} = f_t(\omega_{it}, k_{it}, l_{it}) \quad (1.8)$$

assuming monotonicity, this explains that if the demand for the intermediate input increases monotonically with ω_{it} , it can serve as a valid indicator for the unobservable. Therefore, the demand function for the intermediate input can be inverted to give ω_{it} as a function of capital, labor, and the intermediate input.

$$\omega_{it} = f_t^{-1}(m_{it}, k_{it}, l_{it}) \quad (1.9)$$

By introducing this function that captures the variation in the prediction of firm efficiency ω_{it} in the equation (1.6), the production function can be estimated using semi-parametric methods.

$$y_{it} = \Phi_t(m_{it}, k_{it}, l_{it}) + \epsilon_{it} \quad (1.10)$$

where

$$\Phi_t(m_{it}, k_{it}, l_{it}) \equiv a + \alpha k_{it} + \beta l_{it} + f_t^{-1}(m_{it}, k_{it}, l_{it})$$

the change in inputs is now unrelated to the error term ϵ_{it} , so we have consistent parameter estimates. We compute the TFP for each firm as the residual of an estimate of the equation (1.10).

1.5.2 Empirical model: Fixed effect and GMM methods

After obtaining the firm-level TFP estimates, we follow the methodology employed in the [Levine et al. \(2000\)](#) model of financial development and growth to study the impact of credit facilitation by formal financial institutions on firm performance in the Indonesian manufacturing sector. The regression framework consists of a panel regression of firm performance (i) in period (t) on formal financing in the same period and a set of control variables. The econometric specification is given by the following equation:

$$FP_{it} = \alpha_i + \beta_1 FS_{it} + \beta X_{it} + \mu_i + \nu_t + \epsilon_{it} \quad (1.11)$$

Where $FP_{i,t}$ is a measure of firm performance. It can be measured by the TFP of the firm (i) at a time (t) estimated using [Akerberg et al. \(2015\)](#) and labor productivity. Note that all variables in our regression were transformed into logarithmic form¹³. $FS_{i,t}$ is the financing structure of a firm (i) at a time (t) and measured by formal external credit or fully internal capital. Formal financing is our explanatory variable of interest; it is a dummy variable that takes the value one if the firm relies on external sources from banks, cooperatives, non-bank financial institutions (NBFIs), and zero otherwise. Meanwhile, fully internal capital is a dummy variable that takes the value of one if the MSE's main source of capital is based on the internal source of finance (such as inheritance, savings, and asset liquidation) and zero otherwise. According to the theory discussed earlier, β_1 is expected to be positive for each of these dependent variables. Furthermore, $X_{i,t}$ is a vector of observable characteristics of a firm i in period t that could influence the probability of obtaining a loan. In addition, μ_i are firm-level fixed effects controlling for unobserved characteristics of firm i that do not vary over time, and ν_t is a set of year fixed effects. Finally, $\epsilon_{i,t}$ can be interpreted as random shocks.

In terms of econometric methodology, we estimate the equation (1.11) using a fixed-effect panel model, accounting for firm and year fixed effects. Although a standard error fitted to the model can address heteroskedasticity and autocorrelation, [Wintoki et al. \(2012\)](#) have argued that endogeneity bias still exists. This is because fixed-effects models primarily control for unobserved heterogeneity. They do not control for the endogeneity problem caused by measurement errors, time-invariant endogenous variables, and reverse causality that often occurs in financial research. As a result, the use of the FE model may still be biased, especially in the case of short panel data ([Cameron and Trivedi, 2005](#)).

¹³The natural logarithm is used for several variables to improve the goodness of fit of the regression models and to overcome simultaneity bias.

To deal with this problem, some previous studies have suggested using instrument variable estimators (IV estimators) or dynamic panel GMMs. However, the problem with applying IV estimators is the difficulty of finding variables that can serve as valid instruments because, with weak instruments, IV estimators are likely to be biased. In other words, IV estimates with invalid instruments could offer no improvement over OLS estimators. Therefore, this research applied the dynamic panel GMM explored by [Arellano and Bond \(1991\)](#) to address the endogeneity issue.

One of the advantages of the GMM model over the instrument estimator method is that it is much easier to have instrument variables as exogenous variables in other periods or lagged variables, which could be used as instruments for endogenous variables in the current period¹⁴. Therefore, the GMM provides an abundance of instrumentation variables, which makes it easier to achieve the conditions of valid instruments and over-identification of estimators. Besides, the Arellano and Bond estimator is suitable for short panel data that have small T and large N, i.e., few periods and many individuals. However, this research uses short panel data with large firms and only six years, so the GMM method introduced by [Arellano and Bond \(1991\)](#) was employed and considered the most suitable. In this case, we extend the equation (1.11) by adding the lagged dependent variable.

A problem with the original estimator [Arellano and Bond \(1991\)](#), called difference GMM, is that lagged variables can be weak instruments if the variables in the regressions are close to a random walk because lagged levels transfer little information about changes in the future. Additionally, the GMM difference has a weakness when there are many gaps in the unbalanced panels ([Roodman, 2009](#)). Therefore, [Arellano and Bover \(1995\)](#) and [Blundell and Bond \(2000\)](#) developed the GMM system, in which the original equation is added to the system to augment the instruments, which increases the efficiency of the estimators. In this estimator, the lagged differences are used as instrumentation variables for the level equations, and the lagged levels are used as instruments for the first difference equations.

To ensure the validity of the set of instruments, [Arellano and Bond \(1991\)](#) proposed two key tests to check the validity of the GMM model. The first test is the Sargan test or Hansen test for overidentification. The GMM requires that the overidentification restrictions be valid. The second test is the Arellano-Bond test for autocorrelation errors. The residuals in the first difference AR (1) are expected to be correlated, but there should be no serial correlation in the second difference AR (2). The condition for second-order serial correlation is that any historical value of the dependent variables beyond certain lags, which control the dynamic aspects of an empirical relationship, is a valid instrument because it will be exogenous to the current shocks to the dependent variables ([Wintoki et al., 2012](#)).

We further verify the robustness of our results. This research performed regressions in which industry and year dummy variables were included to capture industry- or year-specific FE. Besides, alternative measures of the dependent or independent variables were applied to retest the results.

1.6 Results and discussion

In this section, we analyze the data according to our empirical strategy. We first generate the baseline result by assessing the relationship between formal financing and firm productivity. Then, fixed-effect

¹⁴The lagged endogenous variable and other explanatory variables are considered as predetermined.

regression and GMM are used to investigate our main hypothesis that external sources of financing from formal entities have a positive effect on MSEs performance. Next, we assess how women entrepreneurs may have a distinct impact on the mentioned hypothesis. Finally, we check with other measures of firm performance to examine the varying impact of financing structures on firm performance.

1.6.1 Formal financing and firm productivity

1.6.1.1 Fixed effect regression

We present in Table (1.3) the baseline result of our empirical model using the FE estimator to assess the relationship between financing structures and firm productivity. Columns (1-4) report the TFP results obtained by Akerberg et al. (2015) estimation of the production function as the dependent variable. Meanwhile, columns (5-8) present the regression results using labor productivity as the dependent variable. We first set the financing structure between formal external financing and full internal financing for each dependent variable as the only independent variables. Then we use control variables that include firm characteristics in the equations. This empirical model includes firm fixed effects and the year fixed effect on the block to hold variation constant for our regression.

Columns (1) and (5) show the key results of the paper, with coefficients on the formal external financing variables showing positive and statistically significant effects at the 1% level in influencing productivity. Specifically, this indicates that if MSEs receive formal financing, they will have a 5.5% chance of increasing TFP and 78.5% chance of increasing labor productivity, compared to firms with full internal financing. The regression also shows that the effects of financing sources are relatively stronger for labor productivity than for TFP, because the coefficient on formal financing is higher for the former.

On the other hand, in columns (2) and (6), we show that firms that use only internal sources of financing have lower productivity, with a negative and statistically significant coefficient at the 1% level affecting productivity. To be more precise, firms that use only internal financing will have 5% lower TFP productivity and 63.1% lower labor productivity than firms that use an external source of formal financing. This is an important result because the vast majority of MSEs in Indonesia use only internal financing. In other words, only a small fraction of MSEs in Indonesia could improve their productivity with access to formal financial institutions. Our main result also holds when we include five firm-specific variables in our regression model, namely female entrepreneurs (female-owned firm), firm size, firm age, legal structure, and education of the owner. In columns (3) and (7), the coefficients on formal financing are positive and highly significant at the 1% level. Meanwhile, in columns (4) and (8), the coefficients for firms using internal financing are negative and highly significant at the 1% level.

Our findings show that external financing by financial institutions has a greater impact than internal financing (retained earnings) for their business operations. This is mainly due to the fact that the primary objective of external financing requested is working capital, purchase of equipment, machinery, and business development, which in turn increases productivity. In addition, it is assumed that MSEs with better access to finance are more likely to engage in and achieve high output¹⁵. In other words,

¹⁵Due to data availability, we were unable to test the hypothesis that the increase in productivity is due to asset accumulation. At the time of writing, the IMK database is not available in BPS, so we were unable to obtain new data on assets.

Table 1.3: The effect of financial structure on firm productivity – Fixed effect estimator with robust standard error

Dependent variable	ln (TFP_ACF)				ln (Labor productivity)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Formal financing	0.055*** (0.010)		0.035*** (0.005)		0.785*** (0.136)		0.556*** (0.078)	
Fully internal financing		-0.050*** (0.006)		-0.028*** (0.003)		-0.631*** (0.091)		-0.385*** (0.054)
Woman entrepreneur			-0.051*** (0.014)	-0.054*** (0.012)			-0.681*** (0.213)	-0.705*** (0.187)
Size (1=micro, 2=small)			0.063*** (0.008)	0.078*** (0.009)			0.361*** (0.115)	0.585*** (0.130)
Firm age(Log)			0.007** (0.003)	0.003 (0.002)			-0.020 (0.052)	-0.088** (0.036)
Sole proprietorship			-0.013*** (0.004)	-0.011*** (0.002)			-0.194*** (0.056)	-0.155*** (0.031)
Primary school			0.008* (0.005)	0.015*** (0.002)			0.148* (0.084)	0.248*** (0.026)
Junior high school			0.021*** (0.006)	0.034*** (0.004)			0.368*** (0.109)	0.551*** (0.060)
Senior high school			0.029*** (0.006)	0.050*** (0.005)			0.486*** (0.093)	0.795*** (0.077)
Diploma or higher			0.036*** (0.004)	0.057*** (0.006)			0.570*** (0.081)	0.845*** (0.084)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Island x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Level	Industry	Industry	Industry	Industry	Industry	Industry	Industry	Industry
Observations	40,995	198,718	40,995	198,718	41,551	201,478	40,995	198,718
R-squared	0.774	0.368	0.839	0.560	0.767	0.357	0.801	0.488

Notes: The dependent variables are TFP and labor productivity. ACF stands for the corrected control function approach of [Akerberg et al. \(2015\)](#). The figures reported in parentheses are robust standards error. *, **, and *** indicate significance at 10%, 5% and 1% respectively.

large firms also tend to be better connected to banks or other formal sources of financing. This argument is consistent, for example, with [Claessens et al. \(2000\)](#) who found that firm size affects the dependence of obtaining credit from the bank in Asian countries, with larger firms being more dependent on the bank.

[Caggese and Cuñat \(2008\)](#) argue that access to finance affects contract terms (i.e., fixed-term and permanent contracts). Financially constrained firms are more willing to employ fixed-term workers who are less productive than permanent workers. This has the effect that fixed-term workers are flexible and have no-layoff costs associated with their contract. They can easily leave halfway through a production process, which affects productivity. This indicates that access to finance affects the quality of workers a firm seeks to employ.

The Table (1.3) also provides us with a baseline result on how firm-specific characteristics affect productivity. One of the main results we would like to highlight from the firm characteristics is how

the gender of the owner affects productivity. In short, we would like to understand whether a female entrepreneur has higher productivity than their male counterpart. This table shows us that, for example, based on column (3), the estimated coefficient of a female entrepreneur is negative and statistically significant at the 1% level. This suggests that a female-owned firm will decrease TFP productivity by 5.1% relative to a male-owned firm. The result still holds, but with a larger magnitude, when we use labor productivity as the dependent variable.

This could be due to many factors, including (a) the lack of education or training opportunities that disadvantages them in accessing formal financing and financial institutions, which negatively affects the productivity of the enterprise ; (b) the explanation may lie in the work of (Leahey, 2006), who argued that male-owned firms outperformed female-owned firms due to women's lack of experience in the industry and their concentration in less profitable sectors of the economy, which contributed significantly to their lower sales and revenues; (c) another explanation cited in the literature (Barber and Odean, 2001; Dohmen et al., 2011) is their higher level of risk aversion which may lead them to restrict investment in their business and thus limit the growth of their businesses; (d) sociocultural factors further limit the growth of women entrepreneurs' businesses, particularly in rural areas where women are more responsible for household chores and childcare. All of these concerns may well explain the underperformance of women entrepreneurs.

We then observe other firm characteristics in their influence on productivity, such as firm size, age, legal status, and education of the owner. First, with respect to firm size, this variable is one of the most studied aspects of firm productivity (e.g., Bartelsman and Doms (2000) and Ahn (2001)). The coefficient estimates for firm size are positive and statistically significant at the 1% level in all model specifications in the Table (1.3). The result indicates that small firms exerted substantial and positive impacts on firm productivity as measured by TFP and labor productivity relative to micro firms. This result is consistent with studies by Leung et al. (2008) and Van Biesebroeck (2005), they argued that small firms tend to be more productive than micro firms and that some differences between small and micro firms could be due to a concentration of micro firms in less productive industries.

Our result shows mixed results when we examine the effect of firm age on firm productivity. Column (3) shows that the coefficient on firm age is positively significant at the 5% level with TFP in a model that includes formal external financing. We lose the significance when the firm relies only on informal financing in column (4). To illustrate this result, the studies of Musamali and Tarus (2013), Le (2012), and Kira (2013) revealed that the number of years the firm has been in operation has a positive impact on access to finance. In other words, this means that the older the firm has been in business, the easier it is for it to access external financial resources, thereby increasing its productivity. However, the influence of firm age on productivity is different when considering labor productivity, as can be seen in columns (7) and (8). The coefficient shows a negative result, indicating that as firms age, and labor productivity decreases.

Consistently, the sole proprietorship is negatively related to firm productivity, as its coefficients are significantly negative at the 1% level in all regressions. This suggests that sole proprietorship firms have lower productivity in terms of TFP and labor productivity. These results are consistent with most previous studies, for example, those of Collins-Dodd et al. (2004) and Farace and Mazzotta (2015).

Based on this result, we argue that the sole proprietorship is less likely to support firm growth and less innovative compared to other organizational forms such as the partnership or cooperative, making it less attractive to lenders. In addition, they may be considered riskier by lenders and investors. As a result, they face considerable financial constraints from formal financial institutions, negatively affecting enterprise productivity.

Finally, in all of our models, we found that the education of business owners is relatively crucial for firm productivity. The firm with the most educated owner has a larger effect on productivity relative to its financing structure. From this perspective, we suspect that low-educated owners tend to have insufficient knowledge about external financing and keep a record of their financial transactions, making it difficult for formal financial institutions such as banks to assess their financial situation. Therefore, the result shows that the productivity of the firm will increase significantly when the entrepreneur is more educated in their ability to manage financial resources.

1.6.1.2 GMM estimator

Using the FE model with a robust standard error can help control for unobserved effects as well as heteroscedasticity. However, the problem of endogeneity, which leads to biased and inconsistent estimators, may still exist. This is due to the inability to test whether a simultaneous and inverse relationship exists between the financing structure and firm performance (i.e., that firm performance also affects financing structure decisions). Furthermore, the financing structure can be viewed as a simple indicator of the unobserved characteristic that influences performance. We doubt the reliability of Difference – GMM to provide unbiased results. Thus, to strengthen the research results, the two-stage GMM system with adjusted standard error is used to cope with the endogeneity problem.

This technique accounts for unobserved firm heterogeneity by estimating first-difference equations and controls for endogeneity by instrumenting the different variables with internal lags. Apart from the lagged dependent variables, further endogeneity may come from access to finance, in the sense that banks are more willing to provide financing to firms with higher levels of productivity. Therefore, we use the lagged independent variable, formal financing or internal capital for one time, ownership type for lagged two times, and owner’s gender as instruments for access to credit. The type of ownership (i.e., sole proprietorship, partnership, listed or unlisted companies) is likely to influence a firm’s ability to access credit. In addition, the gender of the owner influences a firm’s ability to access finance.

The results of the GMM system are presented in the Table (1.4). It confirms the positive relationship between formal financing and TFP and the negative relationship between internal credit and firm productivity. This causality is statistically significant at the 5% and 1% levels in most of the models, with the exception of the coefficient of internal capital in the labor productivity equation, where it is negative but not significant. In conclusion, a positive relationship between formal finance and firm productivity through TFP or labor productivity is supported by all models, as well as the negative effect between internal capital and firm productivity. The consistency of the sign of formal finance across the different methods applied illustrates the robustness of the results. It is remarkable that the magnitude of access to credit from formal financial institutions on labor productivity is considerably higher than TFP.

Table 1.4: The effect of financial structure on firm productivity – GMM estimator with robust standard error

Dependent variable	ln (TFP_ACF)		ln (Labor productivity)	
	(1)	(2)	(3)	(4)
Formal financing	0.039*** (0.002)		0.622*** (0.029)	
Internal Capital		-0.000** (0.000)		-0.001 (0.001)
L.TFP (ACF)	0.029*** (0.010)	0.003 (0.010)		
L.Labor productivity			0.024** (0.012)	0.006 (0.010)
Woman entrepreneur	-0.053*** (0.002)	-0.027*** (0.004)	-0.705*** (0.025)	-0.272*** (0.064)
Size (1=micro, 2=small)	0.067*** (0.003)	0.148*** (0.031)	0.398*** (0.042)	1.657*** (0.550)
Firm age(Log)	0.006*** (0.001)	0.017*** (0.002)	-0.041*** (0.010)	0.154*** (0.033)
Sole proprietorship	0.070 (0.067)	-0.380*** (0.127)	0.996 (1.105)	-5.989*** (2.091)
Primary school	0.010*** (0.002)	0.131*** (0.049)	0.193*** (0.025)	2.025*** (0.729)
Junior high school	0.021*** (0.002)	0.039 (0.051)	0.356*** (0.029)	0.842 (0.845)
Senior high school	0.033*** (0.003)	0.272*** (0.041)	0.540*** (0.048)	4.646*** (0.607)
Diploma or higher	0.046*** (0.010)	0.056 (0.148)	0.694*** (0.161)	0.671 (2.236)
Year FE	Yes	Yes	Yes	Yes
Observations	22,514	107,247	22,831	108,741
Number of included individuals	17,961	49,768	18,169	50,195
Hansen test (p-value)	0.066	0.090	0.071	0.087
AR(2) (p-value)	0.585	0.802	0.407	0.773

Notes: The dependent variables are TFP and labor productivity. ACF stands for the corrected control function approach of [Akerberg et al. \(2015\)](#). All regressions using GMM estimations were performed with the *xtabond2*. The Hansen *J* statistic is a test statistic of the over-identification restrictions, distributed as a chi-squared under the null of instrument validity. AR (2) is the second serial correlation under the null of no serial correlation. The figures reported in parentheses are robust standards error. *, **, and *** indicate significance at 10%, 5% and 1% respectively.

The results in the Table (1.4) also reveal that the signs for most of the control variables are consistent with the FE method, but slightly different in terms of the significance level. While the AR(1) and AR(2) tests for first and second-order serial correlation, the Hansen tests for over-identifying restrictions. All p-values of the AR(2) tests in the table are greater than 0.10, meaning that the null hypothesis of no second-order serial correlation cannot be rejected. Similarly, the results of Hansen's J-tests reveal that the null hypothesis that the instrument variables are valid or cannot be rejected.

1.6.2 Women entrepreneurs, formal financing and productivity

Interest in supporting women's entrepreneurship has recently increased in order to promote economic inclusion, as highlighted by the Sustainable Development Goals (SDG) on gender equality and decent work. This interest stems from the recognition that women's entrepreneurship, particularly in rural areas, will generate economic growth and employment. In Indonesia, Tambunan (2017, 2019) found that women entrepreneurs have a significant effect on poverty reduction as they improve family income.

Therefore, recognizing the potential role of women, the Indonesian government has, since the end of the Asian financial crisis (1997/98), made efforts to encourage the development of women's entrepreneurship by supporting the development of MSEs through various programs, as these enterprises are seen as an important means of testing and developing women's entrepreneurial skills. These programs include vocational training, technical assistance, microcredit from banks, and other formal financial institutions provided by state-owned enterprises through partnership programs. However, as in many other developing countries, despite the growing number of women entrepreneurs and a significant increase in initiatives and policies, as explained, the gender gap in entrepreneurship in Indonesia persists.

Our dataset from the BPS survey on MSEs reveals two interesting facts about women entrepreneurs in Indonesia. First, about 41% of total MSEs are operated by women and are mainly skewed towards micro-sized firms. This means that the percentage of women entrepreneurs in these firms tends to decrease with size. The Figure (1.10) clearly shows that about 39.49% of firms owned by women entrepreneurs are micro enterprises, compared to 1.44% for small firms.

This is consistent with the results of the Table (1.10), in which female entrepreneurs are concentrated in micro enterprises. This difference in firm size could partially explain the existence of a gender gap in firm performance. Second, the proportion of women entrepreneurs in labor-intensive industries (e.g., food products (13.3%), textiles (7.6%), and garments (4.56%)) tends to be high. This may suggest that there is a difference in job choice patterns between women and men. Women might avoid heavy work that requires physical strength or might not have enough capital for production, resulting in relatively lower productivity than their male counterparts.

1.6.2.1 Impact of women entrepreneurs on the probability of access to credit

In this section, we first test for the presence of gender differences and whether women entrepreneurs are more constrained than men entrepreneurs in their access to external financing and formal credit. We follow the form of this basic econometric model:

$$Y_{it} = \alpha_i + \beta_1 \text{Woman}_{it} + \beta X_{it} + \mu_i + \nu_t + \epsilon_{it} \quad (1.12)$$

where Y can be an external financing ratio or a binary variable for formal credit; $Woman$ is a dummy variable that is worth "1" if the principal owner of a firm is a woman and "0" otherwise; X_{it} is a vector of observable characteristics of the firm i at time t . The model can be estimated using Probit or Tobit regressions, allowing for heteroscedasticity and clustering of errors by industry. The estimation results are presented in the Table (1.5). Columns (1-3) show the results of the estimation of the probability of obtaining external financing using the Tobit model. Meanwhile, columns (4-6) present the results of estimating the probability of obtaining formal financing using the Probit model. The marginal effects at the mean are reported for all regressions.

Although the Indonesian government officially launched the so-called "inclusive economic government" in 2007, the main important component of which is "inclusive finance", in an effort to improve access to financial services for both men and women, evidence may suggest that all these initiatives, programs, and resources used have not been as effective and indicate that women's access to formal external credit remains lower than their male counterparts. The results show that the external financing ratio of women-owned businesses is 6.3 percentage points lower than that of male-owned small businesses, but there is no statistically significant difference between them in micro-enterprises. In addition, the coefficient on the female entrepreneur variable, which is of major interest in this study, is negative and statistically significant at the 1% level in column (4). Therefore, female entrepreneurs are estimated to have about a 10.4% lower probability of obtaining formal financing than male entrepreneurs.

Even though both male- and female-owned businesses face barriers in accessing formal financial services, the barriers are greater for women entrepreneurs. The reasons for the gender gap in access to financial services may stem from both the supply and demand sides of the credit market. On the bank side, it is difficult for them to significantly increase lending while meeting lending criteria, as many banks perceive MSEs as a high-risk sector, particularly for micro enterprises, and the high transaction costs of processing and evaluating loans (i.e., relatively small loan amounts, below the banks' normal lending threshold), and conversely low returns. Besides, these types of enterprises have little or no credit history, few or no reliable records, and insufficient or no collateral (Zavatta, 2008).

On the demand side, this could be due to the overrepresentation of the informal sector, which is not registered and does not pay taxes. Women entrepreneurs are more likely than men entrepreneurs to rely on internal or informal financing for the following two main reasons: (i) conducting MSE activities does not require so much capital, advanced technology, and high formal skills, as in general, MSEs are very simple income-generating activities, such as food production, food stalls, stores selling commodities, and handicrafts. This explanation is in line with the study of Tambunan (2017); (ii) because of these simple and small-scale activities, no special space is needed, especially for married women, they have flexible schedules to use their time between customer service and required domestic work. In addition, formal external credit is not adapted to the reality of these activities due to transaction costs such as high-interest rates and the value of the collateral. This finding provides insight into the constraints that limit women SME owners' access to formal external financing.

This finding provides evidence of a gender gap in access to bank financing, which is consistent with the literature regarding decreased access to financial resources for women entrepreneurs. For instance, Muravyev et al. (2009) found that women-owned firms are less likely to be approved for bank loans than

Table 1.5: Access to credit and the role of woman entrepreneur

Dependent variable	Tobit models: External financing ratio			Probit models: Formal financing		
	All firms (1)	Micro firms (2)	Small firms (3)	All firms (4)	Micro firms (5)	Small firms (6)
Woman entrepreneur	-0.001 (0.023)	0.016 (0.019)	-0.063*** (0.017)	-0.104*** (0.040)	-0.097*** (0.036)	0.016 (0.032)
Firm size(log)	0.099*** (0.015)	0.083*** (0.018)	0.025* (0.015)	0.119*** (0.021)	0.186*** (0.019)	0.079*** (0.019)
Firm age(Log)	-0.027*** (0.010)	-0.029*** (0.010)	-0.020*** (0.005)	0.011 (0.011)	0.001 (0.008)	0.041 (0.027)
Sole proprietorship	-0.037** (0.017)	-0.025 (0.015)	-0.048*** (0.017)	-0.086*** (0.015)	-0.058*** (0.016)	-0.126*** (0.022)
Primary school	0.012 (0.012)	0.019 (0.012)	-0.012 (0.008)	0.055*** (0.008)	0.036*** (0.008)	0.128*** (0.011)
Junior high school	0.031*** (0.012)	0.043*** (0.012)	-0.019** (0.009)	0.141*** (0.009)	0.126*** (0.008)	0.185*** (0.024)
Senior high school	0.010 (0.013)	0.027** (0.011)	-0.050*** (0.016)	0.243*** (0.013)	0.233*** (0.010)	0.264*** (0.030)
Diploma or higher	0.001 (0.018)	0.016 (0.015)	-0.070*** (0.019)	0.324*** (0.020)	0.307*** (0.019)	0.364*** (0.026)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Island x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Level	Industry	Industry	Industry	Industry	Industry	Industry
Observations	152,470	131,884	20,586	53,233	40,722	12,511
Pseudo R^2	0.275	0.278	0.214	0.132	0.144	0.091

Notes: The definition of the variables used in the regressions are given in Table (1.11). The dependent variable in the regression reported in columns (1-3) is the ratio of having external financing using Tobit estimation. The dependent variable in the regression reported in columns (4-6) is a binary variable which equals 1 if a loan was granted from formal financing sources to an entrepreneur and 0 otherwise using Probit estimation. All regressions show marginal effects evaluated at means. Micro firms have below 5 employees, and small firms have between 5 to 19. The figures reported in parentheses are robust standard error. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

predominantly male-owned firms. Similarly, [Watson \(2006\)](#) suggested that women-owned firms are less dependent on external financing. Thus, our empirical results provide some support for the discrimination against women entrepreneurs hypothesis.

Firm-specific characteristics are also important from a lender's perspective, as they reflect a firm's creditworthiness and resources that the lender may consider when deciding to lend. Younger firms have a marginal advantage over older firms; the estimated coefficient on firm age in column (1) is negative and significant. Its marginal effect is 2.7%, consistent with the increasing likelihood of having external sources of financing. Further, sole proprietorships have a lower probability of obtaining credit compared to other legal forms of ownership.

Through columns (4-6), we find that firms with a more educated entrepreneur have a higher probability of accessing formal credit than low-educated entrepreneurs. In this context, targeted financial education programs are an important tool to increase knowledge of the range of financing instruments

and help entrepreneurs develop a long-term strategic approach to business financing, improve understanding of the economic and financial landscape relevant to their business, and understand and manage financial risk for different instruments.

1.6.2.2 Gender of the owner and productivity

Next, this leads us to test the hypothesis that women who can obtain additional finance for their businesses can increase their productivity. We further investigate the relationship between women entrepreneurs and external financing and firm productivity to examine this hypothesis. Extending the estimating equation to include the interaction term with women entrepreneurs, we obtain:

$$FP_{it} = \alpha_i + \beta_1 \text{Formal credit}_{it} + \beta_2 \text{Woman}_{it} + \beta_3 \text{Formal credit}_{it} \times \text{Woman}_{it} + \beta X_{it} + \mu_i + \nu_t + \epsilon_{it} \quad (1.13)$$

where FP_{it} represents the performance/productivity of firm i at time t . *Formal credit* is the dummy variable that takes the value 1 if firms finance their activity through formal financing and zero otherwise. *Woman* is the dummy variable that takes the value 1 for a female entrepreneur and 0 for a male entrepreneur. We are also interested in estimating β_3 the coefficient of the interaction term $\text{Formal credit} \times \text{Woman}$, which gives the additional effect associated with women-owned firms and obtains formal external credit. Where ϵ_{it} is the error that captures other variations, which are not captured by the explanatory variables in the model.

The Table (1.6) provides an overview of this result based on a FE and system-GMM panel regression. The result clearly suggests that there is a significant gender difference in performance. In all specifications, male entrepreneurs perform better than female entrepreneurs, which is consistent with our baseline regression. To further motivate this result, Figure (1.11c) shows the kernel density estimate of log TFP by gender. We find that the distribution of male-owned firms is relatively skewed to the right for female-owned firms, demonstrating that, on average, male-owned firms have a higher level of productivity.

Nevertheless, if we focus on the interaction term – $\text{Formal credit} \times \text{Woman}$ – the estimated coefficient is positive and significant in all model specifications. This suggests that a woman entrepreneur who has access to formal external financing, such as a bank, will improve her productivity. This, in turn, will reduce the productivity gap between male and female entrepreneurs.

To be more precise, in our first specification using the FE model, a female entrepreneur who has access to formal external financing will increase her TFP productivity by 2.4% while labor productivity will increase by about 24%. The result holds when we include more firm-specific characteristics in the FE model. Holding all other variables constant, we note that the interaction terms still have positive and significant coefficients for affecting productivity, although, for labor productivity, the significance falls to the 10% level. In this model, the behavior of firm characteristics in affecting productivity is also similar to our baseline regression. Size, age, and owner education also positively affect productivity, while sole proprietorship has a negative or insignificant impact on productivity. Finally, our GMM model shows the robustness of our result by confirming the positive correlation of women entrepreneurs with access to formal external financing with higher productivity.

Table 1.6: Interaction term between formal financing and woman entrepreneur and firm productivity

Dependent variable	ln (TFP_ACF)			ln (Labor productivity)		
	FE	FE	GMM-Sys	FE	FE	GMM-Sys
Formal financing	0.045*** (0.006)	0.030*** (0.006)	0.034*** (0.002)	0.670*** (0.086)	0.508*** (0.096)	0.561*** (0.034)
Woman entrepreneur	-0.076*** (0.006)	-0.061*** (0.005)	-0.064*** (0.002)	-0.894*** (0.086)	-0.783*** (0.084)	-0.817*** (0.029)
Formal financing x woman entrepreneur	0.025*** (0.008)	0.024*** (0.007)	0.024*** (0.003)	0.243** (0.117)	0.241* (0.122)	0.250*** (0.042)
Size (1=micro, 2=small)		0.064*** (0.005)	0.067*** (0.003)		0.361*** (0.090)	0.398*** (0.043)
Firm age(Log)		0.007*** (0.002)	0.006*** (0.001)		-0.023 (0.028)	-0.041*** (0.010)
Sole proprietorship		-0.013*** (0.004)	0.074 (0.068)		-0.195*** (0.063)	1.061 (1.114)
Primary school		0.008** (0.004)	0.010*** (0.002)		0.153** (0.065)	0.192*** (0.025)
Junior high school		0.021*** (0.005)	0.020*** (0.002)		0.371*** (0.077)	0.354*** (0.029)
Senior high school		0.030*** (0.005)	0.033*** (0.003)		0.492*** (0.087)	0.542*** (0.049)
Diploma or higher		0.037*** (0.006)	0.047*** (0.010)		0.575*** (0.106)	0.704*** (0.162)
L.TFP (ACF)			0.028*** (0.010)			
L.Labor productivity						0.024** (0.012)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Level	Province	Province	–	Province	Province	–
Observations	40,995	40,995	22,514	41,551	40,995	22,831
R-squared	0.800	0.838	–	0.784	0.799	–
Number of included individuals	–	–	17,961	–	–	18,169
Hansen test (p-value)	–	–	0.052	–	–	0.063
AR(2) (p-value)	–	–	0.539	–	–	0.392

Notes: The dependent variables are TFP and labor productivity. ACF stands for the corrected control function approach of [Ackerberg et al. \(2015\)](#). Columns (1), (2), (4) and (5) use fixed effects panel regressions, while columns (3) and (6) adopt GMM panel regression approach. All GMM estimations were performed with the *xtabond2*. The Hansen *J* statistic is a test statistic of the over-identification restrictions, distributed as a chi-squared under the null of instrument validity. AR (2) is the second serial correlation under the null of no serial correlation. The figures reported in parentheses are robust standards error. *, **, and *** indicate significance at 10%, 5% and 1% respectively.

In summary, our results suggest that if women entrepreneurs have greater access to formal external financing, it will increase their productivity. We are aware that little research focuses on this area, so the results presented in this paper significantly contribute to providing more inclusive access to financial resources for women entrepreneurs.

We, therefore, recommend three central policies to address these problems. First, policymakers and formal financial institutions should have a better credit policy targeting women entrepreneurs to improve productivity. If women entrepreneurs remain credit-constrained relative to men, this can hinder the potential of the economy itself because women entrepreneurs are likely to remain less productive. Moreover, policymakers should focus their efforts on providing more credit and support to women entrepreneurs through microcredit institutions. In this regard, microcredit has been recognized as an effective tool for fostering women's entrepreneurship in developing countries, particularly in rural areas ([Banerjee et al., 2015](#)). It encourages women's participation, assumes their sustainability, reduces poverty, and improves socio-economic development ([Mayoux, 2005](#)).

In Indonesia, microfinance can be very beneficial to women entrepreneurs for several reasons. (i) It provides better access to capital at a relatively low-interest rate, which can directly increase their liquidity position and enable them to expand their businesses; (ii) women-owned businesses face limited opportunities in the formal sector economy, and also constitute the majority of low-paid workers compared to male-owned businesses. The use of loans from these institutions will increase the number of women-owned small and medium enterprises in Indonesia. This is one way to stimulate self-entrepreneurship among Indonesian women.

Second, a shift to more productive and less labor-intensive sectors for women entrepreneurs can also help increase overall productivity. In this scenario, if women can access more credit to purchase new equipment or support capital for their production, it will help them to be more productive and expand their businesses to make women entrepreneurs thrive in the long run. Finally, policymakers need to adopt alternative financing channels to increase financial inclusion, such as the broader use of digital finance or fintech. The shift to digital financial services can greatly benefit MSMEs through advances in mobile money, fintech services, and online banking. These services will create financial inclusion that can help small businesses improve their access to credit, as well as stimulate economic growth. This policy recommendation is consistent with the previous study, as [Blancher et al. \(2019\)](#) and [Creehan \(2019\)](#) to support the use of financial technology to increase access to finance for MSMEs.

1.6.3 Alternatives firm performance measures

In this part, we further specify our main model with alternative measures of firm performance to replace our efficiency indicators. We extend our main equation (1.11) to include other performance-related variables to assess the impact of access to finance and how the firm is managed, giving us :

$$FP_{it} = \alpha_i + \beta_1 \text{Formal credit}_{it} + \beta X_{it} + \mu_i + \nu_t + \epsilon_{it} \quad (1.14)$$

Where $FP_{i,t}$ is a measure of firm performance. It can be measured by sales, employment, and wages paid by the firm i in the period t . Formal credit is the dummy variable that takes the value 1 if firms

finance their activity by formal financing and zero otherwise. $X_{i,t}$ is a vector of firm i 's control variables at a period t that could affect the probability of obtaining a loan. The following variables are also considered: μ_i is a firm-level fixed effect, ν_t is a set of year fixed effects, and $\epsilon_{i,t}$ is the error term. The Table (1.7) presents the results of the other alternatives. In all specifications, we include control variables, firm fixed effects, and year fixed effects. Our result shows that measuring firm performance by sales or employment rather than productivity does not significantly alter the main results in the Table (1.3), with a similar or even stronger effect. This suggests that access to external finance is an important component of firm growth.

We first find evidence that formal financing can improve sales (column 1) in our data, even after controlling for a set of firm-level variables. Consequently, formal financing led to an estimated 64% increase in sales at the 1% significance level. As expected, we indeed find that the availability of a bank loan allows firms to obtain slightly better margins, as they can purchase raw materials in bulk and increase their production. As a result, their market share is positively affected.

In column (2), we then explore whether changes in employment can explain our results. Employment increases significantly by about 21%. These results imply that firms are more likely to benefit from economies of scale and invest more in machinery and skilled workers, which has led to more modest rates of job creation. As a result, they can develop new products and take advantage of outsourcing, which helps them increase productivity. This empirical evidence confirms that MSEs are an important engine of job creation.

Surprisingly, our result found no significant impact on real or average wages when assessing the link between access to formal finance and wages, as presented in columns (3) and (4). Several factors may explain this behavior. First, the larger share of unpaid workers represents 66,78% of total workers in our sample. Second, and more importantly, there may be a risk that the promotion of MSEs, because of their substantial contribution to employment, may lead to a trade-off between the number and quality of existing and new jobs in MSEs, particularly in developing countries where the share of informal micro enterprises is high. Third, although real wages are a measure of productivity, in practice, there is not always a direct one-to-one relationship between productivity and wages because of regulation, labor unions, and other external effects. In this specific case, it might appear that real wages move more slowly than TFP and labor productivity. This result is in line with [Kersten et al. \(2017\)](#) who found that better access to finance has a positive and significant impact on SME performance measures, e.g., employment, sales, and revenue, but an insignificant effect on wages.

In terms of additional controls, although they have retained more or less the similar sign and significance as the results of our basic econometric specification. The same Table (1.7) highlights some interesting interpretations that reinforce the previous results (Table 1.3). Performance measures are more closely related to firm size rather than age. Small firms have higher sales and make disproportionate contributions to employment and real wages compared to micro firms. Using either measure, we found that the results remain invariant for the female entrepreneur, indicating that female-owned firms do significantly worse than their male-owned counterparts in terms of sales, employment, and wages.

Table 1.7: Alternative measures of firm performance

Dependent variable	(1) ln (Sales)	(2) ln (Employment)	(3) ln (Real wage)	(4) ln (Average wage)
Formal financing	0.641*** (0.098)	0.213*** (0.035)	0.366 (0.256)	0.286 (0.198)
Size (1=micro, 2=small)	1.148*** (0.166)	1.173*** (0.086)	1.105*** (0.157)	-0.094 (0.147)
Firm age(Log)	-0.016 (0.062)	0.012 (0.012)	-0.002 (0.082)	-0.019 (0.055)
Sole proprietorship	-0.675*** (0.131)	-0.074** (0.034)	-0.302** (0.129)	-0.160 (0.114)
Woman entrepreneur	-0.831*** (0.125)	-0.378*** (0.045)	-0.424*** (0.135)	-0.341*** (0.112)
Primary school	0.154 (0.165)	-0.014 (0.033)	0.084 (0.130)	0.095 (0.101)
Junior high school	0.449** (0.180)	0.007 (0.050)	0.254 (0.159)	0.206 (0.124)
Senior high school	0.875*** (0.193)	0.074 (0.061)	0.299** (0.138)	0.223* (0.124)
Diploma or higher	1.323*** (0.212)	0.165** (0.068)	0.363** (0.170)	0.208 (0.140)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Cluster Level	Province	Province	Province	Province
Observations	32,754	53,233	24,798	24,731
<i>R – squared</i>	0.843	0.867	0.860	0.829

Notes: The dependent variables are sales, employment and wage. The figures reported in parentheses are robust standards error. *, **, and *** indicate significance at 10%, 5% and 1% respectively.

1.6.4 Robustness checks

In this part, we show that the results are robust across the different specifications. First, we check whether the previous results are consistent with the different methods of computing firm productivity. Second, we exclude Java Island from the regression.

1.6.4.1 Alternative productivity measures: using the LP method

As discussed in the Section (1.5.1), we investigated whether our results are robust to alternative measures of productivity suggested by Levinsohn and Petrin (2003). We do not use the Olley and Pakes (1996) technique because their method requires primary information on investment to substitute for unobserved productivity shocks, whereas prior information on investment is not provided in the BPS data from MSEs. The result of the regression is presented in the Table (1.8).

Our robustness check using alternative TFP calculations shows that formal external financing still

Table 1.8: The effect of formal financing on TFP measured by the LP method

Dependent variable	(1)	(2)	(3)	(4)
ln (TFP_LP)	FE	FE	FE	GMM-Sys
Formal financing	0.695*** (0.123)	0.486*** (0.074)	0.492*** (0.091)	0.536*** (0.030)
Woman entrepreneur		-0.701** (0.278)	-0.700*** (0.084)	-0.730*** (0.029)
Formal financing x woman entrepreneur		0.206 (0.199)	0.204 (0.122)	0.222*** (0.041)
Size (1=micro, 2=small)		0.093 (0.108)	0.092 (0.089)	0.111*** (0.040)
Firm age(Log)		0.119** (0.051)	0.116*** (0.027)	0.098*** (0.009)
Sole proprietorship		-0.176*** (0.050)	-0.177*** (0.061)	0.659 (1.001)
Primary school		0.150* (0.085)	0.155** (0.067)	0.186*** (0.025)
Junior high school		0.368*** (0.109)	0.373*** (0.076)	0.344*** (0.028)
Senior high school		0.476*** (0.091)	0.480*** (0.085)	0.509*** (0.045)
Diploma or higher		0.541*** (0.083)	0.545*** (0.104)	0.609*** (0.147)
L.TFP (LP)				0.021* (0.012)
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	Yes
Island x Year FE	Yes	Yes	No	No
Cluster Level	Industry	Industry	Province	—
Observations	40,995	40,995	40,995	22,514
R-squared	0.766	0.787	0.785	—
Number of included individuals	—	—	—	17,961
Hansen test (p-value)	—	—	—	0.148
AR(2) (p-value)	—	—	—	0.319

Notes: The dependent variables is TFP. LP stands for the control function approach of [Levinsohn and Petrin \(2003\)](#). The figures reported in parentheses are robust standards error. Columns (1-3) use fixed effects panel regressions, while column (4) adopt GMM panel regression approach. The Hansen J statistic is a test statistic of the over-identification restrictions, distributed as a chi-squared under the null of instrument validity. AR (2) is the second serial correlation under the null of no serial correlation. The figures reported in parentheses are robust standards error. *, **, and *** indicate significance at 10%, 5% and 1% respectively.

has a statistically positive and significant effect on productivity. Columns (1) and (2) indicate that our result holds for all specifications, including firm characteristics. In column (3), we modify our specification using only the year fixed effect and clustering by the province to see significant variation across models. Again, our result holds with the factors that increase productivity: formal financing, age of firm, male ownership, no sole proprietorship, and higher education of the owner.

Interestingly, the coefficients on our interaction variables, which show the benefit of better access to finance for women entrepreneurs to increase productivity, have lost significance in this model. Nevertheless, the GMM model, in column (4), also shows that the result of the interaction terms is consistent with our baseline regression, as well as the most crucial variable of formal financing for productivity.

1.6.4.2 Excluding Java island

In Indonesia, our BPS dataset shows that most MSEs are located in Java, the most populous island and the center of economic (i.e., manufacturing, trade, construction, agriculture, and services) and financial activities in Indonesia. The number of MSEs in Java alone accounts for 39% of all manufacturing activities in Indonesia. In the baseline model, we grouped the islands into five main groups (Java, Sumatra, Kalimantan, Sulawesi, and the other clustered islands). We used fixed effects on islands times year to restrict the variations across islands. To test for robustness, we remove the sample from the island of Java to see if the result still holds, as suggested by [Amiti and Cameron \(2012\)](#) when dealing with Indonesian data.

Table (1.9) displays that our robustness test results excluding Java Island are consistent with the main results of this study. Column (1) generally shows the same effect as our baseline, that there is a positive relationship between formal financing and firm performance as measured by TFP using the ACF method. Our main variables for formal finance and its interaction with women entrepreneurs remain positive and significant at the 1% level. The other variables on firm characteristics also show a similar result to our baseline.

In column (2), when we use the TFP calculation based on the LP method as the dependent variable, formal finance remains positive and significant in affecting productivity. However, consistent with the results in Table (1.8), the coefficients are not significant for the interaction term of formal finance with female entrepreneurs and firm size. Finally, column (3) shows that the main baseline result remains robust, with significant coefficients for formal financing, size, age, legal status, gender, and owner's education.

The same table highlights the different results for the different productivity measures using the TFP measure by ACF and LP. Firms with formal financing have a 3% higher TFP measured by ACF, while TFP measured by LP is 57% higher compared to firms without formal financing, controlling for all other main differences in firm characteristics. These differences at different magnitudes of the measured variable most likely stem from the different methodology and measurement of TFP calculation. On the one hand, the framework of [Levinsohn and Petrin \(2003\)](#) (LP) framework uses intermediate inputs as a proxy for unobservable productivity shocks. On the other hand, [Akerberg et al. \(2015\)](#) (ACF) have proposed a methodological correction that addresses functional dependence problems that can arise in

the LP¹⁶.

Table 1.9: Excluding Java island

Dependent variable	(1) ln (TFP_ACF)	(2) ln (TFP_LP)	(3) ln (Labor productivity)
Formal financing	0.033*** (0.004)	0.572*** (0.061)	0.582*** (0.062)
Woman entrepreneur	-0.058*** (0.005)	-0.641*** (0.080)	-0.727*** (0.080)
Formal financing x Woman entrepreneur	0.020*** (0.007)	0.147 (0.119)	0.185 (0.119)
Size (1=micro, 2=small)	0.057*** (0.004)	-0.052 (0.062)	0.224*** (0.062)
Firm age(Log)	0.005*** (0.002)	0.082*** (0.030)	-0.060** (0.030)
Sole proprietorship	-0.015** (0.006)	-0.245** (0.104)	-0.254** (0.104)
Primary school	0.006 (0.005)	0.112 (0.077)	0.109 (0.077)
Junior high school	0.018*** (0.005)	0.323*** (0.080)	0.321*** (0.081)
Senior high school	0.023*** (0.005)	0.400*** (0.082)	0.403*** (0.082)
Diploma or higher	0.035*** (0.009)	0.525*** (0.149)	0.553*** (0.149)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	25,662	25,662	25,662
R-squared	0.887	0.856	0.864

Notes: The dependent variables are TFP, labor productivity. ACF stands for the corrected control function approach of [Akerberg et al. \(2015\)](#); and LP stands for the control function approach of [Levinsohn and Petrin \(2003\)](#). The figures reported in parentheses are robust standards error. *, **, and *** indicate significance at 10%, 5% and 1% respectively.

