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Zenathan Hasannudin

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UNIVERSITÉ PARIS I PANTHÉON SORBONNE
UFR 02

THÈSE

Pour l'obtention du titre de Docteur en Economie

Présentée et soutenue publiquement

le 18 Février 2022 par

Zenathan Hasannudin

**Essays on labor markets, gender, and external shocks
in manufacturing firms in Indonesia**

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*I dedicate this humble work to Nadia and Rafa,
my parents,
and my country.*

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Résumé

La mondialisation et les industries manufacturières se sont bien renforcées ces dernières années. Au fur et à mesure que le monde devenait plus connecté, les industries manufacturières fabriquent de biens pour répondre à la demande mondiale. La mondialisation donne deux effets principaux pour les pays. Première, ils doivent s'adapter aux règles acceptées au niveau mondiale afin de réduire les frictions dans la circulation internationale des biens et des services. De ce point de vue, nous avons assisté à une réforme des stratégies pour libéraliser le secteur commercial ou même le secteur financier au cours des dernières décennies, en éloignant de la politique intérieure et du protectionnisme pour soutenir la mondialisation. Deuxième, l'économie est devenue interconnectée. Les chocs externes, tels que la hausse et l'effondrement des commodités, affecteront considérablement la performance de l'économie nationale.

Le changement de politique et le choc externe sont cruciaux pour le secteur manufacturier car ils pourraient affecter les coûts principaux des intrants : le capital et l'ouvrier. Étant donné que le secteur manufacturier a besoin plus d'ouvrier que les secteurs de l'agriculture et des services, la réforme des politiques et les chocs externes ont plus d'influence sur le marché du travail. Ce changement pourrait être le changement de la demande de main-d'œuvre, qualifiée ou non qualifiée, ou le changement du salaire, car le salaire est inclus dans le coût de production en secteurs manufacturiers.

Basé sur ce contexte, le sujet de cette thèse de doctorat s'articule autour de l'analyse de ces liens, entre la réforme des politiques, les chocs externes et le marché du travail dans les secteurs manufacturiers. Cette thèse fournit des tests empiriques rigoureux pour analyser ces liens, en utilisant les données d'entreprises manufacturières en Indonésie entre 1990 et 2015. Indonésie est un pays idéal à observer car elle a énormément de main-d'œuvre

non qualifiée, a une économie ouverte, est un preneur de prix sur le marché mondial, et a vécu des diverses réformes et chocs pendant la période d'observation.

La structure de cette thèse est la suivante : Le chapitre 1 traitera de la relation entre la libéralisation financière et la prime aux compétences pour les moyennes et grandes entreprises manufacturières en Indonésie. Le chapitre 2 utilise un ensemble de données similaire pour examiner l'effet des chocs externes, tels que les fluctuations du prix de l'huile de palme jusqu'à la demande d'ouvrier et la structure des salaires sur l'industrie de l'huile de palme dans le pays. Le chapitre 3 fournit des preuves que les femmes entrepreneures bénéficieront d'un meilleur accès aux prêts bancaires pour accroître la performance des entreprises.

Chapitre 1: Libéralisation Financière et Prime à la Compétence Salarial.

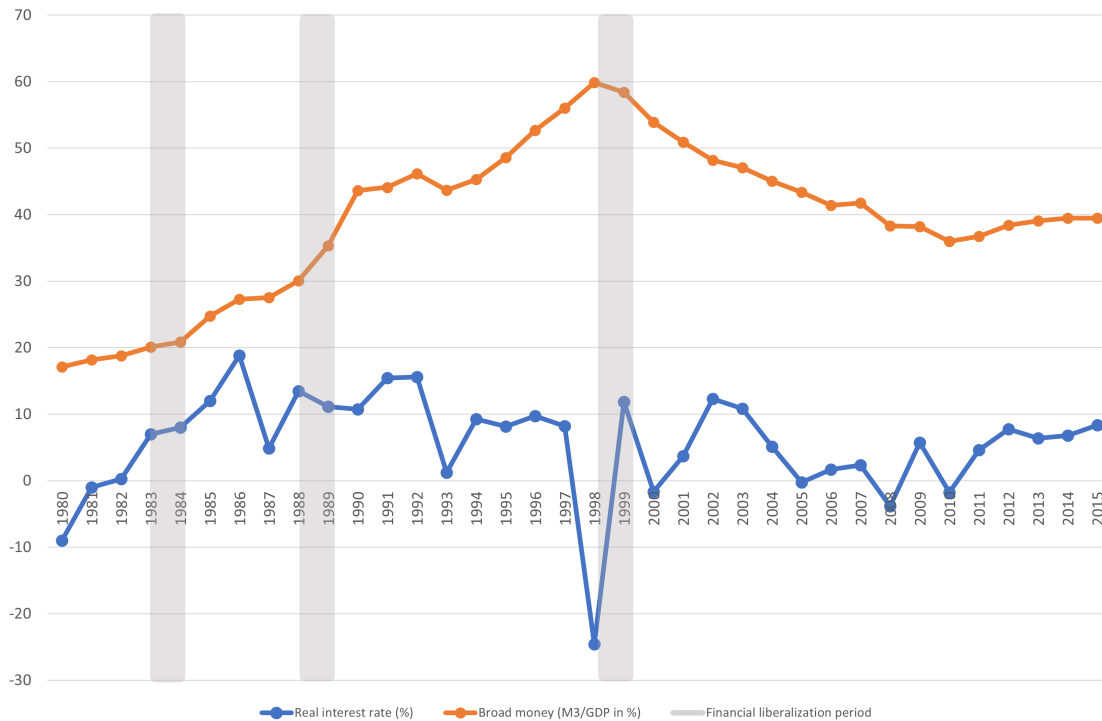
L'inégalité salariale reste l'un des sujets les plus discutés lorsqu'on examine l'effet de la libéralisation, que ce soit dans les pays développés ou en développement. Aujourd'hui, il y a de plus en plus de littérature qui discute sur ce sujet. Cependant, ces littératures tendent à se concentrer plutôt sur l'effet de la libéralisation en inégalités salariales que sur la libéralisation financière. Ce dernière se produit généralement au cours de la même période.

En Indonésie, il existe au moins trois grandes séries de réformes financières du milieu des années 1980 au début des années 2000 (Sato, 2005; Jann, 2008). Les premières grandes réformes financières ont commencé en 1983 lorsque le gouvernement a complètement libéralisé les taux de dépôt et de prêt bancaire, et a également supprimé les plafonds de crédit pour toutes les banques. Pour les années suivantes, cette réforme a conduit à une forte hausse du taux d'intérêt réel, qui est passé de 0,25% en 1982 à plus de 12% en 1985 (Voir la Figure 1).

La réforme marque également un changement significatif du système financier contrôlé par l'État vers un système qui est basé sur le marché. Les taux d'intérêt flottants ont aidé les banques à accroître leurs dépôts et leurs capacités de prêt, en renforçant leur fonction d'intermédiaires financiers.

Cependant, pendant cette période, l'entrée sur le marché reste sous contrôle strict. Les

Figure 1: Taux d'intérêt réel et base de monnaie, 1980-2015



Source: Calcul de l'auteur, basé sur la Banque Mondiale

banques d'État sont essentiellement le seul acteur sur le marché, sans concurrence du secteur privé ou des institutions étrangères. Pour cette raison, les banques d'État bénéficient de la recherche de rente verser de crédit aux secteurs productifs.

En 1988, le gouvernement a lancé une deuxième réforme financière majeure en supprimant les restrictions sur les nouvelles entrées dans le secteur bancaire. À la suite de la réforme, en seulement cinq ans, jusqu'en 1993, le nombre de banques est passé de 63 à 158, tandis que le nombre de leurs succursales a multipliées cinq fois, passant de 559 à 2 926. Par conséquent, dans cette période-là, nous pouvons voir dans la Figure 1 que la monnaie de base se développe rapidement pour rattraper le secteur bancaire expansionniste dans la collecte et le prêt des fonds. Dans le même temps, les entrées de capitaux continuent d'entrer dans le pays par l'intermédiaire de la banque filiales étrangères nouvellement créée. Tous ces facteurs ont été à l'origine d'une croissance économique impressionnante en Indonésie, avant l'effondrement de l'économie en 1998 à cause de la crise financière asiatique.

Cet événement a conduit à la troisième réforme financière qui a eu lieu à la suite de la crise financière de 1998. Le secteur bancaire s'est effondré soudainement en raison de l'inadéquation des échéances et l'inadéquation des taux de change. Le secteur bancaire utilise son prêt à long terme libellé en dollars sur le marché étranger pour financer des projets à court terme du pays. Le taux d'intérêt a fortement baissé avant de rebondir à nouveau, un an après. La base monétaire a chuté et l'économie indonésienne est entrée dans une crise profonde, avec une croissance atteignant -13% par an en 1997-1998.

L'effondrement du secteur bancaire a forcé le gouvernement indonésien à accepter un accord du FMI pour réformer le secteur bancaire, car il est la principale source de cette crise économique. L'une des réformes remarquables est la mise en place d'un système de surveillance qui permette la banque centrale de gagner son indépendance pour surveiller le secteur bancaire. Cependant, au cours de la même période, le gouvernement a introduit certaines mesures pour stabiliser le taux de change, ce qui a conduit à des flux de capitaux internationaux plus restrictifs. En outre, de 1999 à 2003, il y a eu plusieurs paquets de libéralisation financière dans le secteur bancaire, dans le cadre d'un accord post-crise financière.

Ces séries de libéralisations financières deviennent la raison principale pour fournir de nouvelles preuves que la libéralisation financière aura un impact sur les entreprises manufacturières en Indonésie, en mettant l'accent sur l'inégalité salariale. Dans la période qui suivra la libéralisation financière, les entreprises auront plus d'options pour recevoir des financements des institutions financières, qui augmentera ainsi leur capital.

L'augmentation de capital déplacera l'utilisation de l'autre type de travailleur dans la technologie de production (Krusell et al., 2000). Le capital supplémentaire (par exemple, de nouvelles machines ou technologies) nécessitera une main-d'œuvre supplémentaire avec plus de compétences pour gérer la production. C'est ce qu'on appelle l'argument de la complémentarité capital-compétence (Larrain, 2015), où le capital supplémentaire donnera un avantage au travailleur qualifié afin qu'ils puissent avoir un salaire relativement plus élevé que le travailleur non qualifié. De ce fait, ce chapitre testerait l'hypothèse sur laquelle les réformes financières pourraient avoir un effet positif sur les primes de qualification, élargissant l'écart salarial entre les travailleurs qualifiés et non qualifiés.

En Indonésie, la prime aux compétences a été dans la tendance mitigée de 1990 à 2005. Ce document définit la prime de compétence, comme le rapport entre le salaire non lié à la production et le salaire lié à la production à partir des données d'enquête annuelle de l'entreprise manufacturière ou de données de l'Industrie de l'enquête (Survey Industri), suivant [Amiti & Cameron \(2012a\)](#). Avant la crise financière asiatique de 1998, la prime de qualification était dans une tendance à la baisse. Les travailleurs qualifiés gagnant 2,75 fois plus que les travailleurs non qualifiés en 1991, et c'est tombé à 2,41 fois en 1996. Toutefois, nous observons une augmentation drastique de la prime aux compétences à 4,04 en 1997 avant de tomber à 2,72 en 2002 et puis il y avait une légère augmentation en 2005.

Pour comparer le salaire sur la prime de qualification, nous adoptons également les données de l'enquête sur les force de travail indonésienne (Sakernas), tel que présenté dans [Amiti & Cameron \(2012a\)](#), dans le Tableau 1. Les données de la force de travail ne faisaient pas de distinction entre la production et la non-production, mais les données fournissent le nombre de salaires en fonction du niveau de scolarité des travailleurs. La prime salariale est définie comme le ratio salarial moyen pour l'enseignement supérieur, secondaire supérieur, secondaire inférieur et primaire, par rapport aux travailleurs ayant un niveau d'éducation inférieur à l'enseignement primaire.

Table 1: Salaires relatifs des travailleurs qualifiés par rapport aux travailleurs non-qualifiés

| Année | Données de SI | Données de Sakernas | | | |
|-------|-------------------------------|---------------------|--------------------------|--------------------------|----------------------------|
| | Non-production/ Production | Primaire | Secondaire Inferieure | Secondaire Supérieure | Enseignement Supérieure |
| 1991 | 2.75 | 1.19 | 1.60 | 2.22 | 3.29 |
| 1993 | 2.63 | 1.25 | 1.72 | 2.43 | 3.71 |
| 1996 | 2.41 | 1.17 | 1.46 | 2.01 | 2.99 |
| 1997 | 4.04 | 1.18 | 1.51 | 2.08 | 3.13 |
| 1998 | 3.65 | 1.16 | 1.42 | 2.04 | 3.05 |
| 2000 | 2.72 | 1.13 | 1.43 | 2.05 | 3.08 |
| 2005 | 2.75 | 1.20 | 1.49 | 2.10 | 3.14 |

Source: Calcul de l'auteur, basé sur [Amiti & Cameron \(2012a\)](#) et Agence des Statistiques Indonésienne.

Nous pouvons également observer une tendance mitigée sur la prime de compétence avec les données de Sakernas, avec une tendance à la baisse avant la crise financière asiatique, suivie d'une tendance à la baisse avant une reprise après l'an 2000. Le chiffre le plus frap-

pant est que les travailleurs qualifiés ayant fait des études supérieures gagnaient presque systématiquement trois fois plus que les travailleurs non qualifiés : 3,3 fois plus en 1991 mais étaient ensuite tombés à environ trois fois en 2000. Bien que la baisse de la prime aux compétences avant la crise financière se produise pendant la même période de libéralisation (par exemple, dans les finances et le commerce), il est difficile d'établir une relation occasionnelle, car il est influencé par de nombreux facteurs. Plus particulièrement, la baisse de la prime aux compétences peut être attribuée à l'augmentation de l'offre d'éducation, créant plus de travailleurs qualifiés en fonction du niveau de scolarité.

Dans ces contextes, pour analyser la relation entre la libéralisation financière et la prime salariale entre 1990 et 2005, cette étude utilise l'enquête industrielle (Survey Industri) comme source de données principale, un recensement des établissements manufacturiers du pays comptant au moins 20 employés. En outre, ce document utilise les index de la base de données sur la réforme financière par [Abiad, Detragiache, & Tressel \(2008\)](#) pour capturer les variations de la libéralisation financière au cours de la période de recherche. La base de données a mesuré des indicateurs qualitatifs des restrictions dans sept dimensions différentes de la politique du secteur financier, qui est ensuite traduites en un sous-indice. Chaque sous-indice est codé de zéro (complètement réprimé) à trois (entièrement libéralisé).

Les résultats de ce document montrent trois conclusions intéressantes. Première, nous avons constaté un résultat significatif que la libéralisation financière augmentera la prime salariale en Indonésie (Voir Tableau 2. Ce résultat soutient la plupart des publications récentes qui disent que la libéralisation financière augmentera les inégalités salariales.

Table 2: Libéralisation financière et prime à la compétence

| Variable dépendante $\ln(w_s/w_u)$ | (1) Financière libéralisation | (2) Mondialisation | (3) Mesure de Taille | (4) Propriétaire | (5) Compé Rat |
|---------------------------------------|-------------------------------------|-----------------------|-------------------------|------------------------|---------------------|
| L'Indice de libéralisation financière | 0.963** (0.387) | 0.868** (0.368) | 0.863** (0.371) | 0.808** (0.376) | 0.89 (0.4) |
| Importation ratio | | 0.123*** (0.0283) | 0.121*** (0.0283) | 0.107*** (0.0282) | 0.116 (0.02) |
| Exportation ratio | | 0.0280** (0.0117) | 0.0254** (0.0115) | 0.0207* (0.0116) | 0.01 (0.01) |
| Moyen Entreprise | | | 0.0159 (0.0191) | | |
| Grand Entreprise | | | 0.113*** (0.0238) | | |
| Taille | | | | 0.0920*** (0.0117) | |
| Propriétaire étranger | | | | 0.101*** (0.0212) | 0.125 (0.01) |
| Propriétaire gouvernement | | | | -0.0360*** (0.0125) | -0.02 (0.01) |
| Compétence ratio | | | | | -2.53 (0.07) |
| Observations | 250,275 | 233,875 | 233,875 | 233,875 | 233,875 |
| R-squared | 0.476 | 0.478 | 0.479 | 0.480 | 0.53 |
| Entreprise FE | OUI | OUI | OUI | OUI | OUI |
| Année FE | OUI | OUI | OUI | OUI | OUI |

Robuste erreur standard entre parenthèses, regroupement au niveau de secteur-année
*** p<0.01, ** p<0.05, * p<0.1

Deuxième, nous montrons que les réformes financières qui affectent la prime de compétence proviennent principalement de l'assouplissement des barrières de l'entrée pour une institution bancaire. Nous trouvons aussi que c'est seulement le grand entreprise qui est capable de renfoncer le relation positif entre les réformes financières et la prime de compétence.

Globalement, les réforme financières ont aussi l'impact positif sur la prime de compétences, en augmentant les productivité et les ventes. Les réformes financières affecteront le salaire de l'ouvrier qualifiée tout en diminuant leur demande relative. Ces résultats sont robustes, même après avoir contrôlé pour les spécifications diverses.

Ce document suggère que la libéralisation financière atténuera les besoins de financement dans l'acquisition de capitaux. Ceci est montré par l'augmentation de la charge d'intérêts sur prêts qui affectera de manière significative l'augmentation de la réserve de capital. Par l'argument de la complémentarité capital-compétence, nous avons constaté que les nouveaux changements technologiques dans le capital entraîneront une augmentation relative du salaire de travailleur qualifié, créant une prime de compétence plus élevée.

Chapitre 2: Prix de l'huile de palme, demande d'ouvrier et structure des salaires.

Le Chapitre 2 est co-écrit avec Akiko Suwa-Eisenmann. Comme le premier chapitre, le deuxième chapitre est consacré au marché du travail des entreprises manufacturières en Indonésie. Cette fois-ci, nous explorons l'effet des fluctuations du prix de l'huile de palme pendant la période de hausse et pendant la période d'effondrement de commodité, sur la performance des entreprises, la demande d'ouvrier et la structure salariale, en fonction des compétences de l'ouvrier.

Les fluctuations des prix sur les commodités ont été décrites comme une source de volatilité dans les marchés émergents ([Fernandez et al., 2017](#)), où la hausse de commodité pourrait conduire à une forte croissance économique, et l'effondrement de commodité pourrait conduire à des récessions ([Reinhart et al., 2016](#)). Une économie ouverte qui produit la commodité, réagira au prix plus élevé pendant la période de la hausse en augmentant sa capacité de production globale et en attirant plus d'ouvrier dans le secteur lié aux commodités. L'inverse se produit pendant un effondrement de commodité.

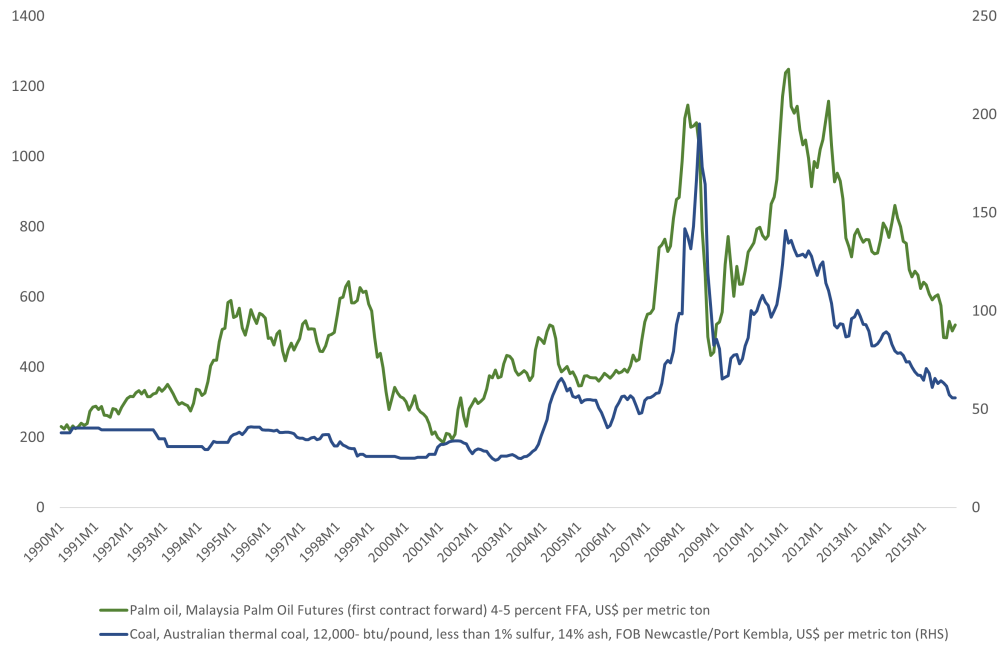
Dans l'analyse des chocs externes sur le changement des prix des matières premières sur le marché du travail, nous sélectionnons le prix de l'huile de palme comme la variable principale pour trois raisons. Première, l'huile de palme est le produit d'exportation agricole le plus crucial en l'Indonésie. Au cours de notre période de recherche, de 1990 à 2015, le volume des exportations d'huile de palme a continué d'augmenter, passant de 815 millions de kg en 1990 à presque de 30 milliards de kg en 2015. Encore plus impressionnant, cela est suivi par la valeur des exportations en termes nominaux, passant d'environ 200 millions USD à plus de 1,5 milliard USD. La valeur du volume des exportations n'a

baissé qu'à la suite de la crise financière asiatique en 1997 et s'est aplatie pendant quelques années après la crise financière mondiale de 2008.

Deuxième, jusqu'à présent l'Indonésie est le plus grand producteur d'huile de palme au monde. Avec la Malaisie, les deux pays fournissent presque 90% de la production mondiale. Cependant, contrairement à la Malaisie qui exporte exclusivement sa production d'huile de palme, l'Indonésie utilise vingt-cinq pour cent de sa production pour la consommation intérieure du pays. Cela signifie que l'Indonésie est l'un des plus grands consommateurs mondiaux d'huile de palme (principalement utilisée pour l'huile de cuisson et les biocarburants). Car Indonésie est le plus grand producteur d'huile de palme, l'Indonésie devient un preneur de prix international d'huile de palme qui a été fixé à Londres et à Chicago.

Troisième, entre 1990 et 2015, le prix de l'huile de palme a vécu plusieurs épisodes de hausse et d'effondrement. La figure 2.3 montre que le premier épisode de la hausse des prix de l'huile de palme a eu lieu au milieu des années 90. Le prix a augmenté de 200 pour cent, passant de US\$ 200 par tonne métrique en 1990 à US\$ 600 par tonne métrique en 1998. Le prix de l'huile de palme a chuté après la crise financière asiatique de 1998. Le prix est revenu à US\$ 200 par tonne métrique en 2000. Le deuxième épisode a été une hausse dramatique en 2006, suivi d'un effondrement soudain à cause de la crise financière mondiale. En cette période, le prix de l'huile de palme est passé de US\$ 400 par tonne métrique en 2007 à US\$ 1200 par tonne métrique en 2008. Ensuite en 2009 le prix a chuté à un prix similaire de 2007. Au début de l'année 2010, le prix de l'huile de palme a continué d'augmenter avant qu'il soit tombé en dessous de US\$ 400 par tonne métrique en 2015. Il est intéressant de noter que les tendances des mouvements des prix de l'huile de palme sont similaires aux autres commodités, tels que le charbon, comme indiqué sur la Figure 2. Cependant, le prix du charbon a été relativement stable dans les années 1990, alors que le prix de l'huile de palme était en plein essor.

Figure 2: Prix mondial de l'huile de palme et du charbon, 1990 - 2015.



Source: Calcul de l'auteur, base sur Fonds Monétaire International.

Des études antérieures montrent que le secteur manufacturier est également touché, négativement ou positivement, par une hausse de commodité. Travail de pionnier qui a été fait par [Corden & Neary \(1982\)](#) a mentionné que le secteur manufacturier (échangeable) sera touché par un *Dutch disease*, comme la hausse des prix dans le secteur extractif affectera l'allocation des ressources, la répartition des revenus factoriels, et le taux de change réel. D'un autre côté, [Smith \(2019\)](#) montre la procyclicité d'une hausse de commodité et du secteur manufacturier en exportations de produits agricoles.

Dans ces cadres, le secteur manufacturier est en concurrence avec le secteur de commodité pour l'ouvrier. La hausse des prix de commodité réajustera au marché du travail, en modifiant les salaires ou en modifiant l'offre et la demande des travailleurs. Cependant, une partie du secteur manufacturier est aussi liée directement à la commodité. Cela est le cas sur les industries de transformation, telles que l'industrie du meuble pour le bois ou l'industrie textile pour le coton. Une hausse des prix des commodité profitera directement à ces industries de transformation, car elle entraînera une augmentation de la quantité de produit. L'amélioration de la transformation des commodités devient un ob-

jectif politique dans les pays en développement. Les gouvernements espèrent d'atteindre l'autosuffisance, par la mise en place la transformation, la récolte des avantages d'une plus grande productivité dans le manufacturier, et la création d'emplois approprié.

Ce chapitre examine l'impact des fluctuations des prix de l'huile de palme sur les industries de transformation, c'est-à-dire les industries qui utilisent des grappes d'huile de palme fraîche comme intrants et ensuite les transforment (que nous appellerons « entreprises de transformation »). Les grappes d'huile de palme sont largement utilisées pour l'huile de cuisson, aussi dans les cosmétiques et les savons, dans les aliments pour animaux et pour les biocarburants. L'Indonésie utilise un quart de sa production d'huile de palme pour la consommation intérieure du pays, à la fois pour la consommation finale et aussi pour la consommation intermédiaire. Développer l'utilisation domestique de l'huile de palme est également un moyen pour que le gouvernement indonésien pourra atténuer l'impact des interdictions d'exportation sur l'huile de palme dans de nombreux pays développés (comme l'UE), en raison des effets environnementaux de l'huile de palme sur la déforestation et la qualité de l'eau.

Nous contribuons à la littérature existante en fournissant une analyse détaillée au niveau micro, en utilisant un ensemble de données au niveau de l'entreprise, suite au travail de [Benguria et al. \(2018\)](#); [Amiti & Davis \(2012\)](#) et [Kis-Katos & Sparrow \(2015\)](#). Nous utilisons les données de Survey Industri (SI), de l'agence indonésienne des statistiques, et aussi les données des prix des commodités du Fonds Monétaire International (FMI) pendant 26 ans, de 1990 à 2015. Nous pourrons ensuite saisir les variations de prix lors des hausses de commodité des années 1990 et 2000 et lors de l'effondrement de commodité pendant les crises financières de 1997 et 2008.

Notre résultat montre plusieurs résultats intéressants. Première, nous observons qu'une hausse des prix de l'huile de palme entraînera une augmentation des ventes des produits fabriqués par les entreprises de transformation de l'huile de palme. Cependant, étant donné que l'huile de palme est utilisée comme intrant de production, un prix plus élevé de l'huile de palme ajustera la demande d'ouvrier et aussi les salaires. Pour ces entreprises de transformation de l'huile de palme, une hausse des prix de l'huile de palme réduira la demande d'ouvrier, principalement pour le travailleur qualifié (Tableau 3. En outre,

le salaire de l'ouvrier qualifiée augmentera pendant la période de hausse de commodité. Pendant ce temps, nous ne pouvons pas trouver de preuve que la variation du prix de l'huile de palme affectera la prime de compétence dans les entreprises de transformation de l'huile de palme (Tableau 4).

Table 3: Régression de base : prix de l'huile de palme sur les ventes et l'ouvrier

| Dépendante variables | (1) Ventes (log) | (2) Demande d'ouvrier | (3) Demande de compétence |
|--------------------------|---------------------------|---------------------------|------------------------------|
| Prix de l'huile de palme | 0.000848*** (0.000289) | -0.000267** (0.000124) | -0.000103** (4.62e-05) |
| Observations | 24,483 | 24,894 | 24,894 |
| R-squared | 0.874 | 0.819 | 0.547 |
| Entreprise FE | OUI | OUI | OUI |
| Année FE | OUI | OUI | OUI |

Robuste erreur standard entre parenthèses regroupé par comté

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Régression de base : Prix de l'huile de palme et salaire d'entreprise de transformation

| Dépendante Variables | (1) Salaire Moyenne | (2) Salaire non-qualifiée | (3) Salaire qualifiée qualifiée | (4) Prime de la compétence |
|--------------------------|-------------------------|------------------------------|------------------------------------|-------------------------------|
| Prix de l'huile de palme | -0.000278 (0.000225) | -0.000360* (0.000203) | 0.000442** (0.000208) | 6.62e-05 (0.000213) |
| Observations | 24,890 | 24,858 | 22,157 | 22,125 |
| R-squared | 0.496 | 0.457 | 0.458 | 0.357 |
| Entreprise FE | OUI | OUI | OUI | OUI |
| Année FE | OUI | OUI | OUI | OUI |

Robuste erreur standard entre parenthèses, regroupé par comté.

*** p<0.01, ** p<0.05, * p<0.1

Deuxième, nous avons constaté que le résultat de cette recherche est plus pertinent sur la période après la crise financière asiatique. Nous observons que la demande d'ouvrier et les salaires ont été affectés négativement par la crise financière asiatique. Cela surmonter l'effet des changements dans le prix de l'huile de palme en la période qui a conduit à la crise et aussi les plusieurs années après.

Troisième, nous avons constaté que cet effet n'est pas exclusif aux entreprises de transformation de l'huile de palme. Nous avons trouvé des preuves que les variations des prix de l'huile de palme pendant la période de hausse et d'effondrement des commodités affecteront l'ensemble des entreprises manufacturières. Une hausse des prix de l'huile de palme augmentera les ventes et les salaires du travailleur.

Quatrième, en examinant les caractéristiques des entreprises, nous avons constaté que les petites entreprises axées sur le marché intérieur du pays bénéficieront de l'augmentation des prix de l'huile de palme. Ils auront une vente plus élevée, une demande croissante d'ouvrier, et pourraient proposer des salaires plus élevés pour leur travailleur.

Enfin, au niveau de l'industrie, nous avons constaté que quand les prix de l'huile de palme augmenteront, tout l'industrie, y compris l'industrie liée à l'huile de palme, gagnera plus de ventes. En plus, il y aura d'augmentation sur la demande d'ouvrier, et ces industries seront capable de proposer les salaires plus élevés aux travailleurs.

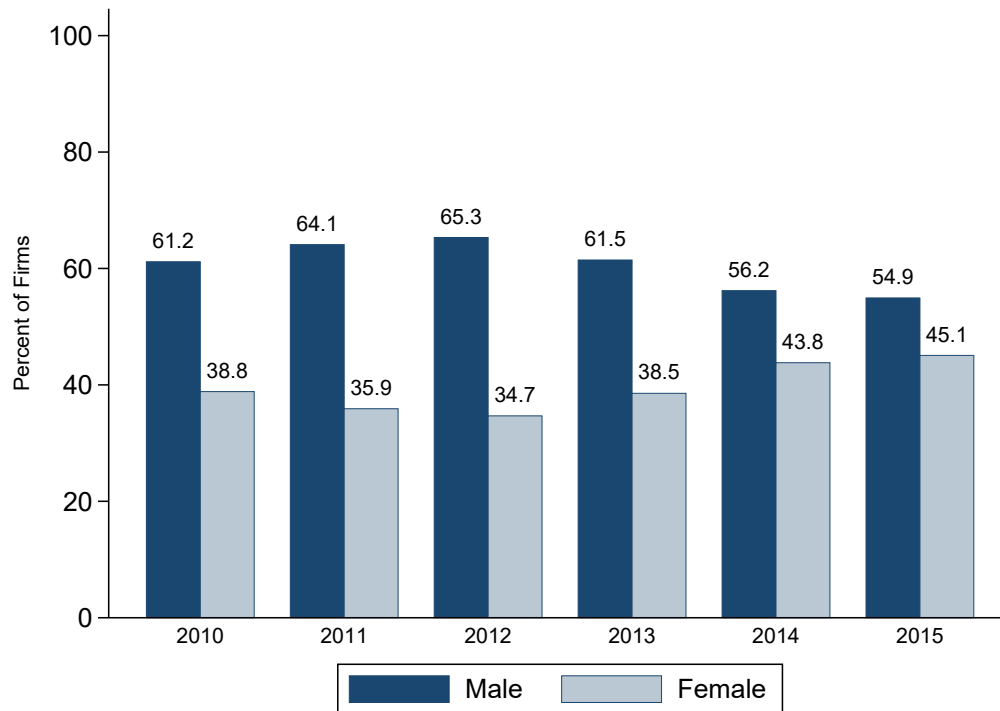
Chapitre 3: Femme Entrepreneur, Prêt Bancaire, et la Performance de Micros & Petits Enterprises.