1.7 Conclusion

This paper investigated the relationship between financial structure and firm performance by mining a dataset of 59,968 Indonesian micro and small manufacturing enterprises (MSEs) that include an average of 249,688 observations from 2010 to 2015. The results show that 77% of firms rely on internal financing resources such as the entrepreneur's savings and inheritance, while there are only 23% of MSEs that have access to external sources of financing. Of this small proportion, most of them are provided credit by banks (28%) and individuals (26%). The most common reason given for not obtaining a loan is a reluctance to borrow from the bank. Furthermore, perceptions of insufficient collateral and complicated

¹⁶See Section (1.5.1) for more details.

procedures are also well-known reasons expressed by micro and small business owners for their lack of interest in applying for bank loans.

We used both fixed-effects panel regressions and dynamic panel estimates by the GMM system. Our results indicate that firm productivity is positively related to obtaining formal financing in all estimated specifications. The availability of loans is a key factor in promoting the productivity of small business startups in Indonesia. As a result of increased credit availability, many productive firms can expand or make technological advances and meet the investment needs to increase their productivity beyond what their internal funds can support. However, MSEs still lag behind in terms of credit growth. Our results show that improved access to finance substantially impacts MSE sales and employment growth, although there is no direct link between formal financing and wages. On the other hand, internal financing is found to be relatively unimportant for firm growth.

Furthermore, various robustness tests were included to support our results. First, we checked our results using the LP method as a different measure of TFP. Second, we excluded the island of Java, where most MSEs are located, from our regressions to see if our results remain valid even after excluding this island. Finally, our robustness checks confirm the main results of the positive relationship between credit and firm productivity.

Additionally, the paper presents new evidence on the influence of owner gender on firm performance. First, our results suggest that differences in access to credit result from discrimination and structural differences between male- and female-owned firms. Second, we measure gender differences in TFP, labor productivity, sales, employment, and real wages. Third, we find significant differences in the performance gap between male- and female-owned firms, even after controlling for firm and year fixed effects and industry clustering. Finally, we find that the interaction coefficient between women-owned firms and obtaining formal financing is significant and more effective than those operating without access to formal lending. These results are also supported by various studies on women's entrepreneurship in developing economies.

Although access to finance is a major barrier for women entrepreneurs, and there is a marked gender gap in access to and use of formal bank accounts, as the results show, a range of different barriers can prevent women's businesses from thriving. On the one hand, the COVID-19 pandemic has particularly affected women in Indonesia. On the other hand, many women are employed in vulnerable sectors, such as retail, hospitality, or the garment industry, which has experienced significant job losses and reduced working hours since the pandemic began. Even more, women work in the informal sector, where the impacts are difficult to capture and access to social support systems is limited.

Further, women are spending more time on unpaid caregiving since the spread of COVID-19. This means that balancing domestic and caregiving workloads with paid work responsibilities have become even more difficult due to the pandemic. Women, therefore, face higher risks of job and income loss. On the other hand, in the context of the COVID-19 pandemic, [Sangem \(2020\)](#) found that nearly 44.8% of women entrepreneurs lost formal financial investment opportunities due to the COVID-19 pandemic concerning a growing need for women's businesses to survive the crisis.

The conclusions of this study are relevant for policymakers in Indonesia to enhance access to financial services through a credit guarantee system for MSEs and expanded factoring programs, particularly for women-owned firms, to increase their productivity. The study highlights the significant constraints faced by manufacturing firms and, therefore, suggests where reform efforts should be focused. A more inclusive approach, including reaping the potential of digital finance to improve access to credit, will benefit MSEs. Another key adaptation strategy in response to COVID-19 was diversification, using digital platforms and digital payment technology groups to help micro and small businesses reach a broader customer base and expand into new sectors by selling a wider variety of products.

Other analyses could examine the impact of gender ownership on exporting, research and development; the impact of entrepreneurial characteristics on MSE performance (e.g., maternity leave, immigration status); and the dynamics of growth performance indicators. Each of these factors could provide insight into the impact of gender ownership on MSE performance.

Appendices

1.A Sample and data definition

Table 1.10: Summary statistics: Female-owned vs male-owned firms

Variables	Male-owned firms		Female-owned firms		Means differences
	Mean	SD	Mean	SD	
<i>Dependent variables</i>					
TFP_ACF (log)	2.875	0.079	2.802	0.080	0.073
Labor productivity (log)	16.841	1.253	15.936	1.237	0.905
Sales(log)	10.935	1.915	9.825	1.721	1.110
Employment (log)	0.907	0.696	0.359	0.530	0.548
Male Workers	2.362	2.250	0.291	0.872	2.071
Female Workers	0.889	1.648	1.436	1.172	-0.547
Salaried workers	1.743	2.992	0.393	1.479	1.350
Non-salaried workers	1.509	0.846	1.334	0.687	0.174
Real wage (log)	17.076	1.181	16.211	1.454	0.864
Average wage (log)	16.091	0.887	15.495	1.091	0.596
Wage male (log)	16.979	1.181	16.532	1.372	0.447
Wage female (log)	16.411	1.088	15.975	1.326	0.436
Collateral	0.885	0.319	0.681	0.466	0.204
<i>Independent variables</i>					
External financing ratio	0.164	0.273	0.129	0.273	0.035
Formal financing	0.472	0.499	0.257	0.437	0.216
Fully internal capital	0.750	0.433	0.810	0.393	-0.060
<i>Firm characteristics</i>					
Micro	0.818	0.386	0.965	0.184	-0.147
Small	0.182	0.386	0.035	0.184	0.147
Firm age	13.540	10.590	14.719	11.655	-1.179
Sole proprietorship	0.939	0.238	0.964	0.186	-0.024
Not finished primary school	0.180	0.384	0.268	0.443	-0.088
Primary school	0.367	0.482	0.379	0.485	-0.013
Junior high school	0.197	0.398	0.173	0.378	0.025
Senior high school	0.220	0.414	0.158	0.365	0.062
Diploma or higher	0.036	0.186	0.021	0.144	0.015

Notes: The table presents summary statistics for the sample used in the analysis. The first two columns show the mean and standard deviations of each variable for the subsample of firms owned by male entrepreneurs. Columns (3) and (4) show the same statistics for the subsample of firms owned by female entrepreneurs. The last column shows the means difference of each variable across the two subsamples of male- and female- owned enterprises..

Table 1.11: Variable description

Variable name	Definition and Description	Data Source
<u>Dependent Variables – Measures of firm performance</u>		
Output (Y)	Output (rupiah) measured by the value of goods produced, deflated by the CPI for ISIC two-digit industries, based on constant 2010 prices.	BPS
Electricity (log)	Cost of the entire electricity consumption for a company/ business, such as lighting and running the engine. We used it to control for unobserved productivity shocks.	BPS
Capital (log)	It is calculated by the logarithm of fixed assets (rupiah) deflated by the CPI for two-digit ISIC industries, based on constant prices for the year 2010.	BPS
Revenue (log)	This is the total revenue generated by the sale of goods or services related to the firm's core business, deflated by the CPI based on the year 2010.	BPS
TFP (log)	Total Factor Productivity of firm "i" in year "t".	BPS ^b
Labor productivity (log)	The ratio of total output to the number of workers used to produce that output.	BPS ^b
Sales (log)	We used indirect taxes to measure sales, that is, taxes imposed on consumers by manufacturers to purchase goods/services. For example, value-added tax, property tax, customs duties, and export taxes, excluding taxes paid by the firm for withholding taxes on workers' compensation.	BPS
Employment (log)	It is the sum of all men and women employed by the establishment. It includes paid and unpaid workers.	BPS ^b
Real wage (log)	It includes all salaried workers, which is deflated by the CPI based on the year 2010.	BPS
Collateral	A dichotomous variable takes the value of 1 if the credit line is secured by a real guarantee and 0 otherwise.	BPS
<u>Independent & control Variables</u>		
External financing ratio	External financing is when the source of funding comes from outside the organization. It includes formal sources of funding (e.g., banks, cooperatives, non-bank financial institutions, and venture capital) and informal sources of funding (e.g., loans from family, friends, and moneylenders). It ranges from 0 to 1. A higher ratio means that firms are more dependent on external financing than on internal financing.	BPS
Formal financing ^a	Dummy variable that takes the value one if the firm uses formal external sources (banks, cooperatives, non-bank financial institutions (NBFIs), venture capitalists) to finance working capital or new investment, zero otherwise (Individual, family, and other loans).	BPS ^b
Fully internal capital	Dummy variable taking the value of one if the MSE's initial source of capital is based on the internal source of funding (inheritance, savings, personal remittance or/and liquidation of assets) and zero otherwise.	BPS ^b
Firm size (employees)	A firm is defined as micro (1-4 employees) and small (5-19 employees). Size is a vector of dummy variables, micro and small, which takes the value one if a firm is micro and zero otherwise.	BPS
Firm age (years)	The years that have passed since the establishment started its operations. It is calculated as the difference between the year of the survey and the year in which the business began operations.	BPS
Gender of the owner	Dummy variable taking the value of one if the MSE's owner is female and 0 otherwise.	BPS
Sole proprietorship	Dummy variable that takes on the value 1 if the firm is organized as a sole proprietorship and zero otherwise (private limited company, limited partnership, cooperative and others).	BPS

(Continued)

Table 1.11 – Variable description (*Continued*)

Variable name	Definition and Description	Data Source
Education	There are five categories for the owner of the firm, 1—“not finished primary school”; 2—“primary school”; 3—“junior high school” 4—“senior high school”; 5—“diploma or higher”.	BPS

^a *Formal financing* includes working capital purchases and fixed asset investment financed by other parties, which meaning that the employer has no contribution at all.

^b Authors’ computation, see the text for details.

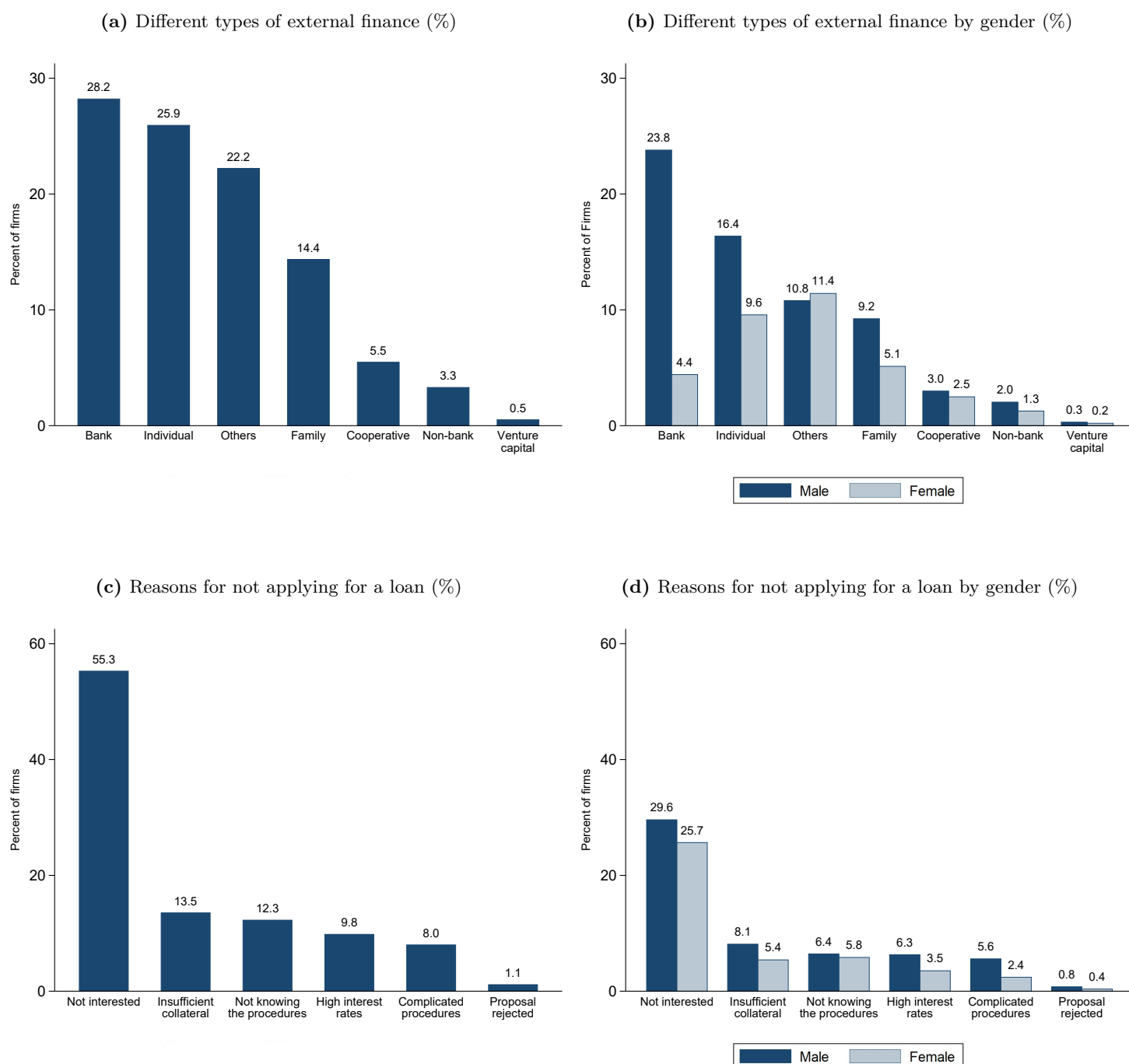
Table 1.12: Industry classification

ISIC 2-digit	Two-digit industry	Total Number	Percentage
10	Food products	67,517	27.04
11	Beverages products	6,912	2.77
12	Tobacco products	5,845	2.34
13	Textiles	23,977	9.60
14	Wearing apparel	22,829	9.14
15	Leather and leather products	4,979	1.99
16	Wood and cork, except furniture	46,938	18.80
17	Paper and paper products	1,189	0.48
18	Publishing and printing	3,456	1.38
19	Coke and petroleum products	3	0.00
20	Chemical products	2,228	0.89
21	Pharmaceuticals products	650	0.26
22	Rubber and plastics products	2,293	0.92
23	Other non-metallic mineral products	28,506	11.42
24	Basic metals	516	0.21
25	Fabricated metal products	10,886	4.36
26	Electronic and optical products	91	0.04
27	Electrical equipment	134	0.05
28	Machinery and equipment	380	0.15
29	Motor vehicles and trailers	336	0.13
30	Other transport equipment	1,907	0.76
31	Furniture	10,352	4.15
32	Other manufacturing	7,206	2.89
33	Repair, installation of machinery and recycling	558	0.22
Total		249,688	100%

Source: Indonesian Statistics Agency database (BPS).

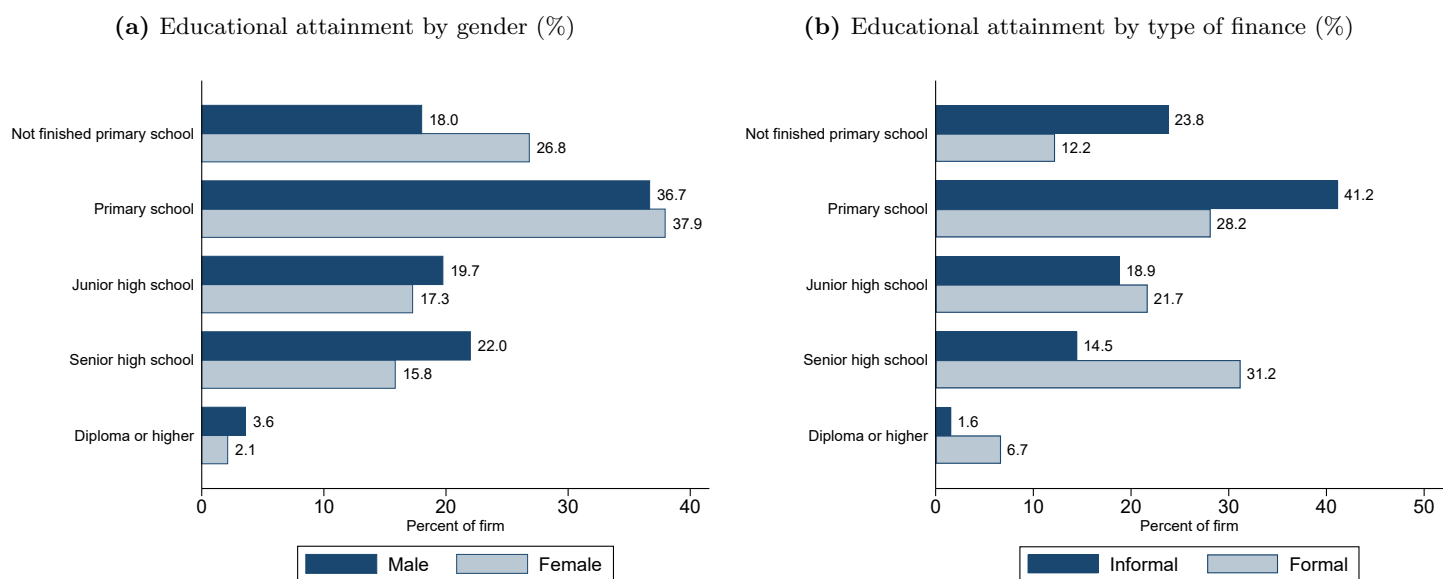
1.B Additional figures

Figure 1.8: Composition of the external financing structure of MSEs



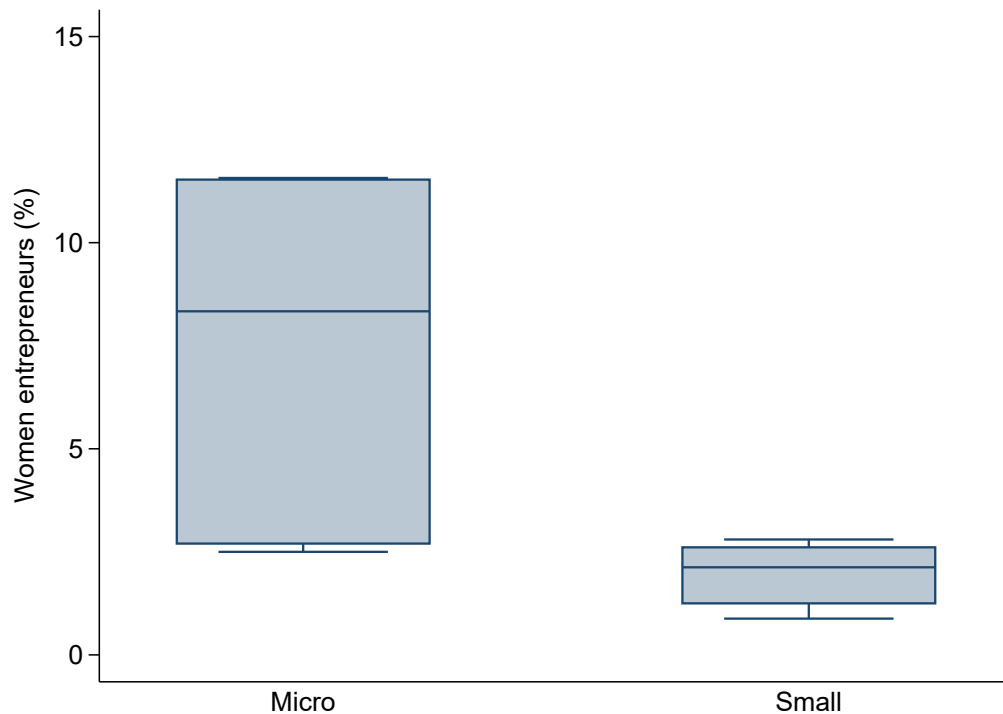
Source: Authors' calculation based on Indonesian Statistics Agency (BPS).

Figure 1.9: Educational attainment of MSEs



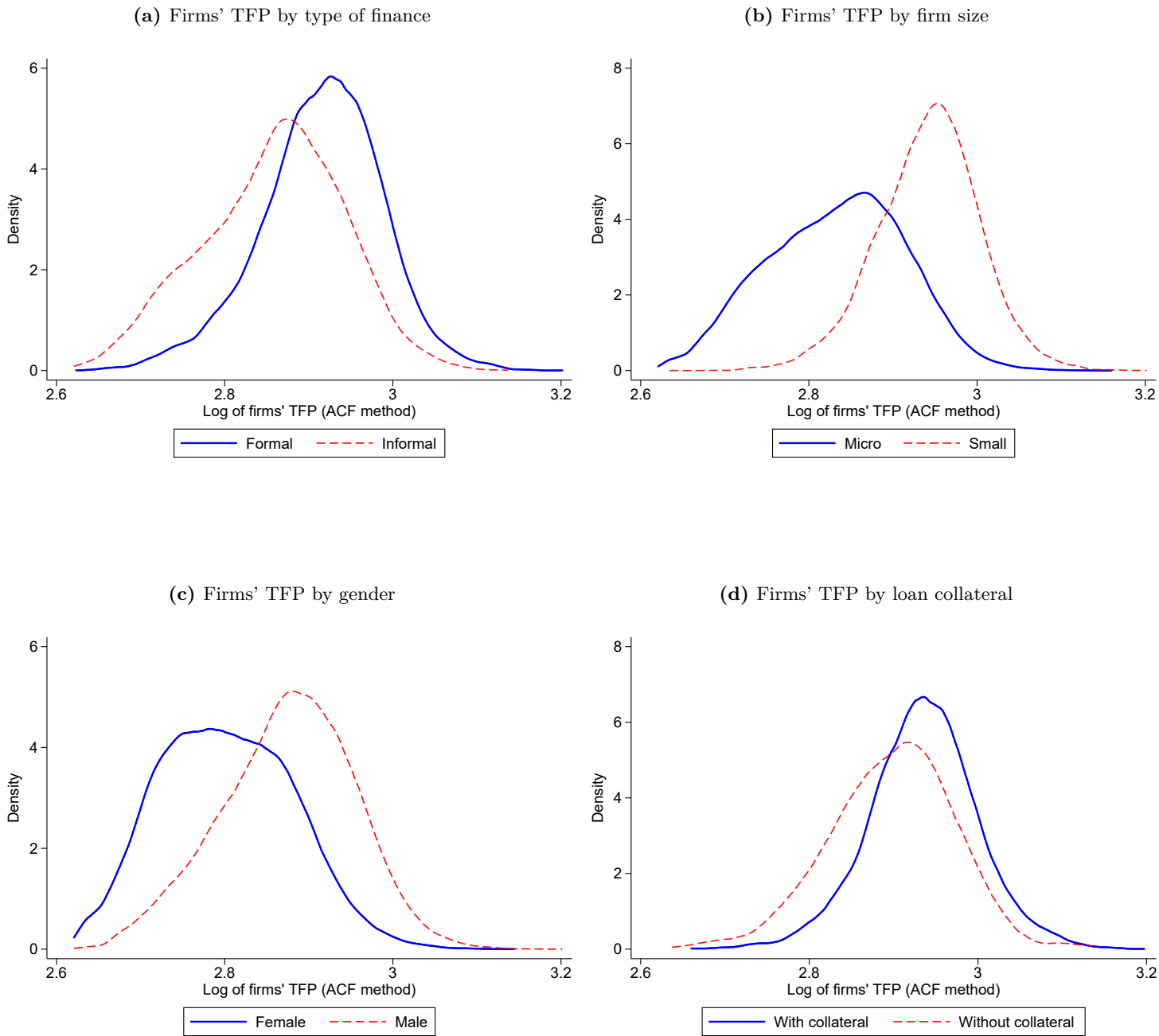
Source: Authors' calculation based on Indonesian Statistics Agency (BPS).

Figure 1.10: Percentage of women entrepreneurs by firm size



Source: Authors' calculation based on Indonesian Statistics Agency (BPS).

Figure 1.11: Kernel density of firms' TFP (log)



Source: Authors' calculation based on Indonesian Statistics Agency (BPS).

Chapter 2

Gender and Access to Finance on Business Development: Evidence from the World Bank Enterprise Surveys

This study explores the role of female ownership and its moderating contribution to the effect of access to finance on firm growth. To do so, I use a sample of 33,971 firms from 62 countries, where firm and country characteristics are included. First, I test how female ownership affects employment growth used as a measure of firm growth. Second, I study how female ownership affects the relationship between firm size, firm age, and access to finance for employment growth. The results indicate that gender is a key determinant of firm growth, but is closely related to firm characteristics and varies by region and country income level. The results clearly show a significant underperformance in employment growth of female-owned firms compared to male-owned firms. This could be partly explained by differences in the age of their firms, the hypothesis being that women-owned firms may be younger, either because of women's recent entry into the market or because of women's lower survival rates, lower levels of know-how, and experience. The results are significant for alternative measures of women's entrepreneurship (women as managers and women as managers and owners at the same time), and the differences are much larger for these alternative measures. Finally, this study confirms the findings of several previous studies that women entrepreneurs tend to underperform compared to men. The results are robust to the use of different approaches, the use of different measures of firm growth such as sales growth, and the use of different independent variable. Controlling for potential endogeneity by implementing an instrumental variables approach does not affect our findings. I also assess the potential effects of the 2008 – 2009 global financial crisis and extend the results to highlight the women's empowerment to informal sector's contribution.

JEL classification numbers: J16, L26, G10, L25

Keywords: Gender, entrepreneurship, access to finance, employment growth, sales growth .

2.1 Introduction

Existing studies that examine and compare female- and male-owned firms in terms of business performance in developing countries are few. Thus, the lack of research and theories regarding the comparison of males' and females' performance in developing countries makes it an essential topic of study. On the other hand, gender issues have been brought to the forefront of the development debate. While it is essential to provide more employment opportunities for women, it is also vital that women are not concentrated in low-paying and vulnerable jobs. Gender can also have direct and indirect effects on business activities and performance, such as exports, profits, innovation, and various types of business growth ([Estrin and Mickiewicz, 2011](#)).

Most previous studies focus on business growth factors such as women's education and career paths, ownership, motivation, skills, networking, and entrepreneurship. Despite the study of firm size and age on firm growth (see [Marlow and Patton, 2005](#); [Coleman, 2007](#)), the interaction between female ownership and firm characteristics or access to finance on firm performance has been little studied ([Belitski and Desai, 2019](#); [Dezsö and Ross, 2012](#)). To better understand how female ownership can shape firm growth, I consider the factors that enable women's involvement in corporate decision-making and ownership. Therefore, it is important to consider the size of the company and the life cycle of the company, including the need and access to resources related to growth ([Hyytinen and Maliranta, 2013](#)). In addition, [Bank \(2019\)](#) presents reforms across and within regions and tracks a wide range of indicators related to the legal gender gap, including measures related to women's participation in business and employment. While progress has been made on the environment for women in the sample countries examined in this paper, there are still notable gaps.

It would be essential to explore the reasons behind the gap between employment and sales growth to measure business growth. According to several researchers and studies, this difference could be explained by many factors. In this study, I first present comprehensive statistics on the contribution of women-owned firms in developing countries and explore the gender gap in access to finance across countries. I, therefore, highlight two main factors that can directly affect a firm's growth: the gender gap in financing and the business characteristics of the firm. The central question, then, is why women entrepreneurs consistently underperform their male counterparts. To answer this, I study the growth of women-owned firms, focusing on employment-based growth measures and how this proportion of women owners relates to access to finance in sub-samples of firm size and age. Furthermore, what explains differences in the relative performance of women entrepreneurs across regions and income levels of countries?

In order to answer these questions within the constraints imposed by the data, I used cross-sectional data from 33,971 firms from 62 countries covering four regions, represented by Africa, Asia, Europe, and Latin American, over the period 2006-2016. The empirical results indicate a highly nuanced influence of female ownership, depending on firm characteristics and the type of firm growth measure studied. On average, male entrepreneurs perform better than female entrepreneurs. I found that female ownership has a mixed influence on employment growth in all three regions of this study. The results also indicate that access to finance plays a critical role in improving firm performance. However, access to external finance does not reduce the performance gap between female- and male-owned firms. Moreover, the results are

negative for women-owned firms with access to finance on employment growth, but not significant for all regions except Europe. Interestingly, the results are largely different for employment growth and the robustness check using sales growth. We apply an instrumental variable (IV) approach to control for the endogeneity problem. Our econometric results based on IV estimations confirm the positive impact of financing access on firm growth.

The empirical results of this study provide additional evidence regarding the debate on the difference in measures of firm growth, as evidenced by the different sensitivity of employment and sales to the owner of the business and firm characteristics. Furthermore, this study focuses on developing countries to fill a knowledge gap on firm growth in general and women ownership in particular, as existing research has been limited to the experience of advanced countries ([Krasniqi and Desai, 2016](#); [Dezső and Ross, 2012](#); [Robb and Watson, 2012](#); [Smith et al., 2006](#)) and has given less attention to developing countries. As a result, these women's entrepreneurial activities have attracted considerable interest from policymakers and researchers who have recognized the potential of women's entrepreneurship to increase economic growth and job creation. Policies related to education, training, and apprenticeships may also be needed to further expand the female talent pool.

The paper proceeds as follows: Section (2.2) provides a review of the literature on gender and the link between female ownership and access to finance on firm performance. Section (2.3) presents stylized facts about female ownership and the nature of economic development. In addition, I explore gender gaps in access to finance across countries. Section (2.4) details the description of the data and provides the construction of the variables in the analysis and descriptive statistics. In Section (2.5), I present the empirical strategy, the estimation of firm growth, and model specifications. The main findings of this study are presented in Section (2.6). The Section (2.7) shows the robustness of the results. Finally, Section (2.8) to discuss the determinants of access to finance, and Section (2.9) summarizes the main results and concludes.

2.2 Related Literature

The performance gap between female and male entrepreneurs is a focal point of the growing literature on female entrepreneurship. The past two decades have seen an increasing interest in women in business ([Rosa et al., 1996](#) and [Dezső and Ross, 2012](#)). However, given this earlier work, there is little work on empirical evidence specific to women ([Chirwa, 2008](#); and [Du Rietz and Henrekson, 2000](#)). Therefore, this article fits into two strands of the literature, one that investigates whether there is a gender gap in firm growth and more broadly explores whether firm characteristics and financing access explain gender differences in performance.

The existing literature has reported mixed evidence of the direct effect of female ownership on firm growth. Several studies ([Fischer, 1992](#); [Rosa et al., 1996](#); [Du Rietz and Henrekson, 2000](#); [Fairlie and Robb, 2009](#)) show that women-owned firms perform less well than those owned by men and have lower levels of sales, profits, and employment. Other studies, such as [Davis et al. \(2010\)](#), have shown that women-owned firms perform better than men-owned firms or have no gender differences (e.g., [Kalleberg and Leicht, 1991](#); [Elizabeth and Baines, 1998](#); [Watson and Robinson, 2003](#); [Johnsen and McMahon,](#)

2005). Using World Bank enterprise surveys (2002-2006), a pioneering work by Bardasi et al. (2007) finds no evidence of gender discrimination in Africa when measured by a value-added per worker and total factor of production. Similarly, Kepler et al. (2007) that there are no significant gender differences in the performance outcomes of nascent entrepreneurs.

Based on these perspectives, it is possible to hypothesize about the reasons for gender performance gaps. On the one hand, personal or environmental constraints that disadvantage women could lead to women's underperformance in entrepreneurship. On the other hand, previous studies of gender differences in firm performance have shown that financial capital, education, and work experience may be critical factors. Another line of research examines whether women have access to different business and investment social networks than men, which could affect outcomes (Fairlie and Robb, 2009).

Another stream of research examining the relationship between firm characteristics (e.g., firm size and age) and growth in the context of gender has been mixed (Krishnan and Park, 2005; Morris et al., 2006; Del Mar Alonso-Almeida, 2013). Both of these factors are key elements of firm performance and are important in understanding the performance of women-owned firms (Coad, 2018; Robb and Watson, 2012). McPherson (1996) provides a more detailed analysis of firm size and age on firm growth and found a negative relationship between firm growth and firm age and size. In this regard, Yasuda (2005) analyzed data on 14,000 Japanese manufacturing firms and shows that firm size and age have an inverse effect on firm growth.

Robb and Watson (2012) point out that firms are more at risk at an early stage and that women-owned firms tend to be younger than men-owned firms because they are more likely to exit the market over time (Rosa et al., 1996). Other studies have shown that women-owned firms are likely to hire more people earlier as firms age (Belitski and Desai, 2019). Male- and female-owned firms were also compared in terms of survival probability. The data indicate that, in Dutch firms, the survival rate of male entrepreneurs' businesses is higher than that of their female counterparts (Bosma et al., 2004). On a different measure, Farhat and Mijid (2018) employed a matched-sample approach to determine whether there is a success gap between male- and female-owned businesses. Based on their survival rate analysis, they did not detect a gender gap in business performance.

Access to credit plays a substantial role in the process of accessing entrepreneurship around the world, and for women entrepreneurs in particular (see for more details: Del Mar Alonso-Almeida, 2013; Dezsö and Ross, 2012). However, significant differences in men's and women's access to finance may be explained by differences in other characteristics affecting their creditworthiness, including human capital factors and personal wealth. For example, Watkins and Watkins (1983) compared 49 women-owned firms and 43 male-owned firms in the United Kingdom (UK). They found that women entrepreneurs were much less likely to have relevant prior education and experience, leading them to start businesses in less favorable fields than typically male-owned businesses.

In the same context, Brush (1992) argues that men are more likely than women to have education and experience, focusing on the technical and managerial elements that could affect their entrepreneurial performance. In seminal work by Jennings and Brush (2013), it is well documented that women-owned start-ups use similar sources of funding as male-owned firms, but they tend to use a smaller amount of

external funding. As a result, they still rely heavily on informal funding sources for their startup capital and working capital needs.

A broad literature supports the positive effect of access to credit on economic performance and growth. [Brown et al. \(2005\)](#) examine the impact of business access to finance on job growth using Small Business Administration data on loans and lenders in the United States (US). They find that a \$1 million increase in lending leads to a 3 to 3.5 percentage point increase in employment, which is more significant for younger and larger firms. On a related topic, [Rajan and Zingales \(1996\)](#) present evidence supporting the role of external financing for faster growth in countries with better developed financial systems.

2.3 Stylized facts

This section provides an overview of the relationship between women-owned businesses in developing countries and various factors such as country income level, educational parity, and access to finance. These relationships are important for the formulation of more informed and effective gender policies.

2.3.1 Female ownership and economic development

GDP per capita is an indicator of many variables such as human capital, infrastructure quality, governance, and institutions, etc. Figure (2.1a) shows that the percentage of female owners in a country increases with (log of) GDP per capita, and that this relationship is both statistically significant and economically important. For example, moving from a country at the 25th percentile (Mauritania) to a country at the 75th percentile (Russia) of the income level of the sample studied is associated with an increase in female-owned firms from 16.43% to 33.18%. This is a significant increase given that the average level of women-owned firms in the sample is 34%.

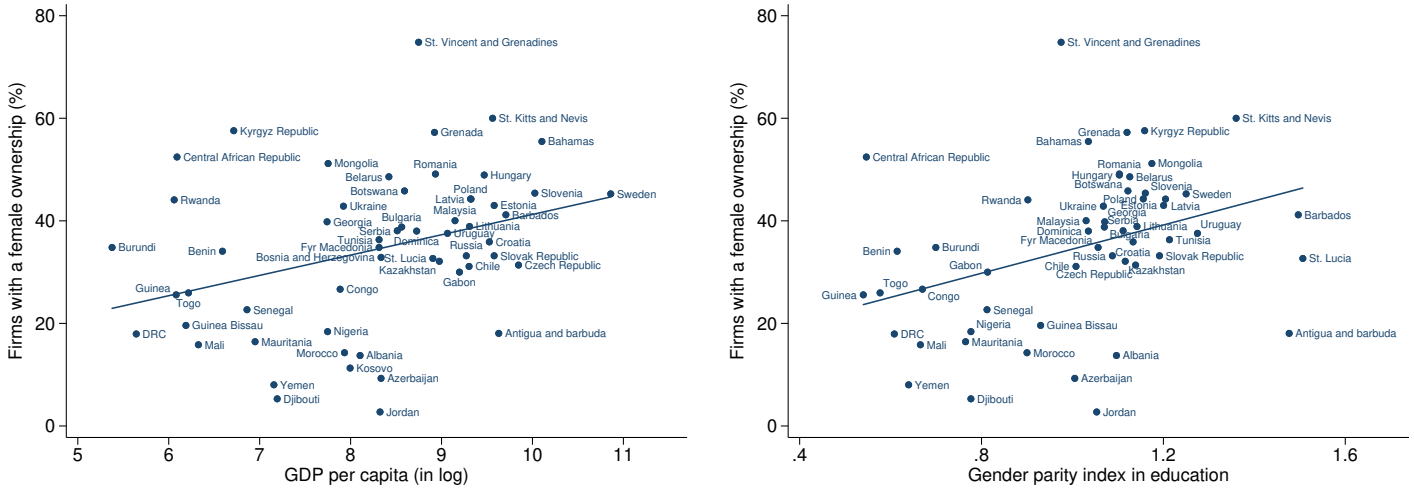
Available evidence suggests that gender gaps in various dimensions, such as educational attainment, tend to decrease with income level. This means that the educational attainment of women relative to men is positively correlated with GDP per capita. Therefore, increasing educational opportunities for women allows for a greater accumulation of skills and expertise in the workforce and boosts their growth potential. Conversely, a greater gender disparity in education levels (favoring men over women) has been linked to slower overall economic growth rates, greater poverty, and lower-income groups for women than for men. In summary, countries with high educational inequality tend to be poor, while high-income countries tend to have greater gender parity, with the exception of oil-rich economies.

Owners in the organized private sector are likely to be highly educated individuals. Therefore, it is neutral to expect a higher proportion of female owners in countries with greater gender parity in education. I use the average of the ratio of female to male gross enrollment rates in primary, secondary, and tertiary education from the United Nations Educational, Scientific, and Cultural Organization (UNESCO) over the period 2006-2016 as a measure of gender parity in education. The Figure (2.1b) shows that there is a strong positive relationship between gender parity in education and the percentage of female-owned firms in a country. For example, moving from the 25th percentile (Nigeria) to the 75th percentile (Lithuania) in the value of gender parity in education is associated with a 20 percentage point increase in the percentage of firms owned by women.

Figure 2.1: Female ownership with GDP per capita and gender parity in education

(a) Firms with a female owner & GDP per capita

(b) Firms with a female owner & GPI in education



Source: Author's compilation based on Enterprise Surveys, World Development Indicators (WDI) of the World Bank, and the United Nations (2006-2016).

Notes: The GDP is the gross domestic product. The gender parity index (GPI) in education is defined as the average ratio of female to male enrollment rates in primary, secondary and tertiary education.

2.3.2 Perception on access to financing by gender

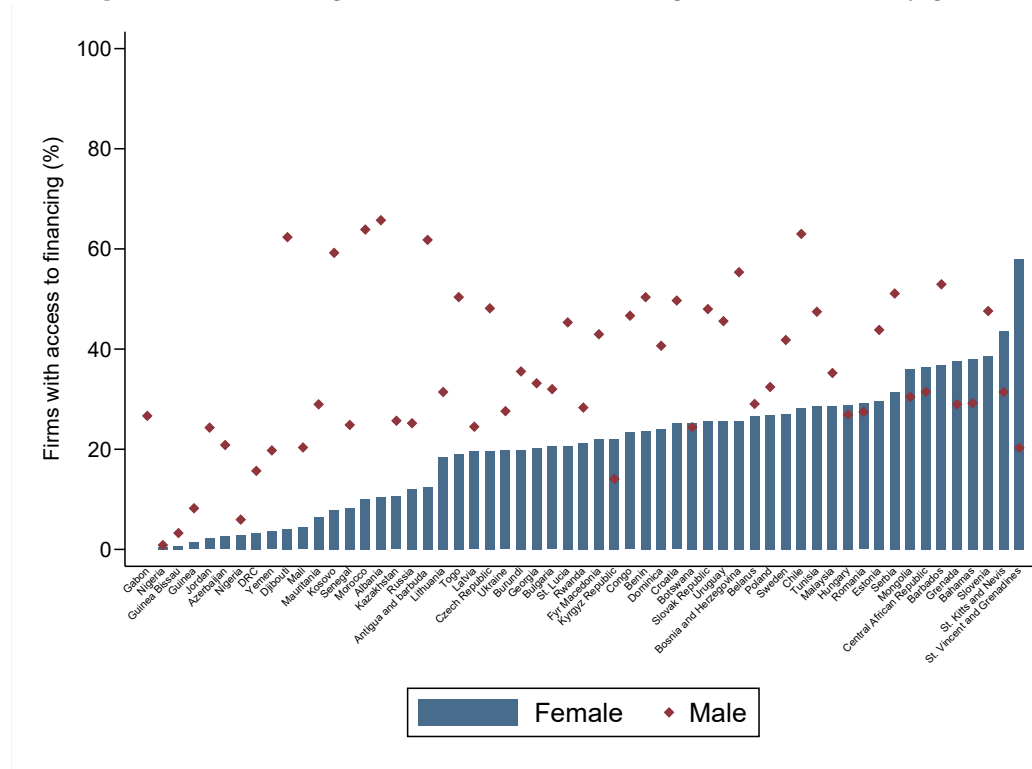
Empirical studies on gender gaps in access to finance are growing, but still scarce. Thus, improving access to finance and closing the gender gap in financing remains a major challenge in many countries around the world, requiring action and intervention by policymakers.

This Figure (2.2) explores gender gaps in access to finance across countries. In general, gender gaps in access to finance are prevalent in the vast majority of developing countries. In about 82% of countries, women have less access to credit than men. Nevertheless, some countries show that women have more access to formal credit than their male counterparts, such as Saint Vincent and the Grenadines (58%) and St. Kitts and Nevis (43.6%). However, on average, only 20% of women, compared to 35% of men, report having access to credit to start a business. This perception of access to entrepreneurial finance by gender to create and grow a start-up appears to be affected by a higher level of education of women in a country.

Gender gaps vary considerably across countries. In terms of income group, a high percentage of high-income countries have women accessing finance, compared to low- and middle-income countries. For example, 28% of women in high-income countries have better access to formal credit than their male counterparts. This compares to 14% in low-income countries and 18.5% in middle-income countries. Gender gaps also vary by geographic region. For example, Africa suffers from large gender gaps in access to finance. For example, only 12% of women report having access to credit compared to men. While in Europe, Asia, Latin America, and the Caribbean, 21%, 32.3%, and 32.5% of women respectively report having access to finance.

It is worth noting that gender gaps in access to financial services also vary considerably across countries within a region. In Africa, the ratio of women to men in access to finance is 36.4% in the Central African Republic and 28.6% in Tunisia. In contrast, the same ratio is miserable in Gabon (0%) and Nigeria (0.52%). The same is true for the Latin American region, where Saint Vincent and the Grenadines have a female-to-male ratio of about 58%, while in Antigua and Barbuda, the ratio is 12.5%. Finally, in Europe, 38.6% of women have access to finance in Slovenia, compared to 2.6% in Azerbaijan.

Figure 2.2: Percentage of firms who declare having access to finance by gender



Source: Author's calculation based on Enterprise Surveys between 2006 and 2016.

Notes: Data shows percentage of positive answers of having a line of credit or a loan from a financial institution by gender.

2.4 Data and descriptive statistics

This section describes the data source for this study and then discusses the dependent and independent variables in the analysis. The detailed firm-level data allow us to identify the gender of the principal owner of firms and explore the relationship between gender and access to finance and business development in developing countries over 2006-2016.

2.4.1 Data description

This study uses data from the Enterprise Surveys (ES)¹, a new enterprise-level data set provided by the World Bank. The ES contains surveys that include various firm-level information answered by business owners and top managers, such as the number of employees, total sales, ownership structure, industry sector, and firm age. Among other topics, the ES addresses questions about firms' access to credit. The survey's sampling methodology generates representative samples from the manufacturing and service

¹The complete questionnaire and database are available at <http://www.enterprisesurveys.org/>.

sectors using two-digit International Standard Industrial Classification (ISIC) codes (see Table 2.16 in the Appendix for details).

An advantage of the ES is its coverage of firms of all sizes in many developing countries, unlike other databases; for example, ORBIS, an alternative database, is skewed toward high-income countries. The data do not necessarily represent all firms in each country. Instead, the ES was constructed to be representative of all firms in each country. Second, the ES is that the same survey instrument was administered in a number of developing countries in different regions. This allows for cross-regional comparisons and within-country variations in the profiles of women-owned firms. The sample weights used are standardized so that each country has the same weight.

A drawback of this dataset is the inability to identify the gender of other firm owners when there is more than one. In addition, the financial variables were estimated on the basis of self-reported categories rather than exact figures obtained from firms' financial statements. Moreover, the number of firms sampled is negligible in most countries.

The sample is created in the following manner: first, firms with missing information on the gender of the principal owner, sales, or the number of permanent employees are dropped. Second, as is commonly done in the literature, the 1% of firms with extreme growth rates were dropped to remove the effect of outliers (Harrison et al., 2014; and Cowling et al., 2018). Finally, I excluded observations for which the interviewer did not think the responses were reliable (questions a16 and a17 in the ES). The final sample consists of 33,971 firms from 62 countries over the period 2006-2016². The sample covers four continents, represented by 10,745 firms in 26 African countries, 1,153 firms in two Asian countries, 18,172 firms in 24 European countries, and 3,901 firms in 10 Latin American countries³. The sample thus has the advantage of grouping economies with heterogeneous characteristics.

The Table (2.1) presents the descriptive statistics of the variables used in the analysis. In addition, details on the definitions and sources of the variables are provided in the Appendix (Table 2.14). Finally, The sample of countries, years, and observations are presented in the Appendix (Table 2.15).

2.4.2 Dependent variables: firm growth

Firm-level data are primarily used to construct dependent variables to measure differences in the performance of male- and female-owned firms in terms of firm growth, namely employment growth and total sales growth. These are the main channels through which firms contribute to the economy in many developing countries. I used data on total sales and the number of employees from the previous year and three years prior to the survey. The number of employees refers to permanent and full-time workers (questions l1 and l2 in the ES)⁴. Total annual sales refer to a firm's reported activity in the previous year (question d2) and the previous three years (question n3). Sales values were deflated using the same base year (100 = 2009) and GDP deflators for each country from the World Development Indicators (WDI).

Each indicator has its advantages and disadvantages. In this work, I focus on employment growth

²Multiple ES are available for some countries, we have 101 year-country pairs.

³Every firm has a unique identifier code, the "idstd" code.

⁴Because there is no data on temporary employees collected three fiscal years prior to the survey year, I focus on permanent full-time employees rather than general full-time employees.

in the benchmark analysis for several reasons. First, employment growth has the advantage of being less sensitive to very short-term variations and measurement problems (e.g., deflation, exchange rates, manipulation of reported sales or profits). In addition, employment is a better indicator for multi-product firms (Krasniqi and Mustafa, 2016; and Léon, 2020a). Sales growth is used as a robustness check (Section 2.7.1) because it is the most common indicator used by managers and entrepreneurs to predict changes in other indicators (employment, total assets, etc.), and it better reflects short- and long-term changes in the firm.