Le chapitre 3 est co-écrit avec Zeinab Elbeltagy. La différence principale avec le chapitre précédent est dans ce chapitre nous explorons le comportement des entreprises manufacturières en forme des micros et petites entreprises (MPE). Nous utilisons l'enquête pour les entreprises qui contiennent des informations sur les sources de financement pour voir l'effet des différents types de financement sur le rendement des entreprises, ancré par l'angle du sexe de l'entrepreneur.

Le financement des micros et petites entreprises (MPE) a été d'un grand intérêt pour les responsables politiques et les chercheurs universitaires. Cela est dû au rôle important des MPE dans le secteur privé pour stimuler l'économie (Berrell et al., 2008). Dans le même temps, l'intérêt du soutien à la femme entrepreneur a récemment augmenté pour promouvoir l'inclusion économique, comme le soulignent les Objectifs de Développement Durable (ODD) sur l'égalité des sexes et le travail approprié. Cet intérêt découle du fait qu'il reconnaît que la femme entrepreneur générera la croissance économique et l'emploi, en particulier dans les régions rurales. En Indonésie, Tambunan (2017, 2019) a trouvé

que les femmes entrepreneurs ont un rôle important sur la réduction de la pauvreté, car elles améliorent le revenu familial. Néanmoins, il y a de plus en plus des discussions qui constatent que les femmes entrepreneurs ont désavantagées par un traitement discriminatoire, qui affecte la volonté de l'institution formelle de fournir un financement pour les femmes entrepreneurs. De l'autre côté, il y a d'autre impression que les femme entrepreneurs ont moins d'envie à chercher un financement externe (Cowling et al., 2020), mettre en évidence le problème de l'accès au financement pour eux. Les femmes entrepreneurs jouent un rôle important dans les MPE en Indonésie puisque près de la moitié des propriétaires d'entreprise en Indonésie sont des femmes. La Figure (3) montre la répartition de la propriété des entreprises par sexe en Indonésie au fil du temps. La figure montre également que le pourcentage d'entreprises de l'industrie manufacturière appartenant à des femmes varie selon l'année. Au cours de la période 2010-2015, il a atteint son plus haut niveau en 2014 et 2015, représentant respectivement 43,8 % et 45,1 % du total des MPE.

Figure 3: Total des MPE dans l'industrie manufacturière selon le sexe du propriétaire, 2010-2015 (%)



Source: Calcul de l'auteur, basé sur l'Agence de Statistiques Indonésienne.

Ce chapitre donne également un aperçu de la répartition des femmes entrepreneures dans les micros et petites entreprises (MPE) pour les entreprises manufacturières en Indonésie, à l'aide de données interprovinciales provenant des 34 provinces. Dans la Figure (4) en 2015, nous pouvons voir que le nombre de femmes entrepreneurs est relativement centralisé dans la partie ouest et plus développée en comté avec des couleurs plus sombres. Cela inclut l'île de Java, Sumatra et la partie sud de Sulawesi. Pendant ce temps-là, dans la région l'est de l'Indonésie, nous avons pu observer une couleur plus claire qui montre un nombre relativement faible de femmes entrepreneurs. Par exemple, dans les Moluques et la Papouasie, les régions les moins développées d'Indonésie, ils ne représentaient respectivement que 3,8% et 1,5% du total des femmes entrepreneurs de MPE en Indonésie en 2015.

Figure 4: Nombre de femmes entrepreneures de MPE selon la province, 2015

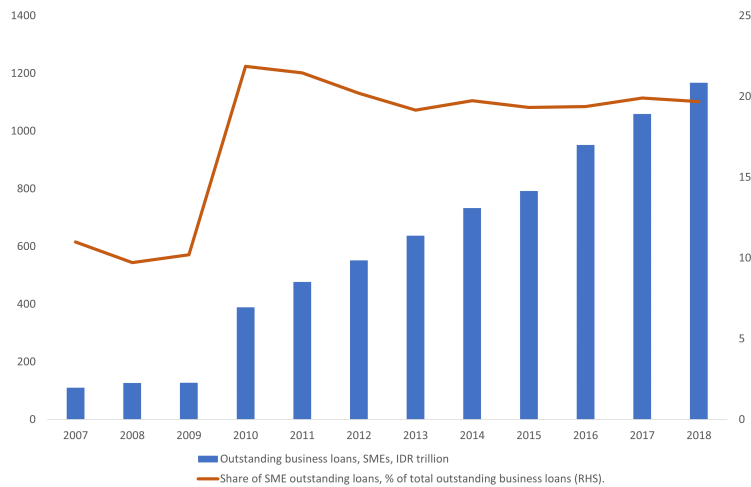


Source: Compilation de l'auteur, basé sur l'Agence Statistique Indonésienne.

Il existe de nombreuses stratégies ambitieuses pour soutenir les MPME en Indonésie, y compris les femmes entrepreneures, pour stimuler la croissance potentielle. Par exemple, pour s'assurer que le système bancaire achemine ses fonds vers les MPME, l'autorité des services financiers en Indonésie oblige les banques commerciales à intégrer un ratio minimum de MPME dans leurs portefeuilles de crédit. L'autorité exige d'accorder un crédit aux MPME à environ 20 % en 2010. En conséquence, depuis 2010, la partie des prêts aux MPME par rapport au total des prêts bancaires est restée d'environ 20 % pour suivre les mandats de l'autorité des services financiers, comme sur la Figure 5. Le chiffre montre également que le montant total des prêts bancaires acheminés aux MPME a continué d'augmenter jusqu'à dix fois, passant d'environ 110 billion IDR en 2007 à 1160 billion IDR en 2018.

Dans ce contexte, cette étude améliore les autres recherches précédentes à plusieurs égards. Première, la plupart des études similaires se sont concentrées sur la mesure de l'impact du crédit et de l'accès au financement sur une seule variable de résultat, comme la croissance économique, la réduction de la pauvreté, ou l'inégalité des revenus. Ainsi, leur analyse s'est limitée à des effets partiels. En revanche, notre étude analyse l'impact des prêts bancaires sur différents résultats microéconomiques (par exemple, la productivité de l'entreprise, les ventes, l'emploi et les salaires), car ils sont étroitement liés dans l'économie

Figure 5: Croissance des prêts bancaires aux micro, petites et moyennes entreprises, 2007-2018 (%)



Source: Calcul de l'auteur, basé sur Autorité des Services Financiers Indonésienne

réelle. Deuxième, nous utilisons un ensemble de données annuelles transversales de MPE indonésiennes pour analyser le rôle de différences des sexes dans la performance des entreprises, qui contribue de manière significative à la littérature existante sur les MPME, en particulier les MPE, et l'autonomisation des femmes dans les pays en développement. Troisième, ce document soutient la littérature existante qui souligne l'importance du financement pour les femmes entrepreneurs. Cette étude contribue en mesurant la probabilité et les facteurs de décomposition qui définissent le rôle de différences sexes dans les entreprises pour accéder le crédit d'externe. Enfin, il y a un manque d'études qui montre comment le financement des femmes entrepreneurs contribue à la performance des MPE, notamment en Indonésie.

En utilisant l'année 2015 comme année de référence, nos résultats montrent que les hommes entrepreneurs ont de meilleures performances que les femmes entrepreneurs. Ce résultat est cohérent avec le fait que les entreprises détenues par des femmes sont désavantagées sur le crédit de financement aux petites entreprises. Cependant, l'obtention d'un prêt bancaire formel réduit l'écart de performance entre les entreprises appartenant à des femmes et à des hommes (Voir le formulaire d'interaction entre les sexes et les prêts bancaires dans le Tableau 5.

Table 5: Productivité totale des facteurs, sexe et accès au crédit en 2015

| Variable Dépendance: ln(TFP Acfest) | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Variables Indépendance Principale | | | | | | | |
| Sexe du propriétaire | -0.057*** (0.002) | -0.054*** (0.002) | -0.054*** (0.002) | -0.043*** (0.003) | -0.040*** (0.003) | -0.040*** (0.003) | -0.043*** (0.003) |
| Capital interne nominale | -0.024*** (0.002) | | -0.000 (0.002) | 0.004 (0.003) | -0.003 (0.002) | -0.000 (0.002) | -0.000 (0.003) |
| Capital bancaire nominale | | 0.059*** (0.001) | 0.059*** (0.001) | 0.056*** (0.001) | 0.034*** (0.001) | 0.040*** (0.001) | 0.047*** (0.001) |
| Sexe x Capital intern | | | | -0.011** (0.004) | -0.006** (0.003) | -0.008** (0.003) | -0.009** (0.004) |
| Sexe x Capital bancaire | | | | 0.012*** (0.003) | 0.015*** (0.003) | 0.017*** (0.003) | 0.011*** (0.003) |
| Contrôle des caractéristiques de l'entreprise | NON | NON | NON | NON | OUI | OUI | NON |
| Contrôle des caractéristiques de propriétaire | NON | NON | NON | NON | OUI | NON | OUI |
| Regroupement provincial | OUI | OUI | OUI | OUI | OUI | OUI | OUI |
| Regroupement industrielle | OUI | OUI | OUI | OUI | OUI | NON | OUI |
| Observations | 48,042 | 48,042 | 48,042 | 48,042 | 48,042 | 48,042 | 48,042 |
| <i>R – squared</i> | 0.133 | 0.167 | 0.167 | 0.167 | 0.280 | 0.241 | 0.224 |

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

De plus, en utilisant la méthode de décomposition de Blinder–Oaxaca, nous pouvons prouver que les femmes entrepreneurs sont plus probable de demander un accès externe au capital bancaire. Nos résultats empiriques indiquent également que le crédit joue un rôle vital au sein de la communauté pour améliorer la productivité des MPE. Nous avons également constaté un effet nettement positif du financement des MPE sur les ventes et sur l'emploi au sein de l'entreprise soutenue. Cette constatation suggère que le financement inclusif, qui cible les MPE et les femmes entrepreneurs, tend à être associé à des gains économiques et sociaux, conduisant à des progrès globaux vers les objectifs de développement durable grâce à l'égalité des sexes et à des emplois appropriés.

Introduction

Globalization and manufacturing industries have gone well together in reinforcing each other in recent years. As the world became more connected, manufacturing industries supplied the production of goods to fulfilled the global demand. The push for globalization also delivers two principal effects for countries. First, they need to adapt to globally accepted rules to reduce friction in the international movement of goods and services. From this stance, we have witnessed policy reform to liberalize the trade sector or even the financial sector in the last few decades, moving away from domestic-oriented policy and protectionism to support globalization. Second, the economy has become interconnected that external shocks, such as commodity boom and bust, will significantly affect the domestic economy's performance.

Change in policy and external shock is crucial for the manufacturing sector since they could affect their main cost of inputs, which are capital and labor. In fact, given that the manufacturing sector absorbs more labor than the agriculture and service sectors, policy reform and external shocks have the ability to shift the labor market. This shift could be in the change of demand for labor, both skilled and unskilled, or change in the wage as the cost of production in manufacturing sectors.

Under this background, the subject of this doctoral thesis revolves around the analysis of these links between policy reform, external shocks, and the labor market in the manufacturing sectors. The thesis provides rigorous empirical tests to analyze those links, using rich manufacturing firm data in Indonesia between 1990 and 2015. In this manner, Indonesia is an ideal country to observe since the developing nation has abundant unskilled workers, an open economy, a price taker on the global market, and experiencing various reforms and shocks during the observation period.

The structure of this dissertation is as follows. Chapter 1 will discuss the relationship between financial liberalization and skill premium for medium and large manufacturing firms in Indonesia. Chapter 2 use a similar dataset to look upon the effect of external shocks like the fluctuations of palm oil price to labor demand and wage structure of the palm oil processing industry in the country. Chapter 3 provides evidence that women entrepreneurs will benefit from better access to bank lending in increasing the firms' performance.

Chapter 1: Financial liberalization and wage skill premium.

Wage inequality remains one of the most discussed subjects when we look at the effect of liberalization, either in developed or developing countries. However, the growing literature on this issue tends to focus on the effect of trade liberalization on wage inequality rather than financial liberalization, which generally occurs in the same period.

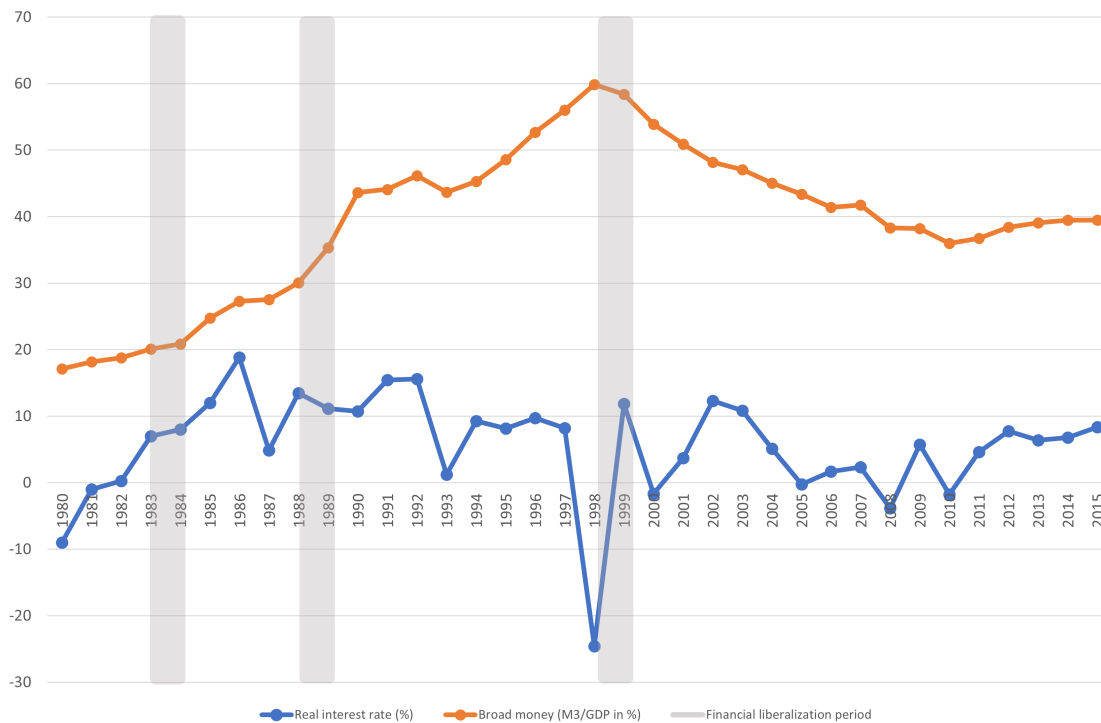
In Indonesia, there are at least three major series of financial reforms from the mid-1980s until the early 2000 (Sato, 2005; Jann, 2008). The first major financial reforms began in 1983 when the government fully liberalized state banks' deposit and lending rates and removed credit ceilings on all banks. For the following years, the reform led to a sharp rise in the real interest rate from 0.25% in 1982 to more than 12% in 1985 (See Figure 6).

The reform also marks a significant shift from the state-controlled financial system into a more market-based one. Floating interest rates have helped banks expand their deposit and increase their lending capabilities, strengthening their function as financial intermediaries.

However, during this period, market-entry remains under strict control. State-owned banks essentially are the only player in the market without competition from the private sector and foreign institutions. Therefore, the state-owned banks enjoy rent-seeking without disbursing credit to productive sectors.

In 1988, the government launched a second major financial reform by removing restrictions on new entries into the banking sector. Following the reform, in just five years until 1993, the number of banks rose from 63 to 158, while their branches multiple five times more from 559 to 2.926. Consequently, in this period, we can see in Figure 6 that base

Figure 6: Real interest rate and money supply, 1980-2015



Source: Author's calculation based on The World Bank

money expand rapidly to catch up with the expansionary banking sector in collecting and lending the funds. At the same time, capital inflow continues to come into the country through the newly established foreign subsidiaries bank. All these factors were the source of impressive economic growth in Indonesia before the economy's collapse due to the Asian Financial Crisis in 1998.

This led to the third financial reform that happened in the aftermath of the financial crisis in 1998. The banking sector collapsed suddenly due to maturity and exchange rate mismatch. The banking sector uses its dollar-nominated long-term loan from the foreign market to fund short-term projects in the country. The interest rate fell sharply before bouncing again, a year after. The money base fell, and the Indonesian economy went into a deep crisis, with growth reaching -13% yearly in 1997-1998.

The collapse of the banking sector has forced the Indonesian government to accept an agreement from the IMF to reform the banking sector as the primary source of economic

crisis. One of the notable reforms is establishing a supervisory system by letting the central bank gain its independence to supervise the banking sector. However, during the same period, the government introduced some measures to stabilize the exchange rate, leading to more restrictive international capital flow. Furthermore, from 1999 to 2003, there were several packages of financial liberalization in the banking sector as part of agreement post-financial crisis.

These series of financial liberalization bring the main motivation to provide new evidence that financial liberalization will impact manufacturing firms in Indonesia, with a focus on wage inequality. In the period post-financial liberalization, firms will have more options to receive funding from financial institutions, thus increasing their capital.

The capital increase will shift the use of a different type of worker in the production technology (Krussel et al., 2000). Additional capital (e.g., new machinery or technology) will require additional labor with more skill to run the production. This is called the capital-skill complementarity argument (Larrain, 2015), where additional capital will give an advantage to the skilled labor so they can have a relatively higher wage than unskilled labor. Therefore, the paper would test the hypothesis that the financial reforms could positively affect skill premium, widening the wage gap between skilled and unskilled workers.

In Indonesia, the skill premium has been in the mixed trend from 1990 to 2005. This paper defines the skill premium as the ratio of the non-production wage to the production wage from Annual Survey Manufacturing Firm, or Survey Industry (SI) data, following Amiti & Cameron (2012a). Prior to Asian Financial Crisis in 1997, the skill premium was in a downward trend, with skilled workers earning 2,75 times higher than the wage of unskilled workers in 1991 and falling to 2,41 times higher by 1996. However, we observe drastic pick-up in skill premium to 4,04 in 1997 before decreasing to 2,72 level in 2002 and a slight increase in 2005.

To compare the wage skill premium, we also adopt data from the Indonesian Worker Force Survey (Sakernas) as presented in the Amiti & Cameron (2012a) in Table 6. The worker force data did not differentiate workers between production and non-production, but the data provide the wage number based on the educational attainment of the workers. The wage skill premium is then defined as the average wage ratio for tertiary, upper secondary,

lower secondary, and primary educated workers' education relative to the workers with less than primary school education.

Table 6: Relative wages of skilled to unskilled workers

| Year | SI Data | Sakernas Data | | | |
|------|-------------------------------|---------------|--------------------|--------------------|----------|
| | Non-production/ Production | Primary | Lower Secondary | Upper Secondary | Tertiary |
| 1991 | 2.75 | 1.19 | 1.60 | 2.22 | 3.29 |
| 1993 | 2.63 | 1.25 | 1.72 | 2.43 | 3.71 |
| 1996 | 2.41 | 1.17 | 1.46 | 2.01 | 2.99 |
| 1997 | 4.04 | 1.18 | 1.51 | 2.08 | 3.13 |
| 1998 | 3.65 | 1.16 | 1.42 | 2.04 | 3.05 |
| 2000 | 2.72 | 1.13 | 1.43 | 2.05 | 3.08 |
| 2005 | 2.75 | 1.20 | 1.49 | 2.10 | 3.14 |

Source: Author's calculation based on [Amiti & Cameron \(2012a\)](#) and Indonesian Statistics Agency.

We can also observe a mixed trend on skill premium with the Sakernas data, with a downward trend prior to Asian Financial Crisis followed again by a falling trend before a pick up after the year 2000. The most striking figure is that the skilled workers with tertiary education almost consistently earned three times higher than the unskilled worker, 3,3 times higher in 1991, but then it fell to around three times higher in 2000.

Although the fall in skill premium before the financial crisis happened in the same period of liberalization (e.g., in finance and trade), it is hard to draw a casual relationship since many factors influence this. Most notably, the fall in skill premium can be attributed to the increased education supply, creating more skilled workers based on education attainment.

Under these backgrounds, to analyze the relationship between financial liberalization and wages skill premium between 1990 to 2005, this study uses Industrial Survey (Survey Industri) as a primary data source, a census of firm-level manufacturing establishments in the country with at least 20 employees. Furthermore, the paper uses the indexes from the financial reform database by [Abiad, Detragiache, & Tressel \(2008\)](#) to capture financial liberalization variations in the research period. The database measured qualitative indicators of restrictions in seven different dimensions in financial sector policy and later on translated into a sub-index. Each sub-index is coded from zero (thoroughly repressed) to three (fully liberalized).

The results of this paper show three interesting findings. First, we found a significant result that financial liberalization will increase the wage skill premium in Indonesia (See Table 7. The result, therefore, supports most of the recent literature that argues that financial liberalization will increase wage inequality.

Table 7: Financial liberalization and skill premium

| Dependent variable $\ln(w_s/w_u)$ | (1) Financial liberalization | (2) Globalization | (3) Size measure | (4) Ownership | (5) Skill share |
|--------------------------------------|------------------------------------|----------------------|----------------------|------------------------|-----------------------|
| Financial liberalization index | 0.963** (0.387) | 0.868** (0.368) | 0.863** (0.371) | 0.808** (0.376) | 0.894** (0.406) |
| Import share | | 0.123*** (0.0283) | 0.121*** (0.0283) | 0.107*** (0.0282) | 0.116*** (0.0279) |
| Export share | | 0.0280** (0.0117) | 0.0254** (0.0115) | 0.0207* (0.0116) | 0.0147 (0.0110) |
| Medium firm | | | 0.0159 (0.0191) | | |
| Large firm | | | 0.113*** (0.0238) | | |
| Size | | | | 0.0920*** (0.0117) | |
| Foreign ownership | | | | 0.101*** (0.0212) | 0.125*** (0.0184) |
| Government ownership | | | | -0.0360*** (0.0125) | -0.0215* (0.0120) |
| Skill share | | | | | -2.538*** (0.0774) |
| Observations | 250,275 | 233,875 | 233,875 | 233,875 | 233,875 |
| R-squared | 0.476 | 0.478 | 0.479 | 0.480 | 0.536 |
| Firms FE | YES | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES | YES |

Robust standard errors in parentheses, clustered in sector-year level

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

Second, we show that financial reforms that affect skill premium mostly come from the relaxation of entry barriers and interest rate control for the banking institution. We also found only large firm that will enforce the positive relationship between financial reform and skill premium.

Overall, the financial reform also have positive impact to the firm performance, increasing

their productivity and sales. Financial reforms will affect the wage for skilled labor while at the same time decreasing their relative demand. These results are robust even after controlling for various specifications.

The paper suggests that financial liberalization will ease financing needs in acquiring capital. This is shown by the increase of expense in interest loans will significantly affect the increase in capital stock. Through the capital-skill complementarity argument, we found that new technological change in the capital will give a relative increase in the wage for a skilled worker, creating a higher skill premium.

Chapter 2: Palm oil price, labor demand, and wage structure.

Chapter 2 is co-written with Akiko Suwa-Eisenmann. In common with the first chapter, it is devoted to the labor market of manufacturing firms in Indonesia. This time, we explore the effect of fluctuations of palm oil price during the commodity boom and bust period on firm performance, labor demand, and wage structure based on labor skill.

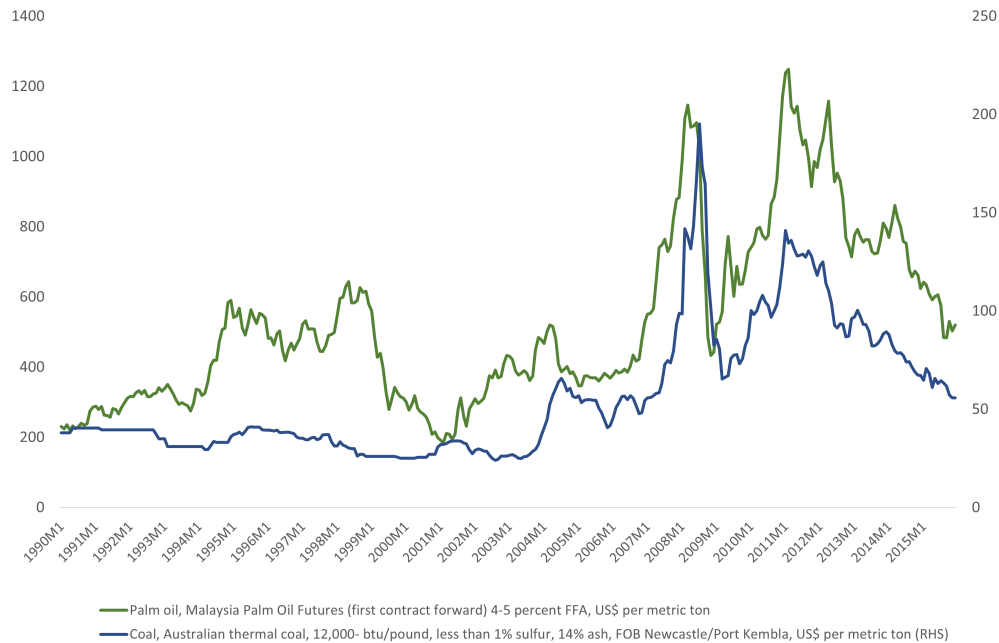
Fluctuations in commodity prices have been described as a source of volatility in the emerging markets ([Fernandez et al., 2017](#)), where commodity boom could lead to high economic growth and commodity bust could lead to recessions and slow recoveries ([Reinhardt et al., 2016](#)). An open economy that produces the commodity will respond to higher commodity prices during the boom period by increasing its aggregate production capacity and attracting more labor in the commodity-related sector. The reverse happens during a commodity bust.

In analyzing the external shocks of commodity price changes to the labor market, we select palm oil price as our main variable for three reasons. First, palm oil is the most crucial commodity export in agriculture for Indonesia. During our research period from 1990 to 2015, the export volume in palm oil continued to increase from 815 million kg in 1990 to almost 30 billion kg in 2015. More impressively, this is followed by the export value in nominal terms, increasing from around 200 million USD to more than 1.5 billion USD. The export volume value only dipped in the aftermath of the Asian Financial Crisis in 1997 and flattened for a few years after the Global Financial Crisis in 2008.

Second, Indonesia is by far the largest palm oil producer globally. Along with Malaysia, the two countries supply almost 90% of global production. However, unlike Malaysia, which exclusively exports its palm oil production, Indonesia uses twenty-five percent of its production for domestic consumption. This made the country one of the world's biggest consumers of palm oil (e.g., mainly used for cooking oil and biofuels). Furthermore, despite being the largest palm oil producer, Indonesia is a price taker of an international price set in London and Chicago.

Third, between 1990 and 2015, the palm oil price experienced several episodes of booms and busts. Figure 2.3 shows that the first episode of the palm oil price boom took place in the mid-90s when the price grew by 200 percent from US\$ 200 per metric ton in 1990 to US\$ 600 per metric ton in 1998. The palm oil price dropped after the Asian Financial crisis of 1998 when the price went back again to US\$ 200 per metric ton in 2000. The second episode was a dramatic boom in 2006, followed by a sudden bust in the aftermath of the Global Financial Crisis. In this period, the palm oil price increased from US\$ 400 per metric ton in 2007 to US\$ 1200 per metric ton in 2008. Then the price dropped in 2009 to a level similar in 2007. In the early 2010s, the palm oil price kept rising before falling to below US\$ 400 per metric ton in 2015. Interestingly, the patterns of palm oil price movements are similar to other commodities, such as coal, as can be seen in Figure 7 - however, coal price has been relatively flat in the 1990s, while the palm oil price was booming.

Figure 7: Palm oil and coal world price, 1990 - 2015.



Source: Authors' calculation based on IMF primary commodity price.

Previous studies show that the manufacturing sector is also negatively or positively impacted by a commodity boom. Pioneer work by [Corden & Neary \(1982\)](#) argues that the manufacturing (tradable) sector will be hit by a *Dutch disease* as the price boom in the extractive sector will affect resource allocation, factorial income distribution, and the real exchange rate. On the other hand, [Smith \(2019\)](#) shows the procyclicality of a commodity boom and the manufacturing sector at the expense of the exports of agricultural products.

In these frameworks, the manufacturing sector competes with the commodity sector for labor. The boom in commodity prices will re-adjust the labor market by changing wages or workers' demand and supply. However, part of the manufacturing sector is also directly related to a commodity. This is the case of downward processing industries, such as the furniture industry for wood or textile industry for cotton. A commodity price boom will directly benefit these downward processing industries as it will trigger an increase in the quantity produced. Enhancing commodity processing is increasingly a policy objective of many governments in developing countries. Governments hope to reach self-sufficiency by upgrading into processing, reaping the benefits of higher productivity in

manufacturing, and creating better jobs.

This chapter looks at the impact of fluctuations of palm oil price on downward industries, that is, industries that use fresh palm oil bunches as inputs and process them (which we will call "processing firms"). Palm oil bunches are widely used in cooking oil, cosmetics and soaps, animal feed, and biofuel. Indonesia uses a quarter of its palm oil production for the domestic final and intermediate consumption. Developing the domestic use of palm oil is also a way for the Indonesian government to alleviate the impact of export bans on palm oil in many developed countries (such as the EU) because of the environmental effects of palm oil on deforestation and water quality.

We contribute to the existing literature by providing a detailed analysis at the micro-level, using a firm-level dataset, following the work of [Benguria et al. \(2018\)](#); [Amiti & Davis \(2012\)](#) and [Kis-Katos & Sparrow \(2015\)](#). We use the Survey Industry (SI) data from the Indonesian Statistics Agency and commodity prices from the International Monetary Fund (IMF) for 26 years, from 1990 to 2015. We can then be able to capture large price variations during the commodity booms of the 1990s and 2000s and the bust during the financial crises of 1997 and 2008.

Our result shows several interesting findings. First, we observe that a rise in palm oil prices will lead to an increase in the sales of palm oil processing firms. However, since palm oil is used as an input of production, a higher palm oil price will adjust the labor demand and wage. For these palm oil processing firms, a rise in palm oil prices will reduce demand for labor, primarily for the skilled worker (Table 8). Furthermore, the wage for skilled labor will increase in the commodity boom period. Meanwhile, we cannot find evidence that change in palm oil price will affect skill premium in palm oil processing firms (Table 9).

Table 8: Baseline regression: Palm oil price on sales and labor

| Dependent variables | (1) Sales (log) | (2) Labor demand | (3) Skilled demand |
|---------------------|---------------------------|---------------------------|---------------------------|
| Palm oil price | 0.000848*** (0.000289) | -0.000267** (0.000124) | -0.000103** (4.62e-05) |
| Observations | 24,483 | 24,894 | 24,894 |
| R-squared | 0.874 | 0.819 | 0.547 |
| Firms FE | YES | YES | YES |
| Year FE | YES | YES | YES |

Robust standard errors in parentheses clustered by district

*** p<0.01, ** p<0.05, * p<0.1

Table 9: Baseline regression: Palm oil price and wages of the downward firms

| Dependent Variables | (1) Average Wage | (2) Unskilled wage | (3) Skilled Wage | (4) Skill premium |
|---------------------|-------------------------|--------------------------|--------------------------|------------------------|
| Palm oil price | -0.000278 (0.000225) | -0.000360* (0.000203) | 0.000442** (0.000208) | 6.62e-05 (0.000213) |
| Observations | 24,890 | 24,858 | 22,157 | 22,125 |
| R-squared | 0.496 | 0.457 | 0.458 | 0.357 |
| Firms FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |

Robust standard errors in parentheses, clustered by district.

*** p<0.01, ** p<0.05, * p<0.1

Second, we found the finding is more relevant to the period after the Asian Financial Crisis. We observe that labor demand and wage was negatively affected by the Asian Financial Crisis. Thus overcome the effect of changes in palm oil price in the period leading to the crisis and several years afterward.

Third, we found that this effect is not exclusive to palm oil processing firms. We found evidence that palm oil price changes during the commodity boom and bust period will affect overall manufacturing firms. A rise in palm oil prices will increase the sales and wage of the labor. Fourth, looking at the firms' characteristics, we found that smaller and domestic-oriented firms will benefit from increasing palm oil prices. They will have a higher sale, increasing demand for labor, and could provide higher wages for their labor.

Finally, on the industry level, we found that when palm oil prices increase, the palm-oil-related industry and other industries will enjoy higher sales, increase demand for labor, and would be able to provide higher wages.

Chapter 3: Women entrepreneurship, bank lending, and micro & small enterprises' performance.

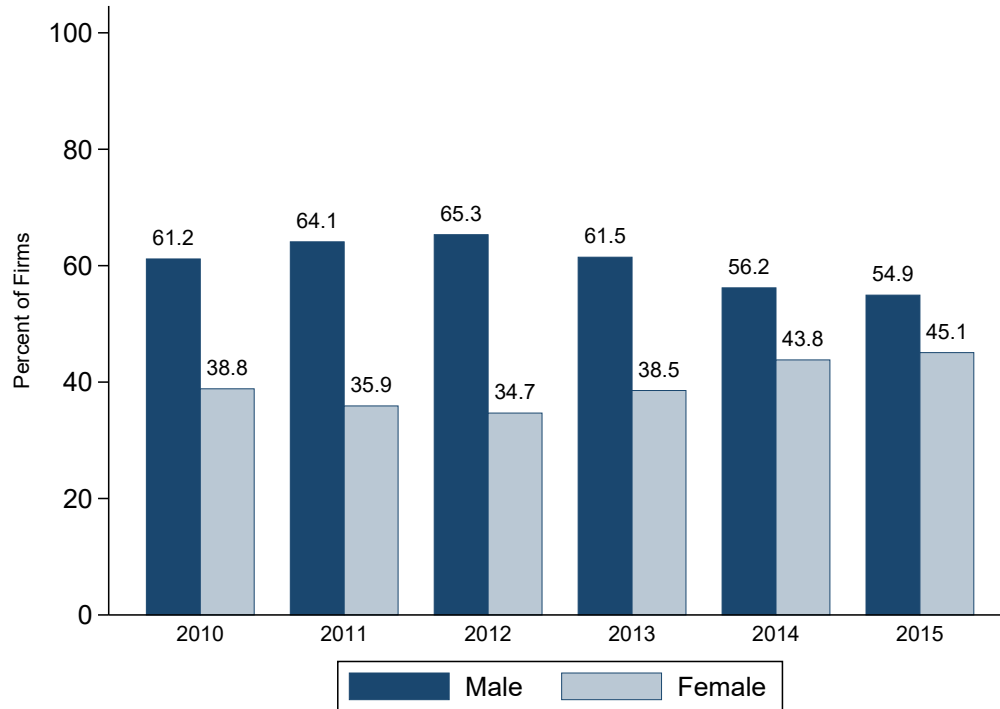
Chapter 3 is co-written with Zeinab Elbeltagy. The main difference with the previous chapter is that we explore manufacturing firms' behavior in micro and small enterprises. We utilize the survey for those firms which contain information on financing sources to see the effect of different types of financing on firms' performance, anchored by gender angle in analyzing the relationship.

Micro and Small Enterprises (MSEs) financing have been of great interest for policymakers and academic researchers. This is due to the significant role of MSEs in the private sector to drive the economy ([Berrell et al., 2008](#)). At the same time, interest in supporting women's entrepreneurship has recently increased to promote economic inclusion, as highlighted by the Sustainable Development Goals (SDG) on gender equality and decent work. This interest stems from recognizing that women's entrepreneurship will generate economic growth and employment, particularly in rural areas. In Indonesia, [Tambunan \(2017, 2019\)](#) found that women entrepreneurs have a significant effect on poverty reduction as they improve family income. Nevertheless, there is growing discussion that women entrepreneurs are disadvantaged on the supply-side by a discriminatory treatment that affects the willingness of the formal institution to provide financing. While in the other hand, there is a perception that women entrepreneurs are less willing to seek external financing ([Cowling et al., 2020](#)), highlighting the problem on the demand side to access finance.

Women entrepreneurs play a significant role in the MSEs in Indonesia since almost half of the business owner is women. The Figure (8) shows the distribution of firm ownership by gender in Indonesia over time. 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.

Figure 8: Total MSE in the manufacturing industry by gender of the owner, 2010-2015 (%)



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

This chapter also provides a snapshot of the distribution of women entrepreneurs in Micro and Small Enterprises (MSE) for manufacturing firms in Indonesia using cross-provincial data from all 34 provinces. In Figure (9) by 2015, we can see that the number of women entrepreneurs is relatively centralized in the western and more developed part of the country with darker colors. This includes the island of Java, Sumatra, and the southern part of Sulawesi. Meanwhile, in the eastern area of Indonesia, we could observe a lighter color which shows a relatively small number of women entrepreneurs. For example, Maluku and Papua, the least developed parts of Indonesia, respectively represented only 3.8% and 1.5% of total women entrepreneurs of MSE in Indonesia in 2015.

Figure 9: Number of Women Entrepreneur of MSEs based on province, 2015



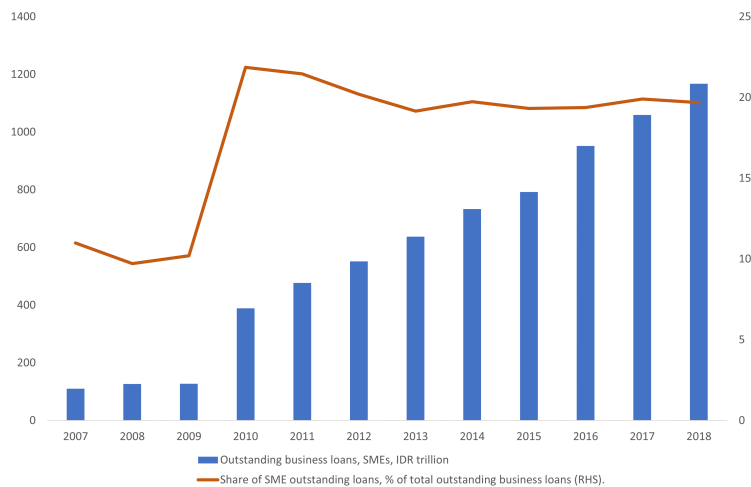
Source: Authors' compilation based on Indonesian Statistics Agency (BPS).

There are many ambitious strategies to support MSME in Indonesia, including women entrepreneurs, to boost potential growth. For example, to ensure the banking system channels its funds to MSMEs, the financial service authority in Indonesia obliges commercial banks to integrate a minimum ratio of SMEs in their credit portfolios. The authority set the minimum share of SMEs credit to around 20% in 2010.

As a result, since 2010, the share of lending to MSMEs compared to total bank lending remained around 20% to follow mandates from the financial service authority, as can be seen in Figure 10. Accordingly, the figure also shows that the total amount of bank lending channeled to MSMEs has continued to rise by around ten folds, from around 110 trillion IDR in 2007 to 1160 trillion IDR in 2018.

Under this background, this study improves upon the previous research in several aspects. *First*, most of the 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 was limited to partial effects only. In contrast, our study analyzes the impact of bank lending on different microeconomics outcomes (e.g., firm productivity, sales, employment, and wages) as they are closely inter-related in the real economy.

Figure 10: Bank lending growth to Micro, Small, and Medium Enterprises, 2007-2018 (%)



Source: Authors' calculation based on Indonesian Financial Service Authority (Otoritas Jasa Keuangan - OJK)

Second, we use a uniquely large data set of cross-sectional annual Indonesian MSEs to analyze the gender differences in firm performance, which contributes significantly to the existing literature on MSMEs, particularly MSEs, and women empowerment in developing countries. *Third*, the paper supports the increasing literature that highlights the importance of financing for women entrepreneurs. This study contributes by measuring the probability and decomposing factors that define gender differences in firms to access external credit. *Finally*, there is a lack of studies showing how financing women entrepreneurs contribute to MSEs' performance in the specific context of Indonesia.

Using 2015 as our baseline year, our findings suggest that male entrepreneurs perform better than women entrepreneurs. This finding is thus consistent with the fact that women-owned firms face a disadvantage in the market for small-business credit. However, obtaining a formal bank loan decreases the gap in the performance of women and men-owned firms (See the interaction form between gender and bank lending in Table 10).

Furthermore, using Blinder–Oacaxa decomposition method, we can prove that women entrepreneurs are more likely to demand external access from bank capital. Our empirical results also indicate that credit plays a vital role within the community to enhance

Table 10: Total factor productivity, gender, and access to credit in 2015

| Dependent Variable: ln(TFP Acfest) | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Main independent variables | | | | | | | |
| Gender of the owner | -0.057*** (0.002) | -0.054*** (0.002) | -0.054*** (0.002) | -0.043*** (0.003) | -0.040*** (0.003) | -0.040*** (0.003) | -0.043*** (0.003) |
| Dummy internal capital | -0.024*** (0.002) | | -0.000 (0.002) | 0.004 (0.003) | -0.003 (0.002) | -0.000 (0.002) | -0.000 (0.003) |
| Dummy bank capital | | 0.059*** (0.001) | 0.059*** (0.001) | 0.056*** (0.001) | 0.034*** (0.001) | 0.040*** (0.001) | 0.047*** (0.001) |
| Gender x internal capital | | | | -0.011** (0.004) | -0.006** (0.003) | -0.008** (0.003) | -0.009** (0.004) |
| Gender x bank capital | | | | 0.012*** (0.003) | 0.015*** (0.003) | 0.017*** (0.003) | 0.011*** (0.003) |
| Firm characteristics control | No | No | No | No | Yes | Yes | No |
| Ownership characteristics control | No | No | No | No | Yes | No | Yes |
| Province cluster | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry cluster | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Observations | 48,042 | 48,042 | 48,042 | 48,042 | 48,042 | 48,042 | 48,042 |
| <i>R – squared</i> | 0.133 | 0.167 | 0.167 | 0.167 | 0.280 | 0.241 | 0.224 |

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

the productivity of MSE businesses. Moreover, we found a significant positive effect of MSE finance on sales and employment within the supported firm. This finding suggests that inclusive financing, which targets micro and small firms and women entrepreneurs, tends to be associated with economic and social gains, leading to overall progress towards sustainable development goals through gender equality and decent jobs.

1. Financial Liberalization and Wage Skill Premium: Firm Level Evidence from Indonesia ¹

Abstract

This paper studies the effect of financial reform on the wage skill premium and the wage difference earned by skilled and unskilled workers in Indonesia. This research contributes to growing literature on income inequality by providing a new evidence on the study in firm-level analysis to measure the impact of financial reform on wage inequality. This paper uses detailed Indonesian manufacturing census data from 1990 - 2005 and the IMF's financial reforms index to show three main findings. First, the paper found a significant result that financial liberalization will increase the wage skill premium in Indonesia. The result, therefore, supports most of the recent literature that argues that financial liberalization will increase wage inequality. Second, the paper shows that financial reforms that affect skill premium mostly come from a relaxation of entry barriers for banking institutions and less control on interest rate. Lastly, it found that financial reform will also increase firms' productivity, increase wage for skill premium, and reduce demand for skilled labor. Even after controlling for other weight, the Asian Financial Crisis, and various firm-level characteristics, these results are robust.

Keywords: *financial reforms, wage inequality, firm-level data*

JEL Classification: JEL: C33, D63, J31.

¹This paper also benefited comments from seminar participants at Paris School of Economics (GSIE Seminar), Université de Strasbourg (ACDD Seminar), Istituto Cattaneo Bologna, and University of Indonesia.

1.1. Introduction

Wage inequality remains one of the most discussed subjects when we look at the effect of liberalization, either in developed or developing countries. However, the growing literature on this issue tends to focus on the effect of trade liberalization on wage inequality rather than financial liberalization, which generally occurs in the same period.

This paper contributes to recent literature by measuring the effect of financial liberalization on the skill premium, the wage difference earned by a skilled and unskilled worker in Indonesia. The main motivation of this paper is to provide new evidence that financial liberalization will have an impact on manufacturing firms in Indonesia, with a focus on wage inequality. In the period post-financial liberalization, firms will have more options to receive funding from financial institutions, thus increasing their capital.

The capital increase will shift the use of a different type of worker in the production technology (Krussel et al., 2000). Additional capital (e.g., new machinery or technology) will require additional labor with more skill to run the production. This is called the capital-skill complementarity argument (Larrain, 2015), where additional capital will give an advantage to the skilled labor so they can have a relatively higher wage than unskilled labor. Therefore, the paper would test the hypothesis that the financial reforms could positively affect skill premium, widening the wage gap between skilled and unskilled workers.

Current studies have shown no consensus on the effect of financial liberalization to wage inequality. The financial liberalization does reduce the income inequality in the cross country analysis (Delis et al., 2014), although other research shows that this is true for some conditional terms, like financial development (Bumann & Lensink, 2016) and human capital (Li & Yu, 2014). On the other hand, recent literature has shown that financial liberalization through lower control on credit, interest rate, and barriers to entry are more likely to increase the income inequality (Naceur & Zhang, 2016). Moreover, the study by de Haan & Sturm (2017) and Larrain (2015) also show that financial liberalization does widen the income inequality despite the quality of financial development.

From the early 1980s until the early millennium, Indonesia has experienced three major

financial liberalizations. The first is the liberalization credit and interest rate control implemented to the banking system by the government in 1983. Second, is the wave of financial liberalization in 1988 that improved competition by allowing new financial institutions to enter the market. Third, is the financial reform right after the Asian Financial Crisis that focuses on improving supervision to create healthy competition in the banking sector and massive privatization of financial institutions. These financial reforms subsequently ease the constraint for the firms to access loans for financing needs, giving the firms more resources to expand their business and increase their productivity and revenue, which will also affect the wage of the workers.

This research observes the period 1990 to 2005, considered the main liberalization period in Indonesia, to measure the extent of financial reforms to wage in manufacturing sectors. The primary data source for this research is the Industrial Survey (Survey Industri), a census of firm-level manufacturing establishments in the country with at least 20 employees. Furthermore, the paper uses the indexes from the financial reform database by [Abiad, Detragiache, & Tressel \(2008\)](#) to capture financial liberalization variations in the research period. The database measured qualitative indicators of restrictions in seven different dimensions in financial sector policy and later on translated into a sub-index. Out of this seven sub-index, we exclude the supervision index because it does not reflect the degree of liberalization that we want to measure. Each sub-index is coded from zero (fully repressed) to three (fully liberalized).

The weight of financial reforms is measured using the five-digit level industries using the Input-Output table of 1990, consisting of 161 sectors. We obtained the tariff dataset from the Trade Analysis Information System (TRAINS) database of the United Nations. We also control the result by adapting the weight of financial dependence indexes introduced by [Rajan & Zingales \(1998\)](#). Lastly, to control our result, we include a reduction in tariff, which occurs around the same period.

The paper is the first research that explores the financial liberalization effect to wage inequality in microeconomics environment using firm-level data. The results of this paper show three interesting findings. First, we found a significant result that financial liberalization will increase the wage skill premium in Indonesia. The result, therefore, supports

most of the recent literature that argues that financial liberalization will increase wage inequality. Second, we show that financial reforms that affect skill premium mostly come from the relaxation of entry barriers for a banking institution. Lastly, we found that the impact of financial reforms on skill premium is negative for firms that input their productions. These results are robust even after controlling for various specifications.

The paper suggests that financial liberalization will ease financing needs in acquiring capital. This is shown by the increase of expense in interest loans will significantly affect the increase in capital stock. Through the capital-skill complementarity argument, we found that new technological change in the capital will give a relative increase in the wage for a skilled worker, creating a higher skill premium.

The remainder of paper is organized as follows. Section 1.2 discussed the related literature. Section 1.3 provides an overview of wage development and financial reforms in Indonesia. Section 1.4 describes the theoretical motivations, data, and measurements. Section 1.5 describes the estimation strategy and main results. Lastly, section 1.6 concludes.

1.2. Related Literature

The theory that builds a relationship between financial liberalization and income inequality is very limited, if not a mixed result. For example, [Demirguc-Kunt & Levine \(2009\)](#) pointed out that the theoretical framework is giving ambiguous predictions to the relation between finance and income distribution. On one side, the theory predicts that financial development will help the poor access finance to pay for education, reducing inequalities in the longer term. On the other side, the theory also predicts that improving financial development benefits those who already enjoy financial services, thus widening the inequalities.

Meanwhile, the most recent literature gave more attention to empirical analysis on understanding the impact of financial liberalization on income distribution. One notable work can be found in [de Haan & Sturm \(2017\)](#) which conducted cross-country analysis over 121 countries covering 1975-2005. They found that financial development, financial liberaliza-

tion, and banking crisis increase income inequality, pointing to a wider Gini coefficient. Their research also contrasts [Bumann & Lensink \(2016\)](#) and [Rajan & Zingales \(2003\)](#) in explaining that institutional quality is not a condition for financial development in affecting income inequality.

Other research by [Naceur & Zhang \(2016\)](#) also shows that financial liberalization will aggravate income distribution and increase poverty. In the paper, with cross-country analysis for 143 countries from 1961 to 2011, they use two financial liberalization proxies: domestic and external liberalization. For domestic liberalization, they use IMF financial liberalization database ([Abiad, Detragiache, & Tressel, 2008](#)) by aggregating the index of credit control, interest rate control, entry barriers, and privatization. While to measure external liberalization, they use consolidated foreign claims of BIS-reporting banks to GDP, with larger values suggesting a more liberalized financial system. Their research concludes that financial liberalization, both domestic and external, is increasing income inequality. While they also found that financial depth, access to finance, efficiency, and stability of the financial system can help reduce inequalities.

The theoretical part to explain the mechanism of positive effect between financial liberalization and wage inequality can be found in [Larrain \(2015\)](#). Based on the work of [Krussel et al. \(2000\)](#) on capital-skill complementarity and inequality, [Larrain \(2015\)](#) use aggregate data on 20 mainly European countries to find that opening the capital account increases aggregate wage inequality. He also explains the mechanism by exploiting industry data based on their dependence on external finance and capital-skill complementarity. [Larrain \(2015\)](#) paper concludes that the positive effect of capital account opening is particular in industries with high financial needs and strong complementarity.

Nevertheless, this recent literature mainly focuses on the macroeconomic environment and uses Gini coefficient or wages data in more aggregate level as their measure for income inequality. Meanwhile, very few works on the microeconomic environment explore the relationship between financial liberalization and income distribution. The microeconomic analysis on firm-level data has an advantage in assessing the heterogeneity effects of financial liberalization to wage inequality based on the size, ownership, age, productivity, or even share of skilled workers among the firms.

In these more microeconomic settings, available literature shows that financial liberalization does affect firms' performance through efficient capital allocation and increase in productivity, but not on the income inequality. For example, research by [Abiad, Oomes, & Ueda \(2008\)](#) uses firm-level data from India, Jordan, Korea, Malaysia, and Thailand to measure the impact of capital liberalization. Their result shows that financial liberalization leads to more access to credit, enabling firms to improve capital allocations' efficiency. Meanwhile, [Guiso et al. \(2006\)](#) using firm-level data from Italy to argue that financial liberalization, which relaxed restriction to market entry, will reduce the cost of credit and increase access to credit that will help the firm to increase their capital. Although in the same time, the reforms will bring more bad loans into the economy.

A more recent publication by [Varela \(2018\)](#) also uses firm-level settings in Hungary to show that financial liberalization improves productivity. She argues that financial liberalization triggers an increase in productivity through a) relocation effect that increases investment in technology and capital for previously credit-constrained; and b) pro-competitive effect that expands investment in technology and capital for a non-constrained firm faces more competition in the market.

Other studies explore further the heterogeneity effect of financial liberalization in firm-level settings. For example, [Jaramillo et al. \(1996\)](#) suggests that financial reforms in Ecuador give more benefit to large and older firms through lower borrowing costs and lower ceiling on leverage, while the small and young firms did not benefit much from the financial reforms. Another good example is from [Bas \(2012b\)](#), which discussed the impact of financial liberalization on the wage difference between firms owned by foreigners and domestic owners. Using a dataset from Romania from 1998 to 2006, she found that better financial development will give wage premium to workers in the firms owned by foreigners. She argues that this is due to the relationship between foreign affiliates and foreign banks, so firms with foreign affiliates will benefit from interaction with foreign banks from those countries.

Similarly, in Indonesia, research in this area was pioneered by [Harris et al. \(1994\)](#), which explores the effect of financial liberalization on firms' capital structure and investment decisions. The paper analyzes the first wave of financial liberalization from 1981-1988

to conclude that the reforms have a significant and positive effect on investment to capital, allowing firms to have wider access to finance (both from domestic and international sources) and help them accumulate the capital. However, they also found heterogeneity effects of financial liberalization, which shows that smaller firms tend to experience incremental costs of borrowing, giving them a slower rate of capital accumulation relative to bigger firms.

Meanwhile, studies that explore income inequality are not assessing the impact of financial liberalization as their main point of view but rather from a trade liberalization perspective. In this sense, [Amiti & Cameron \(2012a\)](#) gives a perfect example of the effect of trade liberalization on income inequality by using the wage skill premium between a skilled and unskilled worker in Indonesia. Their research using firm-level data in Indonesia from 1991 to 2000 shows that the fall in tariff, especially in input tariff, decreases the wage skill premium among workers in the manufacturing sectors. They argue there is some substitution effect that explains the lower demand of skilled workers because firms can import skilled induced inputs to their production, resulting in a lower skill premium. [Kis-Katos & Sparrow \(2015\)](#) also found that the trade liberalization through import tariff in Indonesia will primarily affect middle-skilled wages. It is worth mentioning that other studies also explore the impact of trade liberalization on firms' productivity. Such an example can be found in [Amiti & Davis \(2012\)](#) which shows that trade liberalization in Indonesia has increased firm productivity.

Following the discussion on the literature, we can indicate that there is still a gap in research that explores the relationship between financial liberalization and income distribution in the firm-level analysis. The main contribution of this paper, therefore, is to bridge the analysis on financial liberalization to the wage skill premium, the wage difference between skilled and unskilled workers. It is possible to utilize the method used by previous literature on cross-country analysis to measure the impact of financial liberalization on income distribution, measured by wage gap within firms-level. At the same time, the firm-level analysis will allow the heterogeneity of firm behavior based on their characteristics in assessing the impact of financial liberalization on income inequality.

1.3. Skill Premium and Financial Reforms

1.3.1. Skill Premium in Indonesia

The skill premium has been in the mixed trend from 1990 to 2005. This paper defines the skill premium as the ratio of the non-production wage to the production wage from Annual Survey Manufacturing Firm, or Survey Industry (SI) data, following [Amiti & Cameron \(2012a\)](#). Prior to Asian Financial Crisis in 1997, the skill premium was in a downward trend, with skilled workers earning 2,75 times higher than the wage of unskilled workers in 1991 and falling to 2,41 times higher by 1996. However, we observe drastic pick-up in skill premium to 4,04 in 1997 before decreasing to 2,72 level in 2002 and a slight increase in 2005.

To compare the wage skill premium, we also adopt data from the Indonesian Worker Force Survey (Sakernas) as presented in the [Amiti & Cameron \(2012a\)](#) in Table 1. The worker force data did not differentiate workers between production and non-production, but the data provide the wage number based on the educational attainment of the workers. The wage skill premium is then defined as the average wage ratio for tertiary, upper secondary, lower secondary, and primary educated workers' education relative to the workers with less than primary school education.

Table 1.1: Relative wages of skilled to unskilled workers

| Year | SI Data | Sakernas Data | | | |
|------|-------------------------------|---------------|--------------------|--------------------|----------|
| | Non-production/ Production | Primary | Lower Secondary | Upper Secondary | Tertiary |
| 1991 | 2.75 | 1.19 | 1.60 | 2.22 | 3.29 |
| 1993 | 2.63 | 1.25 | 1.72 | 2.43 | 3.71 |
| 1996 | 2.41 | 1.17 | 1.46 | 2.01 | 2.99 |
| 1997 | 4.04 | 1.18 | 1.51 | 2.08 | 3.13 |
| 1998 | 3.65 | 1.16 | 1.42 | 2.04 | 3.05 |
| 2000 | 2.72 | 1.13 | 1.43 | 2.05 | 3.08 |
| 2005 | 2.75 | 1.20 | 1.49 | 2.10 | 3.14 |

Source: Author's calculation based on [Amiti & Cameron \(2012a\)](#) and Indonesian Statistics Agency.

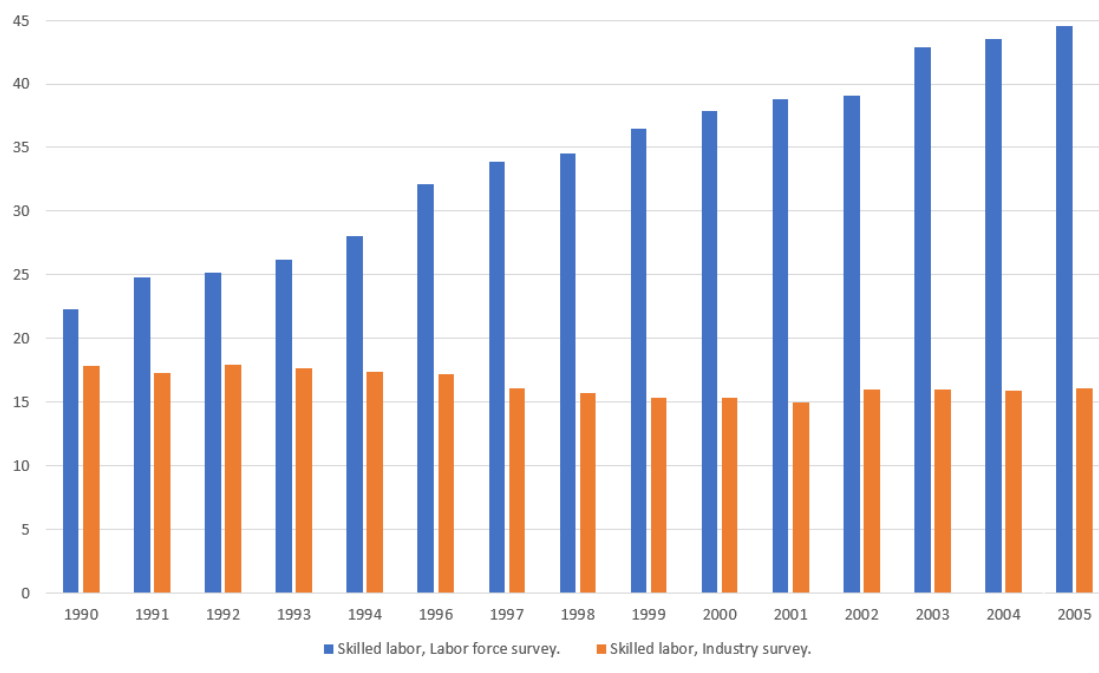
We can also observe a mixed trend on skill premium with the Sakernas data, with a downward trend prior to Asian Financial Crisis followed again by a falling trend before a pick

up after the year 2000. The most striking figure is that the skilled workers with tertiary education almost consistently earned three times higher than the unskilled worker, 3,3 times higher in 1991, but then it fell to around three times higher in 2000.

Although the fall in skill premium before the financial crisis happened in the same period of liberalization (e.g., in finance and trade), it is hard to draw a casual relationship since many factors influence this. Most notably, the fall in skill premium can be attributed to the increase in education supply, creating more skilled workers based on education attainment.

The government program to build school and education campaigns since the 1970s has vastly increased the enrollment to school ratio. This led to the fall of unskilled workers based on education attainment in the 1990s, as recorded in the worker force survey. If we define the skilled worker as the percentage of workers with higher than primary education to total workers, we can see in Figure. 1.1, that the skilled worker increases substantially from 22% in 1990 to around 45% in 2005.

Figure 1.1: Percentage of skilled worker to total worker in Indonesia (1990-2005)



Source: Author's calculation based on Worker Force Survey (Sakernas data) and Industry Survey.

However, surprisingly, the skilled worker ratio to the total worker in manufacturing industries did not change that much. In Figure 1.1, the data from industry survey shows that the skilled worker in medium and big manufacturing firms remained around 16% from 1990 to 2005. In our analysis, the year fixed effect can absorb these economy-wide effects. In doing that, we can focus instead on analyzing how the financial reform at the industry level affects firm-level wages.

1.3.2. Financial Sector Liberalization

Since the mid-1960s, the banking sector has been dominated by state-owned banks. The state-owned bank control 70-80% of the total assets of commercial banks (Harris et al., 1994). Soeharto's regime controls the banking sector as a source of capital to play a vital role in the development program. The government manages to order the bank to give preferential lending rates and credit ceilings by then. Under the coordination of the Ministry of Finance, the central bank can channel a direct or indirect credit system by providing financial resources to corporate sectors.

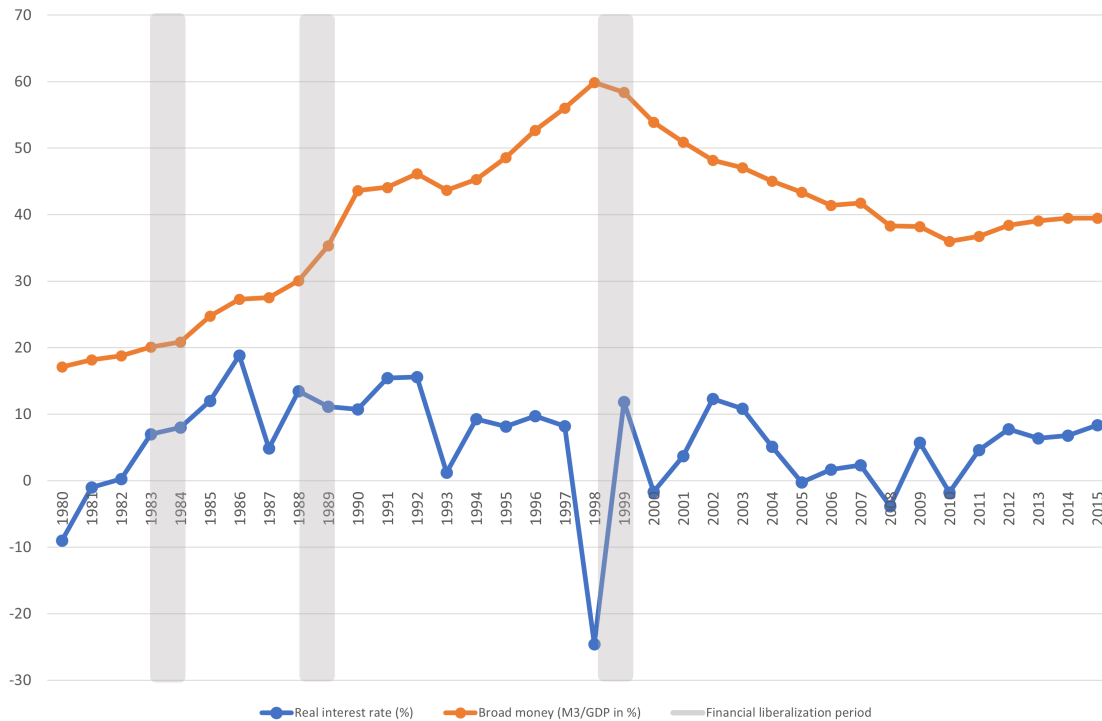
However, the end of the oil boom in 1983 has put the Indonesian bank no longer capable of providing development funds, thus forcing the government to follow the World Bank and International Monetary Fund (IMF) to reform the financial sectors. Since then, Indonesia has experienced at least three major series of financial reforms from the mid-1980s until the early 2000 (Sato, 2005; Jann, 2008).