In line with previous studies (e.g., Dinh et al. (2012); Fowowe (2017); and Nizaeva and Coskun (2019)), employment growth is calculated as the logarithmic difference between the current number of permanent employees and the number of permanent employees three years prior to the survey year, divided by the difference between the survey years. This is given by:

$$\text{Growth}_{isc,(t,t-3)} = 100 \times \left(\frac{1}{3}\right) \times [\log(X_{isct}) - \log(X_{isc(t-3)})]$$

where X is the number of permanent employees (or sales), t and $t - 3$ denote the last fiscal year and the three years preceding the survey, respectively, while i , s , c refer to the firm, sector, and country, respectively. To avoid the regression effect to the mean (Haltiwanger et al., 2013), I used the growth measure "normalized" growth measure that means the change of each variable (employment and sales) over the period t and $t - 3$, divided by the simple average of the firm over the same period. This growth measure follows Davis and Haltiwanger (1992) and Léon (2020b). This method of measuring growth is intended to control for outliers in employment and sales growth that may have been associated with firms that experienced, for example, large contractions and expansions (Aterido and Hallward-Driemeier, 2010). Specifically, growth is measured:

$$\text{growth}_{isc,(t,t-3)} = 100 \times \left(\frac{1}{3}\right) \times \left[\frac{x_{isct} - x_{isc(t-3)}}{\frac{x_{isct} + x_{isc(t-3)}}{2}} \right] \quad (2.1)$$

The Table (2.1) shows that firms are experiencing a positive employment growth of about 3.70% per year, which is greater than sales growth (less than 1%). Guinea, Gabon, and Guinea-Bissau have the highest level of employment growth at 10.7%, 9.9%, and 7.6%, respectively. While with 0.66%, 1.022%, and 1.069%, Ukraine, Sweden and Poland have the lowest employment growth, respectively. Similarly, firms in Guinea-Bissau (13.5%), Mali (10.1%), and Georgia (9.8%) have the highest sales growth. While those in Nigeria (-13%), Yemen (-7.1%), and Burundi (-6.4%) have negative sales growth.

2.4.3 Independent variables

2.4.3.1 Gender of the business

The main explanatory variable is the gender of the business owner, which is collected by answering a question in the ES "Amongst the owners of the firm, are there any females?". This variable equals one if the firm is owned by at least one woman, and zero otherwise. As shown in Table (2.1), on average, 34% of firms are owned by women. Using the country-level average, the proportion of firms owned by

women varies considerably across the sample. We find that Saint Vincent and the Grenadines have the highest percentage of firms owned by women (74.8%), while Jordan has the lowest rate (2.7%).

It is interesting to note the relationship between women-owned firms and firm characteristics, as shown in the Figure (2.3). However, the percentage of women owners may vary from country to country depending on many local factors such as the level of economic development, women's access to higher education, norms, and cultures. The evidence available in Panel (a) shows that, on average across countries, women owners are more prevalent in relatively small firms, with the percentage of firms owned by women in the sample of small firms (less than 20 employees) being 19.2 percentage points higher than in the sample of medium-sized firms (20-99 employees) and 36.5 percentage points higher than in the sample of large firms (equal to and greater than 100 employees). It is argued that the majority of women entrepreneurs are often in business because running a small business allows them to earn extra income with little additional effort, and they are unlikely to expand or invest in their business.

Whereas, according to the Panel (b), women's participation is higher in the mature businesses in the sample, which accounts for about 45.5%. Furthermore, as can be observed in the Panel (c), women entrepreneurs are concentrated in Europe, representing about 59%, while 25.4% are in Africa and 11.8% in Latin American. This means that in the Panel (d), the share of women entrepreneurs is concentrated in upper-middle (42.8%) and high-income (25.1%) countries, while 20.5% are in lower-middle-income countries and 11.7% in low-income countries. It also appears that women-owned businesses are present in all industries. The Table (2.16) shows the percentage of women entrepreneurs in the different industry sectors. Women-owned businesses represent a high percentage in the following sectors: *Leather* (49.4%), *clothing* (47%), and *textiles* (43.9%). This distribution of women across industries not only highlights the sectors in which they work, but may also reflect the importance of this economic activity to the overall economy.

Information on the gender of the manager is also included in the data set. The manager, rather than the principal owner, is the decision-maker and the person responsible for the performance of the firm⁵. The presence of female top managers is determined by responding to a question in the ES survey, "*Is the top manager female?*". The average proportion of female top managers is relatively low (about 18%), ranging from 40% (Mongolia) to 0.9% (Yemen). This appears to be due in part to the gender disparity in educational attainment and the absence of female managers in relatively large firms (Branson et al., 2013). In addition, I also include firms where the principal owner is a woman; she would also be the main manager⁶. They represent 15% of the total sample.

2.4.3.2 Indicators of financial access

Studies on access to credit distinguish between firms that use formal financial services and those that do not. Following several studies (e.g., Aterido et al. (2013); Hansen and Rand (2014); and Love and Martínez Pería (2015)), I identify firms that use formal credit as firms that have access to an overdraft facility and/or a line of credit with financial institutions. This information on firms' access to finance is

⁵ Aterido and Hallward-Driemeier (2011) showed that up to half of the multi-owner firms, at least one of which is female, do not have women as key decision-makers.

⁶ Firms that answer "yes" to both the questions "*Amongst the owners of the firm, are there any females?*" and "*Is the top manager female?*".

1. At this time, does this establishment have an overdraft facility?	Yes/No
2. At this time, does this establishment have a line of credit or loan from a financial institution?	Yes/No

collected from the following two questions:

Thus, I define *financing access* as having access to one of the two credit facilities. It is coded as a dummy variable that equals one if the firm answers "yes" to either question and zero if the firm answers "no" to both. In the ES sample, 52.8% of firms report having an overdraft or a line of credit.

A drawback of this variable is that it does not take into account whether the firm needs external financing. Following [Popov and Udell \(2012\)](#) and [Léon \(2015\)](#), I use an alternative measure as an additional check (Section 2.7.2). They classified firms into three groups: (i) firms with no credit needs; (ii) firms that have taken out at least one credit in the past year; and (iii) firms are expressing a credit need but not taking out credit because they were discouraged from applying or because their application was rejected. This alternative measure ("*credit granted*") takes the value of one for firms that obtained credit and zero for firms in the third group. Firms that did not express a request for external funds (the first group) are excluded from the analysis for this variable⁷. More details on the construction of this variable can be found in [Léon \(2015\)](#).

2.4.4 Control variables

The firm-level variables control for observable firm heterogeneity and are extracted from the ES. To select them, I follow previous studies ([Beck et al., 2005](#); and [Chauvet and Jacolin, 2017](#)) and include firm size and age. The ES distinguishes between small, medium, and large firms on the basis of full-time employees. Specifically, in terms of firm size, small firms employ between 5 and 19 employees, which is 51%. Medium-sized firms employ more than 19 employees but less than 99 employees and comprise 33% of the total sample, while large firms employ more than 99 employees and comprise 16% of the total sample. This also indicates that an overwhelming majority of the firms in the sample are SMEs. Across the sample, firms have an average of 20 employees.

With regard to age, the age of the firm is measured by subtracting the year the firm was established from the year the survey was administered. Firms are classified into three categories: young, mature, and older, based on the number of years the firm has been operating in the selected country. Young companies have been in existence for less than 5 years; mature companies have been in existence for 6 to 15 years, while older companies have been in existence for at least 16 years or more. Of the firms surveyed, 10%, 48%, and 42% are young, mature, and older firms, respectively. For the entire sample, the average age of firms is 17 years.

I also consider dummy variables to determine whether the firm is an exporter, foreign- or state-owned, owned by a larger firm and whether an establishment was officially registered when it began operations. Table (2.1) shows that nearly a quarter of firms (24%) export at least 10% of their total sales, 10% are foreign-owned, and about 16% are owned by a larger firm. In addition, about 90% of firms are formally registered, while 10% did not register their business when they started operations. This may

⁷Due to lack of data, the variable of credit granted can only be calculated for a subset of firms

Table 2.1: Summary statistics

Variables	Observation	Mean	Standard deviation	Minimum	Maximum
<i>Dependent variables</i>					
Employment growth _{$isc,(t,t-3)$}	33,922	3.706	11.19	-32	46
Sales growth _{$isc,(t,t-3)$}	25,499	0.531	19.68	-56	66
<i>Independent variables</i>					
<i>Firm-level variables</i>					
Female-owned _{$isct$}	30,140	0.339	0.47	0	1
Female top manager _{$isct$}	28,749	0.180	0.38	0	1
Female owner & manager _{$isct$}	25,472	0.150	0.36	0	1
Financing access _{$isct$}	33,901	0.528	0.50	0	1
Credit granted _{$isct$}	19,662	0.523	0.50	0	1
Firm size _{$isct$} (in log)	33,922	2.999	1.35	0	11
Small firms _{$isct$}	33,922	0.511	0.50	0	1
Medium firms _{$isct$}	33,922	0.329	0.47	0	1
Large firms _{$isct$}	33,922	0.160	0.37	0	1
Firm age _{$isct$}	33,922	17.100	13.68	0	100
Young firms _{$isct$}	33,922	0.100	0.30	0	1
Mature firms _{$isct$}	33,922	0.480	0.50	0	1
Older firms _{$isct$}	33,922	0.420	0.49	0	1
Exporter _{$isct$}	33,922	0.237	0.43	0	1
Subsidiary _{$isct$}	33,922	0.162	0.37	0	1
Foreign-owned _{$isct$}	33,922	0.100	0.30	0	1
State-owned _{$isct$}	33,922	0.015	0.12	0	1
Publicly listed _{$isct$}	33,922	0.058	0.23	0	1
Privately-held _{$isct$}	33,922	0.564	0.50	0	1
Sole proprietorship _{$isct$}	33,922	0.274	0.45	0	1
Formally registered _{$isct$}	31,819	0.913	0.28	0	1
City _{$isct$}	29,440	0.364	0.48	0	1
<i>Country-level variables</i>					
GDP per capita _{ct} (in log)	101	8.054	1.34	5.4	11
Growth of GDP per capita _{ct}	101	2.456	6.16	-15	25
Inflation _{ct} (CPI)	96	5.542	5.19	-1.4	32
Gender parity index _{ct} (GPI)	97	0.986	0.24	.43	1.5

be because the cost of registration prevents them from doing so, and some entrepreneurs did not register their business because they did not see the benefit of doing so.

On the legal front in the sample, firms are classified into five main categories: publicly traded companies, private companies, sole proprietorships, limited partnerships, and cooperatives. The majority of firms are privately held, accounting for 56.4%, followed by sole proprietorship that amounted to 27.4%. In terms of location, firms are found in various localities, such as the capital city, large cities, and small towns; 36.4% is located in the capital or cities with a population of one million or more.

Other macroeconomic variables are extracted from the World Development Indicators (WDI) and combined with firm-level characteristics for a set of 62 developing countries based on the fiscal year of the survey. In particular, I control two important country-level variables that could affect firm development: GDP per capita growth as an indicator of a country's economic development and inflation measured by the consumer price index (CPI) to capture macroeconomic conditions over 2006-2016. The average value of the inflation rate is 5.5%, ranging from -0.67% (Jordan) to 15.2% (Belarus).

2.5 Empirical strategy

The main interest of the analysis lies in how gender and access to external credit affect firm growth in developing countries. Based on the previous discussion, I will estimate models where employment growth is the dependent variable and variables measuring entrepreneurs' gender and access to finance are the main explanatory variables. In addition, other variables are included as control variables, such as firm characteristics and country controls, to better understand the performance gap between female and male-owned firms.

Primarily, I regress employment growth as a measure of firm performance on three different dummy variables to measure the performance gap: the dummy variable for the female owner, the dummy variable for the female manager, and finally, a dummy variable for the female with a dual role as owner and manager. The econometric model takes the following form:

$$EG_{isc,(t,t-3)} = \beta_1 \text{Gender}_{isc} + \delta Y_{isc} + \zeta Z_{ct} + \alpha_{st} + \alpha_{ct} + \epsilon_{isc} \quad (2.2)$$

where i , s , c , t index firm, sector, country, and year respectively. Average employment growth rates $EG_{isc,(t,t-3)}$ is calculated by the equation (2.1) over three years, between t and $t - 3$. As a robustness check, sales growth could be used as another dependent variable to measure firm growth. The coefficient of interest is β_1 captures the main variable of interest, representing whether a firm has one or more female owners.

To further check, I replace the explanatory variable with a dummy that captures female-run firms compared to male-run firms or a firm with at least one female owner and a top female manager. Y_{isc} is a list of firm-level control variables, Z_{ct} includes country-level control variables that affect firm growth like GDP growth and inflation. I add a vector of sector-year dummies (α_{st}) and of country-year dummies (α_{ct}) to control for unobserved sectoral and country factors. ϵ_{isc} is the error that captures other variations, which are not captured by the explanatory variables in the model.

In a second step, I analyzed the extent to which access to external finance with entrepreneurial gender affects employment growth in a large number of developing countries. In addition to financial indicators, I control the firm- and country-specific factors on firm growth. I, therefore, extend the equation (2.2) as follows:

$$EG_{isc,(t,t-3)} = \beta_1 \text{Financing access}_{isc} + \beta_2 \text{Female owned}_{isc} + \beta_3 \text{Female owned}_{isc} \times \text{Financing access}_{isc} + \delta Y_{isc} + \zeta Z_{ct} + \alpha_{st} + \alpha_{ct} + \epsilon_{isc} \quad (2.3)$$

where $\text{Financing access}_{isc}$ is an indicator variable equal to one for firms with an outstanding loan, overdraft, or line of credit. $\text{Female owned}_{isc}$ which is equal to one if at least one of the principal owners is female and zero for male owners. It is well interesting to estimate the coefficient β_3 of the interaction term $\text{Female owned}_{isc} \times \text{Financing access}_{isc}$, which captures the additional effect associated with women-owned firms having access to formal credit.

After estimating the equation (2.3) for all firms to understand the overall correlation between women owners with access to finance and employment growth, I proceed with separate estimates on sub-samples of size groups, age groups, regions, and income level groups. In all specifications, consistent with Ayyagari et al. (2016) and Léon (2020b), standard errors are clustered at the country-year (survey) level to mitigate the endogeneity problem arising from the omission of country-specific factors that may lead error terms to be correlated for firms within countries and year fixed effects.

2.6 Results and discussion

This section outlines the main quantitative results based on the empirical strategy presented in Section (2.5). First, I begin with the main estimates to examine whether there are differences in firm performance with respect to employment growth between male and female firms, whether the owner is female, the manager is female or both. Next, I present additional estimates to assess the relationship between access to finance and employment growth and how it varies by gender. Subsequently, I extend the results to sub-samples based on firm size, age, and at the subcontinent level to provide insight into gender differences across broad geographic regions⁸. Finally, I conduct robustness tests by applying alternative measures of the dependent or independent variables to retest the results.

2.6.1 Gender of the business and employment growth

The estimation of the equation (2.2) is presented in the Table (2.2). It reports the coefficient of the dummy variable "female-owned" in columns (1-2), while columns (3-4) present the coefficient results for "female top manager" and the results for "female owner and manager" are presented in columns (5-6). Then, I also use control variables that include firm characteristics for each of the independent variables. In this empirical model, I include fixed effect regressions where the dependent variable is employment growth. In all specifications, standard errors are clustered at the country-year (survey) level.

The results in column (1) show that female ownership is negative and strongly significant at 1%. In column (2), after controlling for firm characteristics, female owners are associated with 0.82% lower

⁸A complete list of countries and subcontinent grouping are reported in Table (2.15).

Table 2.2: The effect of gender on employment growth: Baseline results

Dependent variable:	Female owner		Female top manager		Female owner and manager	
(Employment growth)	(1)	(2)	(3)	(4)	(5)	(6)
Female-owned	-1.035*** (0.185)	-0.824*** (0.161)				
Female top manager			-0.295 (0.211)	-0.864*** (0.196)		
Female owner & manager					-0.534** (0.222)	-1.271*** (0.213)
Firm size		-2.186*** (0.262)		-2.051*** (0.257)		-2.142*** (0.282)
Firm age		-0.076*** (0.012)		-0.076*** (0.012)		-0.077*** (0.013)
Exporter		1.630*** (0.239)		1.602*** (0.247)		1.647*** (0.261)
Subsidiary		1.419*** (0.289)		1.248*** (0.281)		1.354*** (0.300)
Foreign-owned		1.629*** (0.302)		1.620*** (0.278)		1.721*** (0.312)
State-owned		-0.601 (0.667)		-0.677 (0.622)		-0.657 (0.662)
Publicly listed		0.093 (0.544)		0.114 (0.508)		-0.116 (0.568)
Privately-held		0.608** (0.290)		0.585** (0.278)		0.538* (0.304)
Sole proprietorship		-0.996** (0.377)		-0.705* (0.395)		-0.907** (0.402)
Formally registered		0.413 (0.373)		0.283 (0.354)		0.547 (0.376)
City		0.302 (0.336)		0.450 (0.347)		0.313 (0.361)
Sector#year FE (α_{st})	Yes	Yes	Yes	Yes	Yes	Yes
Country#year FE (α_{ct})	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Level	Country	Country	Country	Country	Country	Country
Number of countries	62	62	62	62	62	62
Observations	30,140	25,108	28,749	26,293	25,472	23,116

Notes: The dependent variable is the employment growth in percentage term. Country-year and sector-year dummies are inserted but not reported. Standard errors are adjusted for clustering at the survey-level. *, **, and *** indicate significance at 10%, 5% and 1% respectively.

employment growth on average than male owners. Concerning the dummy variable of female managers, its coefficient does not show a significant gender difference in column (3); however, column (4) indicates that female-managed firms with no female owners are on average 0.86% less successful in terms of employment growth than male-managed firms. These results are very similar to the coefficient on the female ownership dummy variable for the entire sample (column 2).

As expected, employment growth has a significant negative relationship with both female owners and female managers. The results in column (6) are similar in sign and significance to those in columns (2) and (4). Nevertheless, the effects are larger compared to the estimates for female ownership or female managers alone. To further motivate this conclusion between female-owned firms and employment growth, Figure (2.4) plots country-level employment growth (log) against female ownership. The slope is significantly negative, suggesting that, on average, the lowest employment growth in a firm is associated with a higher percentage of female-owned firms compared to male-owned firms.

According to the results, women entrepreneurs do worse on average than their male counterparts in terms of employment growth. Many factors can explain this. On the one hand, it may be due to gender gaps in education and training, which disadvantage women entrepreneurs and could lead to women's underperformance in entrepreneurship (Week, 2012; and Altuzarra et al., 2021). On the other hand, women-owned enterprises often lack the networks to facilitate business development, the know-how in public and private markets, and the mastery of technologies that would enable them to penetrate new markets and create new jobs (Abor and Biekpe, 2006). A third possibility is that the results reflect a difference in risk aversion between the women and men that might lead them to restrict investment in their businesses and thus limit business growth (Borghans et al., 2009; and Wellalage and Locke, 2017).

In addition, another explanation could be sociocultural factors (such as property rights or perhaps discrimination) or women's businesses are assumed to be considered less creditworthy (Bardasi et al., 2011) or these gender differences may exist to a large extent because women are more responsible for the household tasks of daily life, such as childcare and housework (Cerrato and Cifre, 2018). Therefore, previous research highlights that the intention and motivation of women entrepreneurs are different from that of male-led businesses. Female-led firms may be less motivated by growth goals but more interested in internal goals such as personal fulfillment and flexibility alongside family obligations (e.g., Klapper and Parker (2011); Morris et al. (2006); and Chaudhuri et al. (2020)). All of these concerns may well explain the underperformance of women entrepreneurs in terms of employment growth.

However, other empirical studies have not found significant gender differences. For example, Kalleberg and Leicht (1991) investigated the relationship between gender and performance. They found that women were no more likely than men to fail, and that there was no difference in earnings growth between male- and female-led firms after controlling for industry and firm characteristics. Another noteworthy study is that of Johnsen and McMahon (2005), which suggests that female-owned firms do not appear to underperform in terms of profitability and employment, particularly once appropriate demographic influences and other relevant controls are taken into account. Watson and Robinson (2003) report no difference in performance between the gender of the owners, provided that performance is risk-adjusted. While others, Davis et al. (2010), have found that female-owned firms perform significantly better than male-owned firms due to their stronger market orientation and the transmission of market performance

into financial performance.

Moreover, Table (2.2) controls for other firm-specific characteristics that affect employment growth, such as firm size, age, export status, subsidiary, ownership structure, legal status, registration status, and capital city location. With respect to firm size, employment growth is negatively associated with large firms and statistically significant at the 1% in all model specifications. The estimated coefficient is -2.1% , suggesting that employment growth is less likely in large firms than small firms. This confirms the results of Ayyagari et al. (2016), which showed the important role of SMEs in creating a larger share of jobs compared to large firms. This is contrary to Okumu et al. (2019), and Chauvet and Jacolin (2015), which indicate that job growth is positively correlated with firm size and that large firms tend to grow more.

Given firm age, on average, older firms have a lower employment growth rate. From another perspective, the significant negative coefficient on firm age indicates that young firms in these developing countries grow faster than older firms because their rate of return to learning and experience decreases as firms mature. These results are consistent with previous studies (e.g., Dunne et al. (1988); Sleuwaegen and Goedhuys (2002); Bigsten and Gebreeyesus (2007); and Aterido and Hallward-Driemeier (2010)). This means that employment growth is more concentrated among younger firms, and they are more likely to create jobs than older firms. In this regard, Evans (1987) argued in a study of 100 manufacturing industries that as the age of firms increases, their growth decreases.

Note that exporters and firms owned by a large firm have faster employment growth across all models than their counterparts. Furthermore, employment growth is positively correlated with the fact of being owned by foreign investors. Fisman and Svensson (2007) argue that foreign-owned firms can provide better access to markets and technical expertise. Another study by Douma et al. (2006) confirms this positive relationship between foreign ownership and performance. Consistently, we find that sole proprietorship has a significant negative relationship with firm performance in terms of employment growth.

I also captured whether the company was formally registered at the beginning of its operations because of the importance of registration status for business growth. However, Williams and Kedir (2016) showed that being a registered startup is significantly associated with lower employment growth rates. This concludes that it is still unclear whether firms register to continue to grow or register once growth requires it (Krasniqi and Desai, 2016). On the other hand, firms located in a capital city or large city may benefit from a network and positive externalities, resulting in higher employment growth than firms in other regions.

2.6.2 Female ownership, access to finance and employment growth

In the previous section, it is clear that female ownership is associated with negative employment growth. In this regression, I consider alternative explanations for the observed gender gaps in firm growth by answering the following question: are the gender performance gaps due to gender differences in formal credit use? Thus, the impact of the interaction term between women-owned firms and access to credit is reported in the Table (2.3) using the estimated equation (2.3).

Table 2.3: The effect of gender and access to finance on employment growth

Dependent variable	Employment growth				
	(1)	(2)	(3)	(4)	(5)
Financing access	1.108*** (0.236)	1.226*** (0.260)	1.521*** (0.288)	2.715*** (0.413)	2.468*** (0.185)
Female-owned		-1.033*** (0.186)	-0.576** (0.242)	-0.586** (0.239)	-0.749*** (0.225)
Female \times Financing access			-0.821** (0.328)	-0.413 (0.310)	-0.240 (0.294)
Firm size				-2.378*** (0.283)	-2.403*** (0.070)
Firm age				-0.075*** (0.012)	-0.079*** (0.006)
Exporter				1.481*** (0.225)	1.323*** (0.180)
Subsidiary				1.431*** (0.296)	1.783*** (0.213)
Foreign-owned				1.844*** (0.306)	1.895*** (0.280)
State-owned				-0.494 (0.659)	-0.592 (0.615)
Publicly listed				0.161 (0.549)	0.113 (0.369)
Privately-held				0.562* (0.307)	0.252 (0.239)
Sole proprietorship				-0.931** (0.379)	-1.090*** (0.264)
Formally registered				0.420 (0.402)	0.018 (0.282)
City				0.378 (0.339)	0.654*** (0.177)
Growth of GDP _{pc}					0.093*** (0.017)
Inflation (CPI)					0.025 (0.019)
Sector#year FE (α_{st})	Yes	Yes	Yes	Yes	Yes
Country#year FE (α_{ct})	Yes	Yes	Yes	Yes	Yes
Cluster Level	Country	Country	Country	Country	—
Number of countries	62	62	62	62	62
Observations	33,901	30,124	30,124	25,093	24,185

Notes: The dependent variable is the employment growth in percentage term. Country-year and sector-year dummies are inserted but not reported. Standard errors are adjusted for clustering at the survey-level. *, **, and *** indicate significance at 10%, 5% and 1% respectively.

Not surprisingly, access to credit is considered one of the most important predictors of firm success and survival. The main results indicate that the estimated coefficient on access to credit significantly improves employment growth in developing countries. For example, a 1% increase in credit access will increase employment growth by 2.468% more than firms without access, even after controlling for the firm- and country-level controls in column (5). In all specifications, the estimated coefficients on financing access are significantly positive on employment growth at the 1% level. These results are consistent with the well-established evidence of the positive impact of access to finance on employment growth ([Rahaman, 2011](#); [Elbeltagy, 2020](#)).

The analysis includes the interaction term between women-owned firms and access to finance to assess how women entrepreneurs may have a distinct effect on employment growth using external finance. Across all specifications, male entrepreneurs perform better than female entrepreneurs. Although access to finance is associated with higher employment growth, there is a negative effect of women-owned firms' use of formal credit and employment growth at the 5% significance level in column (3). This result indicates that women-owned firms do not use credit as effectively as their male counterparts. One possible explanation is that their lesser business management experience may well explain their underperformance as entrepreneurs. In contrast, after controlling for firm and country characteristics in the regressions (columns 4 and 5), the estimated coefficient is still negative but not significant, indicating no gender difference in the impact of access to finance on overall employment growth.

In terms of additional firm-level controls, they retained the same sign and significance as the previous results in the Table (2.2). Country dummies were included in the analysis to control for omitted variable bias. As measured by employment growth, firm growth is also higher on average in countries with higher levels of economic development, as suggested by the significant positive coefficient on GDP per capita growth.

2.6.3 Further analysis by firm characteristics and across countries

It would be interesting to test whether firm characteristics can explain gender differences in firm growth, particularly firm size and age, and to investigate whether the effects of access to finance on firm growth vary by firm size class and age. Firm size is defined as the logarithm of the number of permanent full-time employees working at the end of the previous fiscal year. The age of the firm is defined as the number of years since the establishment began operations.

On this basis, the results are presented in the table (Table 2.4). Although female owners are more concentrated in SMEs than in large firms, the evidence indicates that female-owned firms underperform their male counterparts in these firms by an average of 0.75% at the 1% significance level. This may be due in part to the fact that they are less likely to seek expert advice and guidance when starting and developing their businesses. This is because they may not be aware that such services exist, and women's businesses (due to their size and sector) are often not targeted by SME experts.

On the other hand, a number of studies (e.g., [Abor and Biekpe, 2006](#); [Ahl, 2006](#); [Coleman, 2007](#); and [Orser et al., 2010](#)) have shown that women-owned firms have less access to external credit than

their male counterparts⁹, then gender gaps in access to formal credit may make it difficult for women to enter sectors where firms need investment (which therefore remain male-dominated). This suggests that gender gaps in access to credit may also provide a crucial explanation for gender gaps in entrepreneurial performance and the difficulty of obtaining credit for SMEs (Schiffer and Weder, 2001).

Since firm startup, employment growth in women-owned firms is slower throughout the life cycle than in men-owned firms. While there is a significant negative relationship between women-owned firms and firm age in the mature and older phases at the 5% significance level, it is not significant for younger firms. Overall, I found consistent results that female-owned firms have lower employment growth than their male counterparts across the sub-samples. In other words, male owners are more likely to own older firms than female owners. This suggests that the employment growth gap is because male-owned firms have a higher level of experience than female-owned firms and are better able to develop their skills and performance. Another explanation for the difference in performance is that women-owned firms do not survive at the same rate as men-owned firms. One might expect female-owned firms to be younger than male-owned firms; these results seem to confirm previous empirical studies (e.g., Watson, 2003; Khalife and Chalouhi, 2013; and Chaudhuri et al., 2020).

Table 2.4: Effect of gender and access to finance on the employment growth by firm size and age

Dependent variable:	Firm size		Firm age		
(Employment growth)	SME firms	Large firms	Young firms	Mature firms	Older firms
Female-owned	-0.754*** (0.235)	-0.621 (0.686)	-0.377 (0.743)	-0.723** (0.307)	-0.756** (0.352)
Financing access	2.627*** (0.201)	2.561*** (0.456)	3.125*** (0.704)	2.958*** (0.258)	1.630*** (0.276)
Female \times Financing access	-0.262 (0.320)	-0.773 (0.786)	-1.106 (1.168)	-0.237 (0.427)	-0.081 (0.427)
Sector#year FE (α_{st})	Yes	Yes	Yes	Yes	Yes
Country#year FE (α_{ct})	Yes	Yes	Yes	Yes	Yes
Observations	20,582	3,603	2,358	11,917	9,910

Notes: The dependent variable is the employment growth in percentage term. Small and Medium firms (SME) are those with less than 100 employees, while large companies have 100 or more employees. Young firms are those that have been in existence for less than 5 years, mature firms have been in existence for between 6 and 15 years while older firms have been in existence for at least 16 years and above. Country-year and sector-year dummies are inserted but not reported. Firm level and country control variables are included but not reported. Standard errors are adjusted for clustering at the survey-level. *, **, and *** indicate significance at 10%, 5% and 1% respectively.

This table also presents the association between firm access to credit and subsequent employment growth on the firm size and age sub-samples. In general, the results show that firms with loans and credit lines have faster growth rates, as the coefficient on this variable is significantly positive. Thus, the more firms have greater access to financial markets, the more they will experience higher growth. This result aligns with the results obtained in the previous regression (Table 2.3), which highlights the importance

⁹One explanation could be the high collateral rates for women. This explanation would be consistent with the theoretical model developed by Kon and Storey (2003), which shows that, in the presence of a guarantee, firms that know that the bank requires a guarantee are discouraged from applying for loans (Bardasi et al., 2011).

of finance for firm performance. Most interestingly, the results indicate that access to finance leads to higher employment growth, particularly among SMEs and young firms (2.627% and 3.125% respectively) compared to large and older firms (2.561% and 1.63% respectively).

Indeed, a recent paper from [Ayyagari et al. \(2016\)](#) demonstrates that greater access to finance leads to higher employment growth, particularly for small firms in developing countries. Notably, small firms are a significant driver of job creation on average and contribute more to overall employment growth than large firms. Besides, the study by [Fowowe \(2017\)](#) indicated that firm growth slows as firms age, showing that young firms grow faster than older firms. These results suggest that the effects of access to finance on firm growth are quantitatively important for small firms that are more likely to have financial constraints.

Similar to the results based on the Table (2.3), there is no significant difference in the impact of access to finance for women-owned firms on employment growth across the firm size and age sub-samples. Finally, the core set of firm characteristics is included in all regressions, in addition to country-level control variables, as well as a set of industry and country dummies, but they are not reported.

It is also interesting to test the overall trends in employment growth using the subregions in the Table (2.5). I include the regions (Africa, Europe, and Latin American) with the exception of the Asia/Pacific region because this region represents a small proportion (about 3%) of the total sample, as shown in the Appendix (Table 2.15), so I excluded it from the analysis. The results show that women-owned firms have heterogeneous coefficient estimates, indicating the peculiarities of each geographic location of the corresponding countries.

Table 2.5: Gender and access to finance on employment growth across region and income groups

Dependent variable:	Region			Income level			
(Employment growth)	Africa	Europe	LAC	Low	Lower-middle	Upper- middle	High
Female-owned	0.366 (0.517)	-0.735*** (0.241)	0.195 (0.740)	0.374 (0.560)	-0.632 (0.838)	-0.942*** (0.284)	-0.036 (0.442)
Financing access	0.418 (0.533)	2.189*** (0.304)	1.278* (0.627)	0.675 (0.768)	0.822 (0.518)	1.972*** (0.499)	1.520*** (0.399)
Female \times Financing access	-0.579 (1.005)	-1.082*** (0.323)	-1.064 (0.999)	-1.309 (0.897)	0.231 (1.122)	-1.146*** (0.364)	-0.991 (0.614)
Sector#year FE (α_{st})	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country#year FE (α_{ct})	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Level	Country	Country	Country	Country	Country	Country	Country
Number of countries	26	24	10	14	13	19	16
Observations	7,326	17,835	3,811	3,427	6,027	12,823	7,847

Notes: The dependent variable is the employment growth in percentage term. Country-year and sector-year dummies are inserted but not reported. Standard errors are adjusted for clustering at the survey-level. *, **, and *** indicate significance at 10%, 5% and 1% respectively. LAC refers to Latin America & the Caribbean region.

While the analysis is at the regional and country income level, female ownership is associated with better employment growth performance. Still, it does not show significant coefficients in the African and

Latin American regions. This illustrates that there is no gender gap in overall employment growth in these two regions. In contrast, there is a significant negative effect of female-owned firms on employment growth in Europe and upper-middle-income countries above the 1% significance level. Consistent with previous results, the interaction coefficient between women-owned firms and obtaining external financing is negative and insignificant for almost all regressions except for Europe and upper-middle-income countries.

2.7 Robustness checks

In this section, I perform robustness checks using different specifications. First, I test whether the previous results are consistent when using sales growth as a proxy for firm growth rather than employment growth. Second, I use an alternative measure of external financing to test the impact of credit granted to women-owned firms on firm growth. Third, we implement an instrument variable (IV) approach to control for the endogeneity issue. Fourth, we also control the financial crisis during our sample period, which may affect our result. Finally, we examine whether the results vary for the large and small informal sector in separate samples.

2.7.1 Alternative measure of firm growth: sales growth

Table (2.6) extends the results to include other dimensions of firm performance as the dependent variable, namely sales growth, using the same model specification as in equation (2.3). It is interesting to examine the relationship between women-owned firms and sales growth. Columns (1) and (3) show a significant negative relationship between women-owned firms and sales growth, signifying a gender gap in the average sales growth of women-owned firms. The magnitude is -0.8% , which is consistent with the results in column (2) of the Table (2.2), but the significance level drops to 10% instead of 1%.

In contrast to the negative results for women-owned firms using employment-based measures of firm growth, we find that women-owned firms have higher sales growth in columns (4) through (6) when controlling for firm and country characteristics. However, these results are not statistically significant. This is confirmed by [Elizabeth and Baines \(1998\)](#), which explored sales performance in 104 micro-enterprises in three industries. Their study shows no significant difference between the performance of male and female sole proprietors, even after controlling for the industry. Figure (2.5) highlights additional evidence of the insignificant coefficient of female ownership on sales growth. This figure plots the (log) growth in sales by country as a function of female ownership. Although there is considerable variation in sales growth across countries, there is no significant relationship with female ownership.

As such, growth is positively correlated with its access to credit. This result is consistent with previous findings and confirms the baseline results that having access to credit facilities, such as bank loans, is more likely to enhance sales growth by 3.2 percentage points. Moreover, the interaction term to capture gender differences in the impact of formal credit use is negative and statistically significant. This implies the relatively poor performance of women-owned firms, even when they have access to financing, which is attributed to many factors. These factors include weak technical and managerial skills, poor market access and supply of raw materials, unfavorable legal systems, poor government policies, and inadequate institutional frameworks, as noted in some studies ([Jiggins, 1989](#); [Chirwa, 2008](#)).

Table 2.6: Use sales growth as an alternative measure

Dependent variable	Sales growth					
	(1)	(2)	(3)	(4)	(5)	(6)
Female-owned	-0.810*		-0.819*	0.069	0.257	0.524
	(0.439)		(0.436)	(0.562)	(0.609)	(0.496)
Financing access		1.034**	0.981*	1.532***	2.138***	3.237***
		(0.471)	(0.510)	(0.548)	(0.547)	(0.389)
Female \times Financing access				-1.523**	-1.581**	-1.876***
				(0.600)	(0.679)	(0.623)
Firm size					-1.534***	-1.680***
					(0.250)	(0.136)
Firm age					-0.080***	-0.071***
					(0.018)	(0.013)
Exporter					1.446***	1.735***
					(0.466)	(0.363)
Subsidiary					1.969***	1.591***
					(0.541)	(0.465)
Foreign-owned					0.856	1.145**
					(0.682)	(0.561)
State-owned					1.437	1.930
					(1.478)	(1.501)
Publicly listed					-0.690	-0.158
					(0.739)	(0.820)
Privately-held					0.115	0.463
					(0.797)	(0.534)
Sole proprietorship					-1.855*	-1.646***
					(1.085)	(0.589)
Formally registered					0.670	0.840
					(0.820)	(0.601)
City					0.466	0.722*
					(0.561)	(0.371)
Growth of GDP _{pc}						-0.084**
						(0.036)
Inflation (CPI)						-0.570***
						(0.044)
Sector#year FE (α_{st})	Yes	Yes	Yes	Yes	Yes	Yes
Country#year FE (α_{ct})	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Level	Country	Country	Country	Country	Country	—
Number of countries	62	62	62	62	62	62
Observations	23,756	26,613	23,750	23,750	19,090	18,343

Notes: The dependent variable is the sales growth in percentage term. Country-year and sector-year dummies are inserted but not reported. Standard errors are adjusted for clustering at the survey-level. *, **, and *** indicate significance at 10%, 5% and 1% respectively.

The firm-level control variables are consistent with expectations across specifications. For example, firms that engage in export activities show a 1.7 percentage point improvement in sales growth in column (6) relative to non-exporting firms, with a significance level of 1%. Similarly, foreign-owned firms are the most likely to experience increased sales.

To stress the point of heterogeneity in firm growth, as measured by sales growth within a given firm. The Table (2.7) examines whether the results are robust across different types of firms to explore differences between female- and male-owned firms and assess whether related differences can explain the gender performance gap. I study owner gender in relation to firm characteristics, particularly by size class, and age, which is an important determinant of firm outcomes. In terms of sales growth, female entrepreneurs tend to perform better than male entrepreneurs, but the estimated coefficient is not significant. This result is consistent with the previous regression in the Table (2.6).

As mentioned earlier, access to finance is considered one of the important features to sustain and grow a business. Therefore, it has a positive impact on business growth in terms of sales growth. Based on the sample of firm age, there is a positive coefficient for young firms, but it is not significant. One would expect that young firms are more likely to be concerned with survival than growth if they do not fail in the early years of their establishment. Therefore, growth, particularly sales growth, should be observed in more mature firms that have moved beyond "survival mode." On the other hand, older firms grow more slowly than mature firms.

Table 2.7: Effect of access to finance and gender on sales growth by firm size and age

Dependent variable:	Firm size		Firm age		
(Sales growth)	SME firms	Large firms	Young firms	Mature firms	Older firms
Female-owned	0.500 (0.526)	0.863 (1.536)	0.119 (1.828)	0.848 (0.701)	0.740 (0.745)
Financing access	2.923*** (0.421)	5.267*** (1.069)	1.329 (1.590)	4.294*** (0.545)	2.544*** (0.585)
Female \times Financing access	-1.495** (0.678)	-3.787** (1.734)	-0.540 (2.731)	-2.344** (0.923)	-1.905** (0.886)
Sector#year FE (α_{st})	Yes	Yes	Yes	Yes	Yes
Country#year FE (α_{ct})	Yes	Yes	Yes	Yes	Yes
Observations	15,476	2,867	1,642	8,905	7,796

Notes: The dependent variable is sales growth in percentage term. The dependent variable is the employment growth in percentage term. Small and Medium firms (SME) are those with less than 100 employees, while large companies have 100 or more employees. Young firms are those that have been in existence for less than 5 years, mature firms have been in existence for between 6 and 15 years while older firms have been in existence for at least 16 years and above. Country-year and sector-year dummies are inserted, but not reported. Firm level and country control variables are included but not reported. Standard errors are adjusted for clustering at the survey-level. *, **, and *** indicate significance at 10%, 5% and 1% respectively.

Further, I examine how the results vary by country income group. The Table (2.8) shows mixed results for women-owned businesses on business outcomes by region and by country income level. The evidence indicates that the level of economic development of the country can influence the level of female

entrepreneurial activity. By analyzing these three regions, I allow for gender differences in business behavior to vary across regions. Focusing on the Africa region, the results indicate that women-owned firms perform better in terms of sales growth. In other words, in Africa and low- and lower-middle-income countries, women-owned firms appear to be more polarized in terms of sales and are more important in countries with lower GDP per capita. This could be because, in the case of poorer countries, entrepreneurship is often a way out of poverty. Similarly, it could be due to microfinance institutions' relative access to credit facilities that primarily target women entrepreneurs.

This result corroborates evidence from the literature, [Boserup \(2007\)](#) showing that women-owned firms in most African societies contribute significantly to family labor in the subsistence economy, with women doing most of the cultivating. However, in the next set of regressions, women-owned firms continue to have lower measures of business performance using sales growth than male-owned firms in the other two regions (Europe and Latin America). On the one hand, this may reflect the fact that women-owned firms start from a lower base or the different impact of business problems. On the other hand, it could be closely associated with the higher incidence of necessity entrepreneurship among women and their concentration in low productivity sectors.

Table 2.8: Gender and access to finance on sales growth across region and income groups

Dependent variable:	Region			Income level			
	Africa	Europe	LAC	Low	Lower-middle	Upper- middle	High
(Sales growth)							
Female-owned	2.944** (1.369)	-0.560 (0.408)	-2.521*** (0.667)	1.687* (0.891)	3.192 (1.871)	-0.745 (0.507)	-2.124*** (0.647)
Financing access	1.975** (0.713)	1.931*** (0.698)	0.009 (0.948)	1.677* (0.851)	1.972** (0.810)	1.102 (0.976)	1.400** (0.553)
Female \times Financing access	-3.289*** (1.046)	-1.294* (0.695)	1.995** (0.749)	-3.258** (1.371)	-1.949 (1.468)	-1.875** (0.833)	1.139 (0.773)
Sector#year FE (α_{st})	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country#year FE (α_{ct})	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Level	Country	Country	Country	Country	Country	Country	Country
Number of countries	26	24	10	14	13	19	16
Observations	5,987	13,482	3,167	3,112	4,260	9,958	6,420

Notes: The dependent variable is sales growth in percentage term. Country-year and sector-year dummies are inserted, but not reported. Standard errors are adjusted for clustering at the survey-level. *, **, and *** indicate significance at 10%, 5% and 1% respectively. LAC refers to Latin America & the Caribbean region.

In summary, the evidence indicates a performance gap between female and male entrepreneurs. However, the results of the robustness check using sales growth (Table 2.6) are different from the main results on firm growth measured from employment (Table 2.3). Still, the results of the control variables are broadly consistent for firm growth using either of these growth measures (employment and sales).

2.7.2 Use an alternative measure of external financing

The results may be subject to a selection problem. The variable of *financing access* indicates whether a firm has a line of credit, but does not distinguish between firms that would like to obtain credit but are

Table 2.9: Use an alternative measure of external financing: Credit granted

Dependent variables	Employment growth			Sales growth		
	(1)	(2)	(3)	(4)	(5)	(6)
Credit granted	1.361*** (0.232)	1.824*** (0.275)	2.832*** (0.325)	2.167*** (0.497)	3.293*** (0.667)	3.891*** (0.732)
Female-owned		-0.910*** (0.310)	-0.946*** (0.306)		0.630 (0.810)	0.614 (0.914)
Female × Credit granted		-1.044** (0.402)	-0.501 (0.400)		-2.358*** (0.869)	-2.142** (0.936)
Firm size			-2.437*** (0.286)			-1.760*** (0.284)
Firm age			-0.073*** (0.013)			-0.077*** (0.020)
Exporter			1.731*** (0.263)			1.030 (0.632)
Subsidiary			1.352*** (0.371)			2.738*** (0.751)
Foreign-owned			1.523*** (0.529)			0.595 (0.884)
State-owned			0.194 (1.232)			0.079 (2.343)
Publicly listed			-0.752 (0.574)			-0.525 (1.087)
Privately-held			0.197 (0.355)			-0.005 (1.156)
Sole proprietorship			-0.915** (0.415)			-2.444* (1.252)
Formally registered			0.531 (0.382)			1.864* (1.090)
City			0.113 (0.450)			0.817 (0.743)
Sector#year FE (α_{st})	Yes	Yes	Yes	Yes	Yes	Yes
Country#year FE (α_{ct})	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Level	Country	Country	Country	Country	Country	Country
Number of countries	62	62	62	62	62	62
Observations	19,662	17,223	14,212	15,905	14,024	11,145

Notes: The dependent variables are employment growth and sales growth in percentage terms. Country-year and sector-year dummies are inserted, but not reported. Standard errors are adjusted for clustering at the survey-level. *, **, and *** indicate significance at 10%, 5% and 1% respectively.

denied a loan and firms that do not have credit because they do not need it.

As discussed in section (2.4.3.2), it is crucial to separate firms that did not apply for credit because they did not need it (first group) from those that did not apply because they were discouraged (third group). To identify credit-granted firms, we observe firms approved for loans and firms discouraged from applying for bank credit by anticipating rejection, high rates, or unfavorable collateral requirements. This measure allows us to identify businesses expressing a formal request for funds not met by the supply.

The Table (2.9) leads to a very similar conclusion to the Table (2.3) and the Table (2.6). When we consider the "credit extended" variable, an increase of 2.83% in employment growth and 3.89% in sales growth. This further strengthens the conclusion that access to financial markets has a positive effect on firm performance. The coefficient on all firm characteristics also has a similar sign to our baseline estimate, with female-owned firms significantly decreasing employment growth and non-significantly increasing sales growth. In other words, this estimate confirms our main results.

2.7.3 Instrumental variable estimation

Our findings could be driven due to reverse causality between access to credit and firm growth, which explains that access to finance is an endogenous variable and suggests that the sample is not random, raising the possibility of endogeneity, leading to a bias in the results. Indeed, on the one hand, a firm may experience low growth due to difficulty in obtaining credit, and firms that have access to financing will be able to expand and generate higher profits, thus promoting growth (Ahmed and Hamid, 2011). On the other hand, however, high-performing firms may be better able to access extract causality between firm performance and access to finance (Fowowe, 2017; Fafchamps and Schündeln 2013). In light of the above, I perform instrumental variable estimation in the following robustness test to address the potential endogeneity bias arising from the possible reverse causality between firm growth and access to finance.

The choice of instruments has always been a central issue in instrumental variable estimation. For an instrument to be valid, it must be both relevant, i.e., correlated with the endogenous variable, and at the same time, it must be exogenous, i.e., uncorrelated with the error term. To control for this, I consider the lagged value of credit as an internal instrument. This variable is expected to be highly correlated with contemporaneous credit levels (relevant condition). In addition, we expect this instrument to have no direct effect on firm growth (exclusion restriction). For external instruments, following Beck et al. (2014), I use measures of bank regulatory and supervisory structures as instrumental variables for access to finance. I consider two of these: an index of overall supervisory independence from banks and politicians and the degree of creditor rights. First, we expect both instruments to be correlated with access to finance. Djankov et al. (2007) highlight that creditor rights is associated with higher ratios of private credit to GDP. Second, we assume that both external instruments respect the exclusionary restrictions. Therefore, there is no apparent reason to believe that the two variables exert a direct impact on firm performance.