The first major financial reforms began in 1983 when the government fully liberalized state banks' deposit and lending rates and removed credit ceilings on all banks. For the following years, the reform led to a sharp rise in the real interest rate from 0.25% in 1982 to more than 12% in 1985 (See Figure 1.2).

The reform also marks a significant shift from the state-controlled financial system into a more market-based one. Floating interest rates has helped banks expand their deposit and increase their lending capabilities, strengthening their function as financial intermediaries.

However, during this period, market-entry remains under strict control. State-owned

Figure 1.2: Real interest rate and money supply, 1980-2015



Source: Author’s calculation based on The World Bank

banks essentially are the only player in the market without competition from the private sector and foreign institutions. Therefore, the state-owned banks enjoy rent-seeking without disbursing credit to productive sectors.

In 1988, the government launched a second major financial reform by removing restrictions on new entries into the banking sector. More specifically, the government opens the barrier to entry in three aspects: (i) Liberalized the entry of private banks, (ii) Liberalized the entry of foreign banks through joint ventures, and (iii) Eased requirements to open branches for all banks. Following the reform, in just five years until 1993, the number of banks rose from 63 to 158, while their branches multiple five times more from 559 to 2.926.

Consequently, in this period, we can see in Figure 1.2 that base money expand rapidly to catch up with the expansionary banking sector in collecting and lending the funds. At the same time, capital inflow continues to come into the country through the newly established foreign subsidiaries bank. All these factors were the source of impressive

economic growth in Indonesia before the economy's collapse due to the Asian Financial Crisis in 1998.

This led to the third financial reform that happened in the aftermath of the financial crisis in 1998. Banking sector collapse suddenly due to maturity and exchange rate miss-match, between their dollar nominated long-term loan from foreign market to fund short term project in the country. Interest rate fell sharply before bouncing again a year after, money base fall, and Indonesian economy went to a deep crisis with growth reach -13% yearly in 1997-1998.

The collapse of the banking sector has forced the Indonesian government to accept an agreement from the IMF to reform the banking sector as the primary source of economic crisis. One of the notable reforms is establishing a supervisory system by letting the central bank gain its independence to supervise the banking sector. However, during the same period, the government introduced some measures to stabilize the exchange rate, leading to more restrictive international capital flow. Furthermore, from 1999 up to 2003, there are several package of the financial liberalization in the banking sector as part of agreement post-financial crisis.

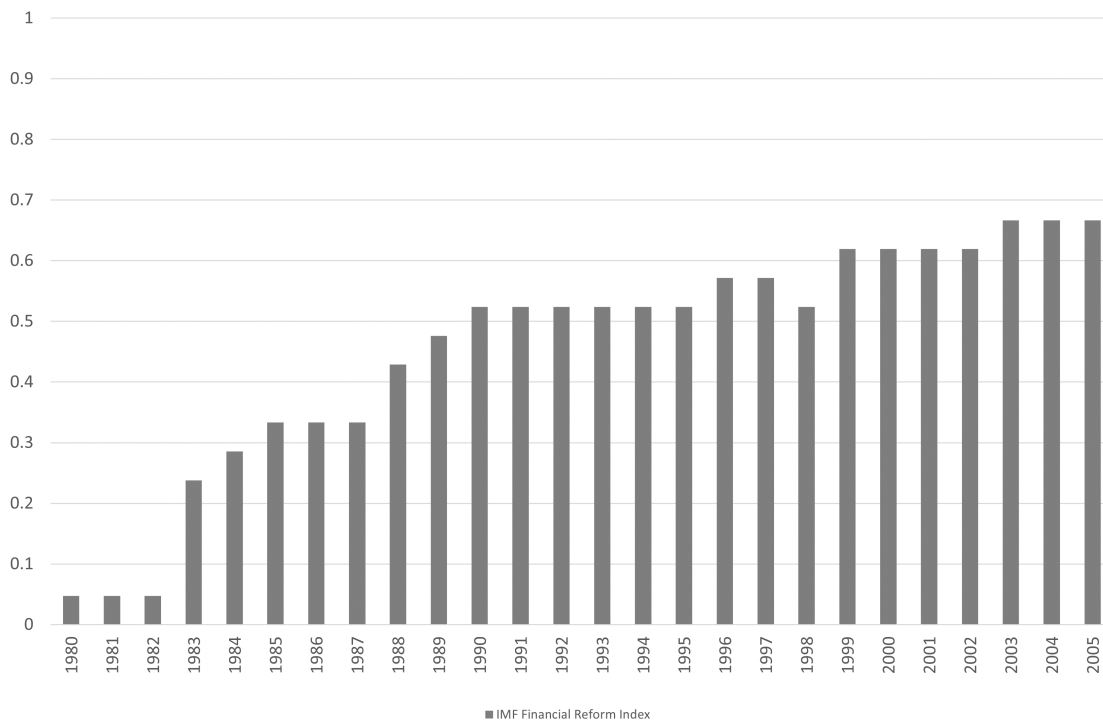
1.3.3. Financial Reform Index in Indonesia

The series of financial reforms in Indonesia were captured in the Index of Financial Reforms which developed by the IMF (Abiad, Detragiache, & Tressel, 2008). The financial reforms index is covering 91 economies over the period 1973 to 2005. The database use a set of questions on seven different dimensions of financial sector policy, to measure the reform and coding into an index. The dimensions include: (i) credit controls and excessively high reserve requirements, (ii) interest rate controls, (iii) entry barriers, (iv) state ownership in the banking sectors, (v) capital account restriction, (vi) prudential regulations and supervision of the banking sector, and (vii) securities market policy.

Along each dimension, a country is given a final score on a graded scale from zero to three, with zero corresponding to the highest degree of repression and three indicating full liberalization. Policy reform then, record shifts in a country's score on this scale in a given

year. The index can also measure the magnitude of the reforms, since a simultaneous reforms will lead to higher jump in the index, vice versa with the repression. For example in Indonesia, the IMF reform index in Figure 1.3, shows a big jump from 0.05 points in 1982 to 0.24 points in 1983. As explained in previous part, this is due to the first wave of financial liberalization on credit and interest rate control.

Figure 1.3: IMF financial liberalization index in Indonesia (1980-2005)



Source: [Abiad, Detragiache, & Tressel \(2008\)](#)

The figure 1.3 also records the other episodes of financial liberalization in Indonesia nicely. The series of reforms that started in 1988 with relaxation on entry barrier, reduce the role of a state-owned bank, and other financial market policy reform brought the index higher to 0.52 points in 1990. From the figure, we can also see that only in 1998 did the index go down from 0.57 to 0.52 points. This is due to tighter international capital flow restrictions to save the falling exchange rate after the Asian Financial Crisis.

A series of increases in the index's value in the 1990s can be attributed to relaxation on entry barriers, better supervision ¹, and the increasing role of the private sector in the

¹In 1999, a new regulation on central bank came into force, providing full independence of the central

banking sector. Finally, the last episode of increase in the Figure 1.3 is recorded in the year 2003, an increase from 0.62 to 0.67 points based on the previous year. During this period, the financial liberalization continued with a series of privatization in banking sectors as part of agreement post-financial crisis.

Following the discussion on financial liberalization and how the IMF financial liberalization index captures the policy reform nicely, it tells a story that the reform affects the Indonesian economy. Therefore it would be exciting if we could analyze further whether those liberalizations can affect the wage inequality in Indonesia. The next part will discuss further the analytical framework of the relationship between financial reform and wage inequality.

1.4. Analytical framework

1.4.1. Theoretical Motivation

This part will give a simple framework to entangle the financial reform and wage skill premium with capital skill complementarity.

To illustrate the theoretical relationship between financial liberalization and wage skill premium, we are referring to the capital-skill complementarity model which developed by [Krussel et al. \(2000\)](#). The model allows to explain that the elasticity of substitution between capital equipment and unskilled labor is higher than that between capital equipment and skilled labor. As the implication, the growth in the stock of equipment increases the marginal product of skilled labor, but decreases the marginal product of unskilled labor. Accordingly, since we assume that financial liberalization will ease the restriction of firms to acquire more capital, it will also trigger an increase to the marginal product of skilled labor.

In their model, they developed the standard neoclassical with focus on aggregate production function with four factor production function with different substitution elasticities

bank from the central government in regulating the banking sector.

between the two types of capital and the two types of labor.

The aggregate production function at given time (y_t) is presented as:

$$y_t = c_t + x_{st} + \frac{x_{et}}{q_t} = A_t G(k_{st}, k_{et}, u_t, s_t). \quad (1.1)$$

Where in the model there are three final goods: consumption c_t , structures investment x_{st} , Consumption and structures are produced with a constant returns to scale technology, and equipment is produced with the same technology scaled by equipment specific technological progress q_t .

The production function G has constant returns to scale in capital structure k_s , capital equipment k_e , unskilled labor input u_t and skilled labor input s_t . While A_t is a neutral technological change.

They assume that the production function is Cobb–Douglas over capital structures and a Constant Elasticity of Substitution (CES) function of the three remaining inputs $y = k_s^\alpha \bar{y}^{1-\alpha}$. Following that, within a CES function they nesting k_e , s , and u , which allow for capital-skill complementarity: $\bar{y} = \Upsilon_1(u, \Upsilon_2(s, k_e))$, where Υ_1 and Υ_2 are CES aggregators. The CES function restricts the elasticity of substitution between unskilled labor and skilled labor to be the same as that between unskilled labor and equipment. Therefore, they achieve the following specifications:

$$G(k_{st}, k_{et}, u_t, s_t) = k_{st}^\alpha [\mu u_t^\sigma + (1 - \mu)(\lambda k_{et}^\rho + (1 - \lambda) s_t^\rho)^{\frac{\sigma}{\rho}}]^{\frac{1-\alpha}{\sigma}} \quad (1.2)$$

Where, μ and λ are parameters that govern income shares, and σ and ρ ($\sigma, \rho < 1$) govern the elasticity of substitution between unskilled labor, capital equipment, and skilled labor. Capital skill complementary requires that $\sigma > \rho$. If either σ or ρ equals zero, the corresponding nesting is Cobb–Douglas.

The labor input of each type is measured in efficiency units: each input type is a product of the raw number of labor hours and an efficiency index: $s_t = \psi_{st} h_{st}$ and $u_t = \psi_{ut} h_{ut}$, where h_{it} is the number of hours worked and ψ_{it} is the unmeasured quality per hour of

type i at date t .

Based on the above, now we can link skill premium to the factor inputs. Since factor prices are equal to marginal products per unit of work, the skill premium can be expressed as a function of input ratios:

$$\pi_t = \frac{(1 - \mu)(1 - \lambda)}{\mu} \left[\lambda \left(\frac{k_{et}}{s_t} \right)^\rho + (1 - \lambda) \right]^{\frac{(\sigma - \rho)}{\rho}} \left(\frac{h_{ut}}{h_{st}} \right)^{1 - \sigma} \left(\frac{\psi_{st}}{\psi_{ut}} \right)^\sigma \quad (1.3)$$

Where π denote the skill premium. Solving the equation 1.3 in the log form and differentiating with respect of time and denoting the growth rate of variable x by g_x , we could obtain:

$$g_{\pi t} \simeq (1 - \sigma)(g_{h_{ut}} - g_{h_{st}} + \sigma(g_{\psi_{st}} - g_{\psi_{ut}})) + (\sigma - \rho)\lambda \left(\frac{k_{et}}{s_t} \right)^\rho (g_{k_{et}} - g_{h_{st}} - g_{\psi_{st}}) \quad (1.4)$$

We obtain the capital-skill complementary effect, if we focus on the third component, $(\sigma - \rho)\lambda \left(\frac{k_{et}}{s_t} \right)^\rho (g_{k_{et}} - g_{h_{st}} - g_{\psi_{st}})$. This component depends on two factors: the growth rate of equipment relative to the growth rates of skilled and unskilled labor input and the ratio of capital equipment to efficiency units of skilled labor input. if $\sigma > \rho$, skilled labor is more complementary with equipment than is unskilled labor. In that case, faster growth to equipment tends to increase the skill premium as it increases the relative demand for skilled labor.

Now following equation 1.4, financial liberalization could provide catalyst for manufacturing firms to have faster growth to equipment. Financial reform in relaxing entry to market, for example, will provide additional supply of lenders to manufacturing firms or could provide more competitive interest rate, which will reduce cost of borrowing. Therefore, financial liberalization could fulfill key assumptions to support faster growth to equipment that will lead to increase in demand for skilled labor and increase the skill premium.

1.4.2. Data & Measurement

Our goal is to understand the impact of financial liberalization on the manufacturing sector's skill premium. To measure this, we rely on the Industrial Survey (Survey Industri) as our primary data source for 16 years panel data series from 1990 to 2005. The Industrial Survey is an annual census of firm-level manufacturing establishments with at least 20 employers. The dataset contains detailed information on the firm, which includes: the number of production and non-production workers; wage bill of production and non-production workers; the proportion of output that is exported; the value of imported and domestically produced inputs; and the percentage of ownership. In addition, the SI also has the information on ISIC Rev.2 5-digit industry code which enables us to match this with the financial reform index and the tariff data.

The financial reform index is taken from IMF's financial reform database by [Abiad, De-tragiache, & Tressel \(2008\)](#). The database measured qualitative indicators of restrictions in seven different dimensions in financial sector policy. Each dimension is translated into a simple average of sub-indexes with equal weight, which includes: (i) credit controls, such as directed credit; (ii) interest rate controls, such as ceilings, floors, or bands; (iii) entry barrier, such as restrictions in the participation of foreign banks; (iv) degree of state ownership; (v) capital account restrictions; (vi) prudential regulations and supervision of the banking sector; and (vii) the securities market policy, such as participation of foreign investors. The source of this database is collected from various IMF reports and working papers and country-specific sources such as central bank websites. Each sub-index is coded from zero (fully repressed) to three (fully liberalized). In this paper, we exclude the index on supervision of the banking sector since the higher value in this index will mean more restrictive and counter-intuitive with another index which eases the restriction as a form of liberalization.

We also use the input-output table to calculate the weight of the financial sector as an input to each manufacturing industry. The IO-table is based on the economic census of 1990, which consists of 161 sectors, compiled by the Indonesian Statistics Agency (BPS). We obtained the tariff dataset from the TRAINS database of the United Nations. We again use the input-output tables to calculate input and output tariffs.

Measure of skill

To measure the skilled and unskilled wage, we follow a similar definition from [Amiti & Cameron \(2012a\)](#) which uses the ratio of average wages on production and non-production workers. Although the classification of production and non-production is not fit perfectly to measure skill as also discussed in [Godlberg & Pavcnick \(2007\)](#) and [Amiti & Cameron \(2012a\)](#), we can validate this if we prove that the average non-production workers have higher education attainment than production workers. Unfortunately, the SI data provide us information on the number of workers based on education attainment only from 1995 until 1997. Nevertheless, we can still use the available data to show the educational attainment of production and non-production workers.

We extract the information of workers based on education attainment from the SI data year 1997, as shown in Table 2. For average firms, around 61 percent of production workers have lower secondary school or lower education, which is higher than 36 percent of non-production workers. On the other side, an average of 64 percent of non-production workers has tertiary education or upper secondary school, compared to the average 38 percent of production workers in the same education range. The most apparent difference in educational attainment is at the tertiary level when almost 15 percent of non-production workers are tertiary educated compared to only 2 percent of production workers.²

Table 1.2: Education attainment of production and non-production workers, 1996

| | Production workers (%) | Non-production workers (%) |
|-------------------------------|------------------------|----------------------------|
| Did not finish primary school | 5.2 | 5.0 |
| Primary | 28.0 | 15.3 |
| Lower secondary | 27.9 | 15.6 |
| Upper secondary | 37.1 | 49.6 |
| Tertiary | 1.8 | 14.5 |

Source: Survei Industri 1996, author's calculation.

²The pattern is similar for three years of available data.

Measure of financial liberalization at the industry level

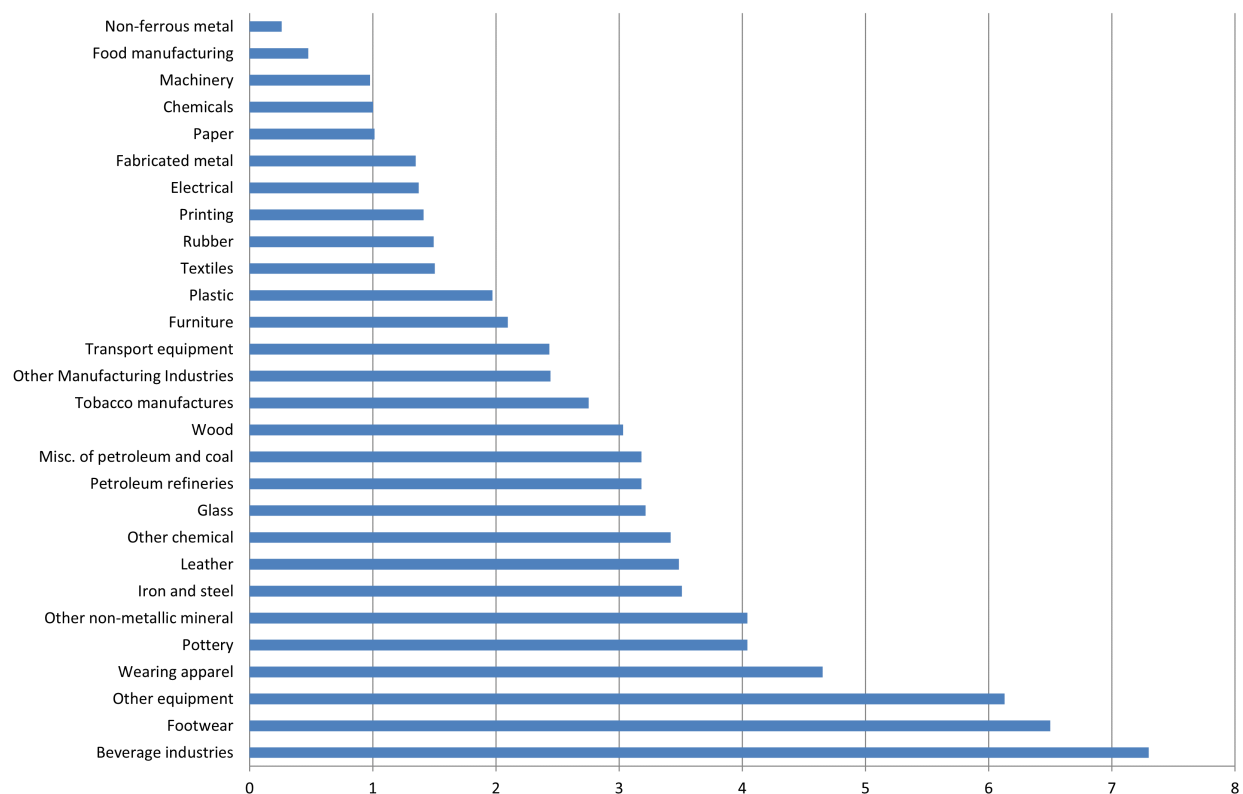
In this analysis, it is importance to understand the linkages between manufacturing industries and the financial liberalization. In doing so, we use information on the intensity with which financial sector are used in the production of a given manufacturing sector. As a proxy to financial sector, we choose banking sector in IO table year 1990 as the weight to measure the impact of financial liberalization to specific industry. For instance, we define the weighted financial liberalization index for each industry s and year t is given by:

$$\text{Financial liberalization}_{i,t} = \alpha_s \text{IMF financial liberalization index}_t \quad (1.5)$$

Where α_i is the value share of banking sector used in the production of the goods in 5 digit manufacturing industry i . An increase in this index value signals higher level of financial liberalization.

To give illustration on the impact of changes in financial liberalization to industry, Figure 2. shows the variation of change in financial reform index to industry in 3 digit ISIC level from 1990 to 2005. From the figure, the beverage industries, footwear, and other equipment are the industries that use lot of financial sector as their input so that the financial reform will most likely affect those industries in Indonesia. In the other side, machinery, food manufacturing, and non-ferrous metal are industries that less affected by changes in financial reform since they use less input from financial sector.

Figure 1.4: IMF financial liberalization index by industry: Change between 1990 - 2005



Source: Author's calculation based on IMF financial liberalization index for Indonesia and Input-Output table year 1990.

On additional note, the Figure 1.4 need to be read carefully when linked the industry to capital intensive and their use of financial sector as an input. Food manufacturing industries and machinery usually considered as a capital intensive sector and therefore need banking sector in acquiring more capital. Despite of that, the changes of weighted financial liberalization is relatively small. One possible explanation is based on the Input-Output record in 1990, these industries utilizes small input from the banking sector compared from other industries. Or, they use a very large input from other sector, that banking sector fairly contribute a small share on the production of output in machinery or food manufacturing industries.

1.4.3. Estimation strategy

Recent research, including [Naceur & Zhang \(2016\)](#), [Larrain \(2015\)](#) and [de Haan & Sturm \(2017\)](#), has shown that financial liberalization will increase the income inequality in more macro-level analysis. We suggest that financial liberalization will also increase the skill premium to support their arguments, largely driven by the capital-skill complementarity factors as described in [Krussel et al. \(2000\)](#).

The estimation strategy uses the industry variation overtime at a 5-digit level to identify how more access to finance through financial liberalization affects firms' wage skill premium. The baseline model to estimate is as follows.

$$skill\ premium_{f,i,t} = \beta_1 * FL_{i,t} + Z_{f,i,t} + \delta_f + \delta_t + \epsilon_{i,t} \quad (1.6)$$

Where, skill premium is the log of the ratio between average wage for non-production workers and the average wage for a production worker ($\ln(\frac{w_s}{w_u})$) in firm f producing in 5 digit industry i in year y .

In analyzing the independent variable, we first assume that financial liberalization will ease access to the credit market to firms eager to improve their production capacity and capital stock. As a result, following equation 1.4, the growth of capital will increase and induce higher skill premium for the skilled worker. This effect will be captured when $\beta_1 > 0$ for the variable *financial liberalization* as the financial liberalization index x share of input used in the industry i from financial sector, in year t .

The vector Z is the additional firm-specific characteristics. This will include the firm export and import status, size, ownership, and the share of the non-production worker.

We control the model by utilizing the firms fixed effect (δ_f) and year fixed effect (δ_t). Finally, we cluster the error at sector level. The specifications then clustered in 5 digit sector following [Amiti & Cameron \(2012a\)](#), all specification will include island-year fixed effect, $\alpha_{l,t}$. The island-year fixed effect is important to consider shifts in the relative supply of skilled workers and other differential shocks across different parts of Indonesia.

1.5. Result and discussion

This section shows the main result of this chapter. First, we check the baseline regression to see the effect of financial reform on skill premium in the manufacturing sector. Second, we look at firm characteristics and work with interaction variables that could affect the skill premium. Third, we discuss the effect of financial reform on other variables that affect firm performance, aside from skill premium. Finally, we are checking the financial liberalization index using another set of indexes that more or less share similar behavior. In this part, we are also checking the different sub-samples to check the robustness of our main findings.

1.5.1. Financial liberalization and skill premium

Before running the complete model from equation 1.6, I first check what kind of reforms that affecting the most skill premium. For this, we disaggregate the index into six sub-indexes and regress it partially with the skill premium variable, as shown in Table 1.3.

The Table shows that the full financial liberalization index is not significant in affecting the skill premium. However, we found positive and significant correlation for the sub-index on interest rate and bank entry liberalization. Meanwhile, liberalization in capital flow will actually reduce the skill premium. The significant result for interest rate and market entry are related closely with banking sector. This is more intuitive, since the financial liberalization index also includes sub-indexes that are not close to the banking sector as our primary weight in the IO table. (e.g., sub-index on international capital flow and security market).

For consistency in this paper, I will continue the analysis of financial liberalization with combination of bank entry and interest rate liberalization as the main independent variable. It means that the main driver for increasing skill premium is related to access for banks or financial institutions to enter the market, which is also in line with the work of [Guiso et al. \(2006\)](#)³. Meanwhile interest rate liberalization will give more flexibility for

³This barrier to entry could be in the form of outright restriction on the participation of foreign banks,

Table 1.3: Financial liberalization index to skill premium

| Dependent variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|-----------------------------|------------------|-------------------|-------------------|--------------------|-------------------|---------------------|-------------------|
| Skill premium (ln_ws_wu) | | | | | | | |
| Financial liberalization | 0.192 (0.209) | | | | | | |
| Credit controls | | -0.477 (0.968) | | | | | |
| Interest rate controls | | | 0.939* (0.568) | | | | |
| Entry barriers | | | | 1.297** (0.533) | | | |
| Privatization | | | | | -0.352 (0.390) | | |
| International capital flows | | | | | | -0.774** (0.363) | |
| Security Markets | | | | | | | -0.477 (0.968) |
| Observations | 250,275 | 250,275 | 250,275 | 250,275 | 250,275 | 250,275 | 250,275 |
| R-squared | 0.476 | 0.476 | 0.476 | 0.476 | 0.476 | 0.476 | 0.476 |
| Firms FE | YES | YES | YES | YES | YES | YES | YES |
| Island*Year Effect | YES | YES | YES | YES | YES | YES | YES |

Robust standard errors in parentheses, clustered in sector-year level

*** p<0.01, ** p<0.05, * p<0.1

banking sector to applying their lending rate. The banks could be competitive to attract more lender, by reducing interest rate that will help manufacturing firms to reduce their cost of borrowing.

In other words, when the government relaxes the barrier to entry and interest rate, the competition among financial institutions will improve in providing more and cheaper financing options for firms. This in turn will increase the growth of capital as explained in [Krussel et al. \(2000\)](#), and will increase skill premium.

Table 1.4, shows the estimation result for equation 1.6 using a within estimator. Column (1) introduces the financial reform index as a sub-indexes entry barrier and interest rate. The coefficients are positive and significant, indicating that the expansion of financial access induced by more competition in the financial system and fall in cost of borrowing will increase the skill premium in average firms. One standard deviation increase in financial liberalization index, will increase the wage skill premium by 96 percentage points, significant at 5% level. To check the robustness of this result, we add firm specific variables in the following specifications.

Next, column (2) introduces variables that reflect a connection with the firm's global trade, import and export share. Import share refers to how much the firm import their input for production. Meanwhile, export share refers to how much the firm will export its production. The estimation shows that both import share and export share are positive and significant in affecting the skill premium. Meanwhile, our primary variable of financial liberalization remains positive and significant, although with a lower coefficients value.

To discuss more on this globalization-related variable, we suggest that the firm that engages in export and import have higher capital growth. Because they are producing on a certain scale when they decide to engage in global trade hence, it is likely that they are also investing in the capital, triggering capital skill complementarity hypotheses and leading to higher skill premium.

In column (3), we put additional variables on the firm's size difference based on the number of workers. We categorize the firm as small if it has between 20-100 workers, medium

restrictions on the scope of bank activities, restrictions on the geographic area where banks can operate, or excessively restrictive licensing requirement. See [Abiad, Detragiache, & Tressel \(2008\)](#)

Table 1.4: Baseline regression

| Dependent variable $\ln(w_s/w_u)$ | (1) Financial liberalization | (2) Globalization | (3) Size measure | (4) Ownership | (5) Skill share |
|--------------------------------------|------------------------------------|----------------------|----------------------|------------------------|-----------------------|
| Financial liberalization index | 0.963** (0.387) | 0.868** (0.368) | 0.863** (0.371) | 0.808** (0.376) | 0.894** (0.406) |
| Import share | | 0.123*** (0.0283) | 0.121*** (0.0283) | 0.107*** (0.0282) | 0.116*** (0.0279) |
| Export share | | 0.0280** (0.0117) | 0.0254** (0.0115) | 0.0207* (0.0116) | 0.0147 (0.0110) |
| Medium firm | | | 0.0159 (0.0191) | | |
| Large firm | | | 0.113*** (0.0238) | | |
| Size | | | | 0.0920*** (0.0117) | |
| Foreign ownership | | | | 0.101*** (0.0212) | 0.125*** (0.0184) |
| Government ownership | | | | -0.0360*** (0.0125) | -0.0215* (0.0120) |
| Skill share | | | | | -2.538*** (0.0774) |
| Observations | 250,275 | 233,875 | 233,875 | 233,875 | 233,875 |
| R-squared | 0.476 | 0.478 | 0.479 | 0.480 | 0.536 |
| Firms FE | YES | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES | YES |

Robust standard errors in parentheses, clustered in sector-year level

*** p<0.01, ** p<0.05, * p<0.1

if between 101-500, and large if it employs more than 500 people, following the formal definition from the Indonesian Statistical Agency. Here we found that only large firm has positive and significant value to skill premium. If the firm is large, the skill premium could increase by 11,3 percentage points, at a 1% significant level. Meanwhile, our primary variable remains robust in affecting skill premium, with positive and significant results.

In column (4), we want to ensure that the firm characteristics variables are not driving our result. We re-introduce the control for the size of firms as a log of the total worker force. We also include controls of the share of government ownership and foreign ownership. The skill premium is higher in foreign-owned and larger firms, while it is lower in firms with some government ownership. However, the inclusion of these variables does not affect the significance and positive coefficients of financial index variables.

Larger firms will employ more unskilled workers for their production activity so that the average wage for the unskilled workers will fall, leading to an increase in the skill premium. For foreign-owned firms, liberalization in the financial sector will help them acquire more financing from international sources or foreign affiliated local banks. The ease of getting finance and lower borrowing cost will help them increase their capital stock growth and increase the relative wage of skilled workers, as explained in the capital-skill complementarity arguments. On the other side, the government-owned manufacturing sector surprisingly will have a lower skill premium when there is liberalization in the financial sector. This is probably because these firms are not affected by the liberalization as they can always secure financing needs from government-owned financial institutions.

Lastly, in column (5), we also control the skill-share, measured as the ratio of non-production to the total number of workers. The negative and significant coefficient for skill-share means that an increase in a firm's non-production (skilled) workers is associated with a lower skill premium. The estimation result shows that the financial index still holds its significance.

This exercise found evidence that financial liberalization will increase skill premium. Our result is robust, even after adding more firm-specific control variables. The next part will explore more on the firm heterogeneity to further analyze the role of financial liberaliza-

tion to wage skill premium.

1.5.2. Firm heterogeneity

In this part, we explore firm heterogeneity by checking the interaction between financial liberalization with firm-specific variables. We use three firm-specific variables to check the specifications, namely when the firm is owned by a foreigner, large by size, and import their input production. We, therefore, use the following model:

$$\text{skill premium}_{f,i,t} = \beta_1 * FL_{i,t} + Z_{f,i,t} + \beta_2 * FL_{i,t} * Z_{f,i,t} + \delta_f + \delta_t + \epsilon_{f,t} \quad (1.7)$$

Where, skill premium is the log of the ratio between average wage for non-production workers and the average wage for a production worker ($\ln(\frac{w_s}{w_u})$) in firm f producing in 5 digit industry i in year y . Z is firm-specific control, including a large, exporting, and foreign-owned firm. β_2 will estimate the interaction between financial liberalization and firm-specific variables. δ is fixed effect and ϵ is error term clustered in sector year level.

Foreign ownership premia

First, we elaborate more on foreign ownership and financial liberalization in affecting the skill premium. The firm which is owned by foreign entities tends to be more productive (Lipsey & Sjöholm, 2004) and give higher wages for their workers (Bas, 2012a). We also found from the baseline regression that the firms owned by foreigners are more likely to have a higher skill premium than domestic entities that own it. Based on previous arguments, we create an interaction variable to know the direct relationship of the financial reform with foreign ownership status in affecting the skill premium, as shown in Table 1.5.

Table 1.5: Foreign Premia

| Dependent variable $\ln(w_s/w_u)$ | (1) | (2) | (3) | (4) |
|--------------------------------------|----------------------|-----------------------|-----------------------|-----------------------|
| Foreign ownership x financial index | -0.584** (0.250) | -0.584* (0.325) | -0.588* (0.325) | -0.594* (0.326) |
| Financial liberalization index | 0.848** (0.353) | 0.848*** (0.322) | 0.844*** (0.322) | 0.844*** (0.322) |
| Foreign ownership | 0.197*** (0.0372) | 0.197*** (0.0467) | 0.192*** (0.0466) | 0.192*** (0.0467) |
| Age | | 0.239*** (0.00452) | 0.245*** (0.00458) | 0.244*** (0.00458) |
| Medium | | | 0.0164 (0.0212) | 0.0164 (0.0212) |
| Large | | | 0.114*** (0.0244) | 0.114*** (0.0244) |
| Skill share | | | | -2.940*** (0.0313) |
| Observations | 250,275 | 250,275 | 250,275 | 250,275 |
| R-squared | 0.477 | 0.477 | 0.477 | 0.477 |
| Firms FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |

Robust standard errors in parentheses, clustered in sector-year level

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

In column (1), we figure out that the interaction between the financial index and foreign status affecting skill premium is negative and significant, at a 5% level. This means that if the firm is owned by foreigners and the financial liberalization index increase by one standard deviation, the skill premium will fall by 58,4 percentage points. Although a higher degree of financial liberalization and foreign ownership status affect skill premium separately, firms that share both characteristics will have lower wage inequality between the skilled and unskilled labor. On the other hand, the financial index and foreign ownership status are still positive and significant in affecting the skill premium, even after controlling for the interaction.

This result in column (1) is held after controlling other firm characteristics such as the firm's age, size, and skill-share in columns (2) to (4).

Size premia

Similar to foreign ownership, independently large firms will positively and significantly affect the skill premium. In this specification, we interact the financial liberalization index with the large firm variable. The result is presented in Table 1.6.

Table 1.6: Size premia

| Dependent variable $\ln(w_s/w_u)$ | (1) | (2) | (3) |
|--------------------------------------|-----------------------|-------------------------|-------------------------|
| Large x financial index | 0.220** (0.174) | 0.220** (0.178) | 0.227* (0.164) |
| Financial liberalization index | 0.843** (0.378) | 0.843*** (0.318) | 0.653** (0.302) |
| Large | 0.0746*** (0.0227) | 0.0746*** (0.0229) | 0.0127 (0.0213) |
| Age | | -0.0209*** (0.00117) | -0.0176*** (0.00112) |
| Foreign ownership | | | 0.192*** (0.0466) |
| Government ownership | | | -0.0182 (0.0123) |
| Observations | 250,275 | 250,275 | 250,275 |
| R-squared | 0.476 | 0.476 | 0.533 |
| Firms FE | YES | YES | YES |
| Island*Year Effect | YES | YES | YES |

Robust standard errors in parentheses, clustered in sector-year level

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

The results in columns (1) to (3) further support our main result. We found evidence that large firm will increase their skill premium when we have financial reform that increases the value of the financial liberalization index. Additionally, independently, the financial liberalization index and large firm remain positive and significant in affecting skill premium, similar to the baseline regression result.

Importer premia

This last firm-specific variable examines whether the interaction between the financial liberalization index and import share will affect skill premium in the manufacturing sectors. Unfortunately, the interaction variable in columns (1) to (4) from Table 1.7 provide a negative but not significant coefficient. Meanwhile, independently, the financial liberalization index and firms which import their input factor will increase skill premium. Therefore, there is no effect to skill premium for the firm that imports their input when the country is experiencing financial reform.

Table 1.7: Importer premia

| Dependent variable $\ln(w_s/w_u)$ | (1) | (2) | (3) | (4) |
|--------------------------------------|----------------------|-------------------------|-------------------------|-------------------------|
| Import share x financial index | -0.229 (0.771) | -0.284 (0.760) | -0.287 (0.751) | -0.492 (0.810) |
| Financial liberalization index | 1.187** (0.507) | 1.193** (0.510) | 1.194** (0.511) | 0.931** (0.406) |
| Import share | 0.135*** (0.0464) | 0.135*** (0.0459) | 0.129*** (0.0456) | 0.141*** (0.0459) |
| Age | | -0.0200*** (0.00120) | -0.0202*** (0.00120) | -0.0168*** (0.00111) |
| Foreign | | | 0.112*** (0.0211) | 0.124*** (0.0184) |
| Government | | | -0.0347*** (0.0125) | -0.0216* (0.0120) |
| Skill share | | | | -2.534*** (0.0774) |
| Observations | 233,875 | 233,875 | 233,875 | 233,875 |
| R-squared | 0.478 | 0.479 | 0.479 | 0.536 |
| Firms FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |

Robust standard errors in parentheses, clustered in sector-year level

*** p<0.01, ** p<0.05, * p<0.1

Again, the result is consistent even after applying other firm-specific controls like age, ownership, and skill share.

From this part, our results show that the change in financial policy reform will have a

more significant effect on large firms. Foreign ownership will help reduce skill premium during the reform, while importing status will not directly affect it.

Different effect of financial reform to manufacturing sector

In discussing the impact of financial reform on skill premium, we are only discussing at the country level, without much discussion on heterogeneity. Although the financial reform will positively impact skill premium, the impact may differ at the sector level. To check this, we run again equation 1.6 for each sector in the database, based on two-digit ISIC rev.2 classification. The dependent variable is skill premium, while the independent variable is the financial liberalization index. The result is presented in Table 1.8, as follows:

Table 1.8: Impact of financial reforms to skill premium - sector differences

| Sector | Coefficients | Std. deviation | Firms FE | Year FE | Observation | R^2 |
|-----------------------|--------------|----------------|----------|---------|-------------|-------|
| Food & beverages | 2.241** | (0.987) | Yes | Yes | 64,507 | 0.462 |
| Textile & leather | 1.450 | (1.973) | Yes | Yes | 53,678 | 0.505 |
| Wood | 4.119*** | (1.764) | Yes | Yes | 36,302 | 0.479 |
| Paper | -0.459 | (1.257) | Yes | Yes | 13,036 | 0.431 |
| Chemicals | 0.352 | (0.929) | Yes | Yes | 36,455 | 0.435 |
| Non-metallic | 0.00976 | (0.770) | Yes | Yes | 6,170 | 0.434 |
| Basic metal | 0.457 | (5.200) | Yes | Yes | 2,541 | 0.444 |
| Machinery & equipment | 1.795 | (1.591) | Yes | Yes | 32,199 | 0.506 |
| Other manufacturing | 10.17** | (4.920) | Yes | Yes | 5,387 | 0.505 |

Robust standard errors in parentheses

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

We found that the financial reform only significantly affects skill premium in food and beverages, wood, and other manufacturing sectors. So the impact is not homogeneous to all sectors. Looking deeper into the financial liberalization index, the result presented above is most likely affected by the use of the banking sector as an input to the particular sector. If the sector uses a lot of banking sector as their input production, they will be affected the most by the financial reform.

However, the result should be read carefully as this means the finding only holds when we use input-output from the year 1990, as in this paper. The affected sector will likely

change if we use a different IO table. This is also why some capital-intensive industries (e.g., machinery and equipment) have low financial liberalization index value, and their skill premium is not affected by financial reform. Even though those industries will need to borrow from the bank to buy new capital for their production. Nevertheless, we can still argue that the sector that uses the most input from the banking sector, their skill premium will be affected by financial reform.

1.5.3. Financial reform and firm performance

In Indonesia, [Amiti & Konings \(2007\)](#) has shown that the liberalization could improve productivity and consequently generate more revenue as shown by [Amiti & Davis \(2012\)](#). Furthermore, [Amiti & Cameron \(2012a\)](#) also found that the liberalization has some substitution effect between imported goods and the demand for skilled workers.

Following the above literature, we try to observe the effect of financial liberalization on several firms' performance indicators. We apply slight modifications to the model specifications as follows:

$$Y_{f,i,t} = \beta_1 * FL_{i,t} + Z_{f,i,t} + \delta_f + \delta_t + \epsilon_{i,t} \quad (1.8)$$

Where additionally, Y equals to variables that measure firm performance in firm f , sector i , and year t .

In estimating the Y , we explore several scenarios. The first is to explore whether financial reform positively affects productivity. We observe this by calculating the Total Factor Productivity (TFP) using the Akerberg, Caves, and Frazer method. Second, we use sales as a proxy of revenue to capture the mechanism that the reform could increase firm revenue. Third, we explore whether the financial reform could increase the average wage and wage for skilled labor (both in log form). Lastly, following [Amiti & Cameron \(2012a\)](#) we use a relative share of skilled workers to unskilled workers as a proxy for the demand of skilled workers. Therefore, we can see if the positive impact of financial reform on skill premium is caused by changing composition of skilled and unskilled workers in the manufacturing

sector. Table 1.9 shows the result.

Table 1.9: Financial reforms and firm performance

| Dependent variables | (1) TFP | (2) Sales | (3) Average wage | (4) Wage Skilled | (5) Relative demand |
|--------------------------------|-----------------------|-----------------------|-------------------------|-----------------------|------------------------|
| Financial liberalization index | 1.397** (0.640) | 1.262*** (0.473) | 0.543 (0.339) | 1.587*** (0.445) | -0.979** (0.451) |
| Import share | -0.508*** (0.0487) | 0.339*** (0.0396) | 0.0284 (0.0203) | 0.107*** (0.0313) | 0.0443 (0.0297) |
| Export share | 0.0315** (0.0156) | 0.0901*** (0.0105) | 0.00794 (0.00722) | 0.0415*** (0.0117) | -0.0145 (0.0106) |
| Foreign ownership | 0.231*** (0.0387) | 0.287*** (0.0268) | 0.136*** (0.0174) | 0.187*** (0.0261) | 0.0421 (0.0261) |
| Government ownership | 0.182*** (0.0219) | 0.266*** (0.0150) | 0.118*** (0.00913) | 0.0637*** (0.0143) | 0.0370*** (0.0124) |
| Size | 0.308*** (0.0130) | 0.809*** (0.0105) | -0.0854*** (0.00624) | 0.0154* (0.00902) | -0.216*** (0.0112) |
| Observations | 150,114 | 276,774 | 276,607 | 233,939 | 241,420 |
| R-squared | 0.782 | 0.914 | 0.737 | 0.619 | 0.696 |
| Firms FE | YES | YES | YES | YES | YES |
| Island*Year Effect | YES | YES | YES | YES | YES |

Robust standard errors in parentheses, clustered in sector-year level

*** p<0.01, ** p<0.05, * p<0.1

In column (1), using TFP as the proxy, we see that financial liberalization produces a positive and significant coefficient in affecting productivity. This finding, therefore, justifies previous research that financial liberalization has a positive correlation to productivity. The logic behind this is that the firm that has more access to financial resources can increase its capital by buying new equipment or replacing old machines that could help the firm to increase its productivity. This better access to finance can also help the firm expand its business and increase its economic scale, which will boost its productivity.

The story is quite the same for the firm's revenue. In column (2), we see that financial reform positively affects sales (in log form). This is to say the sequential effect of the financial reform that after increasing the firm's productivity, the firm will be able to produce more and sell more of their products. Therefore the positive sign on the coefficient for both productivity and sales are pretty much expected.

However, in columns (3), we found that the financial reform did not affect the average wage and wage for skilled workers since the coefficients are not significant. So the improvement in productivity and revenue did not translate to an increase in average revenue for the worker. The reason for this is because, in column (4), we see that financial liberalization will benefit most skilled workers since they absorb all the variations from the financial reform. Suppose we relate them with the baseline specifications on skill premium. In that case, we could argue that financial reform will increase skill premium because skilled workers' wage increases significantly relative to the increase in the average wage.

Lastly, in column (5), we show how the financial reform affects the relative demand for skilled workers to unskilled workers. The coefficient for financial liberalization is negative and significant. This means that in our sample period, financial liberalization decreases the firms' demand for skilled workers. To explain why the financial index negatively relates to the relative demand for skilled workers, we could look at the baseline regression for some clues. In Table 1.4, column (5), the relative demand for skilled workers or skill-share variable is negative and significant to affect skill premium. This means that if we add more skilled workers to the firm, the skill premium will decline. So the story is relevant with this, the financial reform reduces the demand for skilled workers and, therefore, increases the skill premium.

1.5.4. Alternative weight and control for crisis

To address for potential endogeneity problem from the input weight of the financial sector, we explore a new index from other countries based on data provided by [Abiad, Detragiache, & Tressel \(2008\)](#). We used the financial reform index from India and Thailand and weighted the variable at the sector level based on the use of the banking sector as their input for production. We argue that Indonesia, Thailand, and India deployed similar financial reform during the observation period, albeit with different magnitude. We choose India since it shares the similarity of abundant unskilled labor in the manufacturing sectors. At the same time, we choose Thailand since the country is geographically close to Indonesia and similarly affected by the Asian Financial Crisis that triggered various re-

forms in the financial sector.

Furthermore, we also wish to explore whether the Asian Financial Crisis affects our results. For this reason, we run again the equation 1.6 for two period subsamples, after the financial crisis from 2000 to 2005 and before the financial crisis from 1990 to 1996. The results are presented in Table 1.10

Table 1.10: Assigning different index and different sub-samples period

| Dependent variables | (1) | (2) | (3) | (4) | (5) | (6) |
|--------------------------------------|---------------------|------------------------|--------------------|------------------------|----------------------|-----------------------|
| Skill premium (ln_ws_wu) | India's index | India's index | Thailand's index | Thailand's index | 2000-2005 | 1990-1996 |
| Fin. liberalization index (India) | 0.961*** (0.364) | 0.679** (0.288) | | | | |
| Fin. liberalization index (Thailand) | | | 0.570** (0.227) | 0.428** (0.192) | | |
| Fin. liberalization index | | | | | -0.0591 (0.486) | 0.931* (0.522) |
| Importer | | 0.111*** (0.0279) | | 0.112*** (0.0281) | 0.139** (0.0561) | 0.117*** (0.0394) |
| Exporter | | 0.0119 (0.0110) | | 0.0113 (0.0110) | 0.0319* (0.0172) | 0.00865 (0.0161) |
| Foreign | | 0.118*** (0.0184) | | 0.118*** (0.0184) | 0.151*** (0.0329) | 0.0961** (0.0389) |
| Size | | 0.0499*** (0.00829) | | 0.0500*** (0.00830) | 0.0386** (0.0190) | 0.0567*** (0.0124) |
| Skill share | | -2.526*** (0.0763) | | -2.526*** (0.0764) | -2.720*** (0.112) | -2.506*** (0.0860) |
| Observations | 250,275 | 233,875 | 250,275 | 233,875 | 93,092 | 95,750 |
| R-squared | 0.476 | 0.536 | 0.476 | 0.536 | 0.684 | 0.619 |
| Firms FE | YES | YES | YES | YES | YES | YES |
| Island*Year Effect | YES | YES | YES | YES | YES | YES |

Robust standard errors in parentheses, clustered in sector-year level

*** p<0.01, ** p<0.05, * p<0.1

Using different indexes from India and Thailand in columns (1) and (3), we found that our main finding still holds. Our estimation result shows that after we change the index, financial liberalization will increase the manufacturing firms' skill premium. Furthermore, the result is consistent when applying firm characteristics control in columns (2) and (4), such as importer and exporter status, foreign ownership, size, and skill-share. The coefficients for all firm characteristics also show a similar sign with our baseline estimation in

table 1.4, with firms owned by foreigners and larger firms will increase skill premium. At the same time, skill-share will reduce the skill premium.

We also try to capture the effect of the Asian financial crisis in our estimation. This is important because the financial crisis will make high constraints for the firm to access financing facilities, which could shift the relative demand for workers and hence affect the skill premium. We treat the financial crisis using two-period sub-samples for observation. First, in column (5), for the period after Asian Financial Crisis in 2000 to 2005, we found our financial liberalization index lost its significance, and the coefficients turned negative. Following the result, we could argue that the effect of the financial crisis persisted in the early 2000s, which pushed down the overall wage level in Indonesia.

Second, in column (6), we limit our sample to the period before the crisis, as been done in [Amiti & Cameron \(2012a\)](#). With this method, the result shows that all variable related to financial reform is positive and significant in affecting the skill premium, at 10% level.

One concern on this specification when we use two-period sub-samples is that we could not capture the variation on the financial liberalization index itself. Most reforms come in the period between 1997 to 2000, but dividing sub-samples that include that year will only reduce the wage level. Therefore, the Asian Financial Crisis will overcome the result if we break the sub-samples around that period. We then argue that our baseline result provides an ideal sample period in analyzing financial reform's effect on the skill premium.

1.6. Conclusion

This chapter explores the possible cause of wage inequality between skilled and unskilled workers in a microeconomics environment. We contribute to growing recent literature arguing that financial liberalization in developing countries increases income inequality. We explore how financial liberalization through reducing barriers to entry for financial entities and less control on interest rate has affected the wage skill premium, or the wage difference between skilled and unskilled workers. We suggest that through capital-skill complementarity theory, financial liberalization will allow firms to increase their growth

of capital and relatively increase the skilled worker's wage to increase the skill premium.

The chapter focuses on Indonesia to look for empirical evidence because the country has abundant unskilled workers while experiencing significant financial liberalization in the nineties. After controlling for different firm characteristics, we found that the financial reforms will increase the skill premium.

We also found only large firm that will enforce the positive relationship between financial reform and skill premium. Overall, the financial reform also have positive impact to the firm performance, increasing their productivity and sales. Financial reforms will affect the wage for skilled labor while at the same time decreasing their relative demand.

These results are robust even after controlling for different financial liberalization index and controlling for the Asian financial crisis.

2. Palm Oil Price and Wage Structure: Evidence from Firms-level Data in Indonesia ¹

Abstract

This paper studies how external shocks through changes in international palm oil prices affect demand for labor and wage structure in manufacturing firms in Indonesia. To support our argument, we use firm-level data for medium and large manufacturing firms in Indonesia from 1990 to 2015. We found that for palm oil processing firms, a rise in palm oil prices during the commodity boom period will reduce demand for skilled labor and increase their wage. We argue that when palm oil is used as an input, an increase in the price will adjust to another input factor, such as labor. We also find that our result is more relevant in the period after the Asian Financial Crisis. During that period, the crisis will overcome the effect of changes in commodity prices. We further assess the firm heterogeneity to find that smaller and domestic-oriented firms will benefit more from a rise in palm oil prices. Our results are held in the industry level analysis to show that palm oil price will significantly affect palm oil processing firms and overall manufacturing firms.

Keywords: *Commodity price, labor wage, firm-level data.*

JEL Classification: C33, F16, J31.

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2.1. Introduction

Fluctuations in commodity prices have been described as a source of volatility in the emerging markets (Fernandez et al., 2017), where commodity boom could lead to high economic growth and commodity bust could lead to recessions and slow recoveries (Reinhardt et al., 2016). An open economy that produces the commodity will respond to higher commodity prices during the boom period by increasing its aggregate production capacity and attracting more labor in the commodity-related sector. The reverse happens during a commodity bust.

Previous studies show that the manufacturing sector is also impacted by a commodity boom, negatively or positively. Pioneer work by Corden & Neary (1982) argues that the manufacturing (tradable) sector will be hit by a *Dutch disease* as the price boom in the extractive sector will affect resource allocation, factorial income distribution, and the real exchange rate. On the other hand, Smith (2019) shows the procyclicality of a commodity boom and the manufacturing sector at the expense of the exports of agricultural products.

In these frameworks, the manufacturing sector competes with the commodity sector for labor. The boom in commodity prices will re-adjust the labor market through a change in wages or workers' demand and supply. Coxhead & Shrestha (2016) finds that high commodity prices reduce formal employment and that a lower degree of formality results in lower earnings. Siregar (2021) argues that a commodity price boom triggers internal migration in response to a higher purchasing power in commodity-producing districts.

However, part of the manufacturing sector is also directly related to a commodity. This is the case of downward processing industries, such as the furniture industry for wood or textile industry for cotton. A commodity price boom will directly benefit these downward processing industries as it will trigger an increase in the quantity produced. Enhancing commodity processing is increasingly a policy objective of many governments in developing countries. This policy is seen as a way to circumvent the Singer-Prebisch secular

decrease of the relative price of primary products, increase domestic value-added, and base a country's manufacturing sector on its comparative advantage. By upgrading into processing, governments hope to reach self-sufficiency, reap the benefits of higher productivity in manufacturing and create better jobs.

Indonesia provides an ideal setting to analyze the impact of commodity price fluctuations (Usui, 1996), for at least three reasons. First, Indonesia is a large country in terms of population, size, and area, but it is primarily a price-taker in the world commodity market. Even for palm oil, this is the case despite the country being the world's top producer. Second, Indonesia has enjoyed a significant boom in its natural resource products exports. This boom helped fuel a GDP growth that averaged almost five percent annually in per capita terms from 2001 to 2011, a rate sufficient to lift mean per capita income from 15 percent of the world average in 2001 to 20% by the end of the decade (Coxhead & Shrestha, 2016). Third, there is a wide heterogeneity of the wage structure among different manufacturing sectors due to the abundance of low-skilled workers, stark differences across islands and regions, and various degrees of industries' openness. Hence, Indonesia provides the opportunity to study a variety of exposures to an international shock.

This paper looks at the impact of fluctuations of palm oil price on downward industries, that is, industries that use fresh palm oil bunches as inputs and process them (which we will call "processing firms"). Palm oil bunches are widely used in cooking oil, cosmetics and soaps, animal feed, and biofuel. Indonesia uses a quarter of its palm oil production for the domestic final and intermediate consumption. Developing the domestic use of palm oil is also a way for the Indonesian government to alleviate the impact of export bans on palm oil in many developed countries (such as the EU) because of the environmental effects of palm oil on deforestation and water quality.

We contribute to the existing literature by providing a detailed analysis at the micro-level, using a firm-level dataset, following the work of Benguria et al. (2018); Amiti & Davis (2012) and Kis-Katos & Sparrow (2015). We use the Survey Industry (SI) data from the Indonesian Statistics Agency and commodity prices from the International Monetary Fund (IMF) for 26 years, from 1990 to 2015. We can then able to capture large price variations during the commodity booms of the 1990s and 2000s and the bust during the financial

crises of 1997 and 2008.

Our result shows several interesting findings. First, we observe that a rise in palm oil prices will lead to an increase in the sales of palm oil processing firms. However, since palm oil is used as an input of production, a higher palm oil price will adjust the labor demand and wage. For these palm oil processing firms, a rise in palm oil prices will reduce demand for labor, primarily for the skilled worker. Furthermore, the wage for skilled labor will increase in the commodity boom period. Meanwhile, we cannot find evidence that change in palm oil price will affect skill premium in palm oil processing firms.

Second, we found the finding is more relevant to the period after the Asian Financial Crisis. We observe that labor demand and wage was negatively affected by the Asian Financial Crisis. Thus overcome the effect of changes in palm oil price in the period leading to the crisis and several years afterward.

Third, we found that this effect is not exclusive to palm oil processing firms. We found evidence that palm oil price changes during the commodity boom and bust period will affect overall manufacturing firms. A rise in palm oil prices will increase the sales and wage of the labor.

Fourth, looking at the firms' characteristics, we found that smaller and domestic-oriented firms will benefit from increasing palm oil prices. They will have a higher sale, increasing demand for labor, and could provide higher wages for their labor.

Finally, on the industry level, we found that when palm oil prices increase, the palm-oil-related industry and other industries will enjoy higher sales, increase demand for labor, and would be able to provide higher wages.

The remainder of paper is organized as follows. Section 2.2 discuss the related literature. Section 2.3 provides an overview of labor and wage structure in Indonesia. Section 2.4 describes the data and the methodology. Section 2.5 describes the main findings in firm level and district level. Lastly, section 2.6 concludes.

2.2. Related Literature

Our paper contributes to the stream of research, which quantifies the impact of the commodity price cycles on the economy. Recent literature has highlighted the co-movement of the commodity price cycle to the macroeconomic variables, especially in emerging markets (([Fernandez et al., 2018, 2017](#); [Drechsel & Tenreyro, 2018](#)). Meanwhile, this paper belongs to the literature which tries to analyze the impact of the commodity cycle on the microeconomics environment in the labor market ([Coxhead & Shrestha, 2016](#); [Shrestha & Coxhead, 2018](#); [Adao, 2016](#)) and, more importantly, in the firm-level settings ([Benguria et al., 2018](#)). We propose three main contributions to the literature.

First, we contribute to the growing research exploring how the global price shock contributes to the wages structures in the labor market. Most research in this literature explores the effect of trade liberalization through tariffs on the skill premium in emerging countries. The impact is mixed, as the fall in tariff could increase skill premium in Argentina ([Galiani & Sanguinetti, 2003](#)) and Chile ([Harrigan & Reshef, 2015](#)). Meanwhile, the same fall in tariff could reduce the skill premium in Brazil ([Gonzaga et al., 2006](#); [Dix-Carneiro & Kovak, 2015](#)), Columbia ([Attanasio et al., 2004](#)), and Indonesia ([Amiti & Cameron, 2012a](#)). This paper adopts a similar technique and dataset as used in the [Amiti & Cameron \(2012a\)](#)) to bring new dimensions by considering the global commodity price movements in assessing the impact to wage structures in the labor market.

In this sense, some studies predict mixed results on how the commodity boom will affect wages. A previous study for Brazil by [Adao \(2016\)](#) has exploited the distributional effect across sectors and regions to show that commodity price shocks account for 5-ten percent of the decrease in wage inequality. However, other research by ([Coxhead & Shrestha, 2016](#)) and ([Shrestha & Coxhead, 2018](#)) shows that in Indonesia, the commodity boom triggers expansion in export but fails to increase earnings in the non-formal sectors. Hence, wage inequality does widen across sectors.

Second, we enrich the studies on emerging economies, which show the dynamic of wages structure and labor demand in firm-level settings. Given the importance of the commodity sector in labor employment, the discussion at the firm level mainly centered on the

possibility of dutch disease and firm performance (Corden & Neary, 1982; Coxhead & Jayasuriya, 2009). However, it is unclear how this price shock in the commodity sector will affect labor in manufacturing firms. For instance, Allcot & Keniston (2018) utilizes geographical variation to show that oil booms do not reduce employment in the tradable sectors.

Meanwhile, Benguria et al. (2018) shows that commodity booms will increase labor demand and wages in the less-skilled industry. They offer the transmission commodity boom to the economy in the firm-level analysis through: (a) cost channel which will occur when higher commodity prices induce an increase in wages due to the expansion of the labor demand for the commodity sector, and (b) the wealth effect which occurs when the increase in wages trigger an increase in the domestic demand. Higher domestic demand will give heterogeneous effects to the firms, as the non-exporter firm will have more benefits as they serve only domestic demands.

Furthermore, we are filling the gap in the literature by taking into consideration the recent appetite of the government in resource abundant countries to downstream their manufacturing industries. Current literature focus on the discussion the possibilities and condition of downstream activities (Ostensson & Lof, 2017; Magno & Guzman, 2021) in developing countries, but not looking on the adjustment in labor market. In the other hand, another strand of literature does discuss labor market policies and how that will affect downstream industries (Norback, 2001; Cette et al., 2014), but missing the element of external shock.

Lastly, the paper contributes to the literature by measuring the impact of the commodity price cycle on labor mobility across sectors and regions. We adopt the Kis-Katos & Sparrow (2015) approach using the firm-level data to measure how the exogenous price shock affects the wage structures and labor demand at the district level. By adopting district-level analysis, we could examine the heterogeneity of impact on the district with at least one manufacturing firm directly affected by commodity price shocks. The district level analysis also allow us to find evidence of an exogenous shocks to the mobility of labor (Siregar, 2021) or changes in wage structure of the manufacturing firms.

2.3. Palm oil price and wage structure in Indonesia

This section explores the importance of the price movements on the palm oil price that we observe to manufacturing firms in Indonesia. We then discuss the trend and descriptive statistics on the labor wage structure for manufacturing firms in Indonesia.

2.3.1. Trend on Palm oil

Our main proposal in this paper is to link the palm oil price movements and the wage structure of the manufacturing firms in Indonesia. In doing so, we first need to justify the selection of palm oil as our main commodity for the analysis.

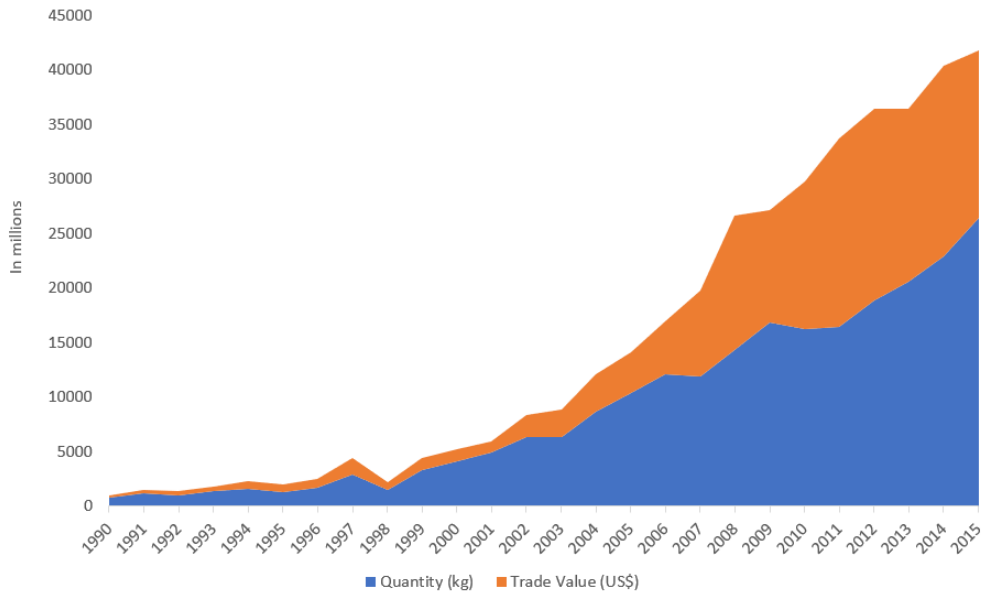
First of all, palm oil is the most important commodity export in agriculture for Indonesia, only behind energy commodities such as oil & gas and coal. Figure 2.1 shows a steady growth in palm oil export, during our research period from 1990 to 2015. The export volume in palm oil continue to increase from 815 million kg in 1990 to almost 30 billion kg in 2015. More impressively, this is followed by export value in nominal terms that increase from around 200 million USD to more than 1.5 billion USD. We observe that the export volume value only dip in the aftermath of Asian Financial Crisis in 1997 and flattening for a few years after the Global Financial Crisis in 2008.

Furthermore, Indonesia is by far the largest palm oil producer globally. Along with Malaysia, the two countries supply almost 90% of global production ¹. However, unlike Malaysia that exclusively exports its palm oil production, Indonesia uses twenty five percent of its production for domestic consumption. This made the country as one of the world's biggest consumers of palm oil (e.g., mainly used for cooking oil and biofuels).

The trend in production and consumption also lead to growth in downward manufacturing firms that process the palm oil as their input. In Figure 2.2, the downward firms grew from 700 in 1990 to more than 1500 in 2015. These firms is not only limited to palm oil processing mills but also include several firms in cosmetics and food industry.