Table 2.10: Effect of financing access on firm growth: Instrumental variable estimations

Dependent variable	Employment growth		Sales growth	
	(1)	(2)	(3)	(4)
Financing access	3.597*** (1.257)	9.723** (4.015)	8.518*** (1.698)	12.633*** (2.077)
Firm level controls	Yes	Yes	Yes	Yes
Country level controls	Yes	Yes	Yes	Yes
Sector#year FE	Yes	Yes	Yes	Yes
Number of countries	62	62	62	62
Observations	20,386	19,143	21,191	14,399
<i>Set of instruments variables</i>				
Lagged value of credit	×	×	×	×
Independence of supervisory–Overall	×		×	
Creditor rights		×		×
<i>Diagnostic of Instrumentation</i>				
First stage F-Statistic	161.98	12.67	218.13	293.64
Sargan test (P-value)	0.700	0.221	0.131	0.064
Wu-Hausman test (P-value)	0.331	0.059	0.0001	0.0000

Notes: The dependent variables are employment growth and sales growth in percentage terms. Country-year and sector-year dummies are inserted, but not reported. Standard errors are adjusted for clustering at the survey-level. The usual tests are displayed at the bottom of the table. First stage F-statistic report the F-Statistic for excluded instruments in the first stage. Sargan test refers to the over-identification test, under the null hypothesis: the instruments are exogenous. Wu-Hausman test evaluate whether IV results differ from OLS results, under the null hypothesis: OLS (here FE) and IV (here IV-FE) provide similar econometric results. *, **, and *** indicate significance at 10%, 5% and 1% respectively.

The data on the degree of creditor protection are taken from the Doing Business project and based on the original methodology developed by [Djankov et al. \(2007\)](#). To proxy creditor protection, I use the Strength of Legal Rights Index, which measures the degree of protection based on collateral and bankruptcy laws. This index ranges from 0 (weak protection) to 10 (strong protection). The index of overall supervisory independence from banks and politicians is obtained from [Barth et al. \(2013\)](#), which ranges from 0 (low independence) to 3 (high independence).

The results of the models with instrumental variable (IV) are presented in the Table (2.10). For the two dependent variables (employment growth and sales growth), I present two different specifications. First, I include the internal instrument and the independence of the supervision index. Second, I consider the internal instrument and the creditor rights index. I report results based on models including fixed effects that are less subject to endogeneity. At the bottom of the table, I display the diagnostic statics for IV strength (F-statistics of the instruments excluded in the first step) and IV exogeneity (Sargan's test that refers to the over-identification test). The F-statistics of the first stage regressions are above the usual 10 thresholds, suggesting that our instrument variables are not weak. In addition, the Sargan test also supports the validity of the instruments, which means that we cannot reject the null hypothesis of the exogeneity of our instruments.

The results indicate that the coefficient on access to finance remains positive and statistically significant at the usual thresholds on employment and sales growth. Therefore, the results of the instrumental variable estimation are consistent with the previous results. Consequently, we can conclude that firms that can participate in financial markets will be able to grow faster. It is interesting to note that beyond statistical significance, the economic size of the access to finance variable is strongly different from the models without IV. When we compare the results of the Table (2.10) with those of the Table 2.3 (column 5) and Table 2.6 (column 6). We observe that the marginal effect of financing access is slightly increased for specifications explaining employment growth and substantially increased for models studying sales growth.

2.7.4 Firm growth and crisis

The regression analysis presented above is based on the entire sample period and all firms. However, the period of this analysis is characterized by a major economic shock, the global financial crisis of 2008. This financial crisis has put a spotlight on the financing decisions of private firms, especially small firms, as the financial crisis will make it very difficult for firms to access financing facilities, which could affect firm growth. Therefore, it is important to examine the effects of the global financial crisis on the relationship between firm growth and sensitivity to access to finance.

Since the onset of the financial crisis in 2008, commercial banks have continued to tighten the supply of bank credit, imposing additional financial constraints and higher access costs on private firms. The increased financial constraints may negatively influence the financing of these firms. To this end, I address the access to finance variable interacting with the financial crisis using crisis and post-crisis dummy variables on employment and sales growth. Whereas the inception of the crisis occurred in 2007 for the US and the UK, I consider the years 2008 – 2009 as the financial crisis period and the years 2010 – 2012 as the post-crisis period. The regression model is estimated separately for the crisis and post-crisis periods. The results are presented in the Table (2.11).

There is a significant positive impact of financing access on employment and sales growth during the crisis. In contrast, the results reveal a decline in firm growth after the financial crisis of -0.18% for employment growth and -0.11% for sales growth. The interaction coefficient of *Access to Financing*Post-Crisis* on sales growth decreases significantly at 1%. In contrast, there is no significant change in the impact of the interaction coefficient of financing access on employment growth in the post-crisis period, as shown by the statistically insignificant coefficients of *Financing access*Post-Crisis*. In other words, although banks in these countries were seen as less willing to take risks in financing the economy, after the global financial crisis of 2008/2009, job creation has been at the top of the agenda for policymakers and regulators.

The results confirm that the sensitivity of access to financing for business growth, as measured by employment and sales growth, changes between quiet and distressed periods. When market and macroeconomic conditions are favorable, it is common to expect economic and business growth periods, whereas growth expectations are different in times of distress. It can be concluded that business growth as measured by employment and sales growth was clearly affected after the financial crisis.

Table 2.11: Crisis effects on firm growth

Dependent variable	Panel A: Employment growth		
	Crisis dummy	Crisis period (2008-2009)	Post-crisis period (2010-2012)
Crisis	0.292 (2.644)	-0.410 (2.696)	
Post-crisis	-0.249 (2.564)		-0.186 (2.580)
Financing access	1.055*** (0.232)	0.720** (0.281)	1.111*** (0.273)
Financing access \times Crisis		1.186** (0.530)	
Financing access \times Post-crisis			-0.256 (0.556)
Sector#year FE (α_{st})	Yes	Yes	Yes
Country#year FE (α_{ct})	Yes	Yes	Yes
Cluster Level	Country	Country	Country
Number of countries	62	62	62
Observations	33,901	33,901	33,901
Dependent variable	Panel B: Sales growth		
	Crisis dummy	Crisis period (2008-2009)	Post-crisis period (2010-2012)
Crisis	9.350** (3.662)	8.356** (3.724)	
Post-crisis	-0.822 (3.450)		-0.111 (3.479)
Financing access	1.143** (0.474)	0.663 (0.583)	1.645*** (0.495)
Financing access \times Crisis		1.655* (0.855)	
Financing access \times Post-crisis			-2.610*** (0.774)
Sector#year FE (α_{st})	Yes	Yes	Yes
Country#year FE (α_{ct})	Yes	Yes	Yes
Cluster Level	Country	Country	Country
Number of countries	62	62	62
Observations	26,613	26,613	26,613

Notes: The dependent variables are employment growth and sales growth in percentage terms. Country-year and sector-year dummies are inserted, but not reported. Standard errors are adjusted for clustering at the survey-level. *, **, and *** indicate significance at 10%, 5% and 1% respectively.

2.7.5 Size of the informal sector

The sample results of the enterprise surveys are limited to the formal sector in each country and exclude the informal sector. Studies such as [La Porta and Shleifer \(2008\)](#) have shown that informal enterprises account for a large share of economic activity in developing countries. Others have highlighted the contribution of the informal sector to women’s empowerment ([Minniti and Naudé, 2010](#)). It is therefore important to distinguish countries in the sample with a large informal sector, which implies underestimating the importance of women entrepreneurs in these countries from those with a small informal sector.

In the following empirical test, as a final robustness check, I examine whether the contribution of female ownership and firm characteristics to firm growth varies with the size of the informal sector in the economy. Of the 62 countries for which we have data on firm growth rates, I collect data on the contribution of the informal sector to GDP in 52 countries from [Medina and Schneider \(2018\)](#). In the Table (2.12), in columns (1) and (2), I present results for countries with large informal sectors above the median value, while in columns (3) and (4), I present results for countries with small informal sector below the median value.

Across the regression models in Table (2.12), in countries with a large informal sector, women-owned firms have significantly lower employment growth but non-significantly higher sales growth than male-owned firms. However, in countries with a small informal sector, women-owned firms significantly lower employment and sales growth. Thus, the results show similar results between the large and small informal sectors for firm characteristics on firm growth measured by employment and sales growth. This suggests that the size of the informal sector does not make a significant difference in the results.

Interestingly, employment growth is likely to be underreported, especially when there is unregistered or underreported employment in terms of time worked or wages paid. As can be seen, in countries with a large informal sector, the estimated coefficient on formal registration is not significant on firm growth. In contrast, in countries with a small informal sector, firms operating legitimately have higher levels of growth, employ more workers, and have higher sales growth than their informal counterparts. This finding is in line with that of [Fajnzylber et al. \(2006\)](#), and that of [McKenzie and Sakho \(2010\)](#) who studied, that growth and revenue are higher for firms that operate with a license. Thus, this study highlights that formally registered entrepreneurs play a critical role in employment and sales growth in developing countries.

As can be illustrated from these two different specifications, this result confirms that formally registered firms often have better access to finance and attract new investment or increase their chances of working with the government to support their business growth. These results could explain the behavior of entrepreneurs operating informally in developing countries and stimulate future research on how to get governments to consider improving incentives and reducing registration costs to encourage the transition to formalization.

Table 2.12: Other robustness check: Large versus small informal sector

Dependent variable	Large informal sector		Small informal sector	
	Employment growth	Sales growth	Employment growth	Sales growth
	(1)	(2)	(3)	(4)
Female-owned	-0.769*** (0.242)	0.076 (0.586)	-1.017*** (0.207)	-0.947** (0.412)
Financing access	3.521*** (0.245)	1.443** (0.569)	1.755*** (0.216)	2.904*** (0.423)
Firm size	-3.234*** (0.113)	-1.746*** (0.254)	-1.739*** (0.096)	-1.564*** (0.172)
Firm age	-0.059*** (0.009)	-0.088*** (0.021)	-0.080*** (0.008)	-0.052*** (0.017)
Exporter	1.367*** (0.315)	0.548 (0.724)	1.600*** (0.247)	2.738*** (0.461)
Subsidiary	1.386*** (0.369)	2.343** (0.921)	1.966*** (0.285)	1.525*** (0.591)
Foreign-owned	1.980*** (0.464)	1.252 (1.030)	1.782*** (0.382)	0.932 (0.732)
State-owned	0.212 (0.862)	1.283 (2.160)	-1.681* (0.905)	5.373** (2.167)
Publicly listed	-0.041 (0.588)	-0.977 (1.429)	0.331 (0.564)	-1.293 (1.262)
Privately-held	-0.124 (0.474)	-0.885 (1.224)	0.257 (0.306)	0.303 (0.665)
Sole proprietorship	-1.804*** (0.473)	-3.919*** (1.227)	-0.626* (0.369)	-0.902 (0.740)
Formally registered	0.047 (0.378)	0.327 (0.882)	1.330*** (0.506)	2.447*** (0.949)
City	-0.049 (0.245)	1.617*** (0.568)	1.285*** (0.286)	-0.681 (0.517)
Growth of GDP _{pc}	0.082*** (0.028)	-0.173** (0.067)	0.049* (0.027)	-0.167*** (0.057)
Inflation (CPI)	-0.025 (0.031)	-0.925*** (0.082)	0.281*** (0.045)	-0.537*** (0.093)
Sector#year FE (α_{st})	Yes	Yes	Yes	Yes
Country#year FE (α_{ct})	Yes	Yes	Yes	Yes
Number of countries	26	26	26	26
Observations	11,316	7,894	10,939	8,812

Notes: The dependent variables are employment growth and sales growth in percentage terms. Large informal sectors are included for countries that have a large informal sector above the median value while small informal sectors are included for countries that have a small informal sector below the median value where informal sector is defined by the contribution of the informal sector to GDP, as mentioned in [Medina and Schneider \(2018\)](#). Country-year and sector-year dummies are inserted, but not reported. Standard errors are adjusted for clustering at the survey-level. *, **, and *** indicate significance at 10%, 5% and 1% respectively.

2.8 Discussion

This section uses subjective information on barriers to accessing credit to identify the degree of financial constraint firms face and the factors that facilitate or exacerbate the financial barriers. In particular, firms were asked to indicate whether access to finance was "no obstacle (0); minor (1); moderate (2); major obstacle (3); or very severe (4)". Thus, the measure of financial constraint is a dummy variable that takes on the value 1 if the firm reports availability of financing as a major or very severe obstacle and zero if the firm reports that there is no obstacle, a minor obstacle, or a moderate obstacle. Such an analysis is particularly important for developing countries where private sector development is lagging and for studying the factors that impede firm performance in each region.

The Table (2.13) presents the results of Probit regressions in which I study the association between gender and the likelihood of firm credit constraints conditional on various firm characteristics that affect the firm's access to credit. I use industry and country fixed effects to control for differences in levels across industries and countries (e.g., cultural norms that may prevent women from obtaining credit) to reduce the potential for omitted variables and use year dummies in the regressions to control for time-specific global shocks.

We find evidence of the importance of the gender of the firm owner as a determinant of the firm's access to finance in developing countries. Overall, in all regions, there is evidence of a gender gap in access to finance. The derived marginal effects show that the probability of being financially constrained is about 1.1 percentage points higher for female-owned firms than for male-owned firms. However, the estimated coefficient on the female ownership indicator varies by region. Female ownership is positive and statistically significant at the 10% level for the Africa and Latin America region. This confirms that female-owned firms in these two regions are more financially constrained than male-owned firms. In contrast, there is no evidence of a gender gap in access to finance in Europe, indicating that gender discrimination is lower in countries with more developed financial markets. This translates into lower rejection rates and collateral requirements for women entrepreneurs in more financially developed economies (Beck et al., 2004).

There are several explanations for the observed gender differences in financing patterns and, in particular, in the use of bank credit, which is the most important overall source of external funds for small firms. On the one hand, the observed gap may result from supply-side discrimination, implying that bankers' decisions about loan applications are different for men and women whose firms are similar in terms of solvency and creditworthiness. On the other hand, the gap may stem from differences in the characteristics of male and female entrepreneurs with respect to human capital, personal wealth, and risk aversion. These heterogeneous characteristics may arise from the experience of entrepreneurs, or they may be determined by nature. For example, if women entrepreneurs are more risk-averse than men, they may have a lower demand for bank loans.

Smaller firms are more likely to be financially constrained than larger ones because of the lack of collateral and the presence of asymmetric information that play a decisive role in financial constraint (Berger and Udell, 1998). Furthermore, foreign-owned firms seem to escape the financing gap by tapping other resources. Therefore, they are less likely to be constrained than domestically owned firms. Finally,

the effects of firm age and firm legal status vary by region. In addition, formally registered firms are associated with fewer perceived barriers to accessing finance than their informal counterparts. This result is consistent with the fact that banks rely on the balance sheets of registered firms as a signal of firm soundness rather than unregistered firms. Subsequent work (e.g., [Gatti and Honorati, 2007](#)) emphasizes that formality is positively and significantly associated with the likelihood of having a line of credit.

Table 2.13: Determinants of access to finance: Probit regressions (marginal effects)

Dependent variable	Index of financing constraint			
	All regions	Africa	Europe	LAC
Female-owned	0.011* (0.006)	0.029* (0.016)	0.006 (0.007)	0.025* (0.015)
Firm size (in log)	-0.014*** (0.002)	-0.037*** (0.006)	-0.008*** (0.003)	-0.023*** (0.007)
Firm age	0.000 (0.000)	0.000 (0.001)	0.001* (0.000)	-0.001* (0.000)
Exporter	-0.001 (0.007)	-0.048*** (0.016)	0.003 (0.009)	0.045** (0.017)
Subsidiary	-0.040*** (0.009)	-0.031* (0.016)	-0.032** (0.012)	-0.081*** (0.022)
Foreign-owned	-0.064*** (0.011)	-0.089*** (0.024)	-0.050*** (0.014)	-0.045* (0.027)
State-owned	0.049** (0.022)	-0.150** (0.060)	0.083*** (0.025)	0.008 (0.095)
Publicly Listed	0.016 (0.014)	-0.033 (0.034)	0.018 (0.019)	-0.030 (0.067)
Privately-held	-0.006 (0.010)	-0.012 (0.024)	-0.009 (0.015)	0.031 (0.028)
Sole proprietorship	0.012 (0.010)	-0.007 (0.017)	-0.001 (0.017)	0.048* (0.028)
Formally registered	-0.018* (0.010)	-0.037** (0.016)	-0.002 (0.019)	0.021 (0.030)
Number of countries	62	26	24	10
Observations	27,269	5,687	17,120	3,305

Notes: The dependent variable is the measure of financing constraint based on the response by the firms to the question "To what degree is access to finance an obstacle to the current operations of this establishment?". It takes on the value 1 if the firm is financially constrained and zero otherwise. The entries above are the marginal effects with standard errors in parentheses. Country, sector and year dummies are inserted but not reported. *, **, and *** indicate significance at 10%, 5% and 1% respectively. LAC refers to Latin America & the Caribbean region.

2.9 Conclusion and policy implications

The effect of gender on firm performance is an exciting topic that attracts researchers from various disciplines. This paper aims to investigate the relationship between women owners and business growth by exploiting a dataset of 33,971 firms from 62 countries during 2006-2016, using firm characteristics and access to finance as a lens for analysis. It extends previous research on the role of women owners in firm growth (e.g., [Rosa et al. \(1996\)](#); [Fairlie and Robb \(2009\)](#); and [Dezsö and Ross \(2012\)](#)) by providing a comprehensive analysis of entrepreneurial performance by gender across regions to explain how women experience business ownership.

I use fixed-effects regressions to present a novel story on the influence of owner gender on firm growth. First, I measure gender differences in firm performance in terms of employment growth. Similar to some studies, firm ownership would be a significant factor in the performance gap between male- and female-owned firms, even after controlling for industry and year-fixed effects and clustering by country. On average, women-owned firms do worse than their male-owned counterparts in terms of employment growth. Second, I find that female ownership has a heterogeneous influence on employment growth in three regions of the study. In addition, the study confirms that firm growth is positively related to obtaining external financing in all estimated specifications. Thus, improved access has a substantial impact on employment and sales growth. Interestingly, better access to finance leads to higher employment growth, especially among SMEs and start-ups compared to large and older firms.

The results also underscore the importance of considering that female ownership interacts with other factors-in particular, firm characteristics such as firm size, age and access to finance to shape firm growth. Women's entrepreneurship is predominantly oriented toward SMEs, and this difference in firm size, at least in part, could explain the existence of a gender gap in firm performance. Another interesting result is that, throughout the life cycle, there is a negative relationship between female-owned firms and firm age. In other words, women-owned firms hire more people early in their life cycle, with the number of employees decreasing with the firm's age. In contrast, there is no significant difference in the impact of access to finance for women-owned firms on employment growth for almost all regressions, except for the European region and upper-middle-income countries.

Noteworthy, the results of the robustness check using sales growth are different from the main results on employment growth. Using sales growth as the dependent variable shows a significant positive effect of female ownership on sales growth in the African region and at the low-income country level, but negatively affects the Latin American region and high-income countries with a significance level of 1%. In a second step, I used an alternative interaction term with credit extended to explain the difference in business performance between female- and male-owned firms; the results are maintained in the main findings on employment and sales growth. To control for potential endogeneity, we apply an instrumental variable approach. Our overall conclusion is unchanged. The econometric results are also robust to a battery of additional sensitivity tests, taking into account the financial crisis and the size of the informal sector.

In conclusion, this study confirms mixed results for women-owned firms in terms of growth, but it is also critical to account for heterogeneity in firm characteristics, such as size, age, and growth

type. Moreover, it is unlikely that a single measure of firm growth can adequately capture these nuances (Krasniqi and Desai, 2016). Therefore, the results of this study demonstrate that firm growth needs to be examined from different perspectives and using both employment and non-employment-based measures.

The summary of this study suggests that variations across regions, country income levels, and many other firm characteristics are relevant to policymakers if they are considering targeted interventions in developing countries. The need to improve economic performance and social welfare calls for a closer examination of the contributions and needs of women-owned enterprises and the implementation of corresponding structural reforms. Furthermore, education and training programs should be provided to women owners to help them acquire the skills to better design and present their financing plans. International networks of existing national women's business associations should be encouraged and strengthened in partnership with government and business. There is also a need to promote the entry of young women into programs and fields of study that are more likely to lead to entrepreneurship and the creation of high-growth innovative enterprises. This can be done by raising awareness of the gaps between opportunities and earning potential in different sectors and ensuring that women have the opportunity to access work experiences (e.g., training, internships, mentoring programs) in traditionally male-dominated sectors.

To improve the effectiveness of these programs, three areas could be considered. First, support programs should better integrate household constraints to overcome some constraints arising from social norms and subjective preferences by providing childcare assistance or joint sessions with spouses to discuss women's business and household responsibilities, which could positively impact women's empowerment and business decisions. Second, in parallel with these efforts, support programs should also engage government institutions to reform legal frameworks limiting women's entrepreneurial activity.

The final piece of the puzzle is to support crossovers by stimulating the entry of women entrepreneurs into higher productivity and higher growth activities, often dominated by men, from the high concentration in low productivity and low growth sectors, in order to reduce the performance gap between men and women entrepreneurs. In this context, crossovers refer to entry into different higher productivity sectors and diversification within the same industry into higher value-added activities. This aligns with Campos *et al.* (2015), who suggests in the Uganda case study that supporting crossovers requires programs to increase women entrepreneurs' exposure to these sectors by using appropriate mentors and facilitating access to information.

Existing approaches to supporting growth-oriented women entrepreneurs are heterogeneous in their design and implementation, and provide indicative evidence that points the way forward. However, further work is needed to better understand what motivates women's participation in ownership and management and its consequences in order to design appropriate policies. This also requires a robust assessment of existing legal constraints and the creation of forums for dialogue across sectors, government, and civil society on women's entrepreneurship to encourage reforms.

Appendices

2.A Sample and variable definition

Table 2.14: Variables description and data source

Variable	Description	Source ^a
<i>Dependent variables</i>		
Employment growth	Growth of the total number of permanent and full-time employees (annual average). It is measured by the difference in logs of firm employment in a current year and 3 years ago.	ES ^b
Sales growth	Sales growth of the firm is between the completed fiscal year and the previous three years. All sales were deflated to 2009 using GDP deflator of each country.	ES ^b
<i>Independent variables</i>		
Female-owned	Dummy variable that takes the value of one if at least one of the principal owners is female and zero if it is owned by a male.	ES
Female top manager	Dummy variable that equal "1" if the top manager is female and zero otherwise.	ES
Female owner & manager	Dummy variable that takes the value of one if the firms where the principal owner is a woman and manager at the same time and zero otherwise.	ES
Financing access	Dummy variable that equals "1" if the firm has access to financing (loan, overdraft, or line of credit) and zero if the firm has not an overdraft or line of credit.	ES
Credit granted	Dummy equal to one for firms that obtained a loan and zero for discouraged borrowers of firms whose credit application was turned down.	ES
Financing constraint	How problematic is financing for the operation and growth of your business. It is a dummy variable that takes on the value of one if the firm report availability of financing as a major or very severe obstacle and zero if the firm report that there no obstacle, a minor obstacle or a moderate obstacle.	ES
<i>Firm-level control variables</i>		
Firm size	Number of permanent full-time employees. A firm is defined as small (5-19 employees), medium size (20-99 employees) and large (100 and over employees). Size is a vector of dummy variables, small, medium and large, that takes the value one if a firm is small and zero otherwise. A similar rule is followed for medium or large firm.	ES
Firm age (in years)	Firms are categorized into three categories (young, mature and older firms) based on the years that have passed since the establishment began its operations. Young firms (less than 5 years), mature firms (6-15 years) and older firms (more than 15 years).	ES
Exporter	Dummy variable that takes the value of one if 10% or more of the firm's sales are exported directly or indirectly, and zero otherwise.	ES
Subsidiary	Dummy variable equals to "1" if the firm is part of larger firm.	ES
Foreign-owned	Dummy variable that equals to "1" if 50% or more of the firm is owned by foreign organization.	ES
State-owned	Dummy variable that equals to "1" if 50% or more of the firm is owned by the government and zero otherwise.	ES
Publicly listed	Dummy variable equals to "1" if the firm is a shareholder company/shares traded in the stock market.	ES
Privately-held	Dummy variable equals to 1 if the firm is a shareholder company/shares traded privately.	ES

(Continued)

Table 2.14 – Variables description and data source (*Continued*)

Variable	Description	Source
Sole proprietorship	Dummy variable that takes on the value "1" if the firm is organized as a sole proprietorship and zero otherwise.	ES
Formally registered	Dummy variable equals to "1" if the establishment was formally registered when it began operations and zero otherwise.	ES
City	Dummy variable which takes on a value of "1" if the firm is located in a capital city or cities with populations of one millions or more and zero otherwise.	ES
Crisis	Dummy variable equal to "1" for the period 2008-2009, 0 otherwise.	ES
Post-crisis	Dummy variable equal to "1" for the period 2010-2012, 0 otherwise.	ES
<i>Country-level control variables</i>		
GDP _{pc}	GDP per capita in constant 2009 U.S. dollars.	WDI
Growth of GDP _{pc}	Real growth of GDP.	WDI
Inflation (%)	It is measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.	WDI
Gender parity index	It is the average of the ratio of female to male enrollment rates in primary, secondary and tertiary education.	UNESCO
Independence of supervisory authority-overall	The degree to which the supervisory authority is independent of the government and legally protected from the banking industry. A higher value means a more independent supervisory agency.	Barth et al. (2013)
Creditor rights	It is an index measures the regulations and procedures that affect the rights of creditors in the sample countries. In addition, it measures the degree to which collateral and bankruptcy laws facilitate lending. The index increases in strength of creditor rights, ranging from 0 to 10.	DB
Informal sector	The contribution of the informal sector to GDP (% of GDP).	Medina and Schneider (2018)

^a ES: World Bank Enterprises Surveys; WDI: World Development Indicators; WGI: World Governance Indicators; and UNESCO: the United Nations Educational, Scientific and Cultural Organization; and DB: Doing Business.

^b Author's computation, see the text for details.

Table 2.15: List of countries, survey year, and number of observations

Country	Year of survey	Observations	Income group
<i>Africa region (26 countries)</i>		10,745 (31.6%)	
Benin	2009	90	Low income
Benin	2016	131	Low income
Botswana	2006	244	Upper middle income
Botswana	2010	220	Upper middle income
Burkina Faso	2009	306	Low income
Burundi	2006	213	Low income
Burundi	2014	131	Low income
Cameroon	2009	306	Lower middle income
Central African Republic	2011	119	Low income
Chad	2009	125	Low income
Congo	2009	72	Lower middle income
Côte d'Ivoire	2009	285	Lower middle income
DR Congo	2006	267	Low income
DR Congo	2010	315	Low income

(*Continued*)

Table 2.15 – List of countries, survey year, and number of observations (*Continued*)

Country	Year of survey	Observations	Income group
DR Congo	2013	414	Low income
Djibouti	2013	162	Lower middle income
Gabon	2009	94	Upper middle income
Guinea	2006	175	Low income
Guinea Bissau	2006	123	Low income
Jordan	2013	383	Upper middle income
Madagascar	2009	363	Low income
Madagascar	2013	367	Low income
Mali	2007	422	Low income
Mali	2010	260	Low income
Mali	2016	123	Low income
Mauritania	2006	197	Lower middle income
Mauritania	2014	113	Lower middle income
Morocco	2013	309	Lower middle income
Niger	2009	96	Low income
Nigeria	2014	1669	Lower middle income
Rwanda	2006	153	Low income
Rwanda	2011	194	Low income
Senegal	2007	413	Low income
Senegal	2014	461	Low income
Togo	2009	108	Low income
Togo	2016	121	Low income
Tunisia	2013	528	Lower middle income
Yemen	2010	381	Lower middle income
Yemen	2013	292	Lower middle income
<i>Asia/Pacific region (2 countries)</i>		1,153 (3.4%)	
Malaysia	2015	597	Upper middle income
Mongolia	2009	237	Lower middle income
Mongolia	2013	319	Lower middle income
<i>Europe region (24 countries)</i>		18,172 (53.5%)	
Albania	2007	216	Upper middle income
Albania	2013	240	Upper middle income
Azerbaijan	2009	266	Upper middle income
Azerbaijan	2013	291	Upper middle income
Belarus	2008	235	Upper middle income
Belarus	2013	302	Upper middle income
Bosnia and Herzegovina	2009	285	Upper middle income
Bosnia and Herzegovina	2013	325	Upper middle income
Bulgaria	2007	942	Upper middle income
Bulgaria	2009	238	Upper middle income
Bulgaria	2013	271	Upper middle income
Croatia	2013	308	High income
Czech Republic	2009	197	High income
Czech Republic	2013	232	High income
Estonia	2009	236	High income
Estonia	2013	229	High income
Fyr Macedonia	2009	295	Upper middle income
Fyr Macedonia	2013	312	Upper middle income

(Continued)

Table 2.15 – List of countries, survey year, and number of observations (*Continued*)

Country	Year of survey	Observations	Income group
Georgia	2008	286	Upper middle income
Georgia	2013	240	Upper middle income
Hungary	2009	270	High income
Hungary	2013	262	High income
Kazakhstan	2009	405	Upper middle income
Kazakhstan	2013	483	Upper middle income
Kosovo	2009	222	Lower middle income
Kosovo	2013	167	Lower middle income
Kyrgyz Republic	2009	191	Lower middle income
Kyrgyz Republic	2013	231	Lower middle income
Latvia	2009	223	High income
Latvia	2013	255	High income
Lithuania	2009	231	High income
Lithuania	2013	215	High income
Poland	2009	290	High income
Poland	2013	410	High income
Romania	2009	411	Upper middle income
Romania	2013	487	Upper middle income
Russia	2009	805	Upper middle income
Russia	2012	3288	Upper middle income
Serbia	2009	312	Upper middle income
Serbia	2013	300	Upper middle income
Slovak Republic	2009	201	High income
Slovak Republic	2013	238	High income
Slovenia	2009	240	High income
Slovenia	2013	219	High income
Sweden	2014	498	High income
Ukraine	2008	663	Lower middle income
Ukraine	2013	709	Lower middle income
<i>Latin America & the Caribbean region</i> (10 countries)		3,901 (11.5%)	
Antigua and Barbuda	2010	138	High income
Bahamas	2010	135	High income
Barbados	2010	132	High income
Chile	2006	822	High income
Chile	2010	950	High income
Dominica	2010	145	Upper middle income
Grenada	2010	140	Upper middle income
St.Kitts and Nevis	2010	131	High income
St.Lucia	2010	150	Upper middle income
St.Vincent and Grenadines	2010	139	Upper middle income
Uruguay	2006	499	High income
Uruguay	2010	520	High income

Source: The original data is collected from the Enterprise Survey data conducted by the World Bank during the 2006-2016 period. The final sample size become 33,971 firms after deleting missing values.

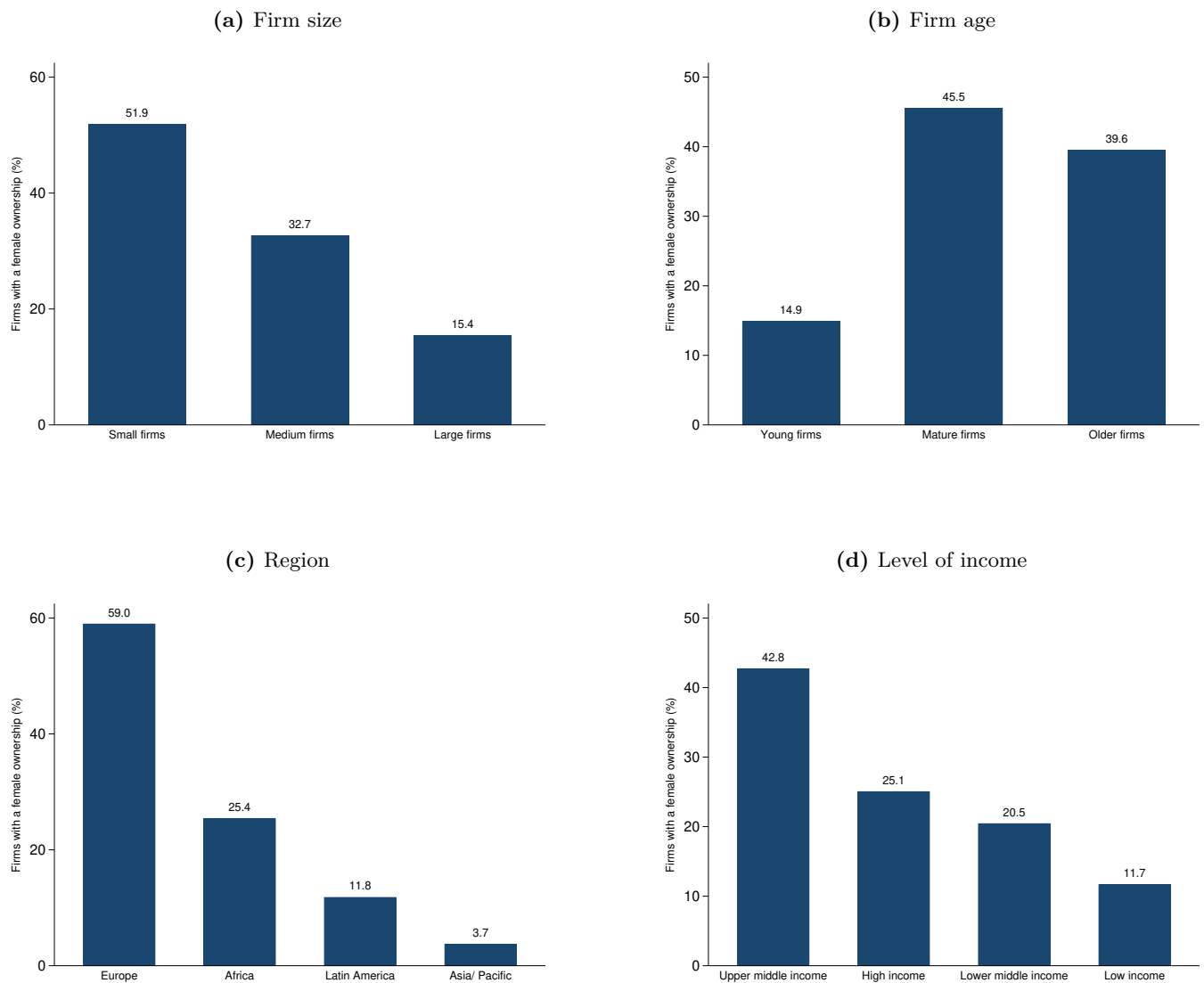
Table 2.16: Industry summary

Industry name	Observations	% of female owned firms	% of firms have access to finance
Auto and auto-components	47	35.6	56.0
Chemicals and pharmaceuticals	977	32.2	64.2
Construction and transportation, etc	2715	26.2	54.1
Electronics	401	30.7	54.5
Food	3010	31.8	55.2
Garments	1959	47.0	42.9
Hotels and restaurants	1608	35.0	37.0
Leather	352	49.4	53.1
Metals and machinery	2361	28.3	56.3
Non-metallic and plastic materials	1365	25.8	53.6
Other manufacturing	3593	36.2	55.6
Other services	3570	26.9	47.0
Retail and wholesale trade	9937	36.0	49.5
Textiles	1151	43.9	66.9
Wood and furniture	779	21.0	44.5

Source: Author's calculation using data from the World Bank Enterprises Surveys during the 2006-2016 period for 62 countries.

2.B Additional figures

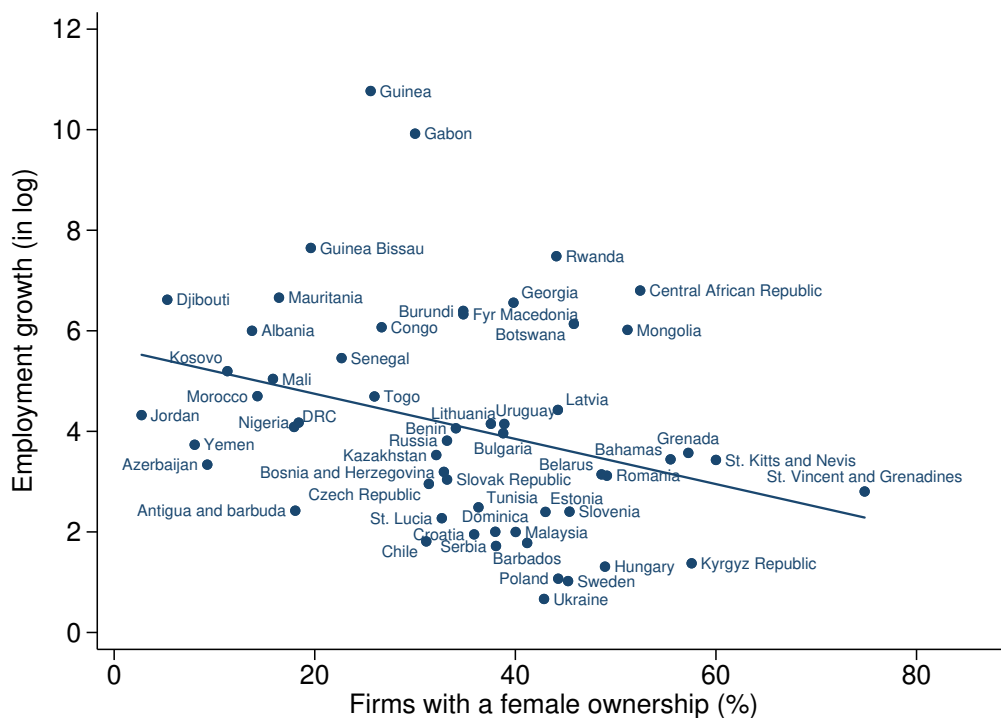
Figure 2.3: Percentage of firms with female owners by:



Source: Author's calculation based on Enterprise Surveys over the period (2006-2016).

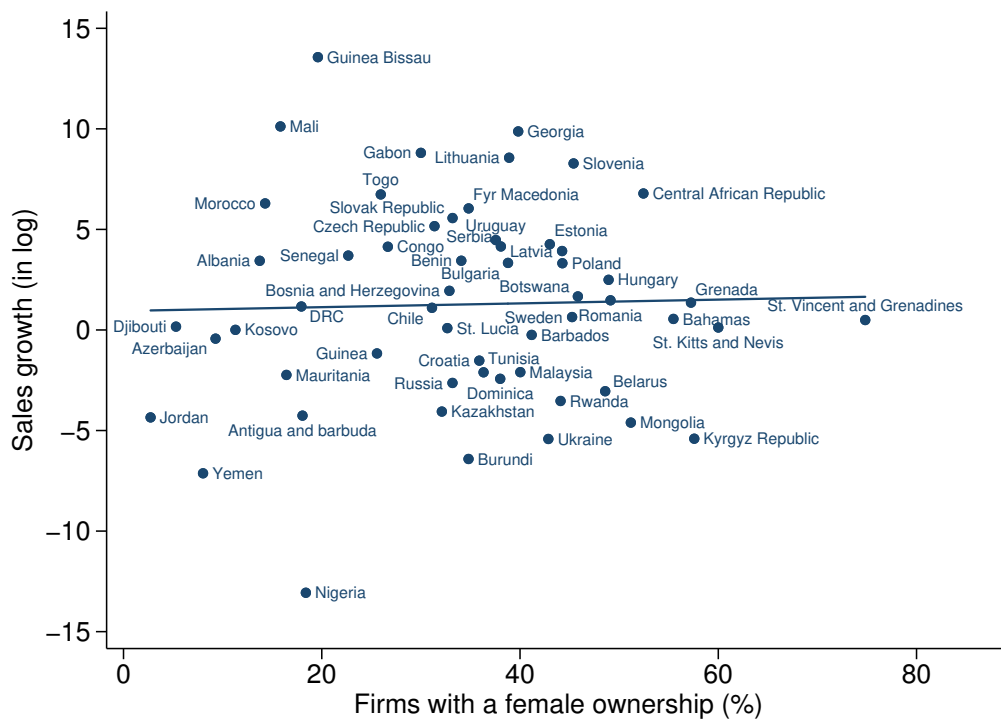
Notes: Panel (a) plots the percentage of firms with female owners by firm size. Small firms are those with less than 20 employees. Medium firms have between 20 and 99 employees and large firms have equal and more than 100 employees. Whereas Panel (b) plots the percentage of firms with female owners by firm age. Young firms (less than 5 years), mature firms (6-15 years) and older firms (more than 15 years). For the Panel (c) and the Panel (d), see Table 2.15 in the Appendix for details on identifying the countries included in each region and income group.

Figure 2.4: Employment growth and female ownership



Source: Author's compilation based on Enterprise Surveys (2006-2016).

Figure 2.5: Sales growth and female ownership



Source: Author's compilation based on Enterprise Surveys (2006-2016).

Chapter 3

Productivity, Resource Misallocation and Manufacturing TFP: Evidence from Indonesian Firm-Level Data

Resource misallocation is identified as one of the causes of the decline in total factor productivity (TFP) in developing countries. This paper applies the [Hsieh and Klenow \(2009\)](#) method to study the effects of distortions on aggregate TFP and establishment-level productivity growth using a rich database of Indonesian establishments belonging to manufacturing industries from 1990 to 2015. The main results are as follows. First, there is a significant increase in resource misallocation across manufacturing establishments, and its impact on manufacturing TFP in Indonesia over the analyzed period significantly, noticeably exceeding the benchmark economies (U.S., E.U.). Second, efficient resource allocation in Indonesia could increase manufacturing TFP between 136% and 292%. Third, the efficient distribution of plant size that would be obtained without distortions would be more dispersed than the actual distribution. Fourth, the distortions have a significant impact on plant-level productivity growth. Finally, firm-level regressions show that TFP related to physical productivity "TFPQ" is positively correlated with firm size, age, and state ownership, while negatively related to firms with a high import share. On the other hand, large firms, foreign-owned firms, and importing and exporting plants are less distorted. This study also examines the productivity impacts of trade liberalization by reducing tariffs on final goods and reducing tariffs on intermediate inputs across firms. The results show positive effects of trade liberalization on firm efficiency as measured by TFPQ and TFPR, focusing on the effect of financial liberalization reform. These results are robust even after controlling for other weights, the Asian financial crisis, and various firm-level characteristics.

JEL classification numbers: D24, D61, L60, O12

Keywords: Resource misallocation; Revenue and physical quantity total factor productivity (TFP-R, TFP-Q); Input and output tariff reductions; Financial reforms; Manufacturing; Firm-level data; Indonesia.

3.1 Introduction

There is interest among Indonesia policy circles in the extent to which Indonesia's poor productivity performance. A number of recent studies argue that the misallocation of resources among firms is a prime cause of underdevelopment. Resources are often misallocated due to the presence of market frictions, with the least productive firms attracting a large number of resources, thereby reducing the growth potential of the most productive. This inefficiency in resource distribution has a negative impact on the overall level of productivity. Understanding the frictions that influence the misallocation of resources is therefore critical to designing effective policy.

One way to assess the role of resource misallocation is to measure how much output could be gained by reallocating capital and labor across plants, in the spirit of [Hsieh and Klenow \(2009\)](#). In this framework, allocation efficiency can be divided into two components, within- and between- industry. The within-industry component measures total output as the fraction of output that could be achieved if capital and labor were reallocated optimally within each industry. The between-industry component measures the latter as a fraction of output that could be achieved by reallocating capital and labor optimally across all plants. In this paper, I focus on quantifying the extent of resource misallocation and the potential TFP gains that could be achieved by better allocative efficiency within industries and the potential sources of distortion.

Given the novelty of the data, this paper is a first step in analyzing the role of resource misallocation in explaining Indonesia's performance, which has been poor despite accelerating productivity growth in recent years. Indonesia is an interesting case for studying the problems arising from resource misallocation because of its severe economic crisis in the late 1990s. In recent years, the country has implemented a series of reforms with trade liberalization and encourages local producers to export to international markets. As a result, Indonesia is now characterized as a two-tier economy, with an innovative, productive, export-oriented sector existing alongside a less productive domestic sector focused on less technology-oriented industries (e.g., low-skilled manufacturing and tourism). In addition, manufacturing is a major contributor to the economy's output, contributing approximately 26.35% of GDP in 2019.

The misallocation of resources remains one of the most discussed topics when looking at the effects of liberalization, whether in developed or developing countries. In addition, the effects of trade liberalization on firms are important for understanding the overall gains from trade. Benefits to the economy arise if more productive firms expand due to trade liberalization, while less productive firms lose and contract. For example, Indonesia became a member of the World Trade Organization (WTO) in January 1995. At that time, it committed to reducing all bound tariffs to 40% or less over a ten-year period ([Amiti and Konings, 2007](#)). Therefore, this study contributes to the growing literature on resource misallocation by paving the way for firm-level analysis to measure the impact of trade liberalization and financial reform on total factor productivity as measured by TFPQ, TFPR, and distortions based on a unique firm-level data set for Indonesia over the period 1990-2015. Therefore, we attempt to answer the question: to what extent does trade affect firm efficiency?

This paper investigates whether changes in resource misallocation within an industry may have contributed to Indonesia's poor productivity performance over time. I use establishment-level data from

the Indonesian Manufacturing Census to answer the following research questions: (i) How important is a deterioration in allocative efficiency in reporting TFP performance in Indonesia over time? (ii) What are the main distortions that have contributed to changes in allocative efficiency? (iii) What would have been the distribution of firm size in the absence of distortions? To answer these questions, this research used the framework employed in [Hsieh and Klenow \(2009\)](#) (hereafter, H.K.) in the Indonesian manufacturing firm dataset with 103,018 observations in the final sample to calculate physical and revenue productivity (TFPQ and TFPR), as well as plant-specific output and capital distortions, for each year between 1990 and 2015. By answering these questions, this paper goes further in providing a better understanding of the potential productivity gains from removing distortions in Indonesia and complements the flow of literature that uses micro-level data to measure the magnitude of micro-level distortions on aggregate productivity ([Buera et al. \(2017\)](#); [Restuccia and Rogerson \(2008\)](#); [Bhattacharya et al. \(2013\)](#); [Chen and Irarrazabal \(2015\)](#)). This analysis will provide useful guidance to inform policies to improve market efficiency and achieve inclusive and sustainable economic growth.

The main findings are as follows. (i) Consistent with the existing literature, there is a significant misallocation of resources in the Indonesian manufacturing industry. The dispersion of revenue productivity is almost two to three times higher than in the U.S. and European benchmarks and has increased over time. Furthermore, the results showed that total distortions are mainly due to output distortions, but capital distortions are also relatively high. (ii) Resources are hypothetically reallocated by equalizing the TFP related to revenue productivity "TFPR" across plants and within industries. If the distortions were eliminated (i.e., TFPR were equalized across firms within each industry), the potential gains would be estimated to be between 136% and 292%. (iii) Another implication of the H.K. model is that the efficient distribution of plant size that would be obtained without any distortions would be more dispersed than the actual distribution. In addition, many small Indonesian firms are larger than their optimal size, given their relatively low productivity levels. Thus, if we compare the actual firm size with the efficient distribution of manufacturing firm size, 89% of the total share of firms in Indonesia would be required to reduce their size, compared to 11% of those firms that would be required to increase their size. The general explanation for this result is that small firms are subsidized by size contingent policies that favor small firms by reducing the cost of capital (through investment subsidies or special credit lines) or the cost of labor (through special labor regulations). (iv) Distortions have a significant negative impact on productivity growth at the plant level. Finally, firm-level regressions show that physical productivity "TFPQ" is positively correlated with firm size, age, and state ownership, while it is negatively related to firms with a high import share. On the other hand, large firms, foreign-owned firms, and importing and exporting plants are less distorted.