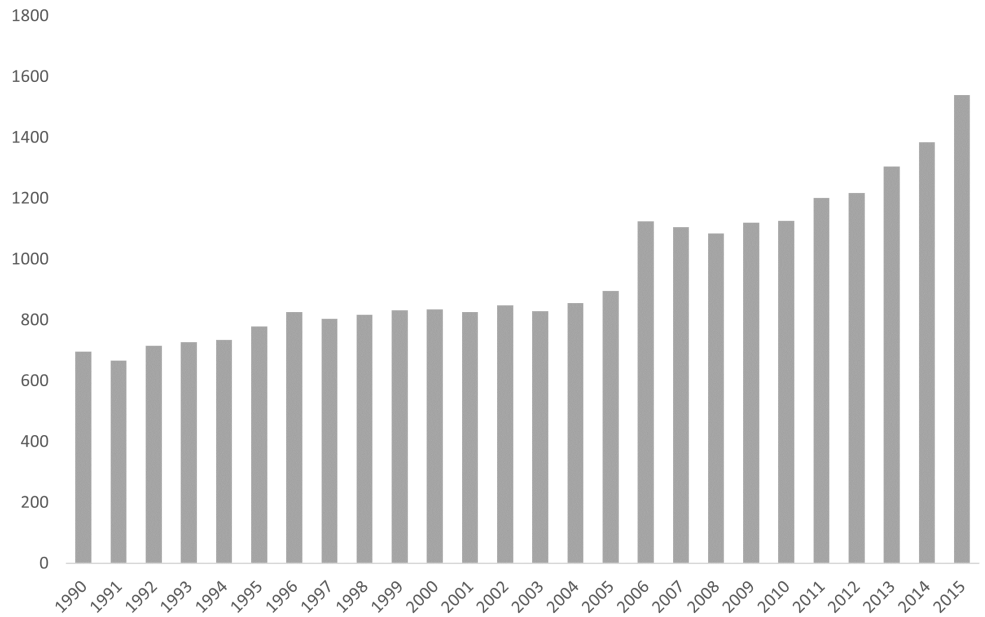
¹Based on Roundtable Sustainable Palm oil (RSPO), May 2020.

Figure 2.1: Palm oil export, 1990 - 2015



Source: Authors' calculation based on UNCOMTRADE.

Figure 2.2: Number of downstream firms that use palm oil as input, 1990 - 2015



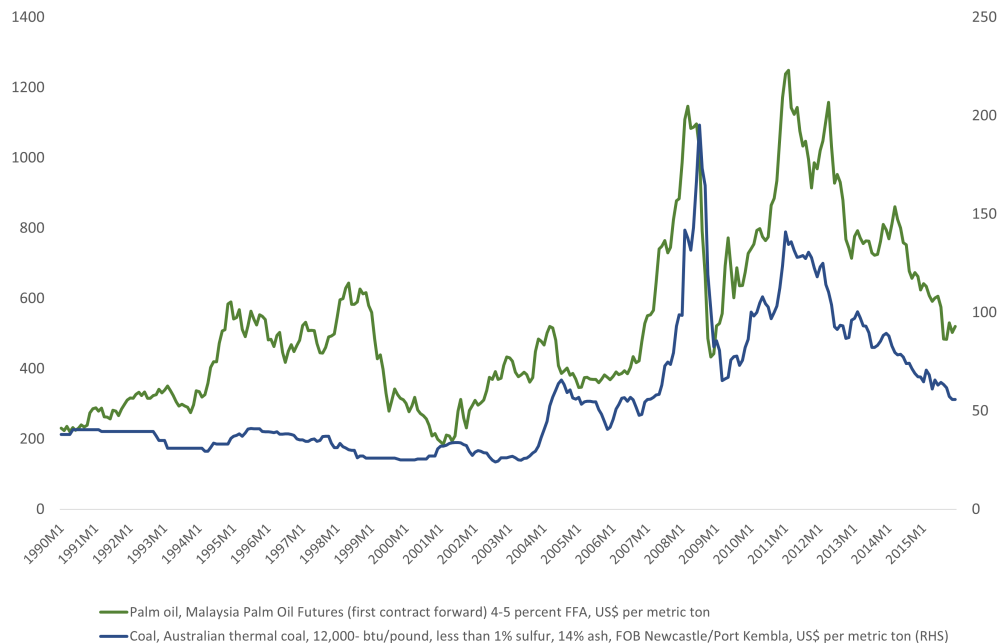
Source: Authors' calculation based on Indonesian Statistics Agency (BPS)

The central characteristic of palm oil that is relevant in the paper is the fluctuation of its price. Between 1990 and 2015, the palm oil price experienced several episodes of booms and busts. Figure 2.3 shows that the first episode of palm oil price boom took place in the mid-90s when the price grew by 200 per cent from US\$ 200 per metric ton in 1990 to US\$ 600 per metric ton in 1998. The palm oil price dropped after the Asian Financial crisis of 1998, when the price went back again to US\$ 200 per metric ton in 2000

The second episode was a dramatic boom in 2006, followed by sudden bust in the aftermath of Global Financial Crisis. In this period, the palm oil price increased from US\$ 400 per metric ton in 2007 to US\$ 1200 per metric ton in 2008 before dropping in 2009 to a level similar in 2007. In the early 2010s, the palm oil price kept rising before slipping down to below US\$ 400 per metric ton in 2015.

Interestingly, the patterns of palm oil price movements are similar to other commodity, such as coal, as can be seen in Figure 2.3 - however, coal price has been relatively flat in the 1990s, while palm oil price was booming.

Figure 2.3: Palm oil and coal world price, 1990 - 2015.



Source: Authors' calculation based on IMF primary commodity price.

Despite being the largest palm oil producer, Indonesia is a price taker of an international price which is set in London and Chicago. Indonesia has tried to set its own price benchmark, in order to limit the influence of global price. However, the world CPO price has not recognized the price set in Indonesia as a reference (Winardi et al., 2017).

To statistically test this notion, we conduct a simple Granger Causality test for palm oil production in Indonesia and its global price, for the period from 1990 to 2015. The result shows that palm oil production in Indonesia does not Granger cause the international price of palm oil². Therefore, we can assume that Indonesia is a price taker on the world palm oil market.

2.3.2. Wage structure in manufacturing firms

Wage and labor distribution

From 1990 until 2015, Indonesia has experienced an annual GDP growth of five percent on average³. With this robust growth, the average real wage for Indonesia's manufacturing sectors doubled during the period. However, it has not grown equally across the archipelago.

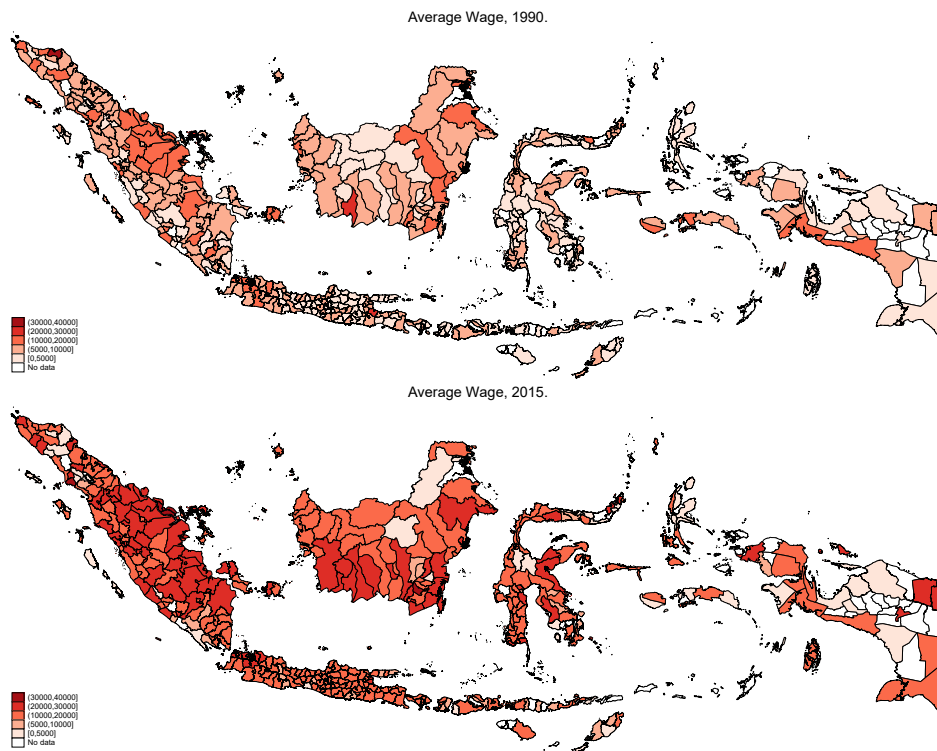
In Figure 2.4, in 1990, the average wage in manufacturing sector was generally low across the country, with few relatively high wages in the western part of Sumatra and Java. By contrast, in 2015, the intensity shades of average wages become darker, showing that average wage in real terms is growing across the archipelago along with the economic growth. A new activity center is appearing in the southern part of Kalimantan and eastern part of Sulawesi. Nevertheless, the increase in average wage from 1990 to 2015 is more marked in the western part of Indonesia, notably in the islands of Sumatra and Java.

There are at least two reasons why the wage increase is more predominant in the western part of Indonesia. First, 80% of the population in Indonesia lives in this part of the country.

²We cannot reject the null hypothesis that palm oil production does not granger cause oil palm price, both variables being in logarithm. (F=2,5964 and Prob>F =0.1007)

³Data based from the World Development Indicators, the World Bank. This average includes the -13% annual growth in 1998.

Figure 2.4: Average wage (in real terms), 1990 and 2015



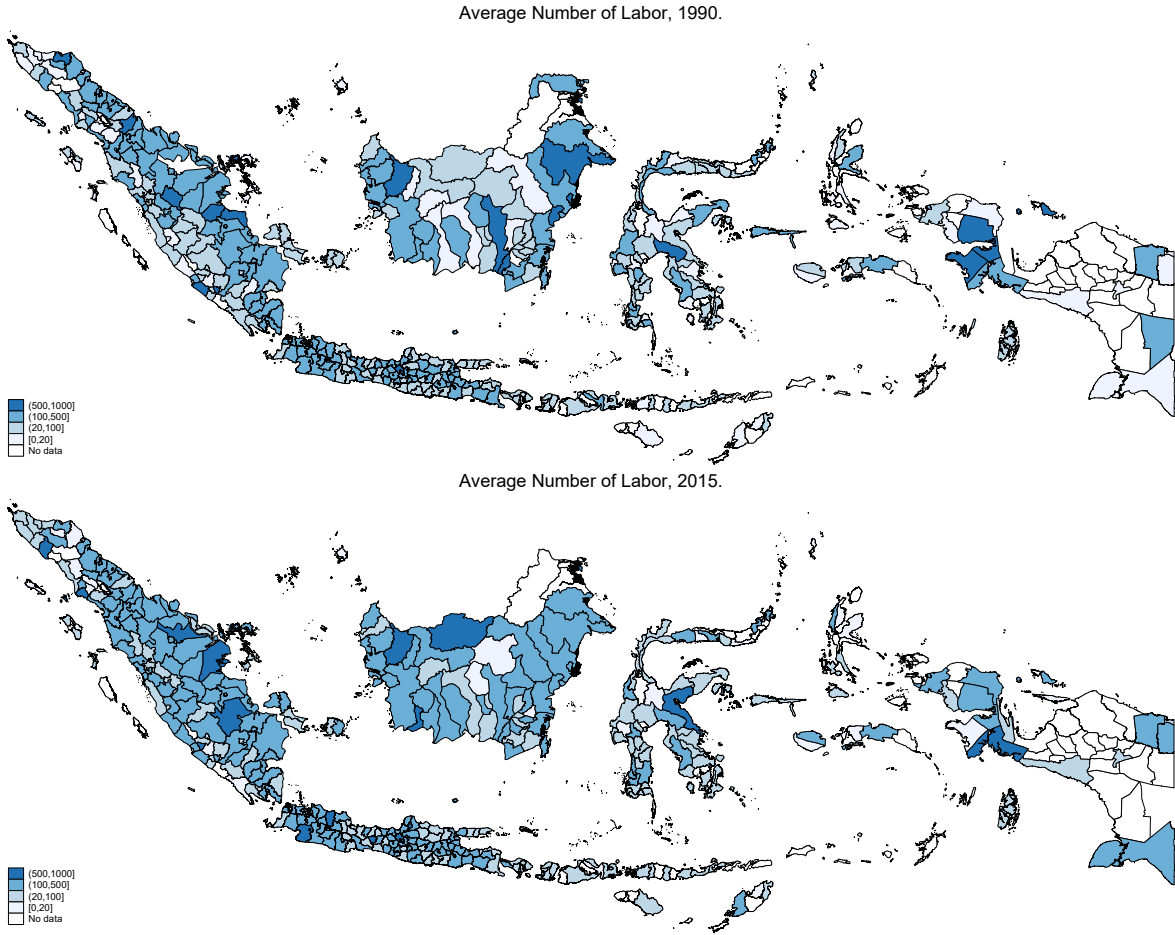
Source: Authors' calculation based on Indonesian Statistics Agency (BPS).

Such population concentration attracts firms that are looking for labor and higher demand for their products.

Second, the western part of Indonesia also benefits from better infrastructure, such as roads, railways, and ports, reducing firms' transaction and logistics costs.

In terms of the distribution of labor in manufacturing firms, Figure 2.5 shows the concentration in Java and Sumatra in 1990 and 2015. However, the difference between districts over time is not as marked as for wages, despite the population growth in the country.

Figure 2.5: Average number of labor, 1990 and 2015



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

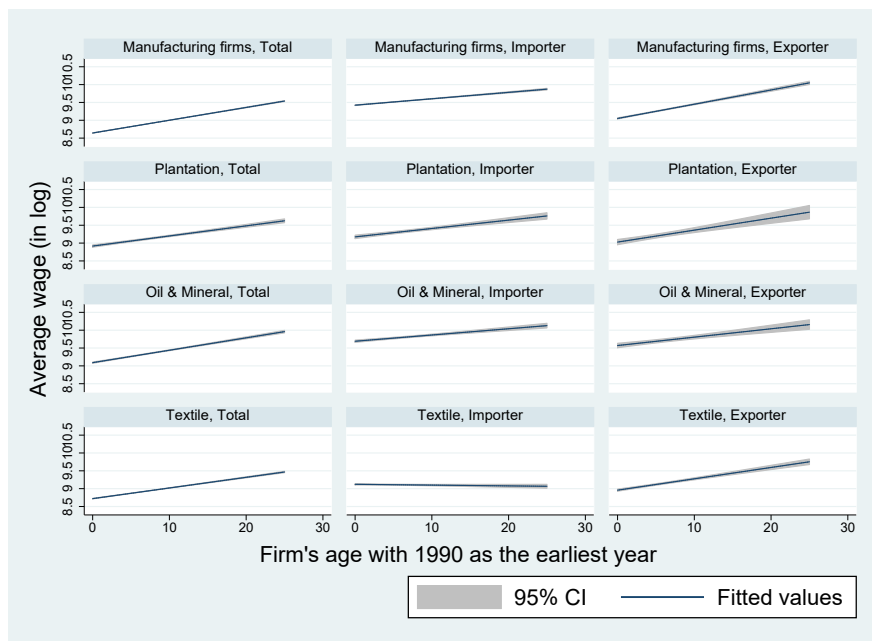
Wage decomposition in manufacturing sectors

Wages in manufacturing sectors have increased on average, between 1990 and 2015. In this section, we analyse the growth, decomposed by skill intensity and sectors. Based on [Amiti & Cameron \(2012a\)](#), the non-production workers usually hold higher education levels than the production workers. Therefore non-production workers are usually classified as skilled labor and production workers as unskilled labor.

We divide the sectors into three categories based on their ISIC code: palm-oil based, oil and mineral-based (oil refinery, coal, metal, non-metal), and textile (the latter act as a control because they are labor-intensive and not directly affected by the external commodity price shocks).

Figure 2.6 display the evolution of the average wage in real terms (2010=100) for the manufacturing firms from 1990 to 2015. The graphs in the second row shows that the palm oil sector plantation sector has experienced an increase in average wage over time. The increase is higher for Exporting firms.

Figure 2.6: Average wage trend by industry and trade status, in real terms.

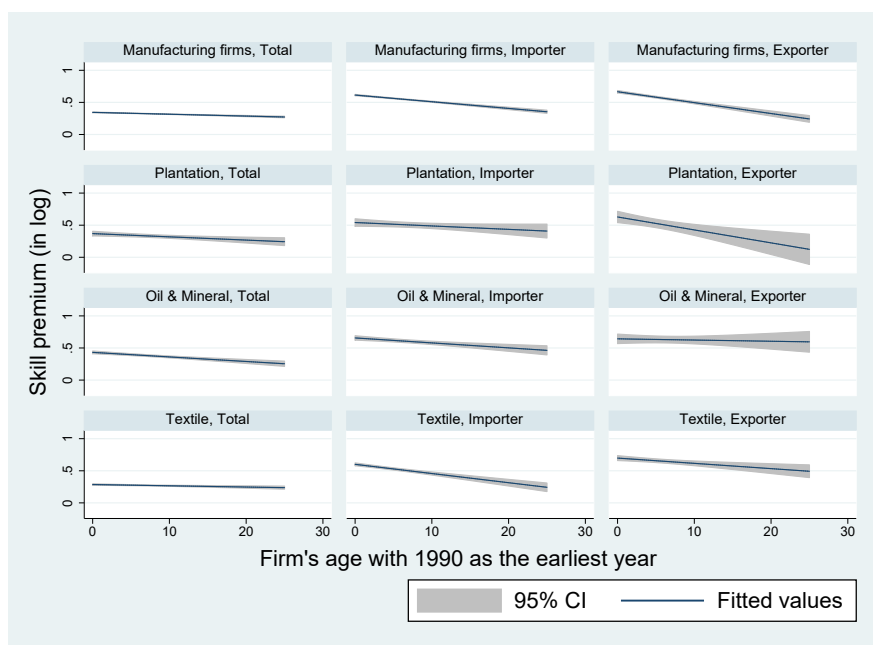


Source: Authors' calculation based on Indonesian Statistics Agency (BPS).

The trend is similar for mineral sectors, with a similar advantage to exporting firms. The evolution of the wage in textile is flatter, mainly due to wage decrease for textile manufacturers that import their product.

For the wage for skilled and unskilled labor, we found the trend is quite similar to the average wage (See Fig. 15 and 16 in the appendix). Wage inequality measured by the skill premium shows a downward trend, indicating that the wage gap is narrowing between skilled and unskilled labor (See Fig. 2.7. As discussed in the first chapter, the fall in skill premium can be attributed to the increase in education supply.

Figure 2.7: Skill premium trend by industry and trade status



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

Considering these factors, we argue throughout the paper that shock such as financial liberalization, trade liberalization, financial crisis, or global price movements could affect the wage structure in Indonesia. To this extent, we are particularly interested in the changes in the labor market for palm oil downward industries. More specifically, the subsequent section will empirically discuss on how this shock affects the wage structures and demand for labor, both for skilled and unskilled labor.

2.4. Empirical strategy

In this section, we first discuss the framework that explain the relationships between palm oil price, labor and wages. We then present the regression equations and the dataset.

2.4.1. Framework: Effects of a palmoil boom on downward processing industries

We refer to the work of [Corden & Neary \(1982\)](#) to explain the mechanism on how a boom in the commodity sector affects wages, in a three sectors economy (the commodity sector - typically, the oil sector, a traded manufacturing sector and a non-traded sector). Two mechanisms are at play : a resource effect, where the commodity sector attracts labor (and capital) at the expense of the other sectors; and a spending effect, due to the higher income thanks to the commodity boom that translates into higher demand. As a result, the relative price of the non-traded sector rises, leaving place to a Dutch disease.

In the case of Indonesia, however, the commodity sector is not oil, which can be considered as a kind of “offshore” sector, with few linkages with the rest of the economy but palm oil. By contrast to the oil sector, palm oil employs numerous labor in the plantations and has deep connections with the manufacturing sector. In this paper, we focus on these downward processing firms which use palm oil as an input. Moreover, as Indonesia is a price taker, the increase in price is expected to induce a rise in production (however, with a lag, as palm oil is a perennial crop that needs about 4 years to become productive). In such a case, an increase in the price of palm oil may have the following effects on downward processing industries :

(i) For the downward firms, palm oil input will be more expansive but the production of palm oil itself should increase with price, thus there will be more input available. We know that the price hikes corresponded to a boom in the production of palm oil in Indonesia. It is thus likely that the quantity effect dwarfs the price effect.

A price increase of palm oil will raise the cost of input material in manufacturing indus-

tries. This will push the firms to reduce production costs by adjusting the labor cost, especially in the short run when firms could not adjust by asking a higher output price. We assume that the main cost component consists of labor and input cost; thus, re-balancing would be needed between these two components when one of them increases.

(ii) Downward firms will compete with palm oil plantations for labor. The degree of competition depends on the skill mix of plantation labor compared to downward industries. It is likely that labor in the plantations are less skilled than downward industries in general, but some of the latter might also be intensive in unskilled labor.

(iii) A spending effect will take place, especially in districts where palm oil grows, due to the income rise of plantation workers and palm oil farmers.

(iv) There will be also entry of new processing firms, possibly counteracted by concentration within existing firms.

(v) There will be migration into the districts which benefit from the palm oil boom

(vi) The resulting impact on wages is ambiguous and is thus a matter for empirical test.

In the current paper, we will examine some of the channels mentioned above, namely the impact on the number of processing firms, their sales, labor, skill mix of labor and wages. At this stage, we are ignoring migration but this can be done in a later version.

2.4.2. Methodology

We examine the impact of palm oil price boom at three different scales : (1) at the firm level, within palm oil processing firms; (2) at the firm-level, comparing palm-oil processing firms and other manufacturing firms, within the same large (isic2) sector and the same district; (3) at the industry (isic5) level, comparing palm-oil related industries and other manufacturing industries, within the same district. In doing so, we are not estimating the overall impact of palm oil boom on Indonesia. We are providing piece of evidence of economic channels of the impact of palm oil price, within groups that are truly comparable.

First, within palm oil processing firms, we estimate the following equation :

$$Y_{fidt} = \beta p_t^* * Z_i + \delta_t + \delta_f + \epsilon_{fidt} \quad (2.1)$$

Where,

- Y_{fidt} : Outcome of the palm oil processing firm f producing in industry i defined as 5-digit isic in district d and year t .
- p_t^* : The international price of palmoil in year t
- Z_i : The (strictly positive) share of palm oil g in total goods inputs used by industry i .
- δ : Fixed effects for year (t), district (d), industry (i) and firm f .

The various outcomes (Y) are sales, total labor, skilled labor, unskilled labor, the ratio of skilled labor over unskilled labor, average wage, skill wage, unskilled wage and the skill premium.

Equation 2.1 follows a palm oil processing firm and looks at its evolution over time, as a function of the international price of palm oil and the degree of its dependence to palm oil. It is a within-firm estimation, clustered at the district level. We assume that β will be positive on sales, total labor and wage as the processing firms activity will increase with the price boom. The demand for skills could go either way, depending on the firm's characteristic as well as the skill premium.

We cut the period in two sub-periods, before and after 2003 (included) so as to take into account the boom of palm oil in the 2000s in Kalimantan island. In a second step, we include firms that are not related to palm oil. We compare palm oil processing firms and other manufacturing firms, within the same industry and district :

$$Y_{fidt} = \beta p_t^* * Z_{ig} + \gamma p_t^* + \delta_t + \delta_{di} + \epsilon_{fidt} \quad (2.2)$$

Where additionally,

- Z_i : can now be equal to 0 or positive.
- δ_{di} : district-industry fixed-effect

We restrict the estimation to districts where palm oil processing firms are present. Estimations are clustered by district.

We explore the heterogeneity of impact across firms depending on the firm's initial characteristic (defined in the first year it appears in the dataset) :

$$Y_{fidt} = \beta p_t^* * Z_i * X_f^0 + \gamma p_t^* + \theta_1 p_t^* * X_f^0 + \theta_2 X_f^0 + \delta_t + \delta_{di} + \nu_{fidt} \quad (2.3)$$

Where additionally,

X_f^0 : Firm's initial characteristic (large or exporter)

We are looking if palm oil related firms experience an additional effect on top of the pure effect of being large (resp. exporter) and how in addition they evolve when the price of palm oil changes. We are thus interested in comparing the signs and order of magnitude of the β coefficient and the θ_2 coefficient. Estimations are clustered at the district level.

The last set of equations is defined at the industry level. The estimation compares industries that are related to palm oil and other industries in the same district. The estimation considers only the districts where there are palm oil related industries.

$$Y_{idt} = \beta p_t^* * Z_i + \gamma p_t^* + \theta Z_i + \delta_t + \delta_{ds} + \mu_{idt} \quad (2.4)$$

Where,

Z_i : share of palm oil used in the goods inputs of industry i , which varies from 0 to 1

Y_{idt} : number of firms, total sales and labor, mean wages, in industry i , district d and year t .

δ_{ds} : sector (isic2) and district fixed effect

The estimation is clustered at the district level.

2.4.3. Data

Our primary data source is the SI (Survei Industri), an annual survey of manufacturing firms with at least 20 employees, between 1990 and 2015. The length of observation period allow us to capture boom and bust in commodity markets and at the same time following the wage structure changes at the firm-level. The survey contains detailed information on the firm: the number of skilled and unskilled labor, wage payments, the proportion of exported output, the value of imported and domestically produced inputs, and the percentage of ownership. The survey SI also provides identification down to the district level. All currency denominated variables (e.g., wages) are in real value, deflated with the consumer price index based in 2010.

We follow [Amiti & Cameron \(2012a\)](#) and define unskilled labor as workers in the production line, while skilled labor is the workers in the non-production line.⁴ We define the skill gap as the ratio of non-production labor over production labor, and the skill premium as the ratio of the non-production wage to the production wage.

To better assess the effect of price changes on the local labor market, we also re-construct our database to build an unbalanced pseudo-panel of Indonesian districts. Districts are classified as either municipalities (*kota*) or rural districts (*kabupaten*). Between 1990 and 2015, new districts emerged due to district splits. We use an harmonization table, provided by the Indonesian Statistics Agency, based on the 2009 district's definition code and frame. We end up with an unbalanced panel of 439 districts from the harmonization process. These 439 districts are spread across five main island groups (Sumatra, Java, Kalimantan, Sulawesi, and the remaining islands).

For the international price of palm oil, we use the IMF Primary Commodity Price series. It is the monthly data on Malaysian palm oil futures in USD per metric tons.

We compute the share of palmoil in the industry's input of goods, using an input-output table based on the economic census of 1990, which consists of 161 sectors and is compiled by the Indonesian Statistics Agency (BPS). With reference to the work of [Edwards \(2019\)](#),

⁴[Amiti & Cameron \(2012a\)](#) explains that the non-production worker has higher education on average, thus relatively more skilled than production worker.

we use the Input-Output table for the years 1990 and 2010 from the Indonesian Bureau of Statistics Agency to see the scale of the forward and backward linkage of palm oil. To give an illustration, we also calculate the number for rubber, as a comparison.

In Table 2.1, we observe that the forward linkages for palm oil are slightly larger than rubber in the two observed years. This shows that palm oil is used more as an input in downstream industries than rubber. The number of backward linkages is much higher for rubber than palm oil in 2010. This, however, could be caused by the difference in the number of sectors as the IO table in 2010 distinguishes 185 sectors compared to 66 sectors in the IO table of 1990. In the following, we use the 1990 IO coefficients.

Table 2.1: Input-Output Linkage

| Commodity | Forward linkage | | Backward linkage | |
|-----------|-----------------|-----------|------------------|----------|
| | 1990 | 2010 | 1990 | 2010 |
| Palm Oil | 1.021806 | 1.123836 | 1.002057 | 1.539244 |
| Rubber | 1.017477 | 0.9941351 | 0.9991255 | 2.257171 |

2.5. Results and discussion

This section analyzes the results of our estimations and discusses the main effect of palm oil prices on manufacturing firms in Indonesia. We first discuss the baseline result on palm oil processing firms only. Second, we compare these firms to other manufacturing firms within the same district and industry. Finally, we analyze the difference across industries within the same broad sector and district.

2.5.1. Firm level analysis

Within palm oil processing firms

This section looks at the impact of palm oil prices on manufacturing firms that use palm oil as an input. We run equation 2.1 for the observation period from 1990 to 2015. Furthermore, we interact palm oil price with a weight that depends on the input share of palm oil used in the related industry (palm oil price - interaction). We present the baseline results in Table 2.2.

Table 2.2 shows that a rise in the palm oil price is correlated with an increase in the sales of processing firms. In column (1), a one percentage point increase in palm oil will increase sales by 0.08 percentage points, significant at a one percent level. However, this increase in palm oil price will lower demand for overall employment, as seen in column (2). A percentage points increase in palm oil price will reduce the demand for overall employment by 0.03 percentage points, significant at a five percent level.

Furthermore, from columns (3) and (4), we found the opposite effect between the demand for skilled labor and unskilled labor. A one percentage point increase in palm oil price will decrease the demand for skilled labor while at the same time increasing the demand for unskilled labor, significant at a five percent level.

Table 2.2: Baseline regression: Palm oil price on sales and labor

| Dependent variables | (1) Sales (log) | (2) Labor demand | (3) Skilled demand |
|---------------------|---------------------------|---------------------------|---------------------------|
| Palm oil price | 0.000848*** (0.000289) | -0.000267** (0.000124) | -0.000103** (4.62e-05) |
| Observations | 24,483 | 24,894 | 24,894 |
| R-squared | 0.874 | 0.819 | 0.547 |
| Firms FE | YES | YES | YES |
| Year FE | YES | YES | YES |

Robust standard errors in parentheses clustered by district

*** p<0.01, ** p<0.05, * p<0.1

The result shows that the rise of palm oil prices will benefit processing firms, increasing their sales. The boost in sales could result from a higher price of those firms' final product⁵, provide room to increase the margins as the cost of input rises. However, the increase of palm oil price that pushes the cost of input will also redirect their labor mix towards unskilled workers rather than skilled workers. Although overall, the demand for employment is falling to adjust the cost of input factors.

The increase in sales and the redirection of the labor mix lead to our main question on this paper to see a further impact on labor wage. To answer the question, we turn now on the wages (in log form) of the palm oil processing firms as presented in Table 2.3. The table results are controlled by firms fixed effect and year fixed effect. Meanwhile, the wages are in the log form.

We found in column (1) that a rise in palm oil price has no significant effect on the average wage of palm oil processing firms. Nevertheless, in column (2), we found evidence that changes in palm oil price will have a negative impact to wage for unskilled labor. To be more precise, a one percentage point rise in palm oil price will decrease the wage for unskilled labor by 0.03 percentage points, significant at a ten percent level.

Table 2.3: Baseline regression: Palm oil price and wages of the downward firms

| Dependent Variables | (1) Average Wage | (2) Unskilled wage | (3) Skilled Wage | (4) Skill premium |
|---------------------|-------------------------|--------------------------|--------------------------|------------------------|
| Palm oil price | -0.000278 (0.000225) | -0.000360* (0.000203) | 0.000442** (0.000208) | 6.62e-05 (0.000213) |
| Observations | 24,890 | 24,858 | 22,157 | 22,125 |
| R-squared | 0.496 | 0.457 | 0.458 | 0.357 |
| Firms FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |

Robust standard errors in parentheses, clustered by district.

*** p<0.01, ** p<0.05, * p<0.1

Meanwhile, column (3) shows us that the rise in palm oil price will also increase the wage for skilled labor. We found that at a five percent significant level, a one percentage point

⁵Assuming that the demand for these final products is relatively inelastic since palm oil based are in the food and beverages industry.

increase in palm oil price will lead to a rise in wage for skilled labor in palm oil processing firms in Indonesia. Finally, in column (4), we did not find evidence that an increase in palm oil price will affect skill premium, the share of the wage difference between skilled and unskilled labor.

From columns (2) and (3), we observe that the wage for unskilled labor is relatively more inelastic to external shock from commodity price than the wage change for skilled labor. This difference in elasticity is consistent and supports earlier studies, for example, from [Kumar \(1972\)](#) and [D. R. Davis \(1998\)](#) or with the recent discussion from [Rotunno & Wood \(2020\)](#) and [Nazier \(2019\)](#). Based on the table 2.3, we can conclude from the baseline specification that changes in palm oil price will only increase the wage for skilled labor in palm oil processing firms while decreasing the wage for unskilled labor.

Time period sub-samples

This paper uses a long observation period of 26 years. During this period, it is possible that structural change happened in labor structure or wage determination. For that reason, we run the model of Eq. 2.1 again on two sub-periods, from 1990 to 2002 and 2003 to 2015. Each sub-period includes a boom and bust in palm oil price. As discussed in section 1.3, the first wave of commodity boom started in the mid-90s before dropping in the aftermath of the Asian Financial Crisis until the early 2000s. The second wave of commodity boom began in 2006 until 2008, and another wave happened after 2010 before receding again.

Moreover, Indonesia has experienced a large recession during the Asian Financial Crisis in the first sub-period, with GDP growth decreasing by 13 percent. The second sub-period coincides with the Global Financial Crisis that has weakened the economy, even though its impact was less severe in Indonesia than the Asian Financial Crisis. The results of the regressions are presented in Tables 2.4 and 2.5.

In Table 2.4, we observe in column (2) that the positive impact of palm oil price on the sales of processing firms occur significantly after 2003. Meanwhile, the adverse effects on total labor happen in the first sub-period. However, we could not find a significant impact of palm oil price to demand skilled and unskilled labor. However, the coefficient is similar

to the baseline result in the second sub-period.

Table 2.4: Baseline regression with time period sub-samples

| Dependent variables | (1) Sales before 2003 | (2) Sales after 2003 | (3) Labor demand before 2003 | (4) Labor demand after 2003 | (5) Skilled demand before 2003 | (6) Skilled demand after 2003 |
|---------------------|-----------------------------|----------------------------|---------------------------------------|--------------------------------------|---|--|
| Palm oil price | -0.000178 (0.000383) | 0.00115*** (0.000331) | -0.000458** (0.000189) | -0.000177 (0.000116) | 0.000106 (7.58e-05) | -5.52e-05 (5.32e-05) |
| Observations | 9,877 | 14,602 | 10,104 | 14,786 | 10,104 | 14,786 |
| R-squared | 0.902 | 0.832 | 0.895 | 0.817 | 0.612 | 0.607 |
| Firms FE | YES | YES | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES | YES | YES |

Robust standard errors in parentheses clustered by district

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

In Table 2.5, we can see the impact of palm oil price on wages of processing firms (depending on their degree of use of palm oil as an input) in two different sub-samples. Consistently in the first sub-period, all coefficients for wage-related indicators experienced negative and significant value, as shown in columns (1), (3), and (5). We can read this as the price for oil palm increases, the wage will fall in the period before 2003.

Nevertheless, we need to read these results with caution. In our opinion, it is likely that the effect of the Asian Financial Crisis has over-ruled the effect of palm oil price increase on the wage structure. The wage level in the period was falling in all economic sectors in Indonesia, with or without the existence of a commodity boom. For that reason, it is difficult to assign the direct effect of palm oil on wages in this period.

Table 2.5: Baseline regression with time period sub-samples

| Dependent variables | (1) Average wage before 2003 | (2) Average wage after 2003 | (3) Unskilled wage before 2003 | (4) Unskilled wage after 2003 | (5) Skilled wage before 2003 | (6) Skilled wage after 2003 | (7) Skill premium before 2003 | (8) Skill premium after 2003 |
|---------------------|---------------------------------|--------------------------------|-----------------------------------|----------------------------------|---------------------------------|--------------------------------|----------------------------------|---------------------------------|
| Palm oil price | -0.000641*** (0.000242) | -0.000432 (0.000277) | -0.000597** (0.000265) | -0.000475** (0.000222) | -0.000783** (0.000377) | 0.000398 (0.000243) | -0.000432 (0.000380) | 3.45e-06 (0.000258) |
| Observations | 10,104 | 14,786 | 10,102 | 14,756 | 9,576 | 12,581 | 9,574 | 12,551 |
| R-squared | 0.652 | 0.432 | 0.585 | 0.400 | 0.585 | 0.444 | 0.435 | 0.412 |
| Firms FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES | YES | YES | YES | YES |

Robust standard errors in parentheses clustered by district

*** p<0.01, ** p<0.05, * p<0.1

After 2003, we observe only unskilled labor wages that still have negative and significant value. This means from column (4), the rise of palm oil price will, between 2003 and 2015, decrease the wage for unskilled labor, significant at a five percent level. Therefore overall, with the two sub-samples periods, we can say that a rise in palm oil price will negatively affect wages for unskilled labor.

All manufacturing firms operating in districts with palm oil-related firms

Next, we include all manufacturing firms active in the same districts as the palm oil firms. This corresponds to equation 2.2. We present the result in Table 2.6.

The interaction of the price of palm oil and the industry's dependence on palm oil gives the same effect as earlier findings. In column (1), firms that depend on palm oil see their sales co-move with the palm oil price. One percentage increase in palm oil price will increase sales by 0.17 percentage points for palm oil processing firms. While for all manufacturing firms, a rise of one percentage point in palm oil price will increase sales by 0.14 percentage points. The coefficients for two independent variables in column (1) are significant at one percent level.

Table 2.6: All manufacturing firms: Palm oil price, sales and labor demand

| Dependent variables | (1) Sales | (2) Labor demand | (3) Skilled demand |
|------------------------------|--------------------------|-------------------------|----------------------------|
| Palm oil price - interaction | 0.00174*** (0.000275) | 9.27e-05 (0.000350) | -0.000135*** (3.30e-05) |
| Palm oil price | 0.0140*** (0.000168) | -6.11e-05 (0.000112) | 2.77e-05** (1.30e-05) |
| Observations | 481,501 | 520,024 | 520,024 |
| R-squared | 0.660 | 0.216 | 0.166 |
| Industry-district FE | YES | YES | YES |
| Year FE | YES | YES | YES |

Robust standard errors in parentheses clustered by district.

*** p<0.01, ** p<0.05, * p<0.1

Furthermore, in column (3), we find that a one percentage point rise in palm oil price will reduce the demand for skilled labor in the firms that process palm oil as their input by 0.013 percentage points, significant at one percent level. In the same column, we can see that a one percent rise in palm oil price positively affects skilled labor in all manufacturing firms.

However, in column (2), the impact on total labor turns positive but not significant. Overall, we can argue that a rise in palm oil price will increase sales for all firms, but their share of skilled labor is reduced for palm oil processing firms and increased for other manufacturing firms.

We now turn the effect of changes in the palm oil price to all manufacturing firms where we present the estimation result in Table 2.7. From column (1), we found that a rise in palm oil price will have a positive and significant effect on palm oil processing firms and the overall manufacturing firm in Indonesia.

Table 2.7: All manufacturing firms: Palm oil price and wages

| Dependent Variables | (1) Average wage | (2) Unskilled wage | (3) Skilled wage | (4) Skill premium |
|------------------------------|--------------------------|--------------------------|---------------------------|---------------------------|
| Palm oil price - interaction | 0.000681** (0.000282) | 0.000603** (0.000262) | 0.000816*** (0.000160) | 9.13e-05 (0.000112) |
| Palm oil price | 0.00443*** (0.000106) | 0.00481*** (9.93e-05) | 0.00291*** (0.000125) | -0.00182*** (9.61e-05) |
| Observations | 520,024 | 519,537 | 428,603 | 428,116 |
| R-squared | 0.397 | 0.361 | 0.251 | 0.070 |
| Industry-district FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |

Robust standard errors in parentheses clustered by district

*** p<0.01, ** p<0.05, * p<0.1

The positive and significant effect can also be observed on skilled and unskilled labor wages in columns (2) and (3). Therefore, from Table 2.7, we found evidence that palm oil processing firms raise their wages, for all types of skills, albeit a little more for skilled workers. Meanwhile, for the overall firms, we observed the same effect that an increase in palm oil price would raise their wage for all types of skills, with unskilled labor having more benefit with a higher increase.

Regarding the last statement, the different elasticity coefficients between skilled and unskilled labor result in a lower skill premium for all manufacturing firms. In column (4), the coefficients are negative and significant at a one percent level, indicating that a one percent increase in palm oil price will reduce the skill premium by 0.185 percentage points. However, we need to interpret the result carefully since the R-squared for these specifications is very small, since palm oil price can only explain seven percentage points the variations on the skill premium.

Firms heterogeneity

In this part, we think it is essential to look further at the result and distinguish firms by their initial characteristics, such as their size (proxied by total employment) or export orientation.

Based on the equation 2.3, we first analyze firm heterogeneity based on size. We took a large firm as our dummy independent variable; this firm has more than 100 workers as defined by the Indonesian Statistical Agency. We then interact the large firm variable with the palm of oil price (double interaction) and palm oil processing firm (triple interaction). The results are given in Table 2.8.

Independently, we see from the table that being a large firm will give benefits on higher sales and will recruit more people, including skilled labor. However, the interaction variables have negative and significant coefficients to affect sales and labor demand by being dependent on palm oil. For example, if the firm is large and there is a one percentage point increase in palm oil price, sales and labor demand are dampened by 0.042 and 0.027 percentage points, respectively, significant at one percent level. Furthermore, the coefficients for triple interaction remain negative and significant. Therefore, a one percent increase in palm oil price for large palm oil processing firms will reduce sales and labor demand accordingly.

Table 2.8: Firm heterogeneity: Palm oil price, sales, and labor demand based on firm's size

| Dependent Variables | (1) Sales | (2) Labor demand | (3) Skilled demand |
|------------------------------|----------------------------|----------------------------|----------------------------|
| Large firm | 2.116*** (0.0765) | 1.894*** (0.0361) | 0.0309*** (0.00516) |
| Double interaction | -0.000429*** (5.14e-05) | -0.000271*** (2.59e-05) | -2.41e-05*** (5.35e-06) |
| Triple interaction | -0.00248*** (0.000398) | -0.00146*** (0.000339) | 2.50e-05 (5.67e-05) |
| Palm oil price | 0.0143*** (0.000165) | 0.000276*** (6.51e-05) | 3.63e-05*** (1.29e-05) |
| Palm oil price - interaction | 0.00329*** (0.000423) | 0.00106*** (0.000323) | 9.40e-05** (4.42e-05) |
| Observations | 481,501 | 520,024 | 520,024 |
| R-squared | 0.727 | 0.560 | 0.167 |
| Industry-district FE | YES | YES | YES |
| Year FE | YES | YES | YES |

Robust standard errors in parentheses clustered by district

*** p<0.01, ** p<0.05, * p<0.1

Another way of reading these results is that smaller firms dependent on palm oil will be doing well during the commodity boom period. Smaller palm oil processing firms could still increase their sales and demand for labor when palm oil prices rise.

We observe a similar pattern when looking at the wage structure's size effect during the commodity boom. In Table 2.9, we found that large firms will have a higher wage for both skilled and unskilled workers. However, a rise in palm oil prices will bring down wages in these large manufacturing firms (double interaction). We can continue to observe that when palm oil prices rise, large palm oil processing firms will have negative and significant coefficients for a skilled wage (triple interaction), lowering the wage inequality with the wage for unskilled labor.

Table 2.9: Firm heterogeneity: Palm oil price and wages based on firm's size

| Dependent Variables | (1) Average wage | (2) Unskilled wage | (3) Skilled wage | (4) Skill premium |
|------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| Large firm | 0.268*** (0.0212) | 0.214*** (0.0196) | 0.504*** (0.0250) | 0.252*** (0.0182) |
| Double interaction | -0.000122*** (3.06e-05) | -0.000113*** (2.95e-05) | -0.000301*** (2.94e-05) | -6.05e-05** (2.88e-05) |
| Triple interaction | -4.76e-05 (0.000390) | 7.26e-05 (0.000381) | -0.000452** (0.000186) | -0.000783*** (0.000217) |
| Palm oil price - interaction | 0.000593 (0.000444) | 0.000491 (0.000420) | 0.000847*** (0.000226) | 0.000311* (0.000178) |
| Palm oil price | 0.00449*** (0.000107) | 0.00486*** (0.000101) | 0.00309*** (0.000125) | -0.00176*** (9.27e-05) |
| Observations | 520,024 | 519,537 | 428,603 | 428,116 |
| R-squared | 0.404 | 0.366 | 0.271 | 0.081 |
| Industry-district FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |

Robust standard errors in parentheses clustered by district

*** p<0.01, ** p<0.05, * p<0.1

We now look at exporting status as the firm's characteristics and link that with the rise in palm oil price. We present the result in Table 2.10 and observe similar behavior for being an exporter.

Table 2.10: Firm heterogeneity: Palm oil price, sales, and labor demand based on export orientation

| Dependent Variables | (1) Sales | (2) Labor demand | (3) Skilled demand |
|------------------------------|----------------------------|----------------------------|---------------------------|
| Exporter firm | 1.224*** (0.0684) | 1.030*** (0.0430) | 0.00680 (0.00423) |
| Double interaction | -0.000517*** (4.57e-05) | -0.000274*** (4.23e-05) | -3.50e-06 (4.52e-06) |
| Triple interaction | -0.00118*** (0.000389) | -0.00115*** (0.000318) | 6.49e-05 (5.66e-05) |
| Palm oil price | 0.0141*** (0.000167) | 3.13e-06 (0.000109) | 2.74e-05** (1.30e-05) |
| Palm oil price - interaction | 0.00182*** (0.000277) | 0.00163*** (0.000323) | 0.000105*** (3.48e-05) |
| Observations | 481,501 | 520,024 | 520,024 |
| R-squared | 0.671 | 0.268 | 0.165 |
| Industry-district FE | YES | YES | YES |
| Year FE | YES | YES | YES |

Robust standard errors in parentheses clustered by district

*** p<0.01, ** p<0.05, * p<0.1

Exporter firms benefit from higher sales and can absorb more workers in their production, but not the skilled ones. The notion is very rational since exporter firms can sell their products in the global market to upscale their production and absorb more workers. Nevertheless, the sign of the coefficients turns negative and significant once we link the exporting firms to the rise in the palm oil price (double interaction). The same case for the palm oil processing firm that exports their products, a rise in palm oil price will reduce their sales and labor demand.

We are looking at a hint from the other variable that shows the interaction between palm oil price and its processing firms has a positive and significant effect on sales and labor demand. Therefore, we can argue that a domestic-oriented firm is the one that benefits more from the increase in the palm oil price since they will still be able to increase their sales and employ more labor during the commodity boom period.

The same deduction can also be applied if we link exporting firms and the wage structure as presented in Table 2.11. Exporting firm status will help the firm give higher wages for

both skilled and unskilled workers, with a higher rate for the skilled one that leads to a higher skill premium. However, during the commodity boom, these exporting firms will give less wage for all types of labor. Special remarks need to be attributed to our triple interaction variable's wage for unskilled labor. An exporter of palm oil processing firms will give a higher wage for their unskilled worker if the palm oil price increase (column 2).

Table 2.11: Firm heterogeneity: Palm oil price and wages based on export orientation

| Dependent variables | (1) Average wage | (2) Unskilled wage | (3) Skilled wage | (4) Skill premium |
|------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| Exporting firm | 0.177*** (0.0211) | 0.135*** (0.0210) | 0.358*** (0.0260) | 0.216*** (0.0206) |
| Double interaction | -0.000110*** (3.52e-05) | -0.000111*** (3.48e-05) | -0.000237*** (3.76e-05) | -7.57e-05*** (2.82e-05) |
| Triple interaction | 0.000288 (0.000268) | 0.000427* (0.000245) | -7.27e-05 (0.000265) | -0.000597*** (0.000200) |
| Palm oil price - interaction | 0.000648** (0.000302) | 0.000553** (0.000280) | 0.000828*** (0.000174) | 0.000166 (0.000118) |
| Observations | 520,024 | 519,537 | 428,603 | 428,116 |
| R-squared | 0.398 | 0.362 | 0.257 | 0.074 |
| Industry-district FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |

Robust standard errors in parentheses clustered by district

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

From the firm heterogeneity analysis, we can conclude that different firm characteristics respond differently to the rise in palm oil prices. A large and exporting firm will negatively affect our outcome variables such as sales, demand for labor, and wages. At the same time, smaller and domestic-oriented firms will have more favorable during the commodity boom.

2.5.2. Industry level estimation

To conduct the industry level estimation, we are now comparing different industries that are more or less dependent on palm oil (including industries that are completely unrelated to the commodity). We focus on districts with some palm oil industry, so we exclude districts with no palm oil-related industry. Finally, we estimate equation 2.4 at the industry-district level.

The results in Table 2.12 shows three interesting findings. First, an industry that uses palm oil is associated with a smaller number of firms. This is obvious because palm oil-related firms are a small share of all manufacturing firms. Furthermore, we found that the palm oil industry is also associated with a positive and significant effect on larger sales and a higher demand for skilled labor.

Table 2.12: Industry level: Palm oil price, sales, and labor demand

| Dependent Variables | (1) Number of firms | (2) Sales | (3) Labor demand | (4) Skilled demand |
|------------------------------|---------------------------|--------------------------|---------------------------|---------------------------|
| Palm oil price - interaction | 0.000594*** (0.000146) | 0.00326*** (0.000377) | 0.00126*** (0.000258) | -7.85e-05** (3.62e-05) |
| Palm oil price | 0.000280** (0.000110) | 0.0149*** (0.000237) | 0.000668*** (0.000158) | 1.96e-05 (1.39e-05) |
| Palm oil use as an input | -0.343*** (0.114) | 2.047*** (0.426) | 0.245 (0.256) | 0.150*** (0.0253) |
| Observations | 164,632 | 159,943 | 164,632 | 164,632 |
| R-squared | 0.200 | 0.461 | 0.265 | 0.189 |
| Sector-district FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |

Robust standard errors in parentheses clustered by district

*** p<0.01, ** p<0.05, * p<0.1

Second, for palm oil processing industries, an increase in palm oil price is associated with a positive and significant correlation on the number of palm oil related firms, sales, and total labor in these industries. One percentage point increase in palm oil price will lead to (i) an increase in the number of firms in the industries by 0.059 percentage points, significant at one percent level; (ii) an increase in industry's sales by 0.326 percentage points,

significant at one percent level; and (iii) increase in labor demand for the related industry by 0.126 percentage points, significant at one percent level. Meanwhile, the price increase is associated with a decrease in the share of skilled workers in the industry, significant at a five percent level.

Third, we figure out the variation on the variable's behavior between firm-level and industry level. While the analysis in both levels results in a higher firm performance (measured by sales), the effect on labor demand is not similar. At the industry level, we argue that the cost of input adjustment between labor and input (e.g., palm oil) is less relevant than at the firm level. Therefore, the commodity boom can incentivize the industry to ramp up its production and obtain higher sales. To do so, they recruit more people in the production line.

In Table 2.13, we observe that the impact of palm oil price in palm oil processing industries is positive and significant on wages, whatever the workers' skill (by 0.052 percentage points, significant at one percent level). The impact is similar but different magnitude for the palm oil price in affecting wage for overall industries. For industries that use palm oil, only their average wage and wage for unskilled labor will increase, which has a positive and significant effect.

Table 2.13: Industry level: Palm oil price and wages

| Dependent Variables | (1) lwage_djt | (2) lwu_djt | (3) lws_djt | (4) lws_wu_djt |
|------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Palm oil price - interaction | 0.000523*** (0.000142) | 0.000532*** (0.000155) | 0.000584*** (0.000185) | -0.000133 (0.000180) |
| Palm oil price | 0.00418*** (8.26e-05) | 0.00460*** (8.07e-05) | 0.00287*** (0.000102) | -0.00172*** (9.19e-05) |
| Palm oil use as an input | 0.261** (0.109) | 0.208* (0.122) | 0.140 (0.137) | 0.0911 (0.131) |
| Observations | 164,632 | 164,541 | 150,706 | 150,607 |
| R-squared | 0.378 | 0.350 | 0.278 | 0.104 |
| Sector-district FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |

Robust standard errors in parentheses clustered by district

*** p<0.01, ** p<0.05, * p<0.1

From Table 2.13, we do find a negative correlation in skill premium once the palm oil price increase. However, we argue that overall the impact on the skill premium at the industry level is not significant. The commodity boom will have a homogeneous effect in increasing the wage level, so we cannot see a robust result that it will benefit one type of labor based on their skill. Therefore, this paper is not providing a conclusion in supporting previous literature that commodity boom will reduce wage inequality (Adao, 2016) or widen it (Coxhead & Shrestha, 2016).

However, we are convinced that the commodity boom will positively impact the wage in manufacturing industries.

2.6. Conclusion

Fluctuations in commodity price affect the economic cycle, wage, and demand for labor, especially for a country with a resource-abundant and relatively low skilled labor level. This paper tries to assess the relationship between the movement in the price for main agricultural products in Indonesia, palm oil, to the labor demand and wage structure in Indonesia's manufacturing firms. We explore a rich dataset of firm-level data in Indonesia for medium and large enterprises in analyzing the relationship to find several main findings.

First, we observe that a rise in palm oil prices will lead to an increase in the sales of palm oil processing firms. However, since palm oil is used as an input of production, a higher palm oil price will adjust the labor demand and wage. For these palm oil processing firms, a rise in palm oil prices will reduce demand for labor, primarily for the skilled worker. Furthermore, the wage for skilled labor will increase in the commodity boom period. Meanwhile, we cannot find evidence that change in palm oil price will affect skill premium in palm oil processing firms.

Second, we found the finding is more relevant to the period after the Asian Financial Crisis. We observe that labor demand and wage was negatively affected by the Asian Financial Crisis. Thus overcome the effect of changes in palm oil price in the period leading

to the crisis and several years afterward.

Third, we found that this effect is not exclusive to palm oil processing firms. We found evidence that palm oil price changes during the commodity boom and bust period will affect overall manufacturing firms. A rise in palm oil prices will increase the sales and wage of the labor.

Fourth, looking at the firms' characteristics, we found that smaller and domestic-oriented firms will benefit from increasing palm oil prices. They will have a higher sale, increasing demand for labor, and could provide higher wages for their labor.

Finally, on the industry level, we found that when palm oil prices increase, the palm-oil-related industry and other industries will enjoy higher sales, increase demand for labor, and would be able to provide higher wages.

3. Women Entrepreneurship, Bank Lending, and Micro & Small Enterprises' Performance in Indonesia ¹

Abstract

This paper investigates the dynamics of bank lending to the performance of micro and small-sized enterprises (MSE), with gender angle to anchor the empirical work. Using rich information from the micro-level dataset of MSE's survey in 2015, we can explore the relationship between bank lending and firms' performance owned by women entrepreneurs. Furthermore, the paper looks upon the probability and decomposition factors affecting firm access to external finance and bank lending. Our paper shows that women entrepreneurs who receive formal financing from banks will improve the firm's performance. Meanwhile, a small firm, more mature, and belonging to an owner with a higher level of education will lead to better performance. Our result is robust when testing against a different measure of productivity (e.g., sales, labor wage, and employment), excluding java island in our specifications, and employing another year to estimate baseline specifications.

Keywords: *Total factor productivity, inclusive financing, women entrepreneurship.* **JEL Classification:** G21, J16, L25, L26, N65

¹Joint work with Zeinab Elbeltagy (Paris School of Economics and Paris 1 Pantheon Sorbonne University, E-mail:zeinab.elbeltagy@cu.edu.eg). The authors are grateful to substantive comments provided by Sandra Poncet, Maria Bas, Akiko Suwa-Eisenmann, and Francois Langot at the Paris School of Economics. The earlier version of the paper also benefit comments from Hamza Ali Malik, Tientip Subhanij, Masato Abe, Yusuke Tateno, Roman Pradier, and Patchara Arunsuwannakorn at UN ESCAP.

3.1. Introduction

Micro and Small Enterprises (MSEs) financing have been a source of great interest for policymakers and academic researchers. This is due to the significant role of MSEs in the private sector to drive the economy (Berrell et al., 2008). It is evident from the literature that MSEs find it challenging to meet the standards of formal financial institutions to obtain funds, such as higher costs and the relatively high risk of loan lending. Hence, the lack of access to formal financing allows informal institutions to fill the gap.

It is well documented that financial conditions significantly influence the firm's productivity. For instance, Carlin et al. (2006) reported that a high cost of finance adversely affects firm output, and Nguimkeu (2016) revealed that the lack of access to credit negatively impacts the gross margins of retail enterprises in Cameroon. On the other hand, the repressed financial system impedes economic growth since financial distortions can lead to resource miss-allocations. Hsieh & Klenow (2009) show that lower Total Factor Productivity (TFP) of developing countries can be explained by resource miss-allocation across establishments in manufacturing in China and India. Specifically, they found that the calculated gains of manufacturing TFP are 25-40% in China and 50-60% in India when capital and labor are reallocated to equalize marginal products to the extent observed in the US.

At the same time, interest in supporting women's entrepreneurship has recently increased to promote economic inclusion, as highlighted by the Sustainable Development Goals (SDG) on gender equality and decent work. This interest stems from recognizing 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. Nevertheless, there is growing discussion that women entrepreneurs are disadvantaged on the supply-side by a discriminatory treatment that affects the willingness of the formal institution to provide financing. While in the other hand, there is a perception that women entrepreneurs are less willing to seek external financing (Cowling et al., 2020), highlighting the problem on the demand side to access finance.

Under the background, we choose Indonesia as our case country to study the impact of

different financing structures and gender on the firm performance for the following reasons: (a) according to data from the ministry of co-operatives in 2014, the Micro, Small and Medium Enterprises (MSMEs) sector account for more than 95% of the industrial units¹, where women own around 40% of those MSEs. In terms of employment, based on the Indonesian Statistics Agency (BPS) dataset in 2013, the 57.9 million enterprises in the sector employ 114.1 million workers, which helps contribute between 58% to 61% to Gross Domestic Product (GDP) (Tambunan, 2019); (b) the policymakers in Indonesia emphasize the need to encourage MSMEs and provide them a favorable treatment by offering credit and tax incentives for investments (Japhta et al., 2016). Therefore, MSMEs, especially MSEs, play a vital role in generating employment and promoting industrialization in the Indonesian economy.

This study improves upon the previous research in several aspects. *First*, most of the 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 was limited to partial effects only. In contrast, our study analyzes the impact of bank lending on different microeconomics outcomes (e.g., firm productivity, sales, employment, and wages) as they are closely interrelated in the real economy. *Second*, we use a uniquely large data set of cross-sectional annual Indonesian MSEs to analyze the gender differences in firm performance, which contributes significantly to the existing literature on MSMEs, particularly MSEs, and women empowerment in developing countries. *Third*, the paper supports the increasing literature that highlights the importance of financing for women entrepreneurs. This study contributes by measuring the probability and decomposing factors that define gender differences in firms to access external credit. *Finally*, there is a lack of studies showing how financing women entrepreneurs contribute to MSEs' performance in the specific context of Indonesia.

We used a dataset from MSEs enterprises provided by Indonesia's central statistics agency (Badan Pusat Statistik, BPS) to analyze the role of bank lending, women entrepreneurs, and firm performance in Indonesia. Our findings suggest that men entrepreneurs do perform better than women entrepreneurs. This finding is thus consistent with the fact that

¹There were 98.75% micro-enterprises, 1.15% small enterprises and 0.1% medium-sized enterprises based on asset MSMEs definition.

women-owned firms face a disadvantage in the market for small-business credit. However, obtaining a formal loan decreases the gap in the performance of women and men-owned firms. Furthermore, using Blinder–Oaxaca decomposition method², we can prove that women entrepreneurs are more likely to demand external access from bank capital.

Our empirical results also indicate that credit plays a vital role within the community to enhance the productivity of MSE businesses. Moreover, we found a significant positive effect of MSE finance on sales and employment within the supported firm. This finding suggests that inclusive financing, which targets micro and small firms and women entrepreneurs, tends to be associated with economic and social gains, leading to overall progress towards sustainable development goals through gender equality and decent jobs.

The rest of the paper is structured as follows: section (3.2) presents the literature review on MSEs and the link between finance structure and firm performance. In section (3.3), we provide stylized facts on the factors affecting access to bank lending, woman entrepreneur, and the market structure of the Indonesian manufacturing sector. Additionally, we provide the distribution of MSEs and TFP using cross-provincial data. Section (3.4) details the methodology, data construction and descriptive statistics. In section (3.5), we present our empirical strategy, firm productivity estimation, and model specifications. The key results of this study and robustness check are presented in section (3.6). Finally, a conclusion and policy recommendations are provided in section (3.7).

3.2. 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 (P. Rosa et al., 1996 and Dezsö & Ross, 2012). However, given this earlier work, there is little work on empirical evidence specific to women (Chirwa, 2008; and Du Rietz & Henrekson, 2000). Therefore, this article fits into two

²The Blinder–Oaxaca decomposition is a statistical method that explains the difference in the means of a dependent variable between two groups by decomposing the gap into that part that is due to differences in the mean values of the independent variable within the groups.

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 first strand of the existing literature has reported mixed evidence of the direct effect of female ownership on firm growth. Several studies ([Fischer, 1992](#); [P. Rosa et al., 1996](#); [Du Rietz & Henrekson, 2000](#); [Fairlie & 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 [P. S. Davis et al. \(2010\)](#), have shown that women-owned firms perform better than men-owned firms or have no gender differences (e.g., [Kalleberg & Leicht, 1991](#); [Elizabeth & Baines, 1998](#); [Watson & Robinson, 2003](#); [Johnsen & McMahan, 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 & Shane \(2007\)](#) that there are no significant gender differences in the performance outcomes of nascent entrepreneurs.

Based on these perspectives, it is possible to hypothesize the reasons for gender performance gaps. On the one hand, personal or environmental constraints that disadvantage women could lead to under-performance 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 & 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 & 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 & 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 & 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 ([P. Rosa et al., 1996](#)). Other studies have shown that women-owned firms are likely to hire more people earlier as firms age ([Belitski & 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 & 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.

The second strand of literature that is relevant to this paper is the role of access to credit for entrepreneurship around the world and women entrepreneurs in particular (see for more details: [Del Mar Alonso-Almeida, 2013](#); [Dezsö & 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 & 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 accessing the credit, [Cowling et al. \(2020\)](#) found that women entrepreneur had lower demand for bank loans. However, they also found that those who did apply were more likely to be successful. In the same context, [Jennings & Brush \(2013\)](#) argues 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.

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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.

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 & Terrell \(2008\)](#) provides 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 ([P. Rosa et al., 1996](#); [Fairlie & Robb, 2009](#)). Conversely, some studies ([Kepler & Shane, 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. Meanwhile, the main contribution of this paper to the existing literature is to explore the microeconomics environment at the firm level to highlight the importance of women entrepreneurs and how access to finance can improve the performance of their firms. In summary, based on these theoretical and empirical studies, the paper aims to strengthen the view that credit programs for MSEs owned by women could significantly affect firms' performance.