Following an analysis of the effects of input-output liberalization on firm productivity, the paper examines changes in production processes across firms of different "real" productivity, i.e., the efficiency of firm production as calculated using quantity-based total factor productivity (TFPQ) and revenue productivity (TFPR). A lower output tariff can increase TFPQ by inducing tougher import competition, i.e., increasing foreign competition in the domestic market. Positive gains in immediate revenue productivity (TFPR) result from the increase in the profit margin of firms. With output trade liberalization, the least productive firms reduce their production scope. On the other hand, cheaper imported inputs can increase TFPQ through learning, and firms can access better quality inputs and new varieties. As

a result, firms increase the scope and quality of their products.

The remainder of this paper is structured as follows: Section (3.2) discusses the literature on some frictions and policies that have been linked to resource misallocation. Section (3.3) briefly describes the monopolistic competition model of [Hsieh and Klenow \(2009\)](#) to measure misallocation within industries and provides details on the methodology used to obtain the empirical results. The Section (3.4) describes the panel dataset used in the analysis and how to calculate idiosyncratic distortions at the plant level. In addition, it provides an overview of the context of the Indonesian economy, the distribution of firms, and the misallocation of resources using provincial data over the period examined. It is followed by the Section (3.5) that presents the empirical results. The Section (3.6) shows the robustness of the results. Finally, the Section (3.7) summarizes the main results and concludes. The appendices present the derivation of the aggregate TFP using plant-specific wedges, the definition of the variables, and the descriptive statistics of the sample firms and productivity.

3.2 Related Literature

The literature has highlighted the possibility that resources are not allocated efficiently among different production opportunities, leading to a decrease in TFP. This perspective is interesting for understanding the higher degree of misallocation in some developing countries for at least two reasons. First, in developed countries, it is well established that the reallocation of factors across production units explains a large part of productivity growth over time. Second, it is widely recognized that specific public policies and institutions prevailing in developing countries and weak economies may distort the allocation among production units. Most of these studies have focused on the allocation of labor and capital across firms. However, workers are not homogeneous, and how their characteristics match the skill demands of firms affects overall productivity. In this sense, a skill mismatch occurs when the match is not perfect, or the most skilled workers are not assigned to the most productive firms. While [Jovanovic \(2014\)](#) studies misallocation using an allocation framework with heterogeneous firms and workers.

Other studies attempt to link credit market imperfections to misallocation. For example, some studies such as [Banerjee and Duflo \(2005\)](#) provide evidence that suggests that capital misallocation resulting from credit constraints and institutional failure is a major source of productivity differences across countries. Similarly, other related studies such as [Buera et al. \(2011\)](#); [Midrigan and Xu \(2014\)](#); [Gopinath et al. \(2017\)](#); and [Wu \(2018\)](#) have shown that capital market imperfections are a barrier to the efficient allocation of resources across production opportunities. For example, as firms become more dependent on external resources to finance their investment decisions, misallocation of capital across sectors and firms can occur when financial frictions prevent the most productive firms from obtaining sufficient funds to reach their optimal size. These financial frictions may be associated with information asymmetries and borrowing constraints.

On the other hand, resource allocation can also be distorted when rules and regulations are applied differently to firms of different sizes. Such size-dependent regulations include, for example, taxes on capital and labor applicable to large firms or subsidies to small firms. In general, these policies induce firms to enter the market despite their low productivity, to be smaller than optimal because of the costs

of regulation, and thus have negative consequences for overall productivity ([Garicano et al., 2016](#)). For instance, [Lileeva and Trefler \(2010\)](#) study the impact of trade tariff reductions on firm productivity in Canada. Similarly, [Epifani and Gancia \(2011\)](#) argue that trade barriers influence the degree of competition and thus affect margins. These varying margins are a source of distortion and misallocation of resources. [Eslava et al. \(2013\)](#) focus on whether significant changes in tariffs in Colombia are associated with resource misallocation.

[Restuccia and Rogerson \(2008\)](#), using a model incorporating heterogeneous firms facing different levels of distortion, showed that resource misallocation across firms can significantly reduce TFP. Furthermore, they pointed out that productivity losses due to misallocation would be more considerable if distortions were positively correlated with the level of firm productivity. Previous work suggests that resource misallocation within an industry may be necessary for explaining low productivity growth in Indonesia. Building on the seminal work of [Restuccia and Rogerson \(2008\)](#), growing literature studies the impact of resource misallocation on GDP and TFP growth and generally finds significant adverse effects. [Hsieh and Klenow \(2009\)](#) develop a model of monopolistic competition with heterogeneous firms, which have not only different levels of productivity but also face different distortions in output and capital. These distortions lead to a dispersion of the marginal products of capital and labor across firms and, consequently, to a decline in TFP in order to show the effect of resource misallocation on aggregate productivity.

In addition, other research following the methodology of [Hsieh and Klenow \(2009\)](#) confirms the quantitative importance of misallocation for several countries. For example, the case of Chile is also studied by [Oberfield \(2013\)](#) and [Chen and Irarrazabal \(2015\)](#). [Oberfield \(2013\)](#) studied the period 1979-1996, i.e., the entry into the 1982 crisis and the post-crisis recovery. The estimates show that the Chilean manufacturing sector underperformed its optimal productivity by 43-54 percent. [Chen and Irarrazabal \(2015\)](#) studied the period 1983-1996, i.e., the post-crisis recovery period. They found that the gap between TFP and optimal productivity ranged from 40.6 percent to 76.1 percent, while improvements in resource allocation efficiency accounted for 38.3 percent of the overall TFP growth in manufacturing between 1983 and 1996.

[Sandleris and Wright \(2014\)](#), provides evidence that resource misallocation was responsible for nearly half of the deterioration in TFP during the Argentine crisis of 2001. Besides, [Machicado and Birbuet \(2012\)](#) found that about 42% of the decline in TFP in the manufacturing sector could be attributed to suboptimal resource allocation. [Gopinath et al. \(2017\)](#) found an increase in the misallocation of capital in Southern European countries, in particular, a decline in the real interest rate during the process of convergence to the euro. This led to a decline in TFP, as increased capital flows were misallocated to firms with a higher net worth but were not necessarily more productive. Moreover, [Barnett et al. \(2014\)](#) found that the increased misallocation of resources contributed significantly to the productivity slowdown in the United Kingdom.

In recent years, research has also focused on zombie firms¹, and their relationship to efficient resource allocation. [McGowan et al. \(2017\)](#) shows that zombie firms are less productive than their counterparts

¹There are several definitions of zombie firms in the literature. [McGowan et al. \(2017\)](#) defines zombie firms as old firms that do not have enough funds to cover their interests and remain in business.

and that viable firms have fewer opportunities for growth, which has negative effects on the efficiency of resource allocation. Some authors have been particularly interested in the impact of distortions on a specific set of firms, the frontier firms, i.e., the most productive firms in the economy. [Andrews et al. \(2016\)](#) has found that these firms exhibit significant differences in productivity dynamics relative to their peers (lagging firms). [Andrews et al. \(2015\)](#) argued that productivity improvements could be achieved if the most productive firms in each country were able to reach their optimal size. This, they argued, could be achieved through a set of structural reforms aimed at reducing barriers to the growth of these firms, such as greater flexibility in product and labor markets, lower barriers to exit, or easier access to capital markets.

Our paper departs from these studies in two ways: first, with the benefit of panel data, we are able to show the dynamics of resource misallocation and its effect on TFP. Second, we provide evidence, utilizing firm-specific characteristics to inform how firm characteristics conditions interplay with distortions. Additionally, it is very important to link our measures of productivity and idiosyncratic distortions to policies that may have led to improved allocative efficiency in terms of trade and financial liberalization over the period analyzed. Indeed, the majority of the studies have argued the effect of trade reform based on revenue total factor productivity (TFPR). However, TFPR does not disentangle the effects of trade liberalization on firms' production efficiency (TFPQ), in terms of producing more products with the same amount of inputs. Therefore, relative to the existing literature, our analysis goes one step further and investigates the heterogeneous effects of trade liberalization on firms' efficiency (TFPQ) and revenue productivity (TFPR), which is one of the main potential avenues for countries to boost productivity levels. This issue features high on policymakers' agenda.

3.3 Theoretical framework: Misallocation and Productivity

In this section, I use the methodology developed by [Hsieh and Klenow \(2009\)](#) (H.K. hereafter), incorporating their correction appendix ([Hsieh and Klenow, 2013](#)), to identify the link between an economy's aggregate productivity and the misallocation of resources that results from the existence of a firm-level distortion that affects the optimal allocation of production factors. I also solve the model along an alternative path to derive new results and perform further analysis.

The H.K. model is based on [Melitz \(2003\)](#) of monopolistic competition with heterogeneous firms facing price distortions that they observe. Firms recognize their market power in their variety (i), but they take the aggregate of the economy as given. In addition to differences in their efficiency levels, I assume that firms potentially face different levels of distortions in production and capital. This model evaluates the effect of resource misallocation within an industry on aggregate productivity, which has recently been applied by [Calligaris \(2015\)](#), [Chen and Irarrazabal \(2015\)](#), [García-Santana et al. \(2016\)](#), [Gopinath et al. \(2017\)](#) and others. This misallocation of resources is caused by distortions that produce differences in the marginal productivity of capital and labor and lower total factor productivity (TFP) ([Hsieh and Klenow, 2009](#)).

In this model, this implies that revenue productivity between firms in the same industry should be equalized. Therefore, the change in revenue productivity is considered a measure of resource misallocation

due to distortion within an industry. The results support the hypothesis that the increase in resource misallocation among firms is the cause of the poor performance of the Indonesian aggregate TFP. The Appendix (3.A) contains a detailed derivation of the model equations.

A single final good (Y) is produced by a representative firm in a perfectly competitive final goods market. The firm combines products Y_s produced in a finite number of different industries $s \in S$ that are aggregated to produce the final good using Cobb-Douglas production technology²:

$$Y = \prod_{s=1}^S Y_s^{\theta_s} \quad \text{where} \quad \sum_{s=1}^S \theta_s = 1 \quad (3.1)$$

maximizing the production of the final output implies that the share of the value-added industry share, θ_s , is given by $(\theta_s = \frac{P_s Y_s}{PY})$. The final output Y is assumed to be the numeraire such that its price P is normalized to 1. The Cobb-Douglas hypothesis implies that the only source of inefficiency in this model is misallocation within the industry. The increase (decrease) in an industry's productivity is fully offset by the decrease (increase) in its price index. In turn, the output of each industry Y_s is obtained by combining N_s of differentiated products produced by an individual firm (indexed by i). Thus, the output of industry Y_s is that the aggregate output of individual firms Y_{si} employing constant elasticity of substitution (CES) technology ($\forall s = 1, \dots, S$), which is given by :

$$Y_s = \left(\sum_{i=1}^{N_s} Y_{si}^{\frac{\epsilon-1}{\epsilon}} \right)^{\frac{\epsilon}{\epsilon-1}}$$

where ϵ is the elasticity of substitution between varieties of differentiated goods. The higher this value, the more substitutable the products are, and the less the firm can control the market price through its markup. The firm (i) in an industry (s) employs capital (K_{si}) and labor (L_{si}) has access to a constant return to scale production function of the form³:

$$Y_{si} = A_{si} K_{si}^{\alpha_s} L_{si}^{1-\alpha_s} \quad (3.2)$$

where $0 < \alpha_s < 1$ is the degree of constant production efficiency, and each firm is characterized by its physical productivity (A_{si}). Besides, α_s is an industry-specific share of capital, which is different from one industry to another but identical for all firms in the same industry.

3.3.1 Marginal revenue products and sources of misallocation

The idea of the H.K. model is that each firm acts as a monopoly on its differentiated product and is confronted with two types of "wedges", output distortions (τ_{si}^Y) which take the form of a tax (or subsidy) on revenue and capital distortions (τ_{si}^K) that take the form of a tax on capital services, which induce distortions in the choice of inputs relative to an efficient allocation of inputs. Specifically, output distortions increase the marginal products of capital and labor by the same proportion, while capital distortions increase the marginal product of capital relative to labor.

²I suppress the time subscript to avoid heavy notation. However, I utilize firm-level panel data in the empirical analysis. That means variables with a (i) subscript refer to the firm i , variables with a (s) subscript refer to aggregates for industry s , and variables without a subscript refer to the aggregate for all manufacturing firms.

³While [Gong and Hu \(2016\)](#), they estimated the elasticities of capital and labor by relaxing the assumption of constant returns to scale for differentiated products.

As noted in [Dias et al. \(2016\)](#) and [Ryzhenkov \(2016\)](#), output distortions may be due to factors such as high transportation costs, bribes, tax regulations, or restrictions on firm size due to the limited size of the market. On the other hand, capital distortions increase the cost of capital, which includes credit restrictions or conditions that differ from one firm to another firm, such as credit history, fraud patterns, and interest rates⁴. These market distortions appear as "*taxes*" in the firm's profit equation. The problem of a firm (i) in an industry (s) is described below:

$$\pi_{si} = \max_{\{P_{si}, L_{si}, K_{si}\}} \left\{ (1 - \tau_{si}^Y) P_{si} Y_{si} - w L_{si} - (1 + \tau_{si}^K) r K_{si} \right\}$$

where $P_{si} Y_{si}$ is the firm's nominal value-added; it is calculated as the difference between gross output (operating revenues) and materials. w denotes the wage rate, and r denotes the rental cost of capital, composed of the real interest rate and the depreciation rate. From the first-order conditions (FOC) of profit maximization, the firm's optimal price can be given by :

$$P_{si} = \underbrace{\frac{\epsilon}{\epsilon - 1}}_{\text{fixed markup}} \underbrace{\left(\frac{r}{\alpha_s} \right)^{\alpha_s} \left(\frac{w}{1 - \alpha_s} \right)^{1 - \alpha_s} \frac{(1 + \tau_{si}^K)^{\alpha_s}}{A_{si} (1 - \tau_{si}^Y)}}_{\text{marginal cost}} \quad (3.3)$$

this is the standard equation indicating that the price of a firm's output is a fixed markup charged by the firm and its marginal cost. This equation indicates that distortions in capital and output affect a firm's marginal cost and, therefore, its factor allocation decisions. If there is no market friction, the constant margin of price over marginal cost ensures that the firm's higher productivity is fully passed on to the consumer in the form of a lower price; ([Melitz and Redding, 2014](#)).

The dispersion of productivity across firms in the same sector is generally considered a measure of resource misallocation. However, the allocation of resources across firms depends not only on the level of TFP of each firm but also on the output and capital distortions they face. This results in differences in the marginal products of labor and capital across firms. Rewriting the two profit-maximizing FOCs, the marginal revenue products of labor and capital are proportional to the revenue per worker and the revenue-capital ratio, respectively⁵.

$$MRPL_{si} \equiv \frac{\epsilon - 1}{\epsilon} (1 - \alpha_s) P_{si} Y_{si} = w L_{si} \frac{1}{(1 - \tau_{si}^Y)} \quad (3.4a)$$

$$MRPK_{si} \equiv \frac{\epsilon - 1}{\epsilon} \alpha_s P_{si} Y_{si} = r K_{si} \frac{(1 + \tau_{si}^K)}{(1 - \tau_{si}^Y)} \quad (3.4b)$$

In the absence of idiosyncratic distortions ($\tau_{si}^K = 0$ and $\tau_{si}^Y = 0 \quad \forall si$), all firms in a given industry would equalize their marginal revenues at factor prices (w and r), which means that the capital-labor ratio is equalized across firms. In contrast, the existence of idiosyncratic distortions, τ_{si}^Y and τ_{si}^K , in factor markets, prevents firms from equalizing their capital-labor ratios. This also leads to a dispersion of marginal revenue products and a decline in TFP.

⁴For example, if we have two companies that have the same technology, but one can borrow from the bank at a higher interest rate than the other that can borrow at a lower interest rate. The result is a misallocation of capital because the marginal product of capital will be higher in the firm that borrows at a higher rate than the other, even if both firms have the same technologies.

⁵The products of marginal revenue are given by the products of marginal (physical) products and marginal income. Here they are simply derivatives of after-tax revenue, $(1 - \tau_{si}^Y)$, relative to K_{si} and L_{si} , respectively.

The first step in the analysis is to calculate the distortions in output and capital that lead to the dispersion of marginal revenue products; this means that marginal revenue products should be higher in firms that face disincentives and may be lower in firms that receive subsidies. Note that the output distortion affects the marginal revenue product of two factors symmetrically, but does not distort the capital-labor ratio. In contrast, a capital distortion $(1 + \tau_{si}^K)$ makes capital services more expensive relative to labor services, distorting the capital-labor ratio below the level of the first choice. Using the marginal revenue product equations (3.4a & 3.4b), the two wedges can be estimated from information on value-added, input costs, elasticity, and factor shares :

$$(1 - \tau_{si}^Y) = \frac{\epsilon}{\epsilon - 1} \frac{1}{(1 - \alpha_s)} \frac{w L_{si}}{P_{si} Y_{si}} \quad (3.5a)$$

$$(1 + \tau_{si}^K) = \frac{\alpha_s}{(1 - \alpha_s)} \frac{w L_{si}}{r K_{si}} \quad (3.5b)$$

3.3.2 Physical, revenue productivity, and aggregate TFP

According to Foster et al. (2008) and Hsieh and Klenow (2009), there are two types of productivity at the firm level: physical productivity (TFPQ), which measures productivity in terms of actual output A_{si} , and revenue productivity (TFPR), which represents a firm's revenue $P_{si} A_{si}$. The former explains how many units of output a firm can obtain by using inputs in production, while the latter illustrates how much revenue can be obtained from the same amount of inputs. This distinction is important because it is usual to use revenue when estimating the production function since the physical output is usually unavailable. Therefore, TFPR can be calculated using industry-level price deflators that do not vary across plants in the same industry unless plants face capital and/or output frictions. Conversely, it is common for the TFPQ to vary across firms because different firms may have different productivity levels. Thus, the firm-level TFPQ and TFPR are defined as follows⁶:

$$TFPQ_{si} \equiv A_{si} = \kappa_s \frac{(P_{si} Y_{si})^{\frac{\epsilon}{\epsilon-1}}}{K_{si}^{\alpha_s} L_{si}^{(1-\alpha_s)}} \quad (3.6)$$

$$TFPR_{si} \equiv P_{si} A_{si} = \frac{\epsilon}{\epsilon - 1} \left(\frac{r}{\alpha_s} \right)^{\alpha_s} \left(\frac{w}{1 - \alpha_s} \right)^{1-\alpha_s} \frac{(1 + \tau_{si}^K)^{\alpha_s}}{(1 - \tau_{si}^Y)} \quad (3.7)$$

Intuitively, a high (low) TFPR means that the firm faces barriers (receives subsidies) that increase (decrease) the marginal products of capital and labor in the plant, making the plant smaller (larger) than optimal. Thus, the higher the $(1 + \tau_{si}^K)$ and the lower the $(1 - \tau_{si}^Y)$ in the equation (3.7), the lower the output relative to the optimal level. Therefore, the price P_{si} and, consequently, $TFPR_{si}$ are higher than the first optimal level⁷. Similarly, aggregate TFPQ should be high in the absence of distortions, implying a reallocation of resources from less productive firms to more productive ones. However, there will be some dispersion in firms' physical productivity distribution due to inefficiencies in resource allocation. To assess productivity gaps for each manufacturing industry, the actual ratio of TFP to efficient TFP is

⁶See Appendix (3.A.3) for more details of the calculation.

⁷Recall that in the absence of distortions, revenue productivity should be equalized across plants and the first best allocation is achieved because more resources would be allocated to firms with higher physical productivity (TFPQ), resulting in higher output and lower prices.

calculated and aggregated across all sectors using the Cobb-Douglas aggregator.

$$\frac{TFP}{TFPE} = \prod_{s=1}^S \left[\left(\sum_{i=1}^{N_s} \left(\frac{A_{si}}{\bar{A}_s} \frac{\overline{TFPR}_s}{TFPR_{si}} \right)^{\epsilon-1} \right)^{\frac{1}{\epsilon-1}} \right]^{\theta_s} \quad (3.8)$$

The TFP gap is the potential gain resulting from the reallocation of factors, which is calculated as follows:

$$\% Gain = \left(\frac{TFPE}{TFP} - 1 \right) * 100 \quad (3.9)$$

3.3.3 Decomposition analysis of industry TFP

This section presents a decomposition analysis of potential gains to identify the key factors that determine the misallocation of resources in the economy. Assuming that A_{si} , $(1 - \tau_{si}^Y)$, and $(1 + \tau_{si}^K)$ are jointly distributed according to a log multivariate-normal (MVN) distribution, we understand the forces that determine aggregate TFP by decomposing it into different components. Using the central limit theorem and assuming that $N_s \rightarrow \infty$ as described (Midrigan and Xu, 2014), we obtain the following decomposition for aggregate TFP⁸:

$$\log(TFP_s) = \underbrace{\mathbb{E}(a_{si}) + \frac{(\epsilon-1)}{2} \sigma_{a_{si}}^2}_{\log(TFPE_s)} - \frac{\epsilon}{2} \sigma_{(1-\tau_{si}^y)}^2 - \frac{\alpha_s + \alpha_s^2(\epsilon-1)}{2} \sigma_{(1+\tau_{si}^k)}^2 + \alpha_s \epsilon \text{cov}((1 - \tau_{si}^y), (1 + \tau_{si}^k))$$

The above equation implies that changes in sectoral manufacturing TFP come from two sources: *first*, changes in efficient TFP or the distribution of physical productivity, represented by the first part on the right-hand side; *second*, changes in allocative efficiency, represented by the second, third and fourth parts on its right-hand side. Thus, the relative sectoral loss is equivalent to the relative loss in the sector's aggregate output due to the inefficient allocation of inputs implied by the presence of the dispersion of input costs across firms. It is given by:

$$\begin{aligned} \log\left(\frac{TFPE_s}{TFP_s}\right) &\equiv \log\left(\frac{A_s^E}{A_s}\right) \\ &= \frac{\epsilon}{2} \sigma_{(1-\tau_{si}^y)}^2 + \frac{\alpha_s + \alpha_s^2(\epsilon-1)}{2} \sigma_{(1+\tau_{si}^k)}^2 - \alpha_s \epsilon \text{cov}((1 - \tau_{si}^y), (1 + \tau_{si}^k)) \end{aligned}$$

it can be expressed in terms of $TFPR$:

$$\log\left(\frac{TFPE_s}{TFP_s}\right) = \underbrace{\frac{\epsilon}{2} \text{var}\left(\log(TFPR_{si})\right)}_{(a)} + \underbrace{\frac{\alpha_s(1-\alpha_s)}{2} \text{var}\left(\log(1 + \tau_{si}^K)\right)}_{(b)} \quad (3.10)$$

where;

$$\begin{aligned} \text{var}\left(\log(TFPR_{si})\right) &\equiv \text{var}\left(\log\left(\frac{(1 + \tau_{si}^K)^{\alpha_s}}{(1 - \tau_{si}^Y)}\right)\right) \\ &= \alpha_s^2 \text{var}\left(\log(1 + \tau_{si}^K)\right) + \text{var}\left(\log(1 - \tau_{si}^Y)\right) - 2\alpha_s \text{cov}\left(\log(1 - \tau_{si}^Y), \log(1 + \tau_{si}^K)\right) \end{aligned} \quad (3.11)$$

⁸See Appendix (3.A.4) for details of the calculation.

The interpretation of the equation (3.10) is very intuitive, since it is simply the ratio of efficient output to observed output on the left-hand side, which represents efficiency gains in the industry (s). Component (a) captures on its right-hand side the distortions in the allocation of sources across firms. Consequently, an increase in the elasticity of substitution (ϵ) or dispersion of $TFPR_{si}$ leads to a decrease in the TFP of the industry relative to the efficient industry and thus a decrease in the aggregate level of TFP. While component (b) on its right-hand side captures the distortions that derive the capital-labor ratio $\left(\frac{K_{si}}{L_{si}}\right)$ away from the first-best outcome. Notice also that in the equation (3.11), it captures the misallocation of resources due to the specific distortion of capital in the first part of its right-hand side, the second term is due to the distortion of output, and the third term has their covariance.

3.4 Data and stylized facts

This section first describes the dataset used to analyze firm-level distortions in the Indonesian manufacturing sector and documents some important stylized facts about aggregate output, the market structure of the manufacturing sector, and the distribution of firms by province – firm-level TFP gains.

3.4.1 Data description

The survey of large and medium-sized manufacturing firms is the primary data source for this analysis provided by the Indonesian Central Bureau of Statistics (Badan Pusat Statistik, BPS) to cover all manufacturing firms employing 20 or more people on an annual basis. Following the 2016 Indonesian Economic Census definition, which uses an employment-based classification, where medium-sized firms employ 20-99 people, and large firms employ more than 99 people. This dataset provides an unbalanced panel of 21,819 of the firms over the period 1990-2015. Each firm participating in the survey was given a unique code to generate a panel dataset using the firm's unique identifier.

The BPS uses the International Standard Industrial Classification (ISIC) for all economic activities. The industry classification is crucial for calculating the extent of resource misallocation within industries because the ISIC code has changed over time. Thus, I convert all manufacturing industries to the 3-digit ISIC code (ISIC rev. 3) with about 29 industries represented in the sample (see the Table 3.20 for more details in the Appendices) to match other databases in calculating firm-level distortions such as labor shares of U.S. industries.

This dataset on manufacturing establishments at the enterprise level contains detailed information, including enterprise identification, sectoral classification, type of ownership, the proportion of exported output, and the value of imported and domestically produced inputs. Among other things, firms are also required to answer a series of questions about their production, output, value-added, capital, and labor. Since the main objective is to examine the magnitude and impact of resource misallocation on aggregate TFP in the Indonesian manufacturing sector, I use firms' information on wages, material costs, capital, and labor to calculate the distortion variables. Following [Petrin and Levinsohn \(2012\)](#), and [Bartelsman et al. \(2013\)](#), I use firm employment as a measure of firm labor input. A robustness check using wage bill as the measure of labor input is provided in (3.6.2). In addition, all monetary variables are deflated to 2010 constant prices using the consumer price index (CPI).

To enhance the robustness of the results, I follow the order of the data cleaning steps. First, I drop plants that enter or exit more than twice and remain in the sample for less than five consecutive years. Second, I drop plants that are at the top of the 0.1% of investment each year. Third, I drop plants with negative value-added and investment and missing information on employment, capital, value-added, and wages to track dynamic changes in measures of allocative efficiency. Further, I drop firms that are at the top and bottom of the wage distribution by 0.2% of the wage distribution each year. Finally, the upper and lower tails of 1% of the distribution of $TFPQ$, $\log(TFPR_{si}/\overline{TFPR_s})$, $TFPR$, and $\log(A_{si}N_s^{\frac{1}{\epsilon-1}}/\overline{A_s})$ are trimmed to account for outliers for each year and recalculate the firm's wage bill, capital and value-added, as well as physical productivity and revenues. At this point, I calculate the industry's share ($\theta_s = P_s Y_s / Y$). After removing these plants, the final sample of observations averages about 103,018. Most of the analyses focused on the sub-sample called the "unbalanced panel", and I also computed the corresponding statistics for a "balanced panel" for comparison purposes and performed robustness checks (Section 3.6.2). These are the firms that survived the entire analyzed period from 1990 to 2015 (see Table 3.18 for more details in the Appendices).

Table 3.1: Summary statistics

Variables	Observation	Mean	Standard deviation	Minimum	Maximum
<i>Firm characteristics</i>					
Size	103,018	1.309	0.462	1	2
Medium	103,018	0.691	0.462	0	1
Large	103,018	0.309	0.462	0	1
Firm age	103,018	3.560	3.589	0	15
Government ownership	103,018	0.048	0.215	0	1
Foreign ownership	103,018	0.066	0.248	0	1
Import share	103,018	0.061	0.149	0	1
Export share	103,018	0.110	0.287	0	1
Island	103,018	2.117	0.793	1	5
<i>Inputs & types of distortions</i>					
Employment (log)	103,018	4.213	1.170	2.3	10
Wage bill (log)	103,018	9.194	0.779	3.6	13
Capital stock (log)	103,018	11.392	2.820	.82	24
Interest expense (log)	41,135	10.777	2.626	1.4	19
Output distortion $[\log(1 - \tau_{si}^Y)]$	103,018	-8.822	1.627	-16	-2.3
Capital distortion $[\log(1 + \tau_{si}^K)]$	103,018	-4.253	2.595	-17	7.8
<i>Productivity measures & others</i>					
Value added (log $P_{si}Y_{si}$)	103,018	13.901	2.142	6.4	23
Physical productivity (log $TFPQ_{si}$)	103,018	14.380	2.320	5.6	23
Revenue productivity (log $TFPR_{si}$)	103,018	7.429	1.553	.63	13
TFP (log)	103,018	17.691	1.989	11	23
Consumer price index (CPI)	103,018	67.123	39.953	13	132

The Table (3.1) reports the summary statistics for the 103,018 observations that are included in the final sample. The standard deviation of physical productivity from its industry average is 2.3, which is higher than the result of Hsieh and Klenow (2009), which found a three-year average of 0.83 in the U.S. The Appendix (3.B) provides definitions of the variables used in the empirical results.

3.4.2 Calibration of parameters

This section describes additional assumptions that facilitate the empirical analysis. To examine the degree of misallocation and its implications for TFP, certain parameters such as the elasticity of substitution, the rental price of capital, and the share of capital must be calibrated using the evidence from other studies. Following Hsieh and Klenow (2009), I set the elasticity of substitution (ϵ) to 3. For the robustness check (Section 3.6.2), I set ϵ to 5. I calibrated the rental price of capital using Indonesian data sets from the World Bank’s World Development Indicators database. The real interest rate in Indonesia over the period 1990-2015 ranged from 10.75% in 1990 to 8.35% in 2015, with an average rate of 5%.

One more variable is needed to be able to compute the TFP gains: A_{si} in equation (3.6). The problem here is that we do not observe real output for each firm (Y_{si}) but rather its nominal output ($P_{si}Y_{si}$). Then, Y_{si} can be simply inferred from the observed $P_{si}Y_{si}$ by assuming an elasticity of demand ($-1/\epsilon$). Thus, we raise $P_{si}Y_{si}$ to the power $\epsilon/(\epsilon - 1)$ to arrive at Y_{si} . This shortcut is one of the reasons that has made this approach so popular, and it is possible to compute both revenue and physical productivity for each firm⁹.

Finally, to set the capital share (α) (i.e., the elasticity of output with respect to capital) is equal to one minus the labor share in the corresponding industry in the United States. Since, I cannot separately identify the capital production elasticity in each industry and given the assumption that the U.S. economy is less distorted than the Indonesian economy, the use of U.S. shares can be justified. The U.S. labor shares are extracted from the NBER-CES manufacturing database, which is a joint product of the National Bureau of Economic Research and the Center for Economic Studies of the U.S. Census Bureau¹⁰. The industry classification is based on the North American Industry Classification System (NAICS) version 1997. Using the 3-digit ISIC classification for the industries in the analysis, the U.S. capital shares have an average value of 38.78, a minimum of 20.77, and a maximum of 77.56. As a robustness check in Section (3.6.5), I estimate the capital stock with an alternative measure using the perpetual inventory method (PIM) to see the sensitivity of our results.

3.4.3 Stylized facts

I briefly present the manufacturing section’s aggregate output and market structure by firm-level in Indonesia over the analyzed period (1990-2015). Besides, I provide an overview of the distribution of medium and large firms and TFP gain using cross-provincial data.

⁹See Appendix (3.A.3) for more details of the calculation.

¹⁰Data can be downloaded from NBER’s website at <http://www.nber.org/nberces>. In addition, I have listed the U.S. share of the labor in the Appendix 3.C.2.

3.4.3.1 Aggregate production in Indonesia

As many studies have found, total factor productivity (TFP) is a crucial factor explaining Indonesia's sustainable recovery from the crisis. The Figure (3.1) provides more information on Indonesia's aggregate production during the crisis using World Bank's World Development Index (WDI) data for the period 1990-2015. Over the past two and a half decades, Indonesia has experienced two major global crises: the Asian financial crisis of 1997/98 and the global economic crisis of 2008/09. However, the Indonesian economy has weathered the latter crisis more resiliently than the 1997/98 crisis.

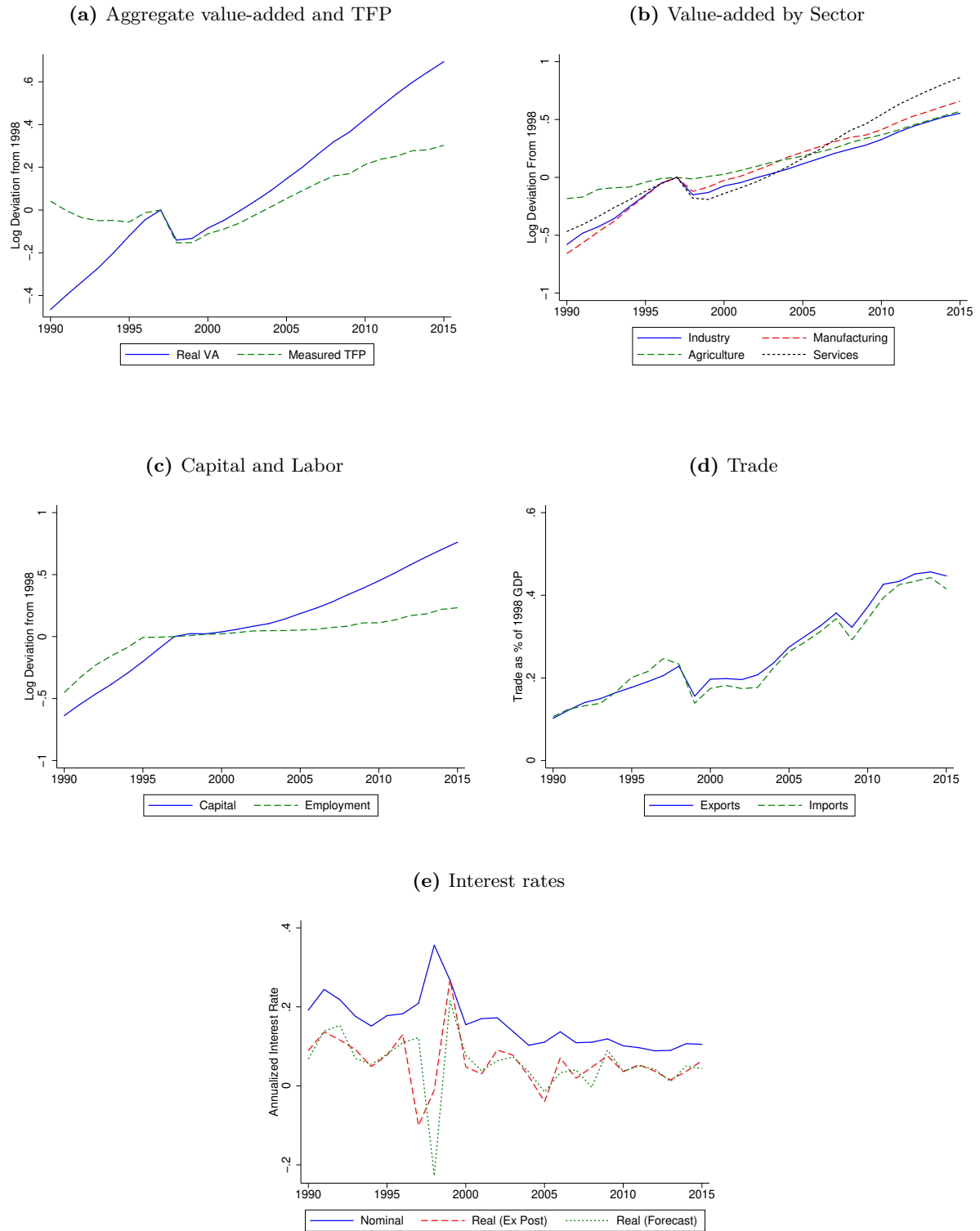
Prior to the 1997 crisis, Indonesia was characterized by high annual GDP growth rates, following the 1983 deregulation to liberalize the banking sector and foreign trade and general changes in the investment climate. This period was marked by an export-led growth strategy, including measures to attract foreign direct investment (FDI) by dismantling barriers and encouraging investment in the export-oriented sector, which fueled growth during the crisis years. [James and Fujita \(2000\)](#) showed that the development of manufacturing exports, particularly in labor-intensive industries, was the driving force behind employment gains over the period 1990-1996.

In the following period, in 1997/98, the Asian financial crisis plunged the Indonesian economy into a deep recession and a sharp decline in value-added and TFP as a whole, with an overall growth of minus 13.7% in 1998. Figure (3.1b) shows the evolution of value-added for each sector of the economy. The contraction in the manufacturing sector was mainly severe. Although Indonesia's manufacturing sector has historically played a crucial role in the country's economic growth and contributes 26.35% of GDP in 2019 ([Tarigan et al., 2019](#)), it accounted for about 12.9% of the decline in total real value-added between 1997 and 1998. In 1999, the manufacturing sector recovered slowly relative to the service sector.

The 1997/98 crisis was primarily a currency crisis, which led to the rupiah's depreciation against the U.S. dollar. As a result, the direct impact of the currency depreciation will be felt mainly in the significant decline in exports. On the import side, domestic prices of imported consumer and non-consumer goods (i.e., raw materials, capital goods, and intermediate goods) will also rise in response to the price increase. Furthermore, the economy experienced high inflation, a high nominal interest rate as a direct response of the monetary authority of the time to stop capital flight (as shown in Figure 3.1e), a decline in real incomes, and this was accompanied by an increase in unemployment due to a large number of layoffs of employees in the companies affected by the crisis, and then led to a significant increase in poverty rates ([Tambunan et al., 2010](#)).

Conversely, while the 2008-2009 crisis affected most economies in the region, Indonesia continued to grow, albeit at lower levels than those achieved during the decade thanks to a more prudent monetary policy framework, which helped minimize the effects of the crisis, except for those achieved through export demand channels-this was true for all sectors, including manufacturing, which came under severe pressure due to extremely low order levels, particularly in the U.S. and Japan. Moreover, the overall management of this crisis was much more effective than before because macroeconomic management was better, the banking sector remained sound, prices were maintained, and foreign exchange reserves were healthy and sufficient to meet debt obligations.

Figure 3.1: Aggregate production



Source: Author's calculation based on World Development Indicators (WDI) & International Monetary Fund (IMF).

Notes: Panel (a) shows value added and TFP for the Indonesian economy as a whole. Measured TFP is $\frac{VA}{K^\alpha L^{1-\alpha}}$ with $\alpha = 1/3$. Moreover, panel (b) shows the log of value added for various sectors with 1998 normalized to zero. While, panel (c) shows aggregate quantities of the capital and labor, capital is constructed using perpetual inventory method assuming 10% depreciation. Panel (d) shows total exports and imports as a percent of 1998 Indonesian GDP. All series are in logs with 1998 normalized to zero. Panel (e) shows that the annual values of real interest rates are the average of these monthly real interest rates.

However, after the crisis, job creation declined in Indonesia's labor-intensive manufacturing sector. In particular, the composition of merchandise exports shifted from light industries to more capital- and skill-intensive industries. On the other hand, [Aswicahyono et al. \(2011\)](#) found that while the share of traditionally labor-intensive industries such as textiles, clothing, and footwear has declined, the share of primary exports has persisted.

As a result, the Indonesian government implemented three major financial reforms in Indonesia from the late 1980s to the beginning of the millennium. The first wave of financial reforms was in 1983, when the government fully liberalized the deposit and lending rates of state-owned banks and removed credit limits for all banks. In 1988, the government launched the second major financial reform by reducing credit and interest controls and improving competition by allowing new financial institutions to enter the market. Specifically, the government opened the barrier to entry in three aspects: (i) liberalizing the entry of private banks; (ii) liberalizing the entry of foreign banks through joint ventures; and (iii) easing the requirements for opening branches for all banks. As a result, in the five years prior to 1993, the number of banks increased from 63 to 158, and the number of branches increased more than five times, from 559 to 2,926 ([Sato, 2005](#)). The third wave of financial reforms was the one following the Asian financial crisis, which focused on improving supervision to create healthy competition in the banking sector. These financial reforms have eased the constraints on access to loans for business financing needs. As a result of these reforms, the Indonesian economy experienced rapid growth and a massive influx of capital in the late 1990s, as shown in Figure (3.1c).

Furthermore, the Figure (3.1e) shows that the nominal interest rate is the average of the lending rate, i.e., the bank rate, which generally meets the short- and medium-term financing needs of the private sector, and the deposit rate, as reported by the IMF. Although there is no direct measure of the real interest rate, I calculate two estimates of expected inflation, as mentioned in ([Oberfield, 2013](#)): (i) the ex-post real interest rate over the analysis period is $\frac{(1-R)}{(1-\pi)} - 1$, where R is the nominal interest rate, and π is expected inflation (annualized) over the next six months, and (ii) a simple forecast using actual inflation over the previous six months.

3.4.3.2 Market structure of the Indonesian manufacturing sector by firm size

In what follows, I choose two years, 1998 and 2015, to characterize the distribution dynamics. This is because the year 1998 corresponds to the peak of the Asian financial crisis, and 2015 is the last year in the sample. The Table (3.2) presents the size structure of Indonesian manufacturing firms by subgroups for two years, 1998 and 2015. It can be seen that medium-sized firms (20-49 employees) account for about 65% of the total number of manufacturing firms and have a high share of value-added, 65.8% and 71.4% in 1998 and 2015 respectively with few employees, between 13% in 1998 and 19% in 2015. On the other hand, large firms (more than 99 employees), which account for less than 34% of the total number of firms and produce a low value-added compared to medium-sized firms, account for 80% of employment.

In order to provide additional evidence for our empirical results, it was interesting to assess the share of value-added and employment at the industry level. These results were highlighted in the Table (3.20) to provide summary statistics for each industry. It shows that the number of plants varies considerably across industries, as does the degree of competition. For example, petroleum refineries (ISIC 353) are

organized as a monopoly.

Furthermore, food manufacturing, garments manufacturing, textile manufacturing, and furniture manufacturing appear to be the most important industries, as these sectors account for the largest share of value-added. Besides, employment is dominated by textile manufacturing, which absorbs 16.1% of the labor force, followed by wood manufacturing and garments manufacturing, which account for 12.1% and 11.4% respectively. In addition, food and furniture manufacturing accounts for 8.1% and 5.6% of employment. On the other hand, value-added and employment by province remain concentrated on the island of Java as the industrial district, with 80% and 10% for the island of Sumatra.

Table 3.2: Number of plants and the share of value added, employment and wage bill by size class

Panel A: Year = 1998

Firm size class (Number of employees)	# Firms	Value Added share	Employment share	Wage bill share
20-49	1563	49.7%	7.2%	5.0%
50-99	506	16.1%	5.6%	4.9%
100-249	509	16.2%	12.6%	13.0%
250-499	264	8.4%	14.6%	17.4%
500-999	183	5.8%	20.1%	21.9%
>= 1000	123	3.9%	39.9%	37.8%

Panel B: Year = 2015

Firm size class (Number of employees)	# Firms	Value Added share	Employment share	Wage bill share
20-49	3163	47.9%	8.0%	6.8%
50-99	1553	23.5%	11.0%	12.1%
100-249	993	15.0%	13.7%	14.1%
250-499	430	6.5%	13.3%	13.8%
500-999	263	4.0%	16.5%	17.1%
>= 1000	198	3.0%	37.5%	36.2%

Source: Author's calculation based on BPS-Statistic Indonesia data.

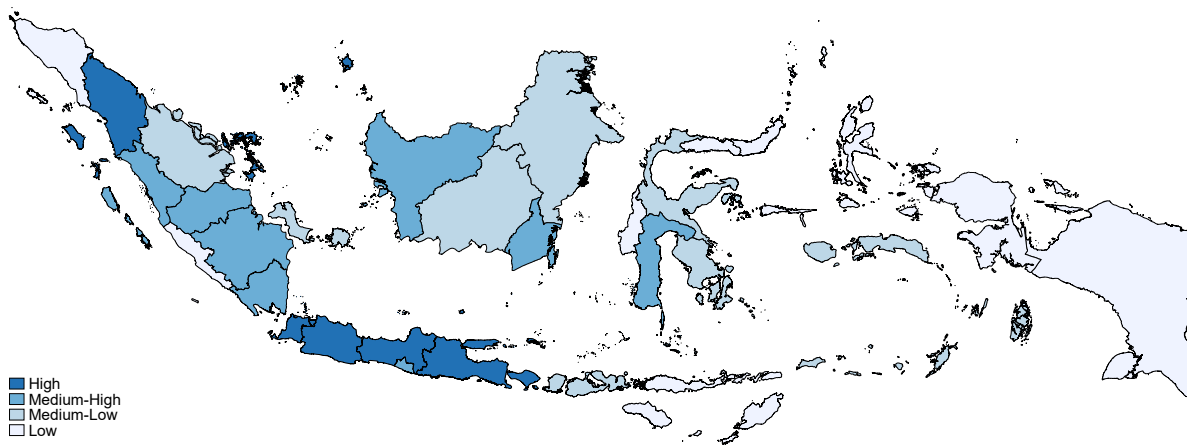
3.4.3.3 Distribution of firms and TFP gains at the provincial level

This section provides a snapshot of the distribution of medium and large enterprises (MLEs) using cross-provincial data from 34 provinces in Indonesia. In this global perspective, I combine these provinces into five main island groups such as Java, Sumatra, Kalimantan, Sulawesi, and Outer Island. Figure (3.2) shows that the number of MLEs is relatively centralized in the western and more developed part of the country, with darker colors. This includes the island of Java, Sumatra, the southern and western part of Kalimantan, and the western part of Sulawesi. Meanwhile, in the eastern area of Indonesia, there is a relatively small number of MLEs highlighted by the lighter color. For example, the least developed

parts of Indonesia were given by the provincial groups of Maluku and Papua, which accounted for only 0.27% and 0.81%, respectively, of the total MLEs in Indonesia in 2015.

The majority of manufacturing companies are located on the island of Java, particularly in the provinces of West Java, Central Java, East Java, and Banten. The Java Island group of provinces is the largest contributor to Indonesia's GDP at 59.03% and accounts for 60% of the population. This means that due to the availability of the labor market environment, companies are encouraged to establish their businesses and take advantage of the abundant natural resources to access more workers, in addition to the availability of infrastructures such as roads, port facilities, and financial services that allow companies to run their businesses.

Figure 3.2: Number of Medium and Large firms (MLEs) based on province, 2015



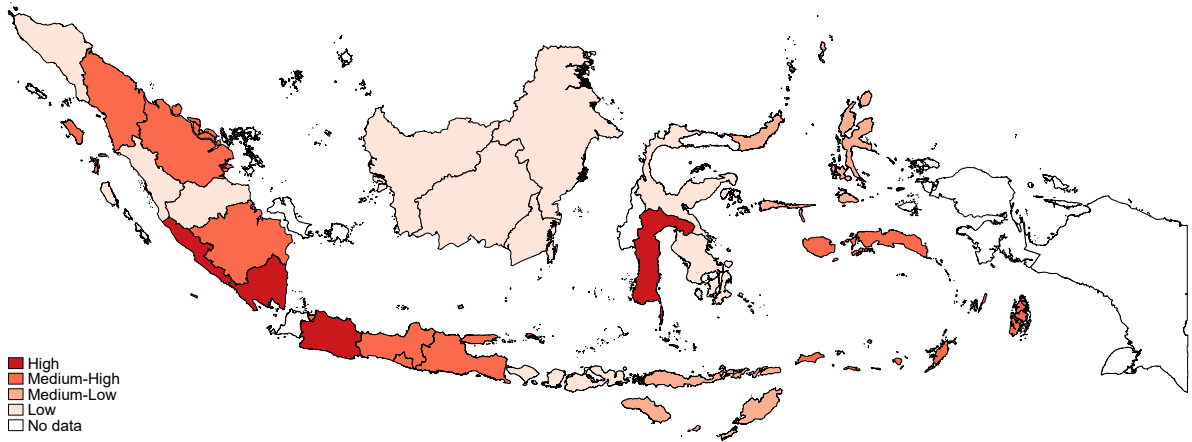
Source: Author's compilation based on BPS-Statistic Indonesia data.

The map in the Figure (3.3) shows the level of resource misallocation (expressed in quartiles) by province, which corresponds to the TFP gains if resources were optimally distributed across firms in all sectors considered in each province. As a first observation, the map shows that the level of resource misallocation in the provinces increases over time. Going further, the inequitable distribution of economic benefits leads to redistributive policies and various interventions, such as tax measures and social subsidies, which have a fundamental distorting effect and lead to inefficiencies and resource misallocation in the provinces. This factor is reflected in [Alesina and Rodrik \(1994\)](#), which has argued that distributional consequences pose severe problems for sustainable and inclusive economic development in Indonesia.

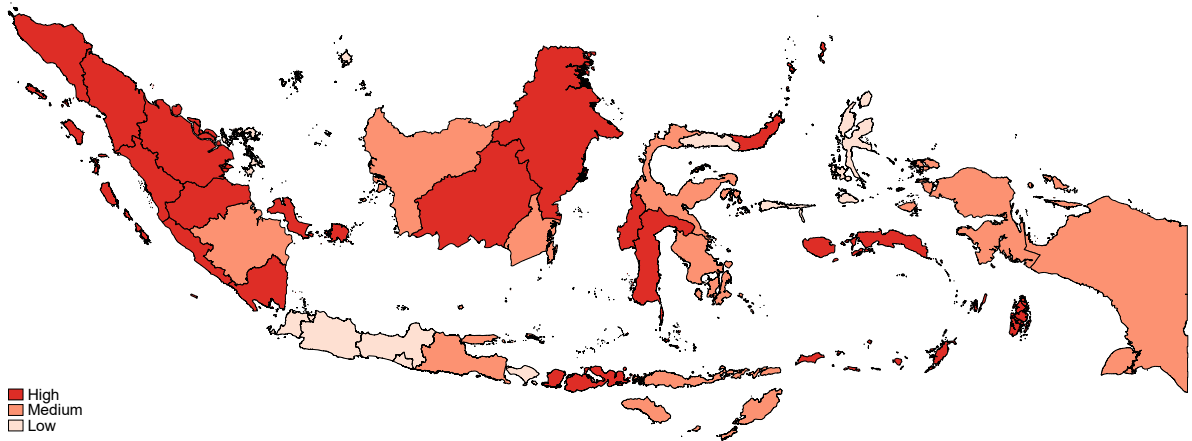
Moreover, the map shows that high levels of misallocation are concentrated in the islands of Sumatra and East Kalimantan. This is because their economies are heavily dependent on Indonesia's mineral resources, such as gold and copper. Still, the full development of the mining and energy sectors has been hampered by the low level of infrastructure in these provinces. Besides, the degree of misallocation of production resources in Indonesia's poorer north, such as Papua, a province also rich in mineral resources, is increasing due to the substantial rise in mineral prices that can lead to misallocation of resources through the relative price mechanism.

Figure 3.3: Resource misallocation by Indonesian provinces in 1998 and 2015

(a) Resource misallocation by Indonesian provinces, 1998



(b) Resource misallocation by Indonesian provinces, 2015



Source: Author's compilation based on BPS-Statistic Indonesia data.

3.5 Results and discussion

This section describes the empirical application of the H.K. method presented in Section (3.3) to the Indonesian manufacturing data described in the previous section (3.4) to explore the importance of resource misallocation for TFP. First, I would like to describe the evolution of various measures of dispersion and productivity distortions over time. Second, compare the actual firm size with the size observed if TFPR were equalized across plants and within industries and consider aggregate TFP gains in an environment where resources are allocated efficiently to quantify the contribution of better allocative efficiency to aggregate TFP growth, with the expectation that the most productive firms use the largest share of resources, leading to higher output and thus lower prices relative to small firms. This is followed by the decomposition analysis of the distortions to track the misallocation of the resources. Finally, I relate productivity to firm characteristics to highlight the main source of variation in TFP in the sample, in addition to policy reforms in terms of trade and financial liberalization.

3.5.1 To what extent are resources misallocated in Indonesia

To characterize the dynamics of productivity and plant size distribution, I choose different years to report different measures of productivity dispersion and other statistics. I mainly focus on three different years: 1998 corresponds to the peak of the Asian financial crisis, 2008 corresponds to the global financial crisis, and 2015 is the last year in the sample. The Table (3.3) shows numerically how the dispersion of TFPQ and TFPR changes over the period analyzed. The dispersion of TFPQ shows the difference in physical productivity across firms in the manufacturing sector. On the other hand, the dispersion of TFPR highlights the misallocation of factors across firms, showing the existence of distortions that affect the production process of firms.

It can be seen that over the period 1990-2015, a strong upward trend in resource misallocation is observed for the different measures of revenue productivity dispersion. Note that, consistent with the model, revenue productivity is less dispersed than physical productivity because the model predicts that prices and TFPQ are negatively correlated. Furthermore, the dispersion of physical productivity also increases, implying that more establishments become more skewed toward the left tail of the distribution. The situation worsened during the Asian financial crisis (1997/1998), as evidenced by the widening variation in the TFPQ and TFPR. Thus, more firms become significantly less productive than the average productivity, and are subject to more severe distortions.

Table 3.3: Dispersion statistics of productivity: physical and revenue productivity (1990-2015)

Year	$\log TFPQ_{si}$				$\log TFPR_{si}$				
	SD	p90 – p10	p50 – p10	p90 – p50	SD	p90 – p10	p50 – p10	p90 – p50	Corr. with A_{si}
1990	1.613	4.081	1.930	2.151	1.111	2.699	1.530	1.169	0.869
1993	1.613	4.068	1.870	2.198	1.122	2.695	1.498	1.198	0.865
1995	1.566	3.889	1.765	2.123	1.092	2.606	1.489	1.117	0.858
1998	1.834	4.756	2.048	2.708	1.281	3.195	1.846	1.349	0.874
2003	1.864	4.757	2.224	2.533	1.279	3.208	1.759	1.449	0.895
2008	1.797	4.632	2.377	2.255	1.342	3.298	1.996	1.302	0.885
2013	1.955	4.940	2.744	2.195	1.427	3.592	2.209	1.382	0.900
2015	1.941	4.838	2.651	2.187	1.422	3.484	2.155	1.329	0.906

Source: Author's calculation based on BPS-Statistic Indonesia data.

Notes: For each firm (i), $\log TFPQ_{si} = \log(A_{si}N_s^{\frac{1}{\epsilon-1}}/\bar{A}_s)$ whereas, $\log TFPR_{si} = \log(TFPR_{si}/\overline{TFPR}_s)$. Industries are weighted by their value-added shares. SD is the standard deviation, p90 – p10 is the difference between the 90th and 10th percentiles, p50 – p10 is the difference between the 50th and 10th percentiles and p90-p50 is the difference between the 90th and 50th percentiles.

We also find that $TFPR_{si}$ and $TFPQ_{si}$ (A_{si}) are positively correlated, indicating that the most productive firms tend to face greater distortions and are most affected in terms of resource misallocation (higher $TFPR$), and therefore tend to produce less. Next, distortions make firms with high physical productivity (high A_{si}) less than optimal, which hurts aggregate TFP. Therefore, these results suggest that the most productive firms face unfavorable barriers, but their situation has deteriorated over time. In other word, more productive firms are "taxed" at a higher rate either explicitly or implicitly, resulting in capital and output wedges or taxes that absorb resources that would otherwise have been used to

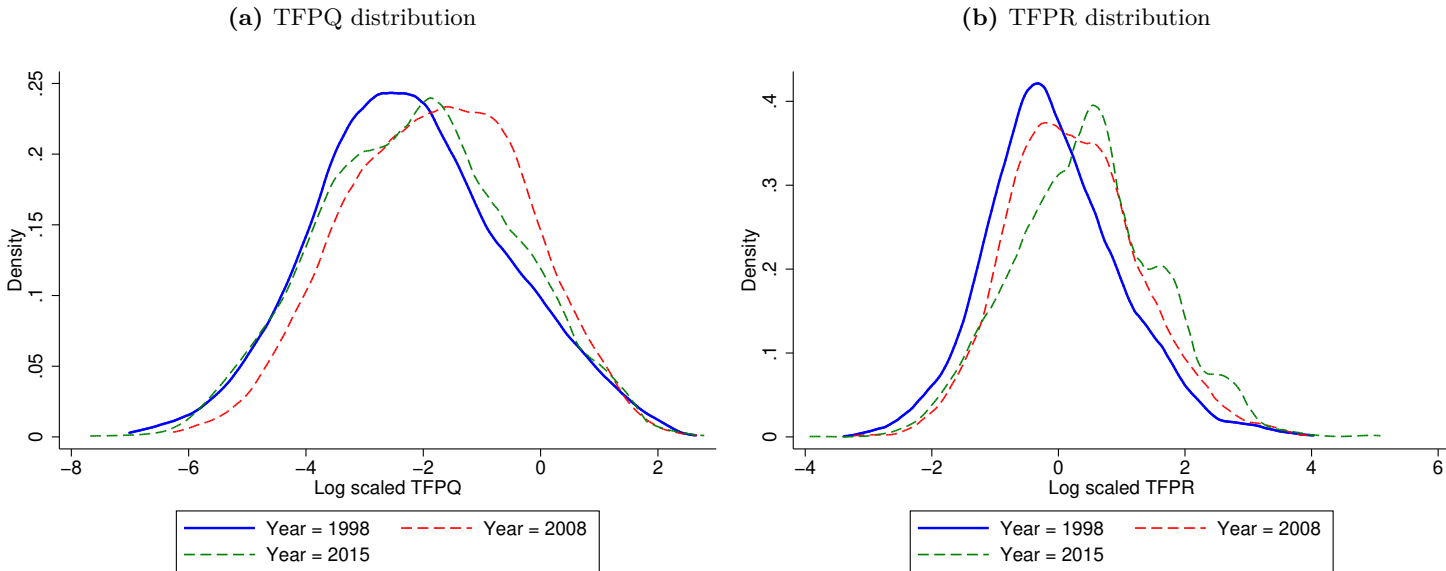
expand production. The result is a decline in productivity for the economy as a whole.

The Table (3.3) shows that the standard deviation of TFPR varies between 1.111 and 1.422 in 1990 and 2015 respectively. Comparing these results with those of developed countries, the Hsieh and Klenow (2009) indicates a standard deviation of TFPR of 0.41-0.49 for the US; while the Bellone et al. (2013) indicated 0.45-0.48 for France and the Dias et al. (2016) reports 0.36-0.42 for Portugal. This reveals that the Indonesian dispersion is nearly 2 to 3 times greater than in the U.S. and E.U. benchmarks.

In the same context, the ratio between the 90th and 10th percentiles of the TFPQ increased from 4.081 to 4.838 and for the TFPR, from 2.699 to 3.484. To get a sense of the economic magnitude of these figures, p90/p10 can be explained by two components; the first is the p50/p10 ratio, which includes firms below the median and is primarily concerned with inequality at the bottom of the distribution, and the second is the p90/p50 ratio, which primarily includes firms above the median and is primarily concerned with inequality at the top of the distribution. As shown in the Table (3.3), the dispersion of TFPRs in the p50/p10 ratio is greater than the dispersion in the p90/p50 ratio. This means that the firms above the median (i.e., 50% of the most productive firms in each sector) are less dispersed and able to produce more with the same amount of inputs than the 50% of the least productive firms.

The Figure (3.4) highlights additional evidence of significant dispersion in TFPQ and TFPR in the Indonesian manufacturing sector for three different years in 1998, 2008, and 2015. The more dispersed productivity is, the greater the misallocation may be. High dispersion implies that some firms are better able to produce with the same amount of inputs, given the technological process in each sector. The distributions are weighted by the industries' shares of total manufacturing value-added.

Figure 3.4: Distribution of productivity for selected years



Source: Author's calculation based on BPS-Statistic Indonesia data.

Notes: Panel (a) plot the density of TFPQ measured by $\log(A_{si}N_s^{\frac{1}{\epsilon-1}}/\overline{A_s})$. Whereas, panel (b) plot the density of TFPR measured by $\log(TFPR_{si}/\overline{TFPR_s})$.

Figure (3.4a) traces the dispersion of TFPQ. We see that the dispersion of TFPQ has increased over

time, indicating that these inefficient plants have entered the sample. Similar to the physical productivity, Figure (3.4b) plots the dispersion of TFPR for the same years. Since the dispersion of TFPR indicates a misallocation of resources, the distribution of TFPR shows a large dispersion across firms over time. This reflects less improvement in allocative efficiency since 1998, implying that firms are becoming less productive and subject to distortions. This is clearly visible in the left tail of the increasing distributions of TFPQ and TFPR, suggesting that an increasing number of unproductive firms compensate for their low productivity with higher prices, pushing their distribution away from the mean.

This pattern is consistent with the dispersion measures presented in the Table (3.3), which show greater volatility for TFPQ than for TFPR, contributing to the slow growth of efficient TFP and indicating that some policies favor the survival of some inefficient firms rather than their exit from the industry.

Furthermore, I would explore how establishments' TFPQ and TFPR correlate with their size, measured in terms of the number of employees. As can be seen in Figure (3.9a) shows that the distribution of medium-sized establishments is skewed to the left from zero; whereas large firms have high TFPQ and are close to the average productivity. This indicates that the left tail of physical productivity has become much thinner for large firms over time. Figure (3.9b), which shows changes in the TFPR distribution, shows a similar pattern by firm size, with variation around zero. Large firms have a higher TFPR than medium firms relative to the efficient benchmark, indicating that the distortions have become smaller for medium firms but larger for large firms. As the sample shows, there is a wide range of sizes among firms; the majority of the firms studied are medium-sized firms (69%), and about 31% are large firms. In conclusion, firm size may be partly responsible for greater distortions in Indonesia.

To provide further evidence of deteriorating resource allocation, the Table (3.4) displays the dispersion of the distortions over time and tracks their correlation with productivity, measured as $\log(1 - \tau_{si}^Y)$ for the output wedge and $\log(1 + \tau_{si}^K)$ for the capital wedge. The results revealed the existence of distortions that affect the level of resource allocation inefficiency in the manufacturing sector across firms, suggesting that the capital wedge is more dispersed than the output wedge. This result indicates that, on average, firms face more disadvantageous capital distortions and have limited access to external financing. As a result, the inefficiency of capital allocation in manufacturing is relatively high. This result is also consistent with other strands of the literature (such as Barnett et al. (2014) and Gopinath et al. (2017)), indicating increasing capital distortions and suggesting that the financial sector may have contributed to the relative survival of small inefficient firms.

As explained earlier, firms with higher productivity are subject to greater idiosyncratic distortions. This result is consistent with the findings in the Table (3.4) by observing the negative correlations of $(1 - \tau_{si}^Y)$ and $(1 + \tau_{si}^K)$ with TFPQ (A_{si}). This correlation increases over time, from -0.83 in 1990 to -0.82 in 2015 for the output wedge and from -0.30 to -0.20 for the capital wedge. Over time, the dispersion seems to widen. Output distortions have a standard deviation of 1.05 in 1990 and 1.18 in 2015. On the other hand, the standard deviation for capital distortion increased from 2.33 in 1990 to 2.43 in 2015.

In summary, these results indicate that Indonesia has greater dispersion of its distortions because resources are not allocated efficiently among firms. Thus, it may experience larger losses in manufacturing

TFP due to resource misallocation. This suggests that reallocation of capital and labor factors would lead to productivity gains.

Table 3.4: Dispersion statistics of wedges: output and capital distortions (1990-2015)

Year	$\log(1 - \tau_{si}^Y)$					$\log(1 + \tau_{si}^K)$				
	SD	p90 – p10	p50 – p10	p90 – p50	Corr. with A_{si}	SD	p90 – p10	p50 – p10	p90 – p50	Corr. with A_{si}
1990	1.045	2.720	1.449	1.271	-0.833	2.332	6.114	2.992	3.122	-0.302
1993	0.955	2.421	1.372	1.049	-0.825	2.222	5.716	2.823	2.893	-0.267
1995	0.953	2.409	1.377	1.032	-0.816	2.278	5.992	2.993	2.999	-0.264
1998	1.123	2.835	1.692	1.143	-0.830	2.446	6.248	2.933	3.314	-0.323
2003	1.132	2.869	1.577	1.293	-0.858	2.331	5.988	2.861	3.127	-0.249
2008	1.087	2.728	1.436	1.292	-0.807	2.359	6.065	3.033	3.032	-0.234
2013	1.209	2.920	1.421	1.500	-0.819	2.486	6.210	3.091	3.120	-0.210
2015	1.184	2.910	1.573	1.337	-0.816	2.428	6.375	2.826	3.549	-0.203

Source: Author's calculation based on BPS-Statistic Indonesia data.

Notes: For each firm (i), $\log(1 - \tau_{si}^Y) = \log \frac{(1 - \tau_{si}^Y)}{(1 - \tau_{si}^Y)}$ while $\log(1 + \tau_{si}^K) = \log \frac{(1 + \tau_{si}^K)}{(1 + \tau_{si}^K)}$. See notes in Table (3.3) for more information about the statistics presented in this table.

3.5.2 Implications for the size distribution of firms

Following the approach of Hsieh and Klenow (2009) to quantify changes in the gap between the effective and actual size of plants of different sizes. The Table (3.5) shows how the initial size of Indonesia's large and small manufacturing firms would change if there were no idiosyncratic distortions (i.e. if the TFP were equalized across firms within each industry).

The rows represent the quantiles of the initial actual size of establishments in terms of value-added; the upper quantile represents the largest firms, while the bottom quantile represents the smallest. The columns represent quantiles of effective establishment size relative to actual size; 0-50% implies that firm size should at least halve, 50-100% - effective size is less than twice actual size; 100-200% - effective size is less than twice actual size; more than 200% indicates that establishment size should at least double.

As can be observed in the Table (3.5), the most populated column is the first column. This means that most firms in the Indonesian manufacturing sector in two different years (1998 and 2015), especially the small ones (i.e., the lower quantiles), should have shrunk by half or more from their effective size. However, in 2015, the fraction of small plants expected to decrease by at least 50% increased to 23.91%. Moreover, in Indonesia, the total share of firms expected to reduce their size is about 89%. Conversely, about 11% of the total share of firms is expected to increase in size because some firms have been constrained in their growth due to misallocation of resources. This trend is consistent with the fact that, over time, the correlation between physical productivity and $(1 - \tau_{si}^Y)$ increases. As a result, less productive firms have been reduced, and more productive firms are producing more.

Table 3.5: Percent of firms, actual size versus efficient size**Panel A:** Year = 1998

Actual firm size	Efficient firm size relative to actual firm size				Total (%)
	Shrink		Expand		
	0-50%	50-100%	100-200%	200%+	
Top size quantile	17.41	3.11	2.10	2.38	25.0
Second quantile	21.16	1.18	1.30	1.37	25.0
Third quantile	22.17	1.14	0.67	1.02	25.0
Bottom quantile	22.24	1.14	0.64	0.98	25.0
Total (%)	82.98	6.57	4.71	5.75	100

Panel B: Year = 2015

Actual firm size	Efficient firm size relative to actual firm size				Total (%)
	Shrink		Expand		
	0-50%	50-100%	100-200%	200%+	
Top size quantile	16.23	3.41	1.89	3.47	25.0
Second quantile	20.20	2.00	1.05	1.73	25.0
Third quantile	21.09	1.79	0.86	1.29	25.0
Bottom quantile	23.91	0.58	0.27	0.24	25.0
Total (%)	81.43	7.78	4.07	6.73	100

Source: Author's calculation based on BPS-Statistic Indonesia data.

Notes: In each year, firms are put into quantiles based on their actual value added, with an equal number of firms in each quantile for each row. Top quantile stands for the biggest firms and bottom quantile stands for the smallest. While, the columns are the bins of efficient level of each firm's output relative to their actual firm size, assuming that idiosyncratic distortions are removed. The entries above show the percent of firms with efficient/actual output level in the four bins. For instance, 0-50% means the efficient output less than half of actual output if all distortions are removed. Similarly, 200%+ means the efficient output would be more than double actual output without distortions.

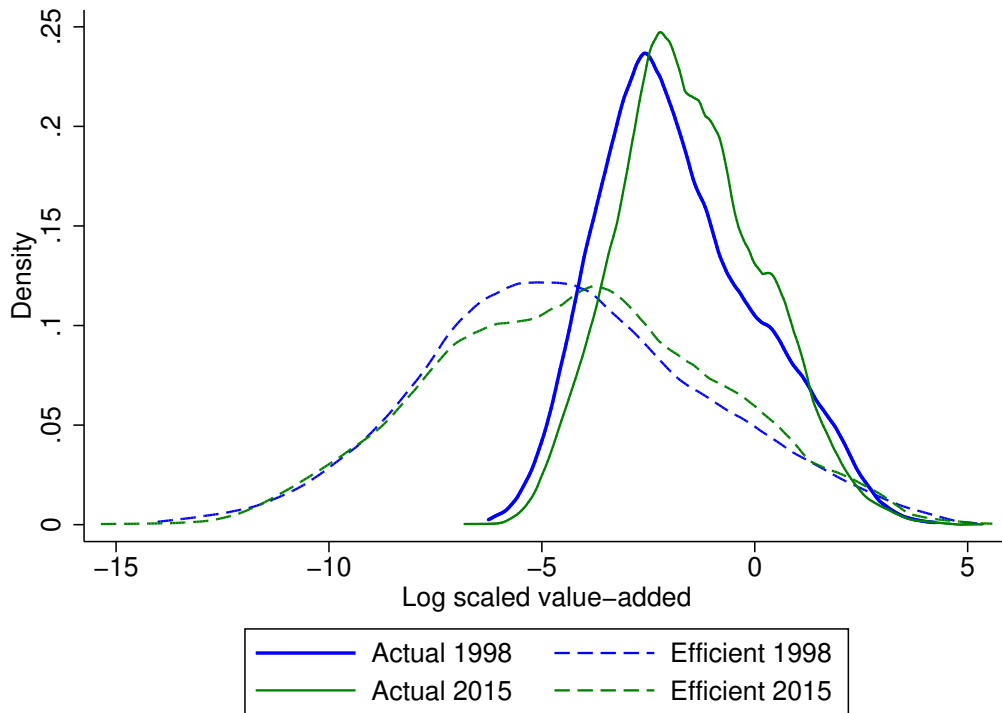
To support this finding, the Figure (3.5) plots the distribution of efficient and effective plant sizes in 1998 and 2015. Looking first at the efficient plant size distribution, we see that it had become more dispersed in 2015. There is a greater concentration of firms in the left tail, suggesting a deterioration in efficient TFP. Let us now turn to the discrepancy between the actual and efficient distribution of firm size. Consistent with the finding of increasing misallocation over time, as discussed in the Section (3.5.1), the negative relationship between A_{si} and $(1 - \tau_{si}^Y)$ means that more (less) productive firms tend to be smaller (larger) than efficient firms. This implies that, when there are distortions, the actual plant size distributions for the two years are less dispersed than their corresponding efficient distribution, and this is indeed what is observed in the Figure (3.5).

Interestingly, the difference between the actual and effective size distribution is mainly on the left tail. This means that most firms are overproducing and that many small plants have been implicitly subsidized relative to their counterparts that have not received implicit subsidies. Therefore, although

their physical productivity grows faster than the industry average, they should be brought back to their optimal level.

Another important factor is that firms that started with different physical productivity in 1998 had different physical productivity growth rates between 1998 and 2015. To confirm this result, I classify firms into quintiles based on their physical productivity in 1998, as shown in the Table (3.19). Next, I calculate the average growth rate of physical productivity between 1998 and 2015 for each quintile. Consistent with the Figure (3.5), plants with lower initial physical productivity grew faster, especially relative to an initially low TFPQ during the sample period (Table 3.19). This result is also found for Ukraine (Ryzhenkov, 2016) and Chile (Chen and Irarrazabal, 2015).

Figure 3.5: Actual vs. efficient size distributions of plants



Source: Author's calculation based on BPS-Statistic Indonesia data.

Notes: Plant size is measured as log of plant value added. That means the actual firm size is measured by $\log(P_{si}Y_{si}/\bar{P}_s\bar{Y}_s)$, where $\bar{P}_s\bar{Y}_s$ indicates the mean value-added of industry (s). While, efficient plant size is measured by $\log(\sum_{i=1}^{N_s} (\frac{A_{si}}{\bar{A}_s})^{\epsilon-1})$.

3.5.3 Potential gains of resource misallocation elimination

Next, a key question is how large the productivity gains would be if the resource misallocation were eliminated. Following the equations (3.8) and (3.9), I estimate the aggregate TFP gain from equalizing the TFPR between firms in each sector. The Table (3.6) displays that the difference in TFP resulting from the two types of distortions is 0.37 in 1990 and 0.39 in 2015, suggesting that without any distortions, TFP gains in the manufacturing sector would increase between 136% and 292% over the period analyzed. Impressively, the results show an overall increase in TFP efficiency gains over time. This reflects an increasing misallocation over the sample period. Putting these results in perspective, allocative efficiency

over the 1990-1998 period improved by 5.1%¹¹. However, due to the Asian financial crisis of 1997/1998, it deteriorated by 35.2%. Overall, allocative efficiency has thus deteriorated by 32% over the period analyzed (1990-2015).

While these gains appear significant, they are broadly in line with the existing literature that applies the H.K. method to data from various countries. For example, [Hsieh and Klenow \(2009\)](#) analyzed major developing economies such as China and India against the U.S. They found that improved resource allocation could boost TFP from 86.6% to 115.1% in China and from 100.4% to 127.5% in India. At the same time, the potential gains in allocative efficiency in U.S. manufacturing would be 30.7% to 42.9%. This study also showed that if we assume that U.S. manufacturing is relatively undistorted across plants and industries and move to the baseline distribution of market distortions in the U.S., the TFP of Chinese and Indian manufacturing increases by 30-50% and 40-60%, respectively.

Table 3.6: TFP gains from equalizing *TFPR* within industries (1990-2015)

Year	TFP gap ($\epsilon = 3$)	TFP gain (%) ($\epsilon = 3$ & Unbalanced panel)
1990	0.366	147.787
1993	0.380	140.956
1995	0.376	151.678
1998	0.387	136.126
2003	0.407	173.392
2008	0.394	204.138
2013	0.395	291.892
2015	0.398	263.971

Source: Author's estimation based on BPS-Statistic Indonesia data.

Notes: Entries are TFP gap, which is measured by $\frac{TFP}{TFPE}$. While the TFP gains = $(\frac{1}{TFPGap} - 1) \times 100$, which given by equation (3.9). The labor input is measured by the employment.

The high magnitude of TFP gain could be explained by two factors. The first factor is due to the misallocation of natural resources in Indonesia. Indonesia is a rich country in terms of natural resources, such as hydrocarbons (oil and gas) and mining sectors. Despite the wealth of extractive raw materials, Indonesia has become a net importer of oil since 2003. Therefore, a substantial increase in mineral prices may lead to a misallocation of resources through the relative price mechanism, which also leads to a misallocation of capital within industries. This is consistent with the conclusion of the study [Tadjoeddin \(2007\)](#), that growth can be achieved through increases in productivity at no cost to environmental preservation. The second reason may be the different degree of competition and concentration within industries. For example, industries that are more open to competition, such as the machinery and textile industries, have a lower level of market distortion than more protected industries where competition is relatively low, such as the food industry. As explained earlier in the Table (3.20), the protected industries (e.g., food products) represent the most important industries in Indonesia, which could increase the misallocation of resources.

¹¹It corresponds to $(\frac{2.48}{2.36} - 1) \times 100$.

Indeed, the model developed by [Hsieh and Klenow \(2009\)](#) was applied to data from other countries, and the potential TFP gains from reducing misallocation were found to be highly variable and considerably higher than in the United States. For example, [Busso et al. \(2013\)](#) conducted a comparative analysis of ten Latin American countries in which TFP could be increased by 41% to 122% on average if resources were better allocated. [Machicado and Birbuet \(2012\)](#) analyzed the Bolivian manufacturing sector during the period of market liberalization from 1988 to 2001 and found a downward trend in allocative efficiency, with TFP gains ranging from 33.8% to 98.4% in the case of full liberalization, or from -6.4% to 38.8% relative to the U.S. [Camacho and Conover \(2010\)](#) estimated that Colombia could experience TFP gains equal to 47-55% (3-8% in the case of a U.S. distribution of market distortions). [Arellano \(2009\)](#) also notes the potential gains from resource reallocation, indicating that overall gains from input reallocation in Ecuador's manufacturing sector range from 12% to 93% of overall value-added. [Dheera-Aumpon \(2014\)](#) reports potential TFP gains of 147.8% in Thailand (73.4% relative to U.S. distribution).

[Dias et al. \(2016\)](#) conclude that TFP gains have tended to be large for developing countries but small for developed countries. Among developed countries, some E.U. members (e.g., France and Portugal) were more efficient than the U.S. in terms of resource allocation. As Indonesia is a developing country with a potentially huge resource misallocation, its TFP can be significantly affected and could be significantly improved by reducing resource misallocation.

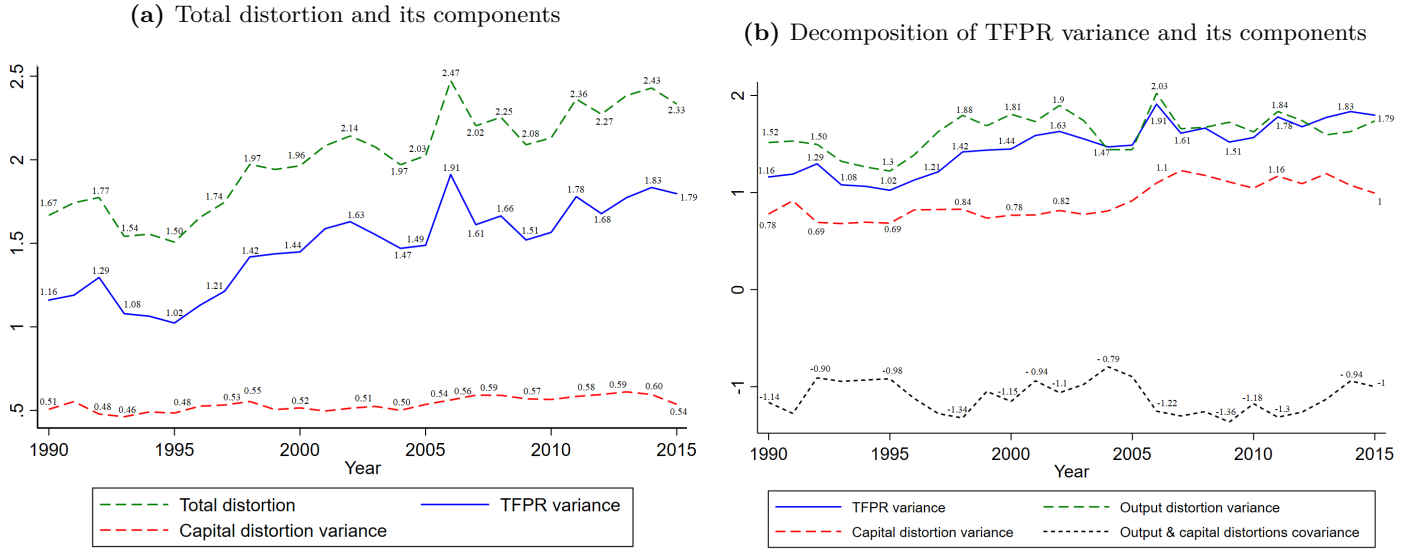
3.5.4 Decomposition of potential gains

This section presents the decomposition analysis of the distortions calculated in Section (3.3.3). The total allocative efficiency can be decomposed within industries into two components, as shown in the right-hand side of the equation (3.10). Figure (3.6a) traces the evolution of these two factors over time. It is clear that the dispersion of $TFPR$ closely tracks the total misallocation of resources, as both measures have steadily increased since 1998. Although $TFPR$ plays a crucial role in the total distortion, I would like to decompose this variable further. In contrast, the capital-specific distortion has remained virtually unchanged.

Figure (3.6b) plots the evolution of $\text{var}(\log TFPR_{si})$ and its various components in equation (3.11). The output and capital distortions are comparable in terms of the magnitude of their impact on the overall misallocation in the economy. Although the capital distortion has a stable and positive impact on resource misallocation, almost all the increase in the dispersion of revenue productivity is explained by the increase in the dispersion of the output distortion.

The covariance of the capital and output distortion is negative, meaning that strong output distortions do not also distort capital in general. This indicates that policies leading to capital and output distortions become more independent over the period analyzed. This result is different from previous studies by [Ryzhenkov \(2016\)](#) using Ukrainian data, and [Chen and Irarrazabal \(2015\)](#) using Chilean data, which found a positive covariance between capital and output distortions (i.e., high output distortions are accompanied by high capital distortions).

Figure 3.6: Decomposition of resource misallocation



Source: Author's calculation based on BPS-Statistic Indonesia data.

Notes: Panel (a) plot total distortion and its two components, TFPR variance measured as $\frac{\epsilon}{2} \text{var}(\log TFPR_{si})$ and the dispersion to capital-labor ratio as expressed by $\frac{\alpha_s(1-\alpha_s)}{2} \text{var}(\log(1 + \tau_{si}^K))$, according to the equation (3.10).

Moreover, panel (b) plot the variance of TFPR and its components as expressed in the equation (3.11) during (1990 - 2015). Variances are weighted by industry shares in each year.

3.5.5 Selection and productivity

The above findings provide evidence of the misallocation of resources within the Indonesian manufacturing sector and the potential gains that could be achieved through better allocative efficiency. This naturally motivates the question of verifying the sources of distortion, primarily for practical policy recommendations.

3.5.5.1 Productivity and firm characteristics

To better understand the role of firms with different characteristics, including firm size, in increasing misallocation over time. In this regard, it will be important to assess the relationship between firm characteristics and TFPQ and TFPR. To this end, this framework consists of a panel regression of firm productivity (i) in the sector (s) over time (t). The econometric specification is given by the following equation:

$$TFP_{si,t} = \beta_0 + \beta_1 Z_{si,t} + \mu_i + T_{t,l} + I_s + \epsilon_{si,t}$$

Where $TFP_{si,t}$ is a measure of physical productivity ($TFPQ$) and revenue productivity ($TFPR$). $Z_{si,t}$ is a vector of observable characteristics of the firm (i) in a given industry at year (t) that could influence firm productivity, which includes firm size, which is measured as the log of the number of employees, firm age, measured from the first time that the firm appeared in the panel dataset, and ownership dummies representing foreign or government ownership. Further, this will include the import and export share to show whether the firm has active international trade operations in the reporting year and take advantage of this unique feature of this Indonesian dataset of providing information on

the proportion of exported and imported inputs at the plant level. Furthermore, μ_i are firm-level fixed effects controlling for unobserved characteristics of firm i that do not vary over time, $T_{t,l}$ is a set of year and island fixed effect, and I_s is a set of industry fixed effects. Finally, $\epsilon_{si,t}$ can be interpreted as a random shock.

The results reported in the Table (3.7) use the industry and island-year fixed effects of observing the impact of firm characteristics on its productivity or efficiency. Columns (1-4) report the results using $TFPQ$ as the dependent variable, while columns (5-8) present the regression results using $TFPR$ as a dependent variable. It is important to remember that a high $TFPR$ indicates a high factor cost due to the presence of distortions. Note that a low $TFPR$ means that plants face favorable distortions, while a high $TFPR$ means that plants face various distortions.

As expected, the results show that productivity measured in $TFPQ$ is positively correlated with plant size and significant at the 1% level for all estimates. This suggests that larger firms are more productive and increase their market share than small firms. This effect can be explained in part by the presence of economies of scale. Moreover, labor and capital flow to the most efficient firms because these agents have the conditions and incentives to increase production and are better able to expand. This result is also in line with the studies of [Camacho and Conover \(2010\)](#); [Machicado and Birbuet \(2012\)](#); and [Alfaro-Ureña and Garita-Garita \(2018\)](#), according to which firm size should be strongly and positively correlated with firm productivity. On the other side, the behavior of large firms could be related to the concentration of market power and tax subsidies to free trade zone (FTZ).

Similarly, in columns (5) through (8), the coefficient on size is significant but negative with $TFPR$. This result implies that medium-sized firms face more distortions compared to large firms. Furthermore, this implies that the marginal product revenue of medium-sized firms is higher than that of large firms. [Busso et al. \(2013\)](#) report similar results for Chilean and Uruguayan firms. This result is also consistent with other studies; for example, [García-Santana et al. \(2016\)](#) found that small firms are potential sources of increased misallocation in Spain. Similarly, [Calligaris \(2015\)](#) found that in Italy, misallocation is higher among small firms. In contrast, [Cuong et al. \(2007\)](#) found that medium-sized firms face less dispersion than large firms, which may be due to the fact that medium-sized firms can take advantage of subsidies and benefit from various policies such as government-supported funding to promote small and medium-sized enterprises (SMEs).

This table shows that, according to column (2), the coefficient estimates for firm age are positive and statistically significant at the 1% level with $TFPQ$. This implies that older firms are more productive than younger firms. In agreement with other studies, the results reported by [Van Biesebroeck \(2005\)](#); [Camacho and Conover \(2010\)](#), argued that older firms are more productive than younger firms and mature firms as evidence of the "learning effect". On the other hand, the coefficient of firm age is positive, implying that older plants tend to have higher $TFPR$ or high distortion than younger plants. This could be explained by a number of factors, including (i) the higher level of distortion of older plants could be related to looser borrowing constraints, which may result from their long relationships with banks; and (ii) it could also be related to their particular relationships with banks or the government. Policies such as microfinance or village funds should be encouraged to help factories reduce financial market frictions.

Table 3.7: Regression of TFPQ and TFPR on plant characteristics

Dependent Variable	log <i>TFPQ</i>				log <i>TFPR</i>			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Size (1=Medium, 2=Large)	0.440*** (0.034)	0.435*** (0.034)	0.436*** (0.034)	0.439*** (0.034)	-0.060*** (0.023)	-0.063*** (0.023)	-0.060*** (0.023)	-0.057** (0.023)
Firm age		0.033*** (0.008)	0.034*** (0.008)	0.034*** (0.008)		0.022*** (0.005)	0.023*** (0.005)	0.023*** (0.005)
Foreign ownership			-0.053 (0.063)	-0.040 (0.063)			-0.144*** (0.044)	-0.128*** (0.044)
Government ownership			0.291*** (0.052)	0.292*** (0.052)			0.088** (0.034)	0.088** (0.034)
Import share				-0.457*** (0.088)				-0.424*** (0.064)
Export share				-0.027 (0.028)				-0.064*** (0.020)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Island x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	103,018	103,018	103,018	103,018	103,018	103,018	103,018	103,018
R-squared	0.642	0.642	0.643	0.643	0.597	0.597	0.597	0.598

Notes: The dependent variables are the deviation of log *TFPQ* and log *TFPR* from their industry mean, with robust standard errors in parentheses. Results are pooled for all years between 1990 and 2015. *** p<0.01, ** p<0.05, * p<0.1.

Surprisingly, foreign ownership is negatively correlated with productivity, but without statistical significance in column (4). At the same time, foreign firms face lower dispersion and have a 12.8% lower TFPR in column (8). This is not surprising given that foreign-owned firms often possess superior technology, have unrestricted access to credit, and have access to external markets, among other things. On the other hand, state-owned plants have a 29% higher TFPQ, indicating higher productivity than other plants. Moreover, they have a higher TFPR of 8.8%, indicating that they are more distorted than the other plants because they probably received subsidies to keep operating despite low profitability. In contrast to other studies, for example with [Dheera-Aumpon \(2014\)](#) which found low levels of TFPR of government-owned plants in Thailand.

The Table (3.7) shows that, on average, firms with a high import or export share are expected to be less distorted. Among other things, [De Loecker \(2007\)](#) noted the empirical evidence that exporting firms are characterized by higher productivity than non-exporting firms. This positive correlation between exporter status and productivity is traditionally linked to the self-selection hypothesis. In the same vein, [Melitz \(2003\)](#) shows that improved resource allocation can be linked to exposure to export markets. Indeed, access to foreign markets requires firms to bear costs traditionally associated with the sale of goods, such as transportation, marketing, and international regulation costs. As a result, only the most productive are able to make profits and gain market share under these conditions. As a result, other less productive firms must downsize or exit the market, allowing a more efficient allocation of resources. According to this interpretation, firms with higher export share have 6.4% lower *TFPR*. These results confirm the predictions made in the study of [Bernard et al. \(2007\)](#).

3.5.5.2 Distortions and firm-level productivity growth

Finally, as suggested by [Hosono and Takizawa \(2015\)](#), I analyze the effect of distortions on physical productivity growth at the firm level. This next regression aims to identify the correlation between distortions and firm-level physical productivity growth.

$$Growth\ TFPQ_{si} = \beta_0 + \beta_1 \log(1 - \tau_{si,t=0}^Y) + \beta_2 \log(1 + \tau_{si,t=0}^K) + T_{t=0} + I_s + \epsilon_{si,t}$$

As in previous estimates, the subscripts s , i , and t refer to industry, firm, and year, respectively. The subscript 0 corresponds to the year in which the firm enters the market. The dependent variable is the average growth rate of the firm's physical productivity in the industry in the years following entry. $\log(1 - \tau_{si,t=0}^Y)$ and $\log(1 + \tau_{si,t=0}^K)$ represent output and capital distortions in the year of entry, respectively.

The estimation results are summarized in the Table (3.8), which shows that distortions in output and capital in the year of entry have a significant negative effect on the growth rate of TFP after entry. This is interpreted as the fact that the high distortions measured reflect unobservable investments, e.g., learning, research, and development. According to this result, strict regulations, which lead to high distortions, are likely to hamper the growth rate of TFP at the firm level.

Table 3.8: Estimation results of firm level TFPQ growth rates

Dependent variable (TFPQ growth rates)	(1)	(2)	(3)
$\log(1 - \tau_{si,t=0}^Y)$	-0.01*** (0.00)		-0.01*** (0.00)
$\log(1 + \tau_{si,t=0}^K)$		-0.00*** (0.00)	0.00 (0.00)
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	15,553	15,553	15,553
R-squared	0.065	0.061	0.065

Notes: The dependent variables are the output and capital distortions at $t = 0$. Robust standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

3.5.6 Policy implications and changes in allocative efficiency

It is noteworthy that Indonesia carried out a series of reforms in terms of trade and financial liberalization in the late 1990s. Therefore, in this section, we attempt to link these policy reforms to our measures of productivity and idiosyncratic distortions over the period under analysis.

3.5.6.1 Impact of trade liberalization on production efficiency

In this study, I examine how the liberalization of trade in output and inputs with Indonesia's entry into the WTO has impacted the efficiency of Indonesian firms. Using Indonesian data, we attempt to

disentangle the impacts of trade liberalization on a comprehensive set of variables that describe firms' production characteristics, such as firm efficiency measured by total factor productivity in terms of quantity and revenue (TFPQ and TFPR). One challenge in assessing the effects of trade liberalization is to distinguish it from other contemporary reforms, such as financial liberalization reform.

I perform the following fixed-effect regression to empirically test the relationship between trade liberalization and firm performance, controlling for the financial reform index.

$$\begin{aligned} \text{TFP}_{si,t} = & \beta_1 \text{Output tariff}_{s,(t-1)} + \beta_2 \text{Input tariff}_{s,(t-1)} + \beta_3 \text{Fin index}_{(t-1)} \\ & + \beta_4 (\text{Fin index}_{(t-1)} \times \text{Import share}_{si,t}) + \beta_5 (\text{Fin index}_{(t-1)} \times \text{Export share}_{si,t}) + \beta Z_{si,t} \\ & + \mu_i + T_{l,t} + \epsilon_{si,t} \end{aligned} \quad (3.12)$$

where $\text{TFP}_{si,t}$ is a measure of physical productivity ($TFPQ$) and revenue productivity ($TFPR$). The explanatory variables are trade liberalization through tariff reduction, so I introduce the effect of tariff reduction on TFP for both output tariff $_{s,(t-1)}$ and input tariff $_{s,(t-1)}$ as pioneering by the study of [Amiti and Cameron \(2012\)](#). I use one-year lagged tariffs to mitigate endogeneity issues. Fin index $_{(t-1)}$ is a measure of the financial liberalization index. In addition, firms that import or export their goods will have to comply with certain standards. This will have an impact on the efficiency of firms. For this reason, we interact the financial liberalization index with the share of imported intermediate goods (import share) and the share of exported goods in their total output (export share).

Furthermore, $Z_{si,t}$ is a vector of establishment control variables, μ_i are firm-level fixed effects controlling for unobserved firm characteristics (i) that do not vary over time. Following [Amiti and Konings \(2007\)](#), all specifications will include an island-year fixed effect ($T_{l,t}$)¹², the island-year fixed effect is important to account for any other differential shocks across the different islands of Indonesia and unobservable time-varying shocks affecting all firms equally. $\epsilon_{si,t}$ is the error that captures other variations, which are not captured by the explanatory variables of the model.

The tariff datasets were obtained from the United Nations Trade Analysis Information System (TRAINS) database. I used the Input-Output (IO) table to calculate the input and output tariffs. The IO table is based on the 1990 economic census, which includes the manufacturing sectors¹³, compiled by the Indonesian Statistics Agency (BPS). Output tariffs are calculated as the simple average of the ISIC 3-digit industry (s). The input tariff for each industry (s) is the weighted average of all output tariffs, where the weights are based on the cost shares of each input used from Table IO.

The financial reform index is derived from IMF's financial reform database by [Abiad et al. \(2010\)](#)¹⁴. This index measures qualitative indicators of restrictions in seven different dimensions of financial sector policy and then translates them into sub-indices covering credit control, interest rate control, entry barriers in banking sector, banking privatization, international capital flows, banking sector supervision, and the securities market. Each sub-index is coded from zero (fully repressed) to three (fully liberalized). I also control for the result by adjusting the weights of the financial dependence indices introduced by

¹²There are five major island groups: Java, Sumatra, Kalimantan, Sulawesi, and the outer island.

¹³For more details, see the Appendix (3.C.2).

¹⁴The full dataset for measuring the extent of financial reforms is available from 1990 to 2005 at <https://sites.google.com/site/md4stata/linked/a-new-database-of-financial-reforms>.

[Rajan and Zingales \(1996\)](#), using the external financial dependence ratio for each industry (see Table 3.21 for more details in the Appendix 3.C.2). If the dependence on external financing is higher, the industry is more financially vulnerable and has greater credit needs.