3.3. Women entrepreneurs, bank lending, and manufacturing firms in Indonesia: stylized facts

3.3.1. Development of women entrepreneurs in Indonesia

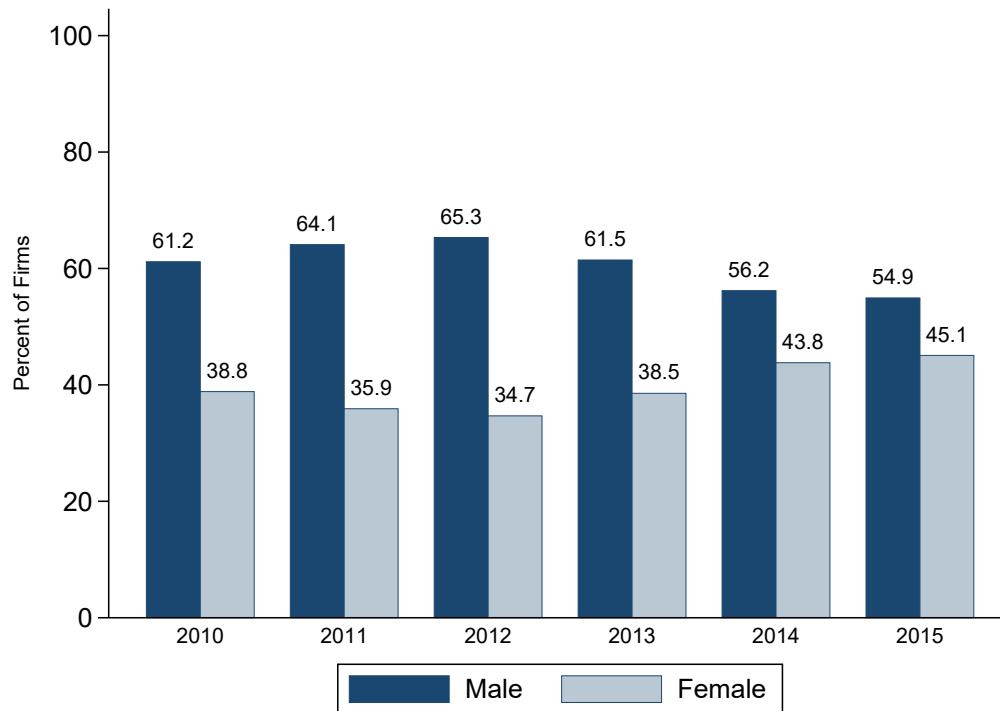
More than half of the total MSEs are owned by men in the manufacturing industry, and women's participation rate as business owners is low compared to men. The Figure (3.1) shows the distribution of firm ownership by gender in Indonesia over time.

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 because 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. As their number continue to rise, women entrepreneurs in Indonesia have been designated therefore as the new engine for economic growth to bring prosperity and welfare in the country.

Existing studies in other countries, [J. M. Rosa & 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.

Figure 3.1: Total MSE in the manufacturing industry by gender of the owner, 2010-2015 (%)



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

3.3.2. Bank lending trend to MSMEs

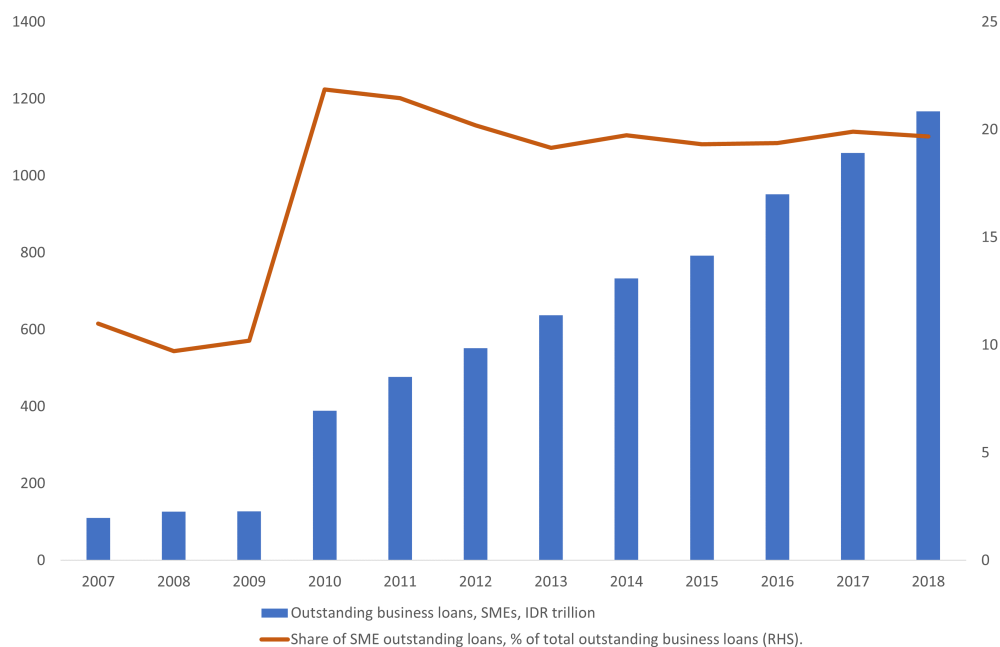
The financing gap in Indonesia between the amount of financing needed and the amount that loans provide, as estimated from the IMF's Financial Access Survey, is as large as 1,320 trillion Rupiah faced by Indonesia's MSMEs. In addition, serving this kind of business is often challenging from a risk-management standpoint due to their limited or no credit history. Consequently, there are many ambitious strategies to solve this challenge to boost potential growth.

For example, to ensure the banking system channels its funds to MSMEs, the financial service authority in Indonesia obliges commercial banks to integrate a minimum ratio of SMEs in their credit portfolios. The authority set the minimum share of SMEs credit to

around 20% in 2010.

As a result, since 2010, the share of lending to MSMEs compared to total bank lending remained around 20% to follow mandates from the financial service authority, as can be seen in Figure 3.2. Accordingly, the figure also shows that the total amount of bank lending channeled to MSMEs has continued to rise by around ten folds, from around 110 trillion IDR in 2007 to 1160 trillion IDR in 2018.

Figure 3.2: Bank lending growth to Micro, Small, and Medium Enterprises, 2007-2018 (%)



Source: Authors' calculation based on Indonesian Financial Service Authority (Otoritas Jasa Keuangan - OJK)

Furthermore, the government has launched a financing scheme called People Business Credit Programme or Kredit Usaha Rakyat (KUR) in 2007. This program aims to increase MSMEs access to finance and works as a bridge for MSMEs to obtain a financing scheme from a financial institution.

One of the best-known institutions to channel KUR is the Bank Rakyat Indonesia (BRI) Micro Business Division (referred to as the BRI Units). According to [Charitonenko & Afwan \(2003\)](#), at the end of 2001, state-owned BRI had served around 30 million clients (27.0 mil-

lion savers and 2.8 million borrowers) through its 3,823 BRI Units and 240 branches. By 2001, BRI accounted for about 43.5% of the total value in outstanding loans in Indonesia.

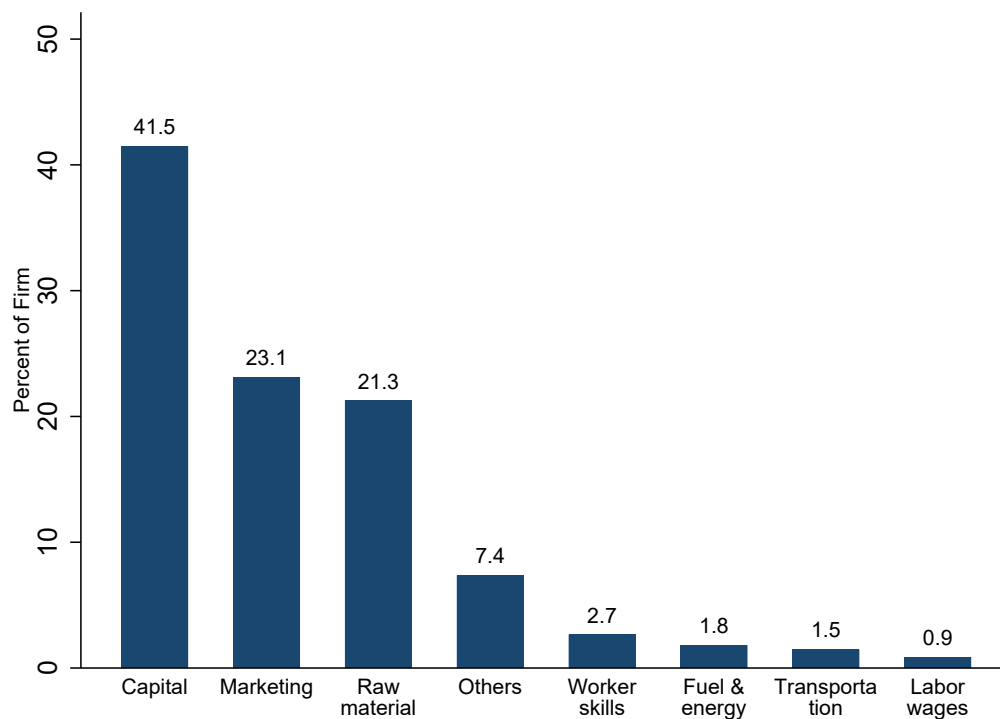
3.3.3. Main difficulties experienced by manufacturing MSEs

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 & Wheeler \(2006\)](#); [Bekele & Worku \(2008\)](#); [Thapa \(2013\)](#); [Das & Mohiuddin \(2015\)](#); [Oyelana & Adu \(2015\)](#); and [Moustafa & Santos \(2016\)](#)), which include lack of capital, marketing difficulties, government policies or regulations that often generate an unfavorable business environment³, access to modern technology, skilled workers, and institutional support.

As shown in the Figure (3.3), 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 various 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 threaten their sustainability ([Abe et al., 2015](#)). The obstacles are 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.

³For 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.

Figure 3.3: Main difficulties experienced by Indonesian manufacturing MSEs (%)



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

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 materials⁴, as well as the remoteness of the place of sale of the raw materials, which often results in high transportation costs. In addition, most of the enterprises interviewed have never received support from their government or the private sector.

3.3.4. Employment structure and average wage by the gender

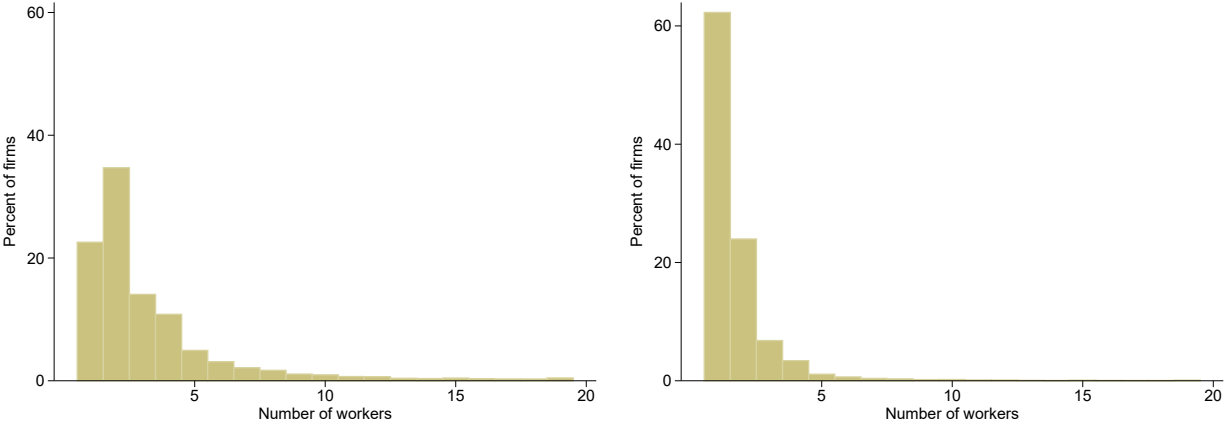
We shed new light on informality in this part, using Indonesia as a case study. The Figure (3.4) presents descriptive statistics on the distributions of the number of workers and,

⁴In 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 & Satrianto, 2014)

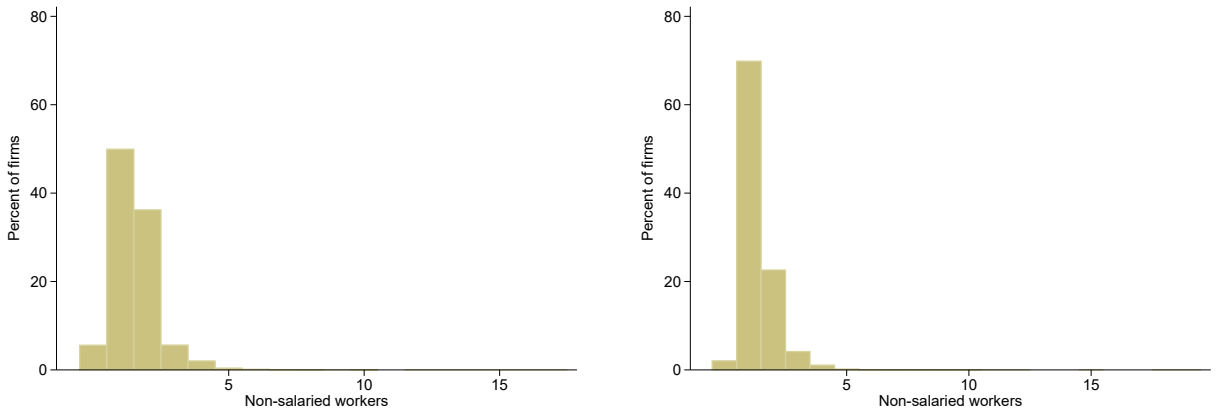
more specifically, on non-salaried workers by gender of the owner. After pooling the 2010-2015 waves of the IMK survey, the Figures (3.4a) and (3.4b) show that more than two-thirds of micro and small firms had no more than two employees in male-owned firms. If we focus only on small firms with more than 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 3.4: Distribution of workers by gender of the owner, 2010-2015

(a) Number of workers by male-owned firms (b) Number of workers by female-owned firms



(c) Non-salaried workers by male-owned firms (d) Non-salaried workers by female-owned firms



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

⁵Micro firms are those with fewer than five employees.

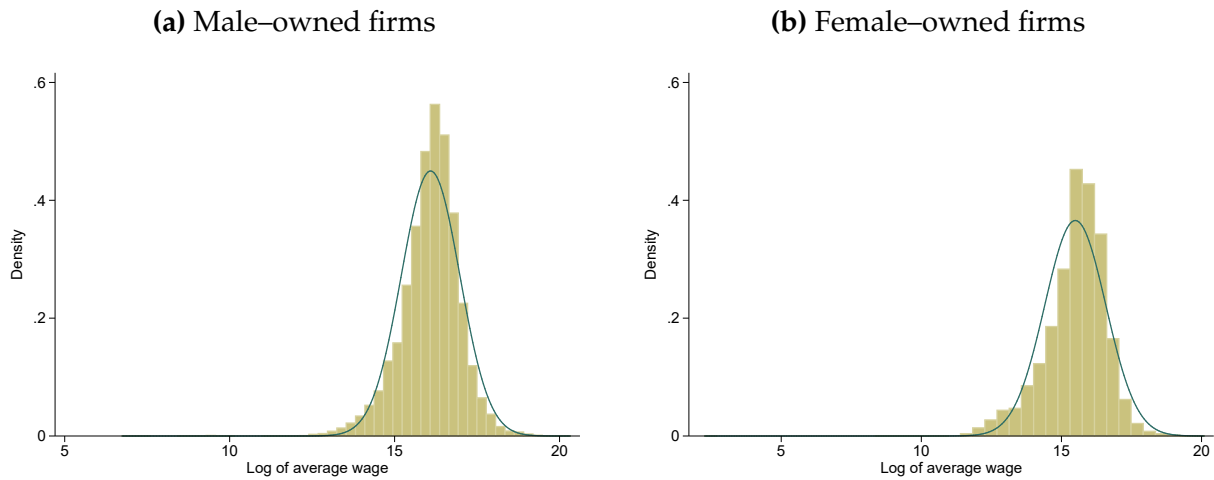
Most Indonesians continue to work in the informal sector despite recent positive employment trends. In Indonesia, based on labor force surveys, researchers have found that the informal sector employs between 61% and 70% of the total workforce (Firdausy, 2000; Bank, 2010). The Figures (3.4c) and (3.4d) measure informal jobs as those attributed to individuals who are unpaid workers. Although informal jobs are preferred by women entrepreneurs because they could offer greater flexibility, they earn less and do not enjoy the benefits associated with formal sector employment. Figure (3.4) 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 & 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 (13) 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 (3.5), 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 developing labor policies and regulations. Thus, Indonesian policymakers face the challenge of representing the concerns and interests of these workers by improving their employment prospects and income security.

Figure 3.5: Distribution of average wage by gender of the owner, 2010-2015



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

3.3.5. Market structure of the Indonesian manufacturing sector

According to [Tijaja & Faisal \(2014\)](#), the manufacturing industry has long been recognized as the backbone of the Indonesian economy. The manufacturing sector contributes 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 (3.1) 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.

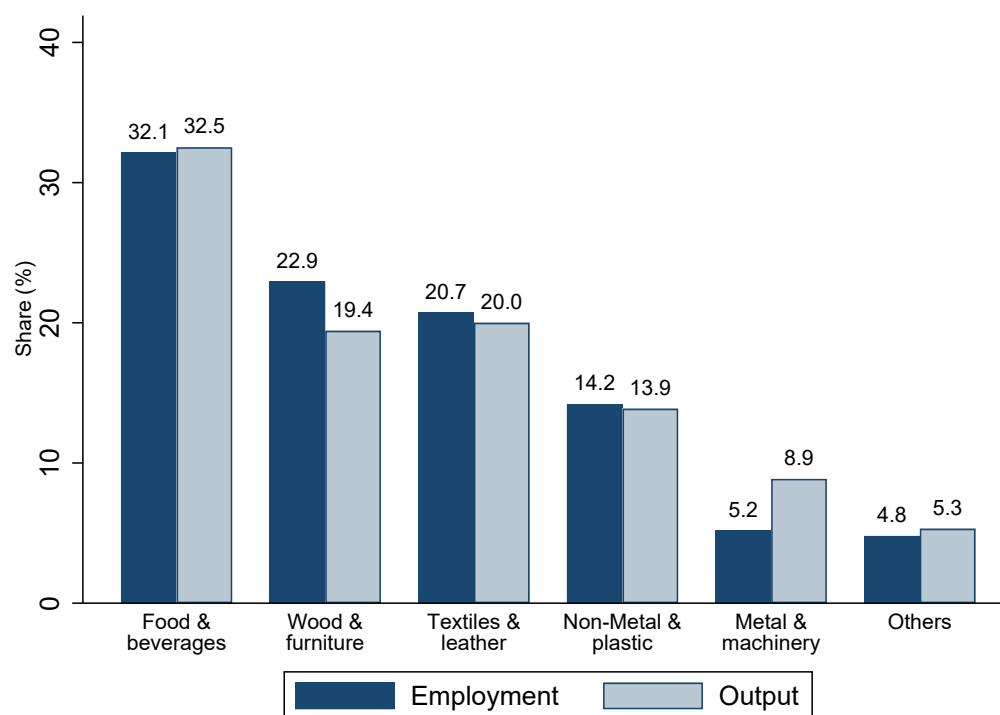
⁶This study uses the two-digit ISIC (the Indonesian Standard Industrial Classification) with codes from 10 to 33, as represented in Table (11).

Table 3.1: 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).

Figure 3.6: Share of employment and output between (2010-2015) in MSEs



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 (3.6), 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, tex-

tiles 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.

3.3.6. Heterogeneity of geographical attributes

This part provides a snapshot of the distribution of women entrepreneurs in Micro and Small Enterprises (MSE) for manufacturing firms in Indonesia using cross-provincial data from all 34 provinces. We follow the research of [Blalock & Gertler \(2008\)](#) who grouped the provinces of Indonesia as geographical units. We thus combined the provinces into five leading island groups: Java, Sumatra, Kalimantan, Sulawesi, and Outer Island.

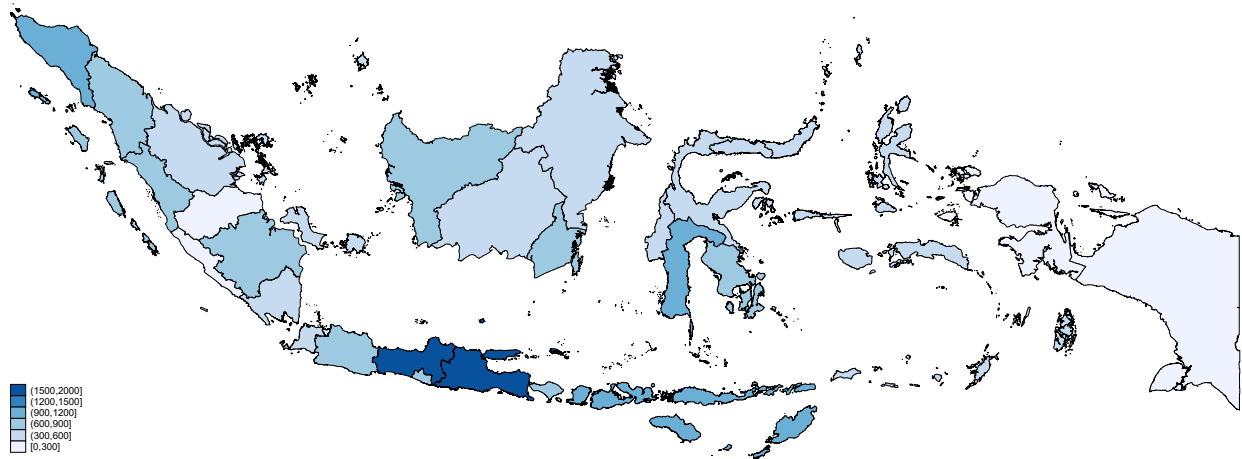
In Figure (3.7) by 2015, we can see that the number of women entrepreneurs is relatively centralized in the western and more developed part of the country with darker colors. This includes the island of Java, Sumatra, and the southern part of Sulawesi. Meanwhile, in the eastern area of Indonesia, we could observe a lighter color which shows a relatively small number of women entrepreneurs. For example, Maluku and Papua, the least developed parts of Indonesia, respectively represented only 3.8% and 1.5% of total women entrepreneurs of MSE in Indonesia in 2015.

The predominance of women entrepreneur MSEs in this western part of Indonesia can be explained from various angles, including the demand side in 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 there. From the perspective of labor supply, population density is highly concentrated on these islands with abundant natural resources, attracting firms to establish their

business 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 women entrepreneurs.

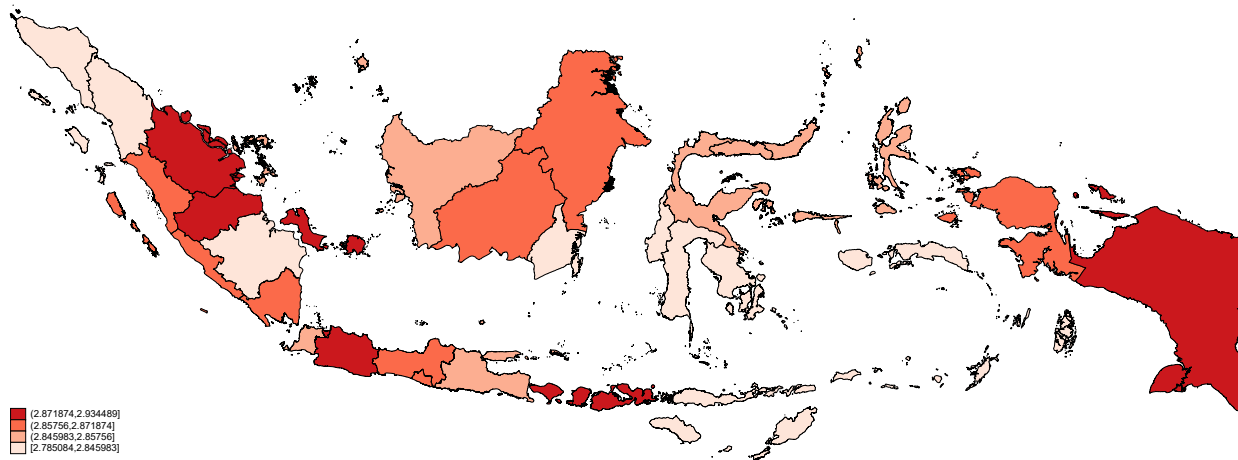
Figure 3.7: Number of Women Entrepreneur of MSEs based on province, 2015



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

Using TFP as a proxy to measure the productivity of the firms, regardless of the gender of the owner, we see in Figure (3.8) that a majority of firms with high productivity reside in 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 the firms to be more competitive and productive. We can also explain the different causes of high productivity in these islands for Sumatra and Kalimantan. In those islands, MSEs productivity can be mainly attributed to palm oil, cocoa, rubber, and other plantation products that are abundant in these islands. Meanwhile, MSEs in Java islands focus more on manufacturing consumer goods to meet demand from their dense populations.

Figure 3.8: Firm productivity (Ln TFP), 2015



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

Interestingly, we also observe abnormality for Papua island with unusually high productivity in the same Figure (3.8). The infrastructure and demand factors are still least developed in Papua, but at least two factors can explain high productivity. First, we notice that the province is a resource-abundant island with minerals like gold and copper. This, in turn, provides extra funds for the local government and major private companies to support MSEs with technical capacity building and financial support to improve their productivity. Second, the province attracts migrants from the eastern part of Java, which is 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 productivity for the MSEs.

In the analytical part of this paper, we try to avoid this heterogeneity issue with different islands characteristics. As suggested by [Amiti & Cameron \(2012b\)](#), we introduce islands times year control variable as a fixed effect, to hold the variations between islands over time.

3.4. Empirical strategy

As highlighted in the introduction, this paper investigates the impact of the financing structure of women-owned MSEs on the firm performance and economic outcomes at the firm level. Moreover, by examining the source of funding and firm characteristics, this paper highlights the role of ownership characteristics (e.g., 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.

3.4.1. 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 & Hassan, 2003). It also accounts for much of the difference in per capita income between countries (Hsieh & 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).

Our study measures 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 inputs⁷. 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:

$$\theta_{it} = \frac{Y_{it}}{f(K_{it}, L_{it})} \quad (3.1)$$

⁷Output 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.

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

$$Y_{it} = f(K_{it}, L_{it}) \theta_{it} \quad (3.2)$$

The next feature in (3.2) is the production technology, which different assumptions can explain. 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. Specifically, the translogarithmic technique generally suffers from a collinearity problem between the regressors. Thus, we assumed that the production technology follows the Cobb-Douglas production function in this study. Therefore, we can write the equation (3.2) as follows:

$$Y_{it} = AK_{it}^{\alpha}L_{it}^{\beta} \theta_{it} \quad (3.3)$$

from the equation (3.3), 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 (3.3) into a linear expression by taking the logarithm of both sides of the equation, we have:

$$\ln Y_{it} = \ln A + \alpha \ln K_{it} + \beta \ln L_{it} + \ln \theta_{it} \quad (3.4)$$

assuming $\theta_{it} = e^{u_{it}}$, So, we can write equation (3.4) as:

$$\ln Y_{it} = \ln A + \alpha \ln K_{it} + \beta \ln L_{it} + u_{it} \quad (3.5)$$

According to equation (3.5), 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 (3.5) 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 (3.5) as follows:

$$y_{it} = a + \alpha k_{it} + \beta l_{it} + \omega_{it} + \epsilon_{it} \quad (3.6)$$

as described above, in the equation (3.6), 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 & 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 & Helmers, 2010).

To address this concern, one of the most common frameworks for estimating firm-level

productivity is the control function approach of [Levinsohn & 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:

$$y_{it} = a + \alpha k_{it} + \beta l_{it} + \gamma m_{it} + \omega_{it} + \epsilon_{it} \quad (3.7)$$

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 :

$$m_{it} = f_t(\omega_{it}, k_{it}, l_{it}) \quad (3.8)$$

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.

$$\omega_{it} = f_t^{-1}(m_{it}, k_{it}, l_{it}) \quad (3.9)$$

By introducing this function that captures the variation in the prediction of firm efficiency ω_{it} in the equation (3.6), the production function can be estimated using semi-parametric methods.

$$y_{it} = \Phi_t(m_{it}, k_{it}, l_{it}) + \epsilon_{it} \quad (3.10)$$

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 (3.10).

3.4.2. Empirical model: Linear regression and Blinder–Oaxaca method

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 following equation gives the econometric specification:

$$FP_{itl} = \alpha_i + \beta_1 FS_{itl} + \beta X_{itl} + \mu_i + \nu_l + \epsilon_{itl} \quad (3.11)$$

Where $FP_{i,t,l}$ is a measure of firm performance. It can be measured by the TFP of the firm (i) at location (l) and time (t) estimated using [Akerberg et al. \(2015\)](#). Note that all variables in our regression were transformed into logarithmic form⁸.

⁸The natural logarithm is used for several variables to improve the goodness of fit of the regression models and to overcome simultaneity bias.

$FS_{i,t,l}$ is the financing source of a firm (i) at location (l) and time (t) and measured by bank lending credit or fully internal capital. Bank lending 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, and zero otherwise.

Meanwhile, fully internal capital is a dummy variable that takes the value of one if the MSE's primary 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 at location l 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_l is a set of location fixed effects. Finally, $\epsilon_{i,t}$ can be interpreted as random shocks.

In terms of econometric methodology, we estimate the equation 3.11 with a linear regression model. This simple technique is selected because our dataset is cross-sectional firm-level data from 2010 to 2015. As a baseline, we use the year 2015, thus $t = 2015$.

We then test the presence of gender differences and whether women entrepreneurs are more constrained than men entrepreneurs in their access to bank lending. We follow the form of this basic econometric model:

$$Y_{itl} = \alpha_i + \beta_1 \text{Woman}_{itl} + \beta X_{itl} + \mu_i + \nu_l + \epsilon_{itl} \quad (3.12)$$

where Y can be an external financing ratio or a binary variable for bank lending; 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.

Finally, we utilize the Blinder–Oaxaca decomposition procedure to assess the decision by firms' owners to obtain bank lending or external financing sources. This methodology could help to study the outcome by gender by decomposing mean differences in the outcome variable (in log) based on linear regression models in a counterfactual manner (Jann,

2008). It divides outcome variables between two groups into a part that is "explained" by group differences in productivity characteristics, such as education, and a residual part that cannot be accounted for such differences in the outcome determinants.

To identify the contribution of group differences in predictors to the overall outcome difference, the basic Blinder–Oaxaca model can be presented as follows:

$$R = \{E(X_A) - E(X_B)\}'\beta_B + E(X_B)'(\beta_A - \beta_B) + \{E(X_A) - E(X_B)\}'(\beta_A - \beta_B) \quad (3.13)$$

Where, $E(Y)$ denotes the expected value of the outcome variable, is accounted for by group A and B differences in the predictors, X is a vector containing the predictors and a constant, and β contains the slope parameters and the intercept.

There are a threefold decomposition in equation 3.13, where the outcome difference is divided into three components. The first component ($\{E(X_A) - E(X_B)\}'\beta_B$), amounts to the part of the differential that is due to group differences in the predictors, or "the endowments effect".

The second component ($E(X_B)'(\beta_A - \beta_B)$), measures the contribution of differences in the coefficients, including differences in the intercept. And the third component ($\{E(X_A) - E(X_B)\}'(\beta_A - \beta_B)$), is an interaction term accounting for the fact that differences in endowments and coefficients exist simultaneously between the two groups.

To estimate the model we use a simple specifications, as follows:

$$Y_{itln} = \alpha_i n + \beta_1 X_{itln} + \beta_2 Z_{itln} + \epsilon_{itln}, \quad n = [Male, Female] \quad (3.14)$$

where Y can be an external financing ratio or a binary variable for bank lending; X is a vector of observable firm characteristics of the firm; Z is a vector of observable characteristics of the owner observe by education; ϵ is error; and n is a decomposition between male and female entrepreneurs.

3.5. Data and variables

This section describes data and variable construction. The detailed firm-level data allows us to address determinants on the productivity of women entrepreneurs, with particular attention to their access to bank lending. Thereby we can identify the underlying channels through which changes in the firm-level characteristics affect their overall performance.

3.5.1. Data description

We used the Micro and Small Industries Survey (IMK) data as the main data source of this analysis provided by BPS⁹. This survey designed by BPS is a complete annual enumeration of micro and small firms. Besides, the information on the ISIC level is available in the published summary form of the survey, while the firm-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 by which micro-enterprises employ 1-4 people, and small enterprises employ 5-19 people.

In this study, we observe IMK survey in 2015 as a baseline for the analysis. The dataset consists of around 48.000 unique firms' identifiers. On