As shown in the Figure (3.10), a higher index means that the country is experiencing financial reforms, which consist mainly of liberalizing the financial sector. The major financial reform in Indonesia took place following the 1998 financial crisis, which largely focused on reforms to remove entry barriers. The collapse of the banking sector forced Indonesian government to accept the IMF's agreement to carry out reforms in the banking sector, the main source of economic crisis. One of the notably reforms is the establishment of supervisory system by letting the central bank gain independence to supervise and create healthy competition in the banking sector. However, during the same period, the government introduced some measures to stabilize the exchange rate, which led to a restrictive international capital flow. In addition, in 2003, the financial liberalization continued with a series of privatization in banking sectors as part of the post-financial crisis agreement.

The Table (3.9) shows the result of estimating the equation (3.12). It clearly suggests a significant negative correlation between trade liberalization as measured by input tariffs, output tariffs, and TFPQ in all specifications. TFPQ improves after both input and output tariff reductions; a 10 percentage point reduction in output tariffs lagged by one year improves average firm efficiency by almost 4%. The coefficient on input tariff is much higher, indicating that a 10 percentage point fall in input tariffs increases TFPQ by 7% in column (1).

Unilateral trade liberalization affects firm productivity through two main channels: increased foreign competition in the domestic market and access to imported inputs. To cope with the foreign competition resulting from the reduction in tariffs on production, firms can adjust their prices by reducing their marginal cost and have incentives to improve their productivity ([Brandt et al., 2017](#); [De Loecker et al., 2016](#), [Bernard et al., 2011](#)). However, some firms may respond to increased competition from foreign firms by investing in the quality of their products to improve non-price competitiveness, thereby increasing their marginal cost and selling better products at higher prices ([Fernandes and Paunov, 2013](#); [Amiti and Khandelwal, 2013](#)).

These results of tariff reductions are consistent with the work of [Amiti and Konings \(2007\)](#), which study the effect of trade liberalization on manufacturing productivity. Their results show that 10% import tariffs elimination leads to 12% productivity increase in case of input tariffs reduction (on those goods, which are used as intermediate) and 6% percent productivity increase in case of output tariff reduction (on the final goods). Additionally, [Bas and Paunov \(2019\)](#), evidence that the trade liberalization provides access to more technologically advanced or high-quality imported inputs, they may take advantage of the opportunity of the tariff reduction to produce higher quality products, which in turn can be reflected in higher output prices.

Tariff reductions on inputs can, in turn, allow firms to access cheaper intermediate goods from abroad and reduce marginal costs and output prices, providing firms with access to more varieties of inputs and better quality inputs. This result confirms the previous findings of [Bas and Paunov \(2019\)](#) and [De Loecker et al. \(2016\)](#). They found that such access to more suitable inputs allows firms to lower their marginal

Table 3.9: The impacts of tariffs on TFPQ

Dependent variable	$\log TFPQ_t$				
	(1)	(2)	(3)	(4)	(5)
Output tariff _(t-1)	-0.395** (0.200)	-0.408** (0.201)	-0.361* (0.203)	-0.360* (0.203)	-0.371* (0.202)
Input tariff _(t-1)	-0.717*** (0.175)	-0.698*** (0.176)	-0.493** (0.239)	-0.493** (0.239)	-0.475** (0.239)
Import share		-0.524*** (0.120)	-0.542*** (0.154)	-0.458*** (0.167)	-0.491*** (0.166)
Export share		0.064 (0.040)	0.056 (0.049)	0.097 (0.065)	0.101 (0.066)
Financial liberalization index _(t-1)			-0.009 (0.167)	0.123 (0.176)	0.102 (0.176)
Fin. index _(t-1) × Import share				-1.196 (0.775)	-0.950 (0.774)
Fin. index _(t-1) × Export share				-0.497 (0.481)	-0.593 (0.485)
Size (1=Medium, 2=Large)					0.166*** (0.062)
Firm age					0.013 (0.014)
Foreign ownership					0.042 (0.136)
Government ownership					0.370*** (0.072)
Firm FE	Yes	Yes	Yes	Yes	Yes
Island x Year FE	Yes	Yes	Yes	Yes	Yes
Observations	66,599	66,599	35,797	35,797	35,797
R-squared	0.831	0.831	0.824	0.824	0.825

Notes: The dependent variables is the deviation of $\log TFPQ$ from its industry mean, with robust standard errors in parentheses. The definitions of all variables are provided in the Appendix (3.B). *, **, and *** indicate significance at 10%, 5% and 1% respectively.

production costs due to the reduced costs of inputs for the same units of product produced of comparable quality and the foreign technology incorporated into these inputs.

To taking this forward, we try to regress both tariff liberalization and financial liberalization index to see how the variable are affecting on the firm productivity as shown in column (3). The coefficient of financial liberalization has a non-significant impact, which suggests that liberalization was an unanticipated shock for many firms. The coefficients for all firm characteristics are introduced in column (5). They still show similar sign with our baseline estimation. Firms owned by government and larger firms are more likely to have more productivity. In general, exporters and foreign owned firms are expected to have higher productivity of TFPQ than domestic firms. However, we found the firms that export any

of their output and the coefficient on the foreign firm indicator are positive but not significant.

Concerning TFPR, Table (3.10) represents the result of estimating the equation (3.12). In regard to the output-tariff cuts, in all specifications, there is a significant negative effect at the 1% level on TFPR. A fall in output tariff of 10 percentage points, increase TFPR by 5.9 percent. The underlying mechanism behind those effect is increased competition in firms' markets that pushes them to invest in improving performance and differentiating of their competitors' products.

Table 3.10: The impacts of tariffs on TFPR

Dependent variable	$\log TFPR_t$				
	(1)	(2)	(3)	(4)	(5)
Output tariff _(t-1)	-0.599*** (0.119)	-0.600*** (0.119)	-0.701*** (0.135)	-0.701*** (0.135)	-0.706*** (0.135)
Input tariff _(t-1)	-0.075 (0.104)	-0.068 (0.104)	-0.097 (0.140)	-0.097 (0.140)	-0.102 (0.139)
Import share		-0.506*** (0.081)	-0.443*** (0.101)	-0.426*** (0.109)	-0.434*** (0.109)
Export share		-0.047* (0.024)	-0.062** (0.029)	-0.056 (0.037)	-0.051 (0.037)
Financial liberalization index _(t-1)			0.067 (0.102)	0.092 (0.108)	0.082 (0.108)
Fin. index _(t-1) × Import share				-0.248 (0.501)	-0.135 (0.498)
Fin. index _(t-1) × Export share				-0.079 (0.271)	-0.105 (0.272)
Size (1=Medium, 2=Large)					-0.134*** (0.038)
Firm age					0.014** (0.007)
Foreign ownership					-0.072 (0.076)
Government ownership					0.141*** (0.041)
Firm FE	Yes	Yes	Yes	Yes	Yes
Island x Year FE	Yes	Yes	Yes	Yes	Yes
Observations	72,306	72,306	38,384	38,384	38,384
R-squared	0.608	0.609	0.616	0.616	0.617

Notes: The dependent variables is the deviation of $\log TFPR$ from its industry mean, with robust standard errors in parentheses. The definitions of all variables are provided in the Appendix (3.B). *, **, and *** indicate significance at 10%, 5% and 1% respectively.

Financial liberalization reform in Indonesia is associated with a positive effect on TFPR, but the coefficient is not significant. This suggests that many firms did not anticipate financial liberalization as

indicated above. With respect to firm-level controls, large firms face a lower TFPR because they are treated differently from medium-sized firms. However, government-owned firms have a higher TFPQ, they are significantly positively correlated with a higher TFPR, indicating that regulatory restrictions affecting these dimensions hinder the realization of capital and labor allocation. These firms are expected to face significant positive distortions resulting from improved access to credit or preferential treatment for these firms. Moreover, firms with a higher import share have a negative effect on TFPR at the 1% level of significance due to productivity gains from technology embedded in foreign inputs.

3.5.6.2 Asian financial crisis

Aside from the fact that trade liberalization reforms are often part of a broader economic liberalization agenda, they are also often implemented under difficult economic conditions or during crises. Therefore, we need to evaluate input-output liberalization with an understanding of this period of analysis, which is characterized by a major economic shock (the 1997/1998 Asian financial crisis), as there is concern that the main results may be affected by this period. This financial crisis has put a spotlight on the financing decisions of private firms, as it will make it very difficult for firms to access financing facilities.

To capture the effect of the Asian financial crisis in the analysis, I treat it using two methods; first, we restrict our sample to the pre-crisis period to ensure that the productivity coefficients are not influenced by the Asian crisis data, as was done in [Amiti and Konings \(2007\)](#), the results are reported in columns (1) and (4) of the Table [\(3.11\)](#). Second, by introducing a crisis dummy variable in columns (2-3) and (5-6) of the same table. The crisis dummy will have a significant negative value for the years 1997 and 1998, when the financial crisis is at its peak. We prove that after controlling for the crisis, our variables of interest remain robust.

With this method, the results show that the output tariff variable has lost significance in affecting productivity, whether it is TFPQ or TFPR in columns (1) and (4). One explanation for this result is that when we limit the sample period to 1996, we did not capture some series of trade and financial reforms that took place after the crisis. Since most trade liberalization began in 1995 and the main round of financial reforms occurred after the Asian financial crisis in 1998. Although the coefficient on the input tariff remains negative and significant.

In the full sample, in columns (3) and (6) of the Table [\(3.11\)](#), we interact the output tariff and the input tariff variables with a crisis dummy variable equal to one for the years 1997 and 1998. Looking at the crisis interaction terms, we note that the interaction term on the output tariff is negative but insignificant on the TFPQ, while it is negative and significant at 1% on the TFPR. Whereas, the coefficient of the interaction term on the input tariff is negative and significant on the TFPQ and TFPR. As for the additional firm-level controls, they retain the same sign and significance as the previous results (Table [3.9](#) and [3.10](#)). In sum, the Table [\(3.11\)](#) suggests that the effect size of tariff reduction on output and inputs is somewhat smaller after accounting for the Asian crisis, but the effect is still significant and sizable.

Table 3.11: Controlling for effect of the Asian financial crisis 1997-1998

Dependent variable	$\log TFPQ_t$			$\log TFPR_t$		
	Pre-Asian crisis	Full sample		Pre-Asian crisis	Full sample	
	(1990-1996)	(1990-2015)		(1990-1996)	(1990-2015)	
	(1)	(2)	(3)	(4)	(5)	(6)
Output tariff _(t-1)	-0.040 (0.409)	-0.370* (0.202)	-0.343 (0.258)	-0.448 (0.295)	-0.705*** (0.135)	-0.505*** (0.172)
Input tariff _(t-1)	-0.796** (0.378)	-0.474** (0.239)	-0.327 (0.239)	-0.601** (0.264)	-0.102 (0.139)	0.001 (0.139)
Import share	-0.632*** (0.242)	-0.558*** (0.153)	-0.555*** (0.153)	-0.511*** (0.168)	-0.443*** (0.102)	-0.440*** (0.102)
Export share	0.028 (0.091)	0.053 (0.049)	0.057 (0.049)	-0.030 (0.061)	-0.059** (0.029)	-0.057* (0.029)
Fin. index _(t-1)	-0.152 (0.320)	-0.021 (0.166)	-0.018 (0.166)	0.090 (0.208)	0.063 (0.102)	0.067 (0.102)
Size (1=Medium, 2=Large)	0.196** (0.096)	0.166*** (0.062)	0.166*** (0.062)	-0.101 (0.068)	-0.134*** (0.038)	-0.134*** (0.038)
Firm age	-0.227 (0.153)	0.013 (0.014)	0.014 (0.014)	-0.104 (0.097)	0.014** (0.007)	0.015** (0.007)
Foreign ownership	0.059 (0.213)	0.042 (0.136)	0.042 (0.136)	-0.063 (0.140)	-0.072 (0.076)	-0.072 (0.076)
Government ownership	0.172 (0.198)	0.371*** (0.072)	0.371*** (0.072)	0.100 (0.137)	0.142*** (0.041)	0.141*** (0.041)
Crisis dummy _t		-0.844*** (0.276)	-0.797*** (0.278)		-0.275** (0.136)	-0.174 (0.138)
Output tariff _(t-1) × Crisis _t			-0.008 (0.212)			-0.406*** (0.157)
Input tariff _(t-1) × Crisis _t			-1.952*** (0.497)			-1.308*** (0.341)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Island x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,592	35,797	35,797	14,650	38,384	38,384
R-squared	0.911	0.825	0.825	0.752	0.617	0.618

Notes: The dependent variables are the deviation of $\log TFPQ$ and $\log TFPR$ from their industry mean. Robust standard errors in parentheses. The definitions of all variables are provided in the Appendix (3.B). *, **, and *** indicate significance at 10%, 5% and 1% respectively.

3.5.6.3 Does trade liberalization affect both capital and output wedges?

In this section, I use Distortions_{si,t} as a different dependent variable, measured as $\log(1 + \tau_{si}^K)$ for capital distortions and $\log(1 - \tau_{si,t}^Y)$ for output distortions using the same equation (3.12). Note that, a positive value of capital wedge, shows an increase in distortions, while a positive value of output wedge shows a decrease in the distortion. Of the results presented in the Table (3.12), columns (1-3) report the results

using capital distortions as the dependent variable, while columns (4-6) present the regression results using output distortions as the dependent variable. In the analysis of the independent variables, I argue that firms engaged in global trade will have a greater need to access the credit market to finance their operations, as these firms are more likely to need to improve their scale of production to meet global demand. We also assume that financial liberalization will make it easier for firms to access the credit market to improve their productive capacity and capital stock.

Table 3.12: Impact of trade liberalization on capital and output distortions

Dependent variable	Capital distortions		$\log(1 + \tau_{si,t}^K)$	Output distortions		$\log(1 - \tau_{si,t}^Y)$
	(1)	(2)	(3)	(4)	(5)	(6)
Output tariff _(t-1)	-0.167 (0.137)	-0.176 (0.137)	-0.167 (0.137)	-0.107 (0.067)	-0.110 (0.067)	-0.101 (0.067)
Input tariff _(t-1)	0.375* (0.198)	0.381* (0.198)	0.390** (0.197)	0.085 (0.097)	0.085 (0.097)	0.092 (0.097)
Import share	-0.627*** (0.096)	-0.709*** (0.107)	-0.688*** (0.107)	0.220*** (0.047)	0.209*** (0.053)	0.215*** (0.052)
Export share	-0.186*** (0.037)	-0.114** (0.051)	-0.105** (0.051)	0.022 (0.018)	0.047* (0.025)	0.048* (0.025)
Fin. index _(t-1)	-0.100 (0.114)	-0.099 (0.119)	-0.088 (0.119)	-0.098* (0.056)	-0.089 (0.058)	-0.083 (0.058)
Fin. index _(t-1) × Import share		0.672* (0.397)	0.652* (0.396)		0.095 (0.195)	0.085 (0.194)
Fin. index _(t-1) × Export share		-0.726** (0.344)	-0.697** (0.343)		-0.254 (0.169)	-0.258 (0.168)
Size (1=Medium, 2=Large)			0.209*** (0.041)			0.189*** (0.020)
Firm age			-0.002 (0.007)			-0.009** (0.004)
Foreign ownership			-0.462*** (0.076)			-0.065* (0.037)
Government ownership			-0.498*** (0.044)			-0.299*** (0.021)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Island x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	38,384	38,384	38,384	38,384	38,384	38,384
R-squared	0.814	0.814	0.815	0.833	0.833	0.834

Notes: The dependent variables are the capital and output distortions with robust standard errors in parentheses. The definitions of all variables are provided in the Appendix (3.B). *, **, and *** indicate significance at 10%, 5% and 1% respectively.

To further examine the effect of WTO accession on distortions, we investigate the effects of trade liberalization on the capital and output wedges separately. As shown in equation (3.7), the TFPR

depends on both the output and capital wedges. One concern is that trade liberalization affects only one of the wedges. Since trade liberalization directly affects output and input prices, its effect is expected to be reflected in a decline in output wedges rather than a decline in capital wedges. The results show that there is no significant impact of the output tariff on either capital or output distortions in all specifications. Although the input tariff has a positive and significant impact on the capital wedge.

The Table (3.12) shows that entry into foreign markets are expected to be less distorted. Firms with a high share of imports or exports have a negative and significant impact on capital and output distortions in all specifications, indicating that imported inputs generate some sort of technological externality that reduces capital or output distortions. These results allow me to conclude that in order to eliminate a part of the resource misallocation, it is worthwhile to continue external trade liberalization by further reducing tariffs on output and inputs, lowering the level of non-tariff barriers and facilitating market access.

The results show that financial liberalization produces a negative coefficient in affecting capital distortions. Our results are consistent with the study by [Abiad et al. \(2008\)](#), they found that financial liberalization was associated with better allocative efficiency in India, Jordan, Korea, Malaysia and Thailand. The logic behind this is that firms with better access to financial resources can increase their capital by purchasing new equipment or replacing old machinery, which could help reduce the firm's capital and output distortions. The interactive term of financial liberalization with export share is negative and significant at 5% on capital distortions, but there is no significant effect on output distortions. This indicates that exporting firms that benefit from the financial liberalization reform have lower capital distortions with greater financial liberalization than non-exporting firms.

This paper studies the relationship between distortions and firm characteristics, one limitation, $\log(1 + \tau_{si}^K)$ captures the effect of distortions on the purchase price of capital as a factor of production. Although one would expect the level of distortions to decrease with firm size, given that medium-sized firms may face higher prices for capital, for example, and asymmetries in access to credit than large firms, the results in the Table (3.12) show that large firms face positive distortions in capital relative to medium-sized firms. One factor that may explain this result is that medium-sized firms may benefit from subsidies and support from various policies such as government-supported financing to promote small and medium-sized enterprises (SMEs). In addition, foreign firms and state-owned firms have lower capital distortions, reflecting their relative privileges in the economies. In contrast, they have larger output distortions.

In sum, the results suggest that input tariff reduction after the accession to the WTO contributed to the decline in the output wedges but increases in the capital wedge. Further, reforms in capital markets could improve aggregate TFP in Indonesia through a reduction in misallocation.

3.6 Robustness checks

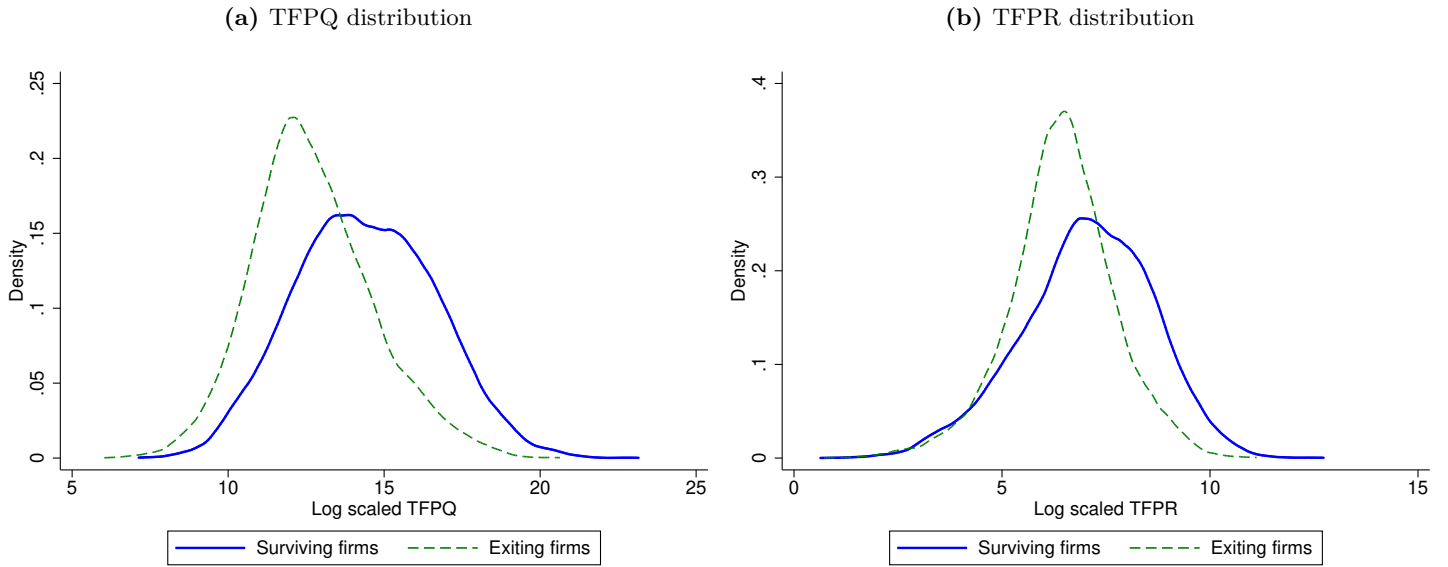
In this section, I conduct robustness checks on the main results. First, I relate the physical and revenue productivity to the probability of plant exit or export to shed light on the main source of variation in revenue productivity in the sample. Second, I use different specifications with respect to parameters of the potential TFP gains from equalizing the TFPR within industries, such as the elasticity of substitution

(ϵ); and the share of capital in the production function (α). Third, it is important to see how productivity evolves over the life cycle of a firm at entry and a set of five post-entry dummy variables. Finally, we tried to have an alternative estimate of the capital stock.

3.6.1 The role of distortions in firm exit and exporting status

The literature suggests that aggregate productivity may also be influenced by firm dynamics, i.e., the decision of firms to enter or exit the market. Figure (3.7) shows that under appropriate and competitive conditions, as expected, the most productive firms are those that survive and increase their market share at the expense of less productive firms that exit the market. To sum up, productivity growth can be achieved if the least productive firms exit the market.

Figure 3.7: Distribution of productivity of surviving and exiting firms



Source: Author's calculation based on BPS-Statistic Indonesia data.

Notes: Surviving firms are the most productive firms, which are able to survive over the entire period (1990-2015).

Whilst, exiting firms correspond to a firm that was previously observed but is not observed in the data set the next year.

Then, as suggested by [Lawless \(2014\)](#), and [Yang et al. \(2011\)](#), who explored the probability of firm exit, together with [Bartelsman et al. \(2013\)](#), who calibrated a general equilibrium model of firm dynamics and found that distortions have a significant impact on endogenous selection, i.e., entry and exit of firms. Finally, to distinguish between sources of productivity and dispersion, I examine the correlation of TFPQ and TFPR with plant exit.

The key mechanism of this study implies that efficiency and distortions should have predictive power on plant exit and export decisions. For example, distortions may decrease a firm's profits and potentially reduce the share of new entrants. As a result, the probability of exit increases for these plants. In other words, plants with higher TFPR values should be more likely to exit, while plants with higher TFPQ values should be less likely to exit. Following [Hosono and Takizawa \(2015\)](#), I use the following pooled

Probit regression with year and industry fixed effects.

$$Prob(Exit_{si,t+1} = 1) = \beta_0 + \beta_1 \log TFPQ_{si,t} + \beta_2 \log TFPR_{si,t} + T_t + I_s + \epsilon_{si,t}$$

where $Exit_{si,t+1}$ is a dummy variable that takes the value one if the firm (i) in industry (s) in year (t) exits at $t + 1$ and zero if it survives. T_t is a set of year fixed effects, which captures macroeconomic shocks, and I_s is a set of industry fixed effects. $\epsilon_{si,t}$ can be interpreted as random shocks.

The Table (3.13) presents the coefficients and marginal effects of the Probit regressions. It shows that the higher the physical productivity, the lower the probability of firm exit. A one log point increase in TFPQ is associated with a 2.8% lower probability of exit. On the other hand, the estimated coefficient for TFPR tends to be positive, meaning that higher revenue productivity is associated with a higher probability of exit. A one log point increase in $TFPR$ is associated with a 0.6% higher exit probability. Consistent with the predictions of the standard model, the fact that plants with higher TFPR have a higher exit probability suggests that the main driving force behind the dispersion of revenue productivity in Indonesian manufacturing plants is the presence of idiosyncratic distortions.

Table 3.13: Probit estimation of the probability of firm exit and export on TFPR and TFPQ

Dependent Variable	Exit _{t+1}		Export _{t+1}	
	Probit	Probit (Marginal effect)	Probit	Probit (Marginal effect)
$\log TFPQ_t$	-0.102*** (0.006)	-0.028*** (0.002)	0.338*** (0.009)	0.058*** (0.002)
$\log TFPR_t$	0.022** (0.010)	0.006** (0.003)	-0.602*** (0.015)	-0.103*** (0.003)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	81,600	81,600	64,006	64,006

Notes: The dependent variables are next period exiting plants or export plants. The independent variables are the deviation of $\log TFPR$ and $\log TFPQ$ from their industry mean in the current period. Entries above are the estimated coefficient and their marginal effect on $\log TFPR$ and $\log TFPQ$, with standard errors in parentheses. Results are pooled for all years between 1990 and 2015. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

A similar argument would suggest that export participation is determined by firm-level distortions and efficiency. The estimation results show that the marginal effect of firm-level TRPQ relative to its industry average is positive and significant at the 1% level, while the marginal effect of TFPR is negative. This could be explained by the fact that only the most efficient and least distorted firms should decide to export, with the expectation that a high TFPQ should be more likely to export. While plants with a high TFPQ should be less likely to export.

3.6.2 Alternative specifications for TFP gain

Using different specifications through the Table (3.14) to check the sensitivity of TFP gains resulting from idiosyncratic distortion removal. First, I performed calculations of potential TFP gains in three ways: (i) by changing the elasticity of substitution (ϵ) between differentiated goods; (ii) by using the wage bill as an alternative measure of labor input ($L_{si} = wL_{si}$), and (iii) by restricting the sample to a balanced panel of plants.

The Table (3.14) shows the TFP gains by removing idiosyncratic distortions within the industry using alternative values of the elasticity of substitution of differentiated goods. The proportion of TFP gains increases with the value of the inter-plant elasticity of substitution, from 3 to 5 for all years in column (2). Between 1998 and 2015, allocative efficiency deteriorated by 34.26%, compared to 32% in the base case in column (1), accounting for a slower reallocation between firms with different productivity. This is consistent with the model, as suggested by equation (3.10) when ϵ is larger, changes in the variance of TFPR have a larger impact on allocative efficiency.

Table 3.14: Sensitivity analysis: TFP gain (%) from removing idiosyncratic distortions within industries

Year	Unbalanced panel			Balanced panel
	(Base case, $\epsilon = 3$)	($\epsilon = 5$)	($\epsilon = 3$ & $L_{si} = wL_{si}$)	($\epsilon = 3$)
	(1)	(2)	(3)	(4)
1990	147.78	207.54	97.13	112.15
1993	140.95	213.89	101.07	101.53
1995	151.67	218.53	133.46	53.93
1998	136.12	194.07	96.21	131.32
2003	173.39	256.44	161.47	165.47
2008	204.13	285.68	185.55	148.07
2013	291.89	436.79	214.38	187.74
2015	263.97	367.08	241.40	206.36

Source: Author's estimation based on BPS-Statistic Indonesia data.

Notes: See notes in Table (3.6). The labor input is measured by the employment in the base case (column 1).

In column (3), applying the wage bill as a measure of labor input yields lower estimates of TFP gains than their counterparts in the base case in column (1). For example, in 1990, the TFP gains from removing distortions were 97%, compared with 147% in the baseline estimation. Such a result could indicate cases of shadow employment where employers do not provide formal contracts to their workers. This implies that using a higher measure of (ϵ) or a different measure of labor input changes the level of potential gains; it does not change the changes over time. We observe that the measure of wage bill tends to reduce reallocation gains; in contrast, employment as a measure of labor input tends to amplify rather than limit TFP differences.

Furthermore, through the benchmark, a plant can enter or exit at any time. Now, I limit the sample to the plants that survived the entire 1990-2015 period (see Appendix 3.C.1 for more details), which refers to the balanced panel. The total number of observations for the entire sample period is 12,506,

with 481 firms per year. Column (4) shows the TFP gains from switching to an efficient allocation in the balanced panel. The TFP gains from using a balanced panel in column (4) are lower than their counterparts in the base case (column 2). However, the upward trend in TFP gains continues over time. The results indicate that only the most productive firms are able to survive over the entire period (1990-2015). In other words, these results present TFP gains only for the sample of top-performing firms, thus underestimating the gains for the manufacturing sector as a whole.

3.6.3 Different parameter values for the capital share

One concern is that our analysis of TFP gains is sensitive to the choice of parameter values. I assume that the elasticity of output with respect to capital is equal to $(1 - \alpha)$ using the U.S. labor share as the benchmark economy with minimal frictions.

To address this concern, I redo the analysis by setting different parameter values for the capital share. Therefore, this section examines the sensitivity of the estimated TFP gains (presented in Section 3.6.2 and in Table 3.14) to the value of the technology parameter in the production function (i.e., the capital share α). I examine two different technologies. One is $\alpha = 1/3$ as in Ziebarth (2013) and the other if $\alpha = 0.45$ which is as in Oberfield (2013). The results are presented in the second and third columns of the Table (3.15).

In column (2), the TFP gains are lower compared to the base case of column (1); in 1990, TFP gains resulting from the removal of distortions are 82.8%, compared with 112% in the baseline calculation. That implies that the TFP gains are very sensitive to the choice and calculation of capital share, and when we use a higher measure of α , it affects the level of potential gains of TFP. Another conclusion from the Table (3.15) is that the Asian financial crisis 1997/98 dampened TFP at the firm level and increased the level of distortion, but did not significantly alter the distribution of distortions. Therefore, the level of TFP gains due to the elimination of misallocations in the crisis years is not significantly different from that in the post-crisis years.

Table 3.15: TFP gain (%) using different parameter values of capital share (α)

Year	Balanced panel		
	Base case (1)	$\alpha = 1/3$ (2)	$\alpha = 0.45$ (3)
1990	112.153	82.860	107.532
1993	101.539	76.459	83.533
1995	53.932	53.718	61.959
1998	131.321	74.262	87.140
2003	165.479	94.504	141.925
2008	148.071	74.387	97.558
2013	187.740	136.363	167.375
2015	206.369	164.772	202.068

Source: Author's estimation based on BPS-Statistic Indonesia data.

Notes: The base case for balanced panel data in column (1) is obtained from column (4) in Table (3.14).

3.6.4 Productivity evolution

The Table (3.16) shows the coefficients from the OLS regression of the levels of TFPQ and TFPR as dependent variables on dummy variables for the year of entry and the five years following entry, along with their standard deviations. As controls, these regressions include a full set of island-year fixed effects; the productivity of entrants is compared to the full sample. An important result of this table is that new entrants are initially less productive than incumbent firms. Incoming firms are estimated to have a 19% lower TFPQ and a 9% lower TFPR. Four years after entry, this difference gradually narrows to a TFPQ that is about 3% lower and a TFPR that is 4% lower relative to the full sample. This pattern means that the gap is quickly closed in about three to four years.

The table shows that the results are consistent with the empirical findings of Brandt et al. (2012). They used firm-level data in China to empirically document the productivity of new entrants relative to incumbent firms, estimating productivity using two parametric productivity measures, the Olley-Pakes (OP) measure and the Akerberg-Caves-Frazer (ACF) measure. They also examined the productivity of new entrants relative to the balanced panel of incumbent firms.

The subsequent decline in initial productivity levels of new firms could be expected when the Indonesian market is liberalized, and the entry process has evolved over the sample period. Consistent with the existing literature Hopenhayn (1992), lower initial productivity would still induce a firm to enter the industry if fixed entry costs had been reduced. Greater market opportunities, especially after Indonesia accedes to the WTO in 1995, could also lead to more experimentation and opportunistic entry.

Table 3.16: Entrants' productivity evolution

	Relative to full sample productivity level	
	$\log TFPQ$	$\log TFPR$
t_0 (entry)	-0.192 (0.022)	-0.094 (0.015)
$t + 1$	-0.113 (0.021)	-0.073 (0.015)
$t + 2$	-0.099 (0.021)	-0.060 (0.014)
$t + 3$	-0.049 (0.020)	-0.052 (0.014)
$t + 4$	-0.034 (0.020)	-0.045 (0.014)

Notes: The dependent variables are the deviation of $\log TFPQ$ and $\log TFPR$ from their industry mean, with robust standard errors in parentheses. Island-year fixed effects are included. OLS regressions of TFPQ and TFPR on dummies for the entry and post-entry years.

3.6.5 Alternative measure of capital stocks

We may also want to check how sensitive our results are to alternative measures of the key firm- and industry-level variables. Here, the main concern is the way we estimated firms' capital stocks. I relied on real capital stocks inferred from the past investment series of firms following a traditional perpetual inventory method (PIM). Specifically, I computed the capital stock as follows: $K_{i,t} = (1 - \delta_{s,t-1}) K_{i,t-1} + I_{i,t}$ where $K_{i,t}$ is the capital stock of the firm i at time t , $\delta_{s,t-1}$ is the depreciation rate at time $(t - 1)$ in industry s , $I_{i,t}$ is the nominal amount invested by the firm i at time t .

This PIM method is a more reliable estimate for calculating capital stock instead of book values of capital as estimated in the benchmark results. The findings, presented in the Table (3.17), show that there is a downward trend in capital dispersion over time. The standard deviations and percentile ratios are close to those shown in the Table (3.4). In this regard, it is worth noting that [Camacho and Conover \(2010\)](#), which also used a PIM methodology to calculate real capital stocks, found much lower dispersion measured by TFPR in Colombia compared to other developed countries.

Table 3.17: Dispersion of capital wedge with alternative capital stock estimation (1990-2015)

Year	$\log(1 + \tau_{si}^K)$			
	SD	p90 – p10	p50 – p10	p90 – p50
1990	2.467	6.363	3.266	3.096
1993	2.031	5.161	2.789	2.373
1995	1.923	5.071	2.769	2.302
1998	1.987	5.169	2.714	2.455
2003	1.936	5.529	3.146	2.383
2008	1.980	5.424	2.716	2.708
2013	1.933	5.036	2.479	2.557
2015	2.423	4.667	2.048	2.619

Source: Author's calculation based on BPS-Statistic Indonesia data.

Notes: As in Table (3.4), statistics are for deviations of $\log(1 + \tau_{si}^K)$ from industry means. SD is the standard deviation, p90 – p10 is the difference between the 90th and 10th percentiles, p50 – p10 is the difference between the 50th and 10th percentiles and p90-p50 is the difference between the 90th and 50th percentiles.

3.7 Conclusion

A long stream of research has pointed out that misallocation of inputs across firms can reduce overall productivity. In this paper, I attempt for the first time to assess the extent of resource misallocation and its consequences for the manufacturing sector in Indonesia. This research applied the method used by [Hsieh and Klenow \(2009\)](#) for data collected from the Indonesian Central Bureau of Statistics with 103,018 observations for the industrial establishment over the period 1990-2015.

The results show a significant misallocation of resources in the Indonesian manufacturing industry, as the dispersion of revenue productivity is almost two to three times higher than in the U.S. and European benchmarks. Similarly, the distribution of TFPQ productivity indicates that most firms are

less productive than the average industry productivity. Total distortions are mainly due to output distortions, but capital distortions are relatively high.

When the misallocation of capital and labor across plants in the same industry is hypothetically eliminated, manufacturing TFP increases between 136% and 292%, moreover, an increase in the output subsidy given to the least productive plants and the corresponding decrease in their revenue productivity is the most important reason for the increase in resource misallocation over this period. In other words, firms that benefit from distortions (e.g., subsidies) may produce above their efficiency level; conversely, this would correspond to a situation where firms are negatively affected by distortions (e.g., increased taxes) and produce below their efficiency level. This suggests that policy reforms in Indonesia need to eliminate subsidies to initially unproductive plants, which will improve the allocation of resources among incumbent firms and accelerate their productivity growth.

I also investigated some specific characteristics of the Indonesian manufacturing sector by relating TFPQ and TFPR to firm characteristics. The results show that the main characteristics that explain the physical differences in production in Indonesia are firm size, with large firms being the most productive. On the other hand, I also compared the dispersion of TFPR with these characteristics. I found that the dispersion of TFPR is negatively correlated with large firms, foreign-owned plants, and exporting firms. This result could be explained by the fact that foreign-owned firms have easy access to credit and good relationships with banks; government policies put pressure on the region's resources for exporting firms. In addition, while older firms face greater dispersion than young and mature firms, this may be because older plants may have more flexible borrowing constraints.

Furthermore, our empirical analysis explicitly separates the impacts of trade liberalization from other reforms and shocks to which firms have been exposed. The results show that input trade liberalization improves firm efficiency, as measured by TFPQ, and leads firms to introduce new products following an increase in the quality of imported inputs. Output trade liberalization also improves firm efficiency, as firms increase the quality of inputs and improve the quality of their commodities. While a higher TFPR of firms after trade liberalization may result from improved production efficiency, variations in markups may also be the source of a higher TFPR. Policies to help productive firms with fewer resources and market power benefit from trade liberalization and appropriate training and competition policies. This would help ensure that the gains from trade liberalization benefit all.

A better understanding of resource allocation is therefore essential. This article contributes to the literature by providing a picture of the current pattern of resource allocation in Indonesia and identifying possible drivers of productivity growth, which can help in policy design and serve as a starting point for further research. A second avenue for future research could extend this analysis by applying the [Oberfield \(2013\)](#) method to examine the relative importance of within-industry and between-industry allocation in a more systemic way, to analyze how industry subsidies affect differences in misallocation patterns. This analysis could help design policies to reduce differences across industries and stimulate overall productivity growth in manufacturing.

Appendices

3.A Model details

3.A.1 Optimization problems

Production of final output: There is a representative firm that produces the final goods and sells its output Y in a competitive market at a price P , which normalize to one. The firm buys the intermediate products Y_s also in competitive markets at prices P_s . Therefore,

$$\max_{Y_s} \left\{ PY - \sum_{s=1}^S P_s Y_s \right\} \implies \max_{Y_s} \left\{ \prod_{s=1}^S Y_s^{\theta_s} - \sum_{s=1}^S P_s Y_s \right\}$$

The FOC associated for each good implies:

$$P_s = \theta_s \prod_{s=1}^S Y_s^{\theta_s-1} \implies P_s Y_s = \theta_s Y \quad (3.A.1)$$

Production of sectoral output: In each sector s , there is a representative firm that produces sectoral output Y_s by aggregating output from each variety (si) within the industry. This firm sells output at a price P_s in a competitive market and buys each variety at a price P_{si} , which is also taken as given. Therefore,

$$\max_{Y_{si}} \left\{ P_s Y_s - \sum_{i=1}^{N_s} P_{si} Y_{si} \right\} \implies \max_{Y_{si}} \left\{ P_s \left(\sum_{i=1}^{N_s} Y_{si}^{\frac{\epsilon-1}{\epsilon}} \right)^{\frac{\epsilon}{\epsilon-1}} - \sum_{i=1}^{N_s} P_{si} Y_{si} \right\}$$

The standard FOC for each good (Y_{si}) gives:

$$P_s \left(\sum_{i=1}^{N_s} Y_{si}^{\frac{\epsilon-1}{\epsilon}} \right)^{\frac{\epsilon}{\epsilon-1}-1} Y_{si}^{\frac{\epsilon-1}{\epsilon}-1} = P_{si} \\ P_s Y_s^{\frac{1}{\epsilon}} Y_{si}^{-\frac{1}{\epsilon}} = P_{si} \quad (3.A.2)$$

Then, the ratio of expenditure shares depends on the relative price between the goods and the elasticity of substitutions. So, the standard condition gives:

$$\frac{P_{si}}{P_s} = \left(\frac{Y_{si}}{Y_s} \right)^{-\frac{1}{\epsilon}} \implies \frac{P_{si} Y_{si}}{P_s Y_s} = \left(\frac{P_{si}}{P_s} \right)^{1-\epsilon} \quad (3.A.3)$$

Since the firm has constant return to scale and it operates in competitive markets. It makes zero profits, that implies:

$$\sum_{i=1}^{N_s} P_{si} Y_{si} = P_s Y_s \quad (3.A.4)$$

Substituting equation (3.A.3) into this zero-profit condition, It indicates that the expenditure demand for variety (si) depends on three components; the aggregate demand for the output of sector ($\theta_s Y$), the relative price of variety ($\frac{P_{si}}{P_s}$) and the elasticity of substitution (ϵ). Hence, I obtain:

$$P_{si} Y_{si} = P_s Y_s \left(\frac{P_{si}}{P_s} \right)^{1-\epsilon} \implies P_{si} Y_{si} = \theta_s Y \left(\frac{P_{si}}{P_s} \right)^{1-\epsilon}$$

It will be useful to derive the demand curve for the firms producing variety (si) in terms of price. I rewrite equation (3.A.2) with the FOC of final good Y_s (equation 3.A.1). I obtain:

$$\begin{aligned} P_{si} &= P_s Y_s^{\frac{1}{\epsilon}} Y_{si}^{-\frac{1}{\epsilon}} \\ P_{si} &= P_s \left(\frac{\theta_s Y}{P_s} \right)^{\frac{1}{\epsilon}} Y_{si}^{-\frac{1}{\epsilon}} \\ P_{si} &= \left(\frac{\theta_s Y}{P_s^{1-\epsilon}} \right)^{\frac{1}{\epsilon}} Y_{si}^{-\frac{1}{\epsilon}} \end{aligned} \quad (3.A.5)$$

The above equation implies that firms sell their output Y_{si} at a price P_{si} , which depends on their own output across the demand curve of the sectoral aggregator.

Sectoral prices (P_s): Using the zero-profit condition (equation 3.A.4) for the producers of sectoral output and the relative price between the goods (equation 3.A.3). It can be obtained an expression for the sectoral price P_s :

$$P_s = \sum_{i=1}^{N_s} \frac{P_{si} Y_{si}}{Y_s} \implies P_s = \sum_{i=1}^{N_s} P_{si} \left(\frac{P_{si}}{P_s} \right)^{-\epsilon}$$

so, we finally have the price index to buy the composite good Y_s :

$$P_s \equiv \left(\sum_{i=1}^{N_s} P_{si}^{1-\epsilon} \right)^{\frac{1}{1-\epsilon}} \quad (3.A.6)$$

Next, I plug the optimal firm price into (equation 3.A.6), I obtain:

$$\begin{aligned} P_s &= \frac{\epsilon}{\epsilon - 1} \left[\sum_{i=1}^{N_s} \left(\left(\frac{r}{\alpha_s} \right)^{\alpha_s} \left(\frac{w}{1 - \alpha_s} \right)^{1-\alpha_s} \frac{(1 + \tau_{si}^K)^{\alpha_s}}{A_{si}(1 - \tau_{si}^Y)} \right)^{1-\epsilon} \right]^{\frac{1}{1-\epsilon}} \\ P_s &= \frac{\epsilon}{\epsilon - 1} \left[\sum_{i=1}^{N_s} \left(\frac{1}{A_{si}} \left(\frac{MRPK_{si}}{\alpha_s} \right)^{\alpha_s} \left(\frac{MRPL_{si}}{1 - \alpha_s} \right)^{1-\alpha_s} \right)^{1-\epsilon} \right]^{\frac{1}{1-\epsilon}} \\ P_s &= \left[\sum_{i=1}^{N_s} \left(\frac{1}{A_{si}} TFP_{R_{si}} \right)^{1-\epsilon} \right]^{\frac{1}{1-\epsilon}} \end{aligned} \quad (3.A.7)$$

3.A.2 Profit maximization problem

The optimization problem of the firm producing variety (si) are given as:

$$\pi_{si} = \max_{\{L_{si}, K_{si}\}} \left\{ (1 - \tau_{si}^Y) P_{si} Y_{si} - w L_{si} - (1 + \tau_{si}^K) r K_{si} \right\}$$

subject to the demand curve of firm (i) and Cobb-Douglas technology:

$$P_{si} Y_{si} = \left(\frac{\theta_s Y}{P_s^{1-\epsilon}} \right)^{\frac{1}{\epsilon}} Y_{si}^{\frac{\epsilon-1}{\epsilon}},$$

$$Y_{si} = A_{si} K_{si}^{\alpha_s} L_{si}^{1-\alpha_s}$$

Taking the FOCs with respect to L_{si} and K_{si} , respectively, yields:

$$(1 - \tau_{si}^Y) \left(\frac{\theta_s Y}{P_s^{1-\epsilon}} \right)^{\frac{1}{\epsilon}} \frac{\epsilon - 1}{\epsilon} Y_{si}^{\frac{-1}{\epsilon}} (1 - \alpha_s) A_{si} \left(\frac{K_{si}}{L_{si}} \right)^{\alpha_s} = w \quad (3.A.8a)$$

$$(1 - \tau_{si}^Y) \left(\frac{\theta_s Y}{P_s^{1-\epsilon}} \right)^{\frac{1}{\epsilon}} \frac{\epsilon - 1}{\epsilon} Y_{si}^{\frac{-1}{\epsilon}} (\alpha_s) A_{si} \left(\frac{K_{si}}{L_{si}} \right)^{(\alpha_s - 1)} = (1 + \tau_{si}^K) r \quad (3.A.8b)$$

Capital-labor ratio: Dividing the FOCs for capital and labor (equation 3.A.8), It becomes:

$$\frac{K_{si}}{L_{si}} = \frac{\alpha_s}{(1 - \alpha_s)} \frac{w}{(1 + \tau_{si}^K) r} \quad (3.A.9)$$

Hence, This equation means that the relative factor depends on the economy-wide ratio of factor prices ($\frac{w}{r}$), the sectoral capital share (α) and the firm-level capital distortions (τ_{si}^K).

Factor demands: Using the marginal revenue products of labor and capital and the optimal price, one can express optimal factor demand for each firm as:

$$L_{si} = \frac{Y_{si}}{A_{si}} \left(\frac{1 - \alpha_s}{\alpha_s} \frac{r (1 + \tau_{si}^K)}{w} \right)^{\alpha_s} \quad (3.A.10a)$$

$$K_{si} = \frac{Y_{si}}{A_{si}} \left(\frac{\alpha_s}{1 - \alpha_s} \frac{w}{r (1 + \tau_{si}^K)} \right)^{1 - \alpha_s} \quad (3.A.10b)$$

3.A.3 TFPR, TFPQ and industry TFP

Physical productivity ($TFPQ_{si}$): Given the Cobb-Douglas production function (equation 3.2), the model implied demand function (equation 3.A.5), the physical productivity of firm (i) is defined as:

$$\begin{aligned} TFPQ_{si} &\equiv A_{si} = \frac{Y_{si}}{K_{si}^{\alpha_s} L_{si}^{1-\alpha_s}} \\ &= \frac{(\theta_s Y)^{-\frac{1}{\epsilon-1}}}{P_s} \frac{(P_{si} Y_{si})^{\frac{\epsilon}{\epsilon-1}}}{K_{si}^{\alpha_s} L_{si}^{1-\alpha_s}} \end{aligned} \quad (3.A.11)$$

Therefore, substituting equation (3.A.1) into equation (3.A.11), $TFPQ_{si}$ can be written as:

$$TFPQ_{si} = (Y_s P_s^\epsilon)^{-\frac{1}{\epsilon-1}} \frac{(P_{si} Y_{si})^{\frac{\epsilon}{\epsilon-1}}}{K_{si}^{\alpha_s} L_{si}^{1-\alpha_s}} \quad (3.A.12)$$

Revenue productivity ($TFPR_{si}$): TFP revenue of firm (i) is defined as $TFPR_{si} \equiv P_{si} A_{si}$. Therefore, I can write $TFPR_{si}$ as:

$$\begin{aligned} TFPR_{si} &= \frac{\epsilon}{\epsilon - 1} \left(\frac{r}{\alpha_s} \right)^{\alpha_s} \left(\frac{w}{1 - \alpha_s} \right)^{1 - \alpha_s} \frac{(1 + \tau_{si}^K)^{\alpha_s}}{(1 - \tau_{si}^Y)} \\ TFPR_{si} &= \frac{\epsilon}{\epsilon - 1} \left(\frac{r (1 + \tau_{si}^K)}{\alpha_s (1 - \tau_{si}^Y)} \right)^{\alpha_s} \left(\frac{w}{(1 - \alpha_s) (1 - \tau_{si}^Y)} \right)^{1 - \alpha_s} \end{aligned} \quad (3.A.13)$$

Then, under the assumption of constant returns to scale and using FOC (equation 3.A.8). TFPR can be expressed as a function of $MRPK_{si}$ and $MRPL_{si}$:

$$TFPR_{si} = \frac{\epsilon}{\epsilon - 1} \left(\frac{MRPK_{si}}{\alpha_s} \right)^{\alpha_s} \left(\frac{MRPL_{si}}{1 - \alpha_s} \right)^{1 - \alpha_s} \quad (3.A.14)$$

Once we have obtained the physical productivity and revenue productivity of the firms in the sample, we can calculate the TFP at the industry level. The industry-level TFP is defined as the wedge between the industry output and an industry input aggregator. Next, it is straightforward that the measured industry TFP_s is given by the average firm-level TFP weighted by the derivations of the firm-level TFP from the industry average. It is also essential to relate TFPQ to the distortions and productivity of firms. Firms with a higher TFPR than the industry average are subject to high distortions.

Industry TFP: I start by defining the sectoral-wide marginal revenue products of capital and labor as the weighted harmonic means of each firm marginal revenue products:

$$\overline{MRPL}_s \equiv \left[\sum_{i=1}^{N_s} \left(\frac{P_{si} Y_{si}}{P_s Y_s} \right) \frac{1}{MRPL_{si}} \right]^{-1} = w \left[\sum_{i=1}^{N_s} \left(\frac{P_{si} Y_{si}}{P_s Y_s} \right) (1 - \tau_{si}^Y) \right]^{-1} \quad (3.A.15a)$$

$$\overline{MRPK}_s \equiv \left[\sum_{i=1}^{N_s} \left(\frac{P_{si} Y_{si}}{P_s Y_s} \right) \frac{1}{MRPK_{si}} \right]^{-1} = r \left[\sum_{i=1}^{N_s} \left(\frac{P_{si} Y_{si}}{P_s Y_s} \right) \frac{(1 - \tau_{si}^Y)}{(1 + \tau_{si}^K)} \right]^{-1} \quad (3.A.15b)$$

It can be expressed the total amount of capital and labor in industry (s) by aggregating over equations (3.A.10). They become:

$$L_s \equiv \sum_{i=1}^{N_s} L_{si} = \left(\frac{1 - \alpha_s}{\alpha_s} \frac{r}{w} \right)^{\alpha_s} \sum_{i=1}^{N_s} \frac{Y_{si}}{A_{si}} (1 + \tau_{si}^K)^{\alpha_s} \quad (3.A.16a)$$

$$K_s \equiv \sum_{i=1}^{N_s} K_{si} = \left(\frac{\alpha_s}{1 - \alpha_s} \frac{w}{r} \right)^{1 - \alpha_s} \sum_{i=1}^{N_s} \frac{Y_{si}}{A_{si}} (1 + \tau_{si}^K)^{\alpha_s - 1} \quad (3.A.16b)$$

Taking a geometric average:

$$K_s^{\alpha_s} L_s^{1 - \alpha_s} = \left[\sum_{i=1}^{N_s} \frac{Y_{si}}{A_{si}} \left(\frac{1}{1 + \tau_{si}^K} \right)^{1 - \alpha_s} \right]^{\alpha_s} \left[\sum_{i=1}^{N_s} \frac{Y_{si}}{A_{si}} (1 + \tau_{si}^K)^{\alpha_s} \right]^{1 - \alpha_s} \quad (3.A.17)$$

Therefore, the output of sector (s) can be written as a cobb-douglas production function:

$$Y_s = A_s K_s^{\alpha_s} L_s^{1 - \alpha_s} \quad (3.A.18)$$

Dividing the equation (3.A.18) on (3.A.17), I obtain:

$$A_s = \left(\left[\sum_{i=1}^{N_s} \frac{Y_{si}}{Y_s} \frac{1}{A_{si}} \left(\frac{1}{1 + \tau_{si}^K} \right)^{1 - \alpha_s} \right]^{\alpha_s} \left[\sum_{i=1}^{N_s} \frac{Y_{si}}{Y_s} \frac{1}{A_{si}} (1 + \tau_{si}^K)^{\alpha_s} \right]^{1 - \alpha_s} \right)^{-1}$$

Given the demand curve for firm products (equation 3.A.3), It becomes:

$$A_s = \left(P_s \left[\sum_{i=1}^{N_s} \left(\frac{P_{si}}{P_s} \right)^{1-\epsilon} \frac{1}{TFPR_{si}} \left(\frac{1}{1+\tau_{si}^K} \right)^{1-\alpha_s} \right]^{\alpha_s} \left[\sum_{i=1}^{N_s} \left(\frac{P_{si}}{P_s} \right)^{1-\epsilon} \frac{1}{TFPR_{si}} (1+\tau_{si}^K)^{\alpha_s} \right]^{1-\alpha_s} \right)^{-1}$$

Following equation (3.A.3), I can replace the terms $\left(\frac{P_{si}}{P_s} \right)^{1-\epsilon}$ by their relative revenues. In addition, I define $\overline{TFPR}_s \equiv A_s P_s$.

$$\begin{aligned} \overline{TFPR}_s &\equiv A_s P_s \\ &= \left(\left[\sum_{i=1}^{N_s} \left(\frac{P_{si} Y_{si}}{P_s Y_s} \right) \frac{1}{TFPR_{si}} \left(\frac{1}{1+\tau_{si}^K} \right)^{1-\alpha_s} \right]^{\alpha_s} \left[\sum_{i=1}^{N_s} \left(\frac{P_{si} Y_{si}}{P_s Y_s} \right) \frac{1}{TFPR_{si}} (1+\tau_{si}^K)^{\alpha_s} \right]^{1-\alpha_s} \right)^{-1} \end{aligned}$$

Using the expression for $TFPR_{si}$ in equation (3.A.13). It can be written as:

$$\begin{aligned} \overline{TFPR}_s &= \frac{\epsilon}{\epsilon-1} \left(\frac{r}{\alpha_s} \right)^{\alpha_s} \left(\frac{w}{1-\alpha_s} \right)^{1-\alpha_s} \left(\left[\sum_{i=1}^{N_s} \left(\frac{P_{si} Y_{si}}{P_s Y_s} \right) \left(\frac{1-\tau_{si}^Y}{1+\tau_{si}^K} \right) \right]^{\alpha_s} \left[\sum_{i=1}^{N_s} \left(\frac{P_{si} Y_{si}}{P_s Y_s} \right) (1-\tau_{si}^Y) \right]^{1-\alpha_s} \right)^{-1} \\ \overline{TFPR}_s &= \frac{\epsilon}{\epsilon-1} \left(\frac{\overline{MRPK}_s}{\alpha_s} \right)^{\alpha_s} \left(\frac{\overline{MRPL}_s}{1-\alpha_s} \right)^{1-\alpha_s} \end{aligned}$$

Dividing \overline{TFPR}_s back by P_s in equation (3.A.7). The industry TFP will be given by:

$$\begin{aligned} A_s &= \left[\sum_{i=1}^{N_s} \left(A_{si} \left(\frac{\overline{MRPK}_s}{\overline{MRPK}_{si}} \right)^{\alpha_s} \left(\frac{\overline{MRPL}_s}{\overline{MRPL}_{si}} \right)^{1-\alpha_s} \right)^{\epsilon-1} \right]^{\frac{1}{\epsilon-1}} \\ TFP_s &= A_s = \left[\sum_{i=1}^{N_s} \left(A_{si} \frac{\overline{TFPR}_s}{TFPR_{si}} \right)^{\epsilon-1} \right]^{\frac{1}{\epsilon-1}} \end{aligned} \quad (3.A.19)$$

where $K_s = \sum_{i=1}^{N_s} K_{si}$ is the capital at the industry level, $L_s = \sum_{i=1}^{N_s} L_{si}$ is the labor at the industry level, and \overline{TFPR}_s is a geometric mean of the average marginal product of capital and labor. To obtain a measure that matches resource allocation and TFP performance, I follow the HK model and define the "efficient" level of TFP, which means that there is no dispersion of MRPK, MRPL and TFPR between firms¹⁵. Plugging $TFPR_{si} = \overline{TFPR}_s$ into equation (3.A.19), the efficient level of TFP is given by:

$$TFP_s^E = \bar{A}_s = \left[\sum_{i=1}^{N_s} A_{si}^{\epsilon-1} \right]^{\frac{1}{\epsilon-1}} \quad (3.A.20)$$

In the equation (3.A.20), resources are reallocated from the least productive to the most productive firms. Therefore, the derivation of the equations (3.A.19) and (3.A.20) can be used to calculate the productivity loss due to distortions at industry level.

Given the assumed aggregate production function (equation 3.1) and using the equation of (3.A.19),

¹⁵It means that after eliminating all the idiosyncratic distortions, (i.e., $\tau_{si}^Y = \tau_{si}^K = 0$).

aggregate TFP can be expressed as:

$$\begin{aligned} TFP &= \prod_{s=1}^S TFP_s^{\theta_s} \\ &= \prod_{s=1}^S \left[\left(\sum_{i=1}^{N_s} \left(A_{si} \frac{\overline{TFPR}_s}{TFPR_{si}} \right)^{\epsilon-1} \right)^{\frac{1}{\epsilon-1}} \right]^{\theta_s} \end{aligned}$$

an important conclusion of the model is that the more variance of firm revenue productivity ($TFPR_{si}$), the lower aggregate productivity (TFP). Specifically, by fixing A_{si} and since $\epsilon > 1$, we can see that a firm with higher revenue productivity has a higher marginal cost and, therefore, proportionately higher prices. This will induce the firm to produce less than the optimal level (i.e., the TFP level in the absence of firm-specific distortions). To understand the cost of idiosyncratic distortions, one can define the efficient level of aggregate TFP:

$$TFP^E = \prod_{s=1}^S (TFP_s^E)^{\theta_s} = \prod_{s=1}^S \left[\left(\sum_{i=1}^{N_s} (A_{si})^{\epsilon-1} \right)^{\frac{1}{\epsilon-1}} \right]^{\theta_s}$$

3.A.4 Decomposition of aggregate TFP

Following [Gilchrist et al. \(2013\)](#), I plug the equation of the optimal firm's price (equation 3.3) with the demand curve equation (equation 3.A.2). Then, the aggregate inputs of labor and capital can be defined by:

$$L_s \equiv \int L_{si} di = Y_s P_s^\epsilon \left(\frac{\epsilon}{\epsilon-1} \right)^{-\epsilon} \left(\frac{\alpha_s}{r} \right)^{\alpha_s(\epsilon-1)} \left(\frac{1-\alpha_s}{w} \right)^{\alpha_s+\epsilon(1-\alpha_s)} \int A_{si}^{\epsilon-1} \frac{(1-\tau_{si}^Y)^\epsilon}{(1+\tau_{si}^K)^{\alpha_s(\epsilon-1)}} di \quad (3.A.21a)$$

$$K_s \equiv \int K_{si} di = Y_s P_s^\epsilon \left(\frac{\epsilon}{\epsilon-1} \right)^{-\epsilon} \left(\frac{\alpha_s}{r} \right)^{\alpha_s(\epsilon-1)+1} \left(\frac{w}{1-\alpha_s} \right)^{(1-\alpha_s)(1-\epsilon)} \int A_{si}^{\epsilon-1} \frac{(1-\tau_{si}^Y)^\epsilon}{(1+\tau_{si}^K)^{\alpha_s(\epsilon-1)+1}} di \quad (3.A.21b)$$

TFP_s is measured as aggregate output to a geometrically weighted average of aggregate labor and capital inputs (equation 3.A.21). It may then be expressed as:

$$\begin{aligned} TFP_s &= \frac{\left[\int \left(\frac{A_{si} (1-\tau_{si}^Y)}{(1+\tau_{si}^K)^{\alpha_s}} \right)^{\epsilon-1} di \right]^{\frac{\epsilon}{\epsilon-1}}}{\left[\int A_{si}^{\epsilon-1} \frac{(1-\tau_{si}^Y)^\epsilon}{(1+\tau_{si}^K)^{\alpha_s(\epsilon-1)+1}} di \right]^{\alpha_s} \left[\int A_{si}^{\epsilon-1} \frac{(1-\tau_{si}^Y)^\epsilon}{(1+\tau_{si}^K)^{\alpha_s(\epsilon-1)}} di \right]^{1-\alpha_s}} \\ \log(TFP_s) &= \frac{\epsilon}{\epsilon-1} \log \left(\int \left(\frac{A_{si} (1-\tau_{si}^Y)}{(1+\tau_{si}^K)^{\alpha_s}} \right)^{\epsilon-1} di \right) - \alpha_s \log \left(\int A_{si}^{\epsilon-1} \frac{(1-\tau_{si}^Y)^\epsilon}{(1+\tau_{si}^K)^{\alpha_s(\epsilon-1)+1}} di \right) \\ &\quad - (1-\alpha_s) \log \left(\int A_{si}^{\epsilon-1} \frac{(1-\tau_{si}^Y)^\epsilon}{(1+\tau_{si}^K)^{\alpha_s(\epsilon-1)}} di \right) \end{aligned} \quad (3.A.22)$$

Assuming that A_{si} , $(1-\tau_{si}^Y)$, and $(1+\tau_{si}^K)$ are jointly distributed according to a logarithm of multivariate-

normal distribution (MVN), we have:

$$\begin{bmatrix} \log A_{si} \\ \log(1 - \tau_{si}^Y) \\ \log(1 + \tau_{si}^K) \end{bmatrix} \sim MVN \left(\begin{bmatrix} a_{si} \\ (1 - \tau_{si}^Y) \\ (1 + \tau_{si}^K) \end{bmatrix}, \begin{bmatrix} \sigma_{a_{si}}^2 & \sigma_{a_{si}, (1 - \tau_{si}^Y)} & \sigma_{a_{si}, (1 + \tau_{si}^K)} \\ \sigma_{a_{si}, (1 - \tau_{si}^Y)} & \sigma_{(1 - \tau_{si}^Y)}^2 & \sigma_{(1 - \tau_{si}^Y), (1 + \tau_{si}^K)} \\ \sigma_{a_{si}, (1 + \tau_{si}^K)} & \sigma_{(1 - \tau_{si}^Y), (1 + \tau_{si}^K)} & \sigma_{(1 + \tau_{si}^K)}^2 \end{bmatrix} \right)$$

The second-order approximation of the three terms in equation (3.A.22) are given by:

$$\begin{aligned} \log \left(\int \left(\frac{A_{si} (1 - \tau_{si}^Y)}{(1 + \tau_{si}^K)^{\alpha_s}} \right)^{\epsilon-1} \right) &= (\epsilon - 1) \mathbb{E}(a_{si}) + \frac{(\epsilon - 1)^2}{2} \sigma_{a_{si}}^2 + (\epsilon - 1) \mathbb{E}(1 - \tau_{si}^Y) + \frac{(\epsilon - 1)^2}{2} \sigma_{(1 - \tau_{si}^Y)}^2 \\ &\quad - \alpha_s (\epsilon - 1) \mathbb{E}(1 + \tau_{si}^K) + \frac{\alpha_s^2 (\epsilon - 1)^2}{2} \sigma_{(1 + \tau_{si}^K)}^2 + (\epsilon - 1)^2 \text{cov}(a_{si}, (1 - \tau_{si}^Y)) \\ &\quad - \alpha_s (\epsilon - 1)^2 \text{cov}(a_{si}, (1 + \tau_{si}^K)) - \alpha_s (\epsilon - 1)^2 \text{cov}((1 - \tau_{si}^Y), (1 + \tau_{si}^K)) \end{aligned} \quad (3.A.23)$$

$$\begin{aligned} \log \left(\int A_{si}^{\epsilon-1} \frac{(1 - \tau_{si}^Y)^\epsilon}{(1 + \tau_{si}^K)^{\alpha_s (\epsilon-1)+1}} \right) &= (\epsilon - 1) \mathbb{E}(a_{si}) + \frac{(\epsilon - 1)^2}{2} \sigma_{a_{si}}^2 + \epsilon \mathbb{E}(1 - \tau_{si}^Y) + \frac{\epsilon^2}{2} \sigma_{(1 - \tau_{si}^Y)}^2 - [1 + \alpha_s \epsilon - \alpha_s] \mathbb{E}(1 + \tau_{si}^K) \\ &\quad + \frac{[1 + \alpha_s \epsilon - \alpha_s]^2}{2} \sigma_{(1 + \tau_{si}^K)}^2 - [1 + \alpha_s \epsilon - \alpha_s] (\epsilon - 1) \text{cov}(a_{si}, (1 + \tau_{si}^K)) \\ &\quad + \epsilon (\epsilon - 1) \text{cov}(a_{si}, (1 - \tau_{si}^Y)) - [\epsilon + \alpha_s \epsilon^2 - \alpha_s \epsilon] \text{cov}((1 - \tau_{si}^Y), (1 + \tau_{si}^K)) \end{aligned} \quad (3.A.24)$$

$$\begin{aligned} \log \left(\int A_{si}^{\epsilon-1} \frac{(1 - \tau_{si}^Y)^\epsilon}{(1 + \tau_{si}^K)^{\alpha_s (\epsilon-1)}} \right) &= (\epsilon - 1) \mathbb{E}(a_{si}) + \frac{(\epsilon - 1)^2}{2} \sigma_{a_{si}}^2 + \epsilon \mathbb{E}(1 - \tau_{si}^Y) + \frac{\epsilon^2}{2} \sigma_{(1 - \tau_{si}^Y)}^2 - \alpha_s (\epsilon - 1) \mathbb{E}(1 + \tau_{si}^K) \\ &\quad + \frac{\alpha_s^2 (\epsilon - 1)^2}{2} \sigma_{(1 + \tau_{si}^K)}^2 + \epsilon (\epsilon - 1) \text{cov}(a_{si}, (1 - \tau_{si}^Y)) - \alpha_s (\epsilon - 1)^2 \text{cov}(a_{si}, (1 + \tau_{si}^K)) \\ &\quad - \alpha_s \epsilon (\epsilon - 1) \text{cov}((1 - \tau_{si}^Y), (1 + \tau_{si}^K)) \end{aligned} \quad (3.A.25)$$

Combining the above expressions (equations 3.A.23, 3.A.24 and 3.A.25) and rearranging yield the second order approximation of (equation 3.A.22):

$$\log(TFP_s) = \underbrace{\mathbb{E}(a_{si}) + \frac{(\epsilon - 1)}{2} \sigma_{a_{si}}^2}_{\log(TFP_s^E)} - \frac{\epsilon}{2} \sigma_{(1 - \tau_{si}^Y)}^2 - \frac{\alpha_s + \alpha_s^2 (\epsilon - 1)}{2} \sigma_{(1 + \tau_{si}^K)}^2 + \alpha_s \epsilon \text{cov}((1 - \tau_{si}^Y), (1 + \tau_{si}^K))$$

3.B List of variables included in the analysis

3.B.1 Construction of misallocation measures for dependent variables

Gross output is defined as the value of all production (rupiah), which is deflated by the CPI for three-digit ISIC industries, based on the constant prices of the year 2010.

Intermediate inputs is defined as the sum of expenditures on raw materials, fuel, and electricity. It is deflated

by the CPI based on 2010 prices.

Value added ($P_{si}Y_{si}$) is calculated as the difference between gross output and intermediate inputs.

Labor measure (L_{si}) is the sum of all men and women employed directly and indirectly by the establishment. This includes the labor supplied by independent contractors.

Wage bill (wL_{si}) includes all salaried and compensation to workers.

Investment includes all purchases of capital goods, including structures and equipment.

Capital stock (K_{si}) is the net book value of machinery, equipment, and structures of firms at the end of the year. In the robustness check, I constructed an alternative measure of capital stocks using the perpetual inventory method (PIM). I use the initial real investment to calculate the initial capital stock. We then update the real capital stock using the investment flows assuming a depreciation rate of 10%.

Real interest rate (r) includes information on interest rates paid on loans after subtracting inflation in the survey's year. The inflation rate is obtained from the International Monetary Fund, which means the annual percentage change in consumer prices.

3.B.2 Independent and control variables

Output/Input tariffs are obtained from Trade Analysis Information System (TRAINS) database of the United Nations. The output tariffs are computed as the simple average of the 3-digit ISIC industry (s). While, the input tariff for each industry (s) is the weighted average of all output tariffs, where the weights are based on the cost shares of each input used from the input-output tables.

Financial liberalization is calculated by the industry-level financial liberalization index using the IMF's financial reform index for Indonesia weighted by the 3-digit industry's dependence on external financing in the United States from [Rajan and Zingales \(1996\)](#) and then updated by [Braun \(2005\)](#).

Firm size (employees) is a categorical variable, which takes the value 1 if the firm is defined as medium (10-99 employees) and takes the value 2 if the firm is defined as large (100 or more employees).

Firm age is measured from the first appearance of the firm in the panel data sets. Since the datasets do not include information on the firm's age, I assume that any firm appearing in 1990 is one year old, the first year of the panel.

Government ownership is a dummy variable that equals 1 if the plant is state-owned and zero otherwise.

Foreign ownership is a dummy variable that is 1 if the plant has foreign ownership and zero otherwise.

Import share is the imported raw materials as a respective fraction of the gross expenditure.

Export share is the total goods exported as a fraction of the output produced.

Crisis dummy is an indicator variable equal to one for the Asian financial crisis of 1997 and 1998.

Island defines five main groups of islands: Java, Sumatra, Kalimantan, Sulawesi, and the outer island.

3.C Additional tables

3.C.1 Descriptive statistics of the firms and productivity in the sample

Table 3.18: Number of firms by year

Year	Unbalanced panel			Balanced panel		
	# Firms	Value Added share	Employment share	# Firms	Value Added share	Employment share
1990	4091	0.2%	3.3%	481	0.2%	2.8%
1991	3429	0.2%	3.4%	481	0.2%	3.0%
1992	3322	0.2%	3.4%	481	0.3%	3.1%
1993	3291	0.2%	3.5%	481	0.2%	3.3%
1994	3373	0.3%	3.8%	481	0.3%	3.5%
1995	3912	0.4%	3.9%	481	0.5%	3.6%
1996	3900	0.4%	3.7%	481	0.5%	3.7%
1997	3410	0.4%	3.5%	481	0.7%	3.7%
1998	3148	0.6%	3.5%	481	0.6%	3.7%
1999	3055	0.6%	3.4%	481	0.8%	3.6%
2000	3378	1.0%	4.0%	481	1.0%	3.8%
2001	3200	1.0%	3.6%	481	1.7%	3.9%
2002	3219	1.3%	3.7%	481	1.8%	3.7%
2003	2993	1.0%	3.3%	481	2.0%	4.2%
2004	3268	1.6%	3.5%	481	1.8%	3.7%
2005	3214	1.5%	3.4%	481	1.7%	4.1%
2006	5896	4.2%	3.9%	481	1.9%	4.2%
2007	5253	4.8%	3.9%	481	6.8%	4.4%
2008	4405	3.9%	3.7%	481	9.4%	4.2%
2009	3920	3.4%	3.2%	481	10.6%	4.3%
2010	3823	4.2%	3.6%	481	9.3%	4.4%
2011	4041	6.0%	3.9%	481	11.8%	4.6%
2012	4467	7.7%	4.4%	481	11.1%	4.5%
2013	4898	10.8%	4.7%	481	7.2%	4.1%
2014	5512	17.5%	5.5%	481	9.8%	4.1%
2015	6600	26.5%	6.2%	481	7.8%	4.1%
Total	103,018	100%	100%	12,506	100%	100%

Source: Author's calculation based on BPS-Statistic Indonesia data.

Table 3.19: Average growth rate of TFPQ by quantiles of TFPQ in 1998

Quintile of TFPQ in 1998	Average growth rate of TFPQ during the period (1998-2015)
1	0.152
2	0.212
3	0.219
4	0.144
5	0.040

Source: Author's calculation based on BPS-Statistic Indonesia data.

3.C.2 Industries classifications based on three-digit international ISIC

Table 3.20: Industry summary in manufacturing sector

ISIC (3 Digit)	Industry Name	Obs.	# Firms	Value Added share (%)	Employment share (%)	US. Labor share (%)
311	Food products	10590	2528	12.6	8.1	52.42
312	Animal feeds, etc	8032	1719	8.6	3.6	36.14
313	Beverages	1200	291	1.3	0.6	42.22
314	Tobacco	1572	409	1.6	1.1	22.44
321	Textiles	11416	2313	10.9	16.1	75.97
322	Garments	11241	2809	11.1	11.4	74.63
323	Leather products	1286	280	1.1	0.7	74.43
324	Footwear	2123	452	1.8	4.5	74.17
331	Wood products	10030	2490	7.5	12.1	76.55
332	Manufacturing of furniture	9495	2224	8.1	5.6	76.26
341	Paper products	2620	617	3.4	1.9	65.96
342	Printing and publishing	1710	431	0.8	0.7	67.39
351	Basic chemicals	1099	301	1.0	1.2	41.96
352	Other chemicals	2777	525	2.7	3.4	34.49
353	Petroleum refineries	14	9	0.0	0.0	33.44
354	Oil and gas processing	130	43	0.1	0.01	48.92
355	Rubber products	2455	464	2.3	3.3	72.64
356	Plastic products	6287	1239	6.4	7.1	64.83
361	Manufacture of pottery, china and earthenware	783	110	0.6	2.5	79.23
362	Glass products	367	77	0.4	0.4	62.39
369	Other non-metallic minerals	1455	397	1.2	0.6	62.25
371	Iron and steel	401	106	0.6	0.3	75.53
372	Non-ferrous metals	259	85	0.4	0.1	53.49
381	Metal products	5811	1082	5.2	3.9	74.34
382	Non-electric machinery	1528	317	1.4	0.9	73.17
383	Machinery electric	2653	618	2.6	4.6	69.85
384	Transport equipment	2871	616	3.5	2.9	59.32
385	Professional equipment	368	75	0.2	0.2	64.12
390	Other manufactured products	2445	642	2.4	2.2	66.86
Total		103,018	21,819	100%	100%	—

Source: Author's calculation based on BPS-Statistic Indonesia data.

Table 3.21: External financial dependence index across industries

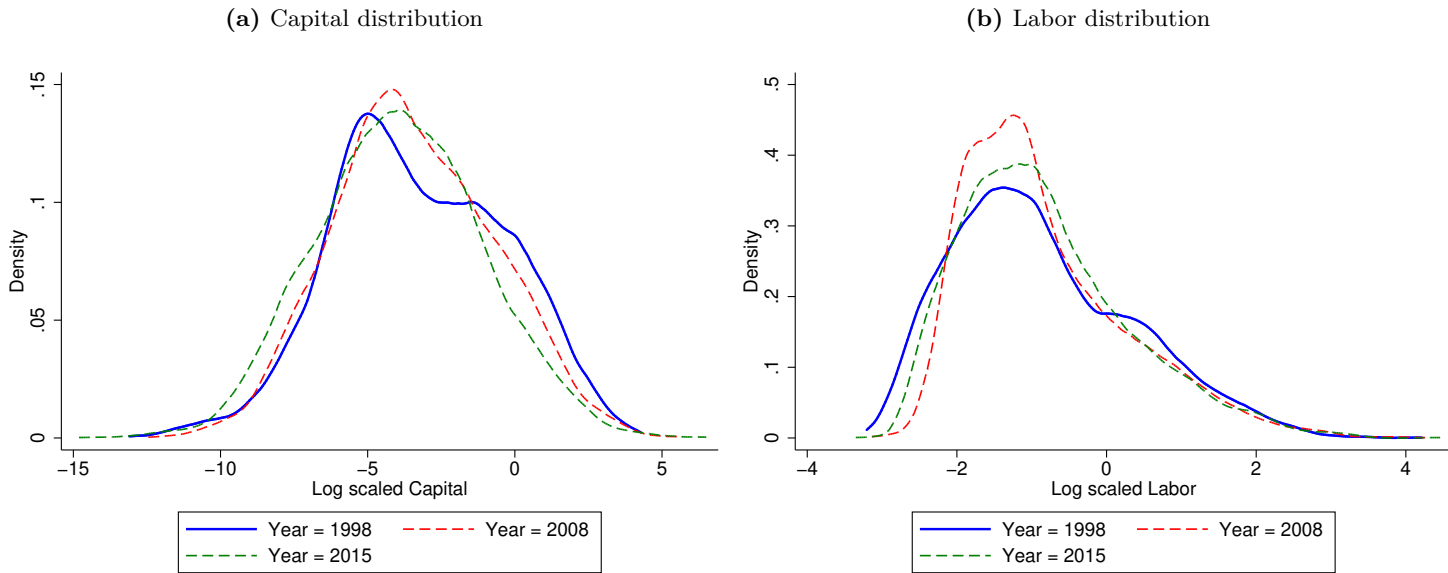
Industry name	ISIC (3 digits)	External financial dependence
Food products	311	.14
Animal feeds, etc	312	–
Beverages	313	.08
Tobacco	314	-.45
Textiles	321	.4
Garments	322	.03
Leather products	323	-.14
Footwear	324	-.08
Wood products	331	.28
Furniture	332	.24
Paper products	341	.18
Printing and publishing	342	.2
Basic chemicals	351	–
Other chemicals	352	.22
Petroleum refineries	353	.04
Oil and gas processing	354	.33
Rubber products	355	.23
Plastic products	356	1.14
Manufacture of pottery, china and earthenware	361	-.15
Glass products	362	.53
Other non-metallic minerals	369	.06
Iron and steel	371	.09
Non-ferrous metals	372	.01
Metal products	381	.24
Furniture	382	.45
Electrical equipment	383	.77
Transport equipment	384	.31
Professional equipment	385	.96
Other manufactured products	390	.47

Source: Calculation based on [Rajan and Zingales \(1996\)](#).

Notes: The table reports the external financial dependence index for the industries used in the sample. Financial dependence is defined as the fraction of capital expenditures not financed by cash flow from operations.

3.D Additional figures

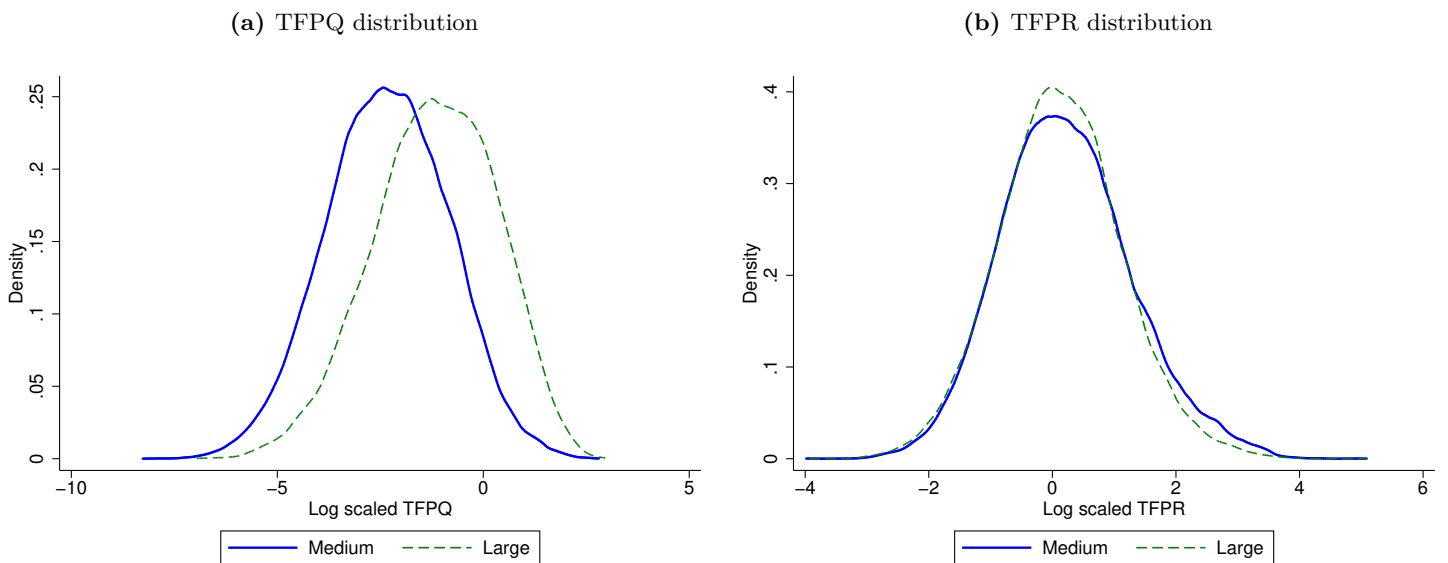
Figure 3.8: Distribution of capital and labor for selected years



Source: Author's calculation based on BPS-Statistic Indonesia data.

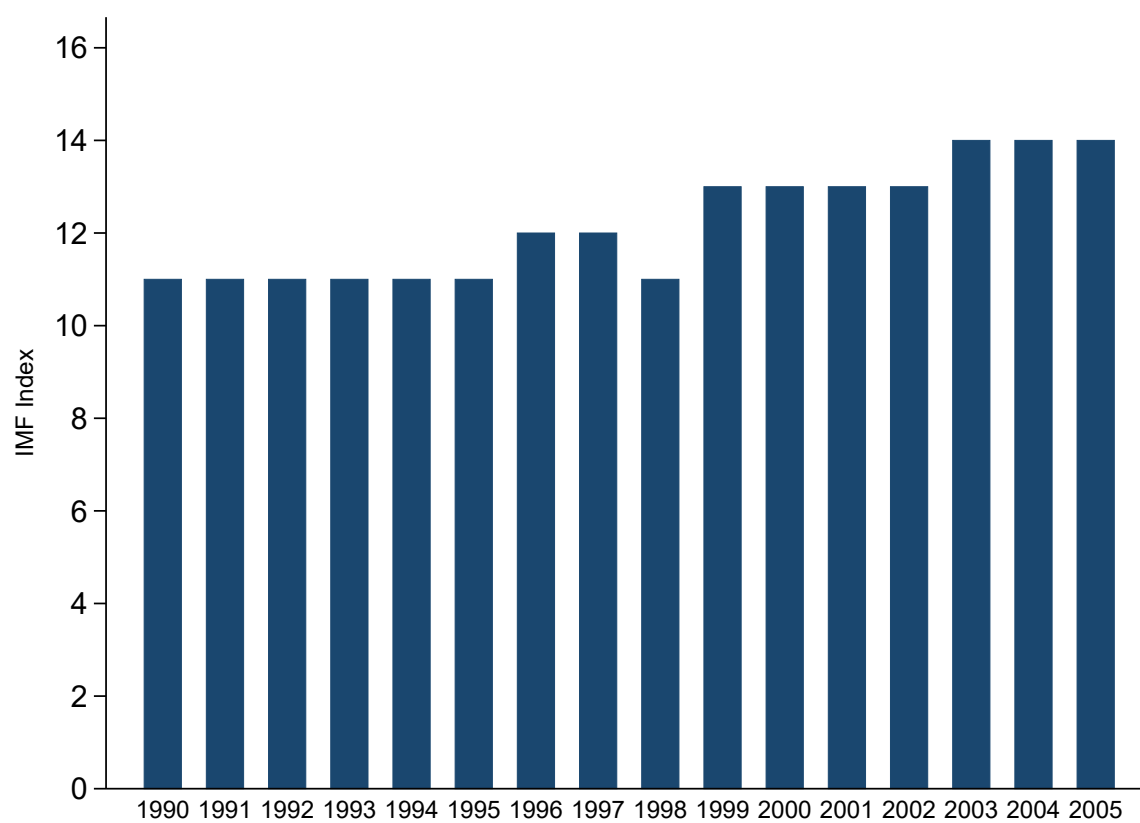
Notes: Panel (a) and (b) plot the distribution of capital and labor measured by $\log(K_{si}/\bar{K}_s)$ and $\log(L_{si}/\bar{L}_s)$ respectively, where \bar{K}_s and \bar{L}_s denotes the mean of capital and labor accordingly of industry (s).

Figure 3.9: Distribution of productivity by firm size (1990-2015)



Source: Author's calculation based on BPS-Statistic Indonesia data.

Figure 3.10: IMF financial reform index in Indonesia (1990-2005)



Source: Author's compilation based on data provided in [Abiad et al. \(2010\)](#).

General conclusion

It is inevitable that firms, including micro and small enterprises (MSEs), need financing to grow and expand their operations. However, in order to do so, MSEs often face difficulties, including limited sources of financing, which creates a financial gap. The Chapter (1) attempts to shed light on this issue and illustrate its impact on the productivity of Indonesian MSEs. It reveals that about 77% of firms rely on internal financial resources such as entrepreneurial savings, while only 23% of MSEs have access to external sources of finance.

In this chapter, we use data from a detailed survey of manufacturing MSEs in Indonesia for 2010-2015 to collect information on the source of finance and estimate the total factor productivity (TFP) of the surveyed firms. To calculate TFP, we use different approaches to resolve input simultaneity, including a version of the adjusted function approach [Akerberg et al. \(2015\)](#), which accounts for firm fixed effects. Our results show that the financing structure is highly determinant of firms' TFP and labor productivity. Thus, an increase in the availability of financing from formal sources can directly improve firm-level productivity.

Based on the survey results, some general policy recommendations were made to improve access to finance. For example, alternative institutions as a source of finance for MSEs, especially in remote areas, should be encouraged and socialized. Cooperatives that offer deposit and credit services to their members are one potential candidate. Furthermore, acknowledging that differences in capabilities and motivations between male and female entrepreneurs in Indonesia affect the performance of MSEs is a necessary step in thinking about how to empower women entrepreneurs.

The next Chapter (2) empirically examines the impact of the gender of a firm's owner on its growth (employment and sales) and highlights the effects of a gender-differentiated use of formal external credit on the performance gaps between men's and women's firms. The data used are for a sample of 33,971 firms from 62 countries from 2006-2016.

This chapter investigates whether women's participation in entrepreneurship, as owners or managers, impacts firm performance. Gender differences in firm performance have been investigated in different regions of the world economy. Although the results have several implications for developing countries, as the constraints facing firms differ across countries and, within countries, across sectors, policies to promote firm growth must be tailored to each country and sector.

Entrepreneurship support programs can be significantly improved by providing follow-up, networking, and other advisory services, in addition to education on basic business practices, and by strengthening

critical areas that can potentially increase the effectiveness of these programs. More experimentation is needed in the following areas: (i) engendering programs more effectively to overcome some of the constraints arising from social norms and subjective preferences, (ii) supporting women entrepreneurs to move into higher value-added and more productive activities, and (iii) addressing legal and institutional constraints.

In addition, this study proposes the following points for future policy considerations and research. First, strengthen policies and programs that provide market information to women to expand their knowledge of market dynamics and help them develop their businesses. Second, establish business development services targeting women, especially in small enterprises, to help them enter larger markets and improve their competitiveness through business training and product development assistance. Third, a better understanding of the specific barriers to women entrepreneurs to better support business growth. This could involve collecting data on owners' family relationships, such as marital and parental status. This basic information is needed to analyze the specific factors influencing the gender gap in business performance, particularly MSEs. Finally, incorporating childcare into business models and government policies that support women-owned MSEs by reducing the double burden faced by women entrepreneurs creates an opportunity for business growth and entry into the formal economy.

It has been argued that informal workers are a vulnerable group because they generally have low incomes and lack social security. This condition is certainly a big challenge for low- and middle-income countries, where the level of informality is high (Bonnet et al., 2019). Developing countries have a higher share of informal employment than formal employment.

Thus, policymakers are concerned about the size of the informal sector for several reasons. First, informal businesses generally do not pay formal taxes, which limits the government's ability to support public goods and services Levy (2010). Second, the coexistence of formal and informal firms means that competing firms in the same sector may have different marginal production costs. This can lead to inefficient allocation of resources in the economy Hsieh and Klenow (2009). Third, the cost advantage for informal firms leads to unfair competition with law-abiding firms in the formal sector, which may limit economic growth Farrell (2004). Finally, informal businesses may not be able to legally obtain credit from formal financial sources, access government programs, or export products. This may put informal enterprises at a disadvantage relative to other enterprises, limiting growth opportunities.

In Chapter (3), we used the framework Hsieh and Klenow (2009) to study misallocation and productivity linkages in the Indonesian manufacturing sector using the datasets of 103,018 observations during 1990-2015. Individual plants are subject to output and capital distortions, which influence revenue productivity; thus, the variance of revenue productivity (TFPR) in this framework is the primary measure of resource misallocation. Therefore, the main objective of this chapter is to estimate the potential gains in manufacturing TFP if distortions are eliminated, and TFPR is equalized across industries.

The empirical results show a misallocation of resources in the Indonesian manufacturing industry, which results in a dispersion of revenue productivity. When the misallocation of capital and labor across plants in the same industry is hypothetically eliminated, the potential TFP gains of the manufacturing industry should increase from 136% to 292%. The decomposition of the baseline results shows that

the total distortions are driven primarily by the revenue productivity variable, which is determined by the output distortions. WTO membership has contributed to increased distortions in capital markets. This result suggests that further capital market reforms could improve aggregate TFP in Indonesia by reducing misallocation.

A natural extension of this work would be to study the effect of resource misallocation in the service sector. Further analysis of the market distortion factors in this sector relative to the manufacturing sector and a calculation of the TFP gain associated with liberalization would be interesting to study. In addition, some topics for future research were highlighted, such as identifying the nature and sources of misallocation and how distortions affect the movement of firms across industries.

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Female Entrepreneurs, Firm Performance, and Resource Misallocation

Abstract

Aggregate productivity is one of the major sources of economic growth and directly depends on how efficiently firms use available resources. In this dissertation, I contribute to the literature by drawing attention to exploring various performance measures at the firm level and the aggregate productivity in developing countries. In general, firms face numerous and serious constraints on their productivity in developing countries, ranging from corruption to lack of infrastructure to inability to access finance. Therefore, in the Chapter (1) co-authored with Zenathan Hasannudin, we investigate the impact of financing access on micro and small enterprises (MSEs) in Indonesia. MSEs are considered the backbone of the Indonesian economy, accounting for 99.3% of total firms in Indonesia and providing 62.5% of total employment ([Istiandari and Anandhika, 2019](#)). We found that access to external formal financial sources has a significant positive effect on the growth of firms in terms of total factor productivity (TFP), labor productivity, and sales in Indonesia. In addition, small firms must rely more on their funds to invest and grow significantly faster if they have greater access to external funds.

Moreover, in developing countries, women entrepreneurs are key drivers of national, regional, and global growth. Therefore, examining their role in the Chapter (2) is important and studying their impact on firm growth as measured by employment and sales growth. In addition, I highlight the effects of gender-differentiated use of formal external credit on the performance gaps between men's and women's firms. The data used is a sample of 33,971 firms from 62 countries over the period 2006-2016. Overall, the study confirms mixed results of women-owned firms in firm growth across regions and income-level countries.

Finally, in the Chapter (3), I used the [Hsieh and Klenow \(2009\)](#) framework to study the misallocation and productivity linkages in the Indonesian manufacturing sector using the datasets of 103,018 observations during the period 1990-2015. Reallocation of resources from low productivity firms to high productivity firms can generate significant aggregate gains. This study uses census data from Indonesia's manufacturing sector to measure the country's hypothetical productivity gains; the productivity gaps appear to have widened somewhat. This suggests that the process of "catching up" remains a challenge and a potential opportunity, especially if total factor productivity is assumed to be the dominant source of future economic growth. This analysis only considers the misallocation of resources within sectors. There may be other, perhaps significant, misallocations of resources across sectors. If so, closing these gaps could further boost total factor productivity and gross domestic product growth.

Keywords: Total factor productivity, Gender, Access to finance, Firm growth, Resource misallocation, Firm-level data, Indonesia.

Femmes Entrepreneurs, Performance des Entreprises et Mauvaise Allocation des Ressources

Résumé

La productivité globale est l'une des principales sources de croissance économique et dépend directement de l'efficacité avec laquelle les entreprises utilisent les ressources disponibles. Dans cette thèse, je contribue à la littérature scientifique en attirant l'attention sur l'étude de diverses mesures de la performance au niveau des entreprises et de la productivité globale dans les pays en développement. En général, les entreprises sont confrontées à de nombreuses contraintes sur leur productivité dans les pays en développement, allant de la corruption au manque d'infrastructures en passant par l'impossibilité d'accéder au financement. Par conséquent, dans le chapitre (1) co-écrit avec Zenathan Hasannudin, nous étudions l'impact de l'accès au financement sur les micros et petites entreprises en Indonésie. Les micros et petites entreprises sont considérées comme le pilier majeur de l'économie indonésienne, représentant 99,3% du total des entreprises en Indonésie, et fournissant 62,5% de l'emploi total ([Istiandari and Anandhika, 2019](#)). Nous avons constaté que l'accès à un financement formel externe a un effet positif significatif sur la croissance des entreprises en termes de productivité totale des facteurs (TFP), de productivité du travail et de ventes en Indonésie. En outre, nous constatons que les petites entreprises doivent compter davantage sur leurs propres fonds pour investir et en concluons que leur croissance serait nettement plus rapide si elles avaient un meilleur accès à des fonds externes.

En outre, dans les pays en développement, les femmes entrepreneurs sont des moteurs essentiels de la croissance nationale, régionale et mondiale. J'étudie donc leur rôle dans le chapitre (2) et j'examine l'impact de leur implication sur la croissance des entreprises mesurée par la croissance de l'emploi et des ventes. En outre, je souligne un recours différencié selon le sexe au crédit formel externe, induisant des variations de performances entre les entreprises détenues par des hommes et celles détenues par des femmes. Les données utilisées portent sur un échantillon de 33 971 entreprises de 62 pays sur la période 2006-2016. Dans l'ensemble, l'étude observe des résultats comparatifs variables pour les entreprises détenues par des femmes en termes de croissance des entreprises dans selon les régions le niveau de revenu des pays considérés.

Dans le chapitre (3), j'ai utilisé le cadre développé par [Hsieh and Klenow \(2009\)](#) pour étudier les liens entre mauvaise allocation et productivité dans le secteur manufacturier indonésien en utilisant un jeu de données de 103,018 observations au cours de la période 1990-2015. Il apparaît que la réaffectation des ressources des entreprises à faible productivité vers celles à forte productivité peut générer des gains globaux importants. Utilisant les données du recensement du secteur manufacturier indonésien pour mesurer les gains de productivité hypothétiques du pays, cette étude montre que les écarts de productivité semblent s'être quelque peu creusés. Cela suggère que le processus de "rattrapage" reste un défi tout comme une opportunité potentielle, en particulier si la productivité totale des facteurs est censée être la source dominante de la croissance économique future. Toutefois, cette analyse ne tient compte que de la mauvaise affectation des ressources au sein des secteurs. Il se peut, ainsi, qu'il y existe d'autres défauts d'allocation des ressources, peut-être importants, entre les secteurs. Si tel est le cas,

combler ces écarts pourrait stimuler encore davantage la productivité totale des facteurs et la croissance du produit intérieur brut.

Mots-clés: Productivité totale des facteurs, genre, accès au financement, croissance des entreprises, mauvaise allocation des ressources, données au niveau des entreprises, Indonésie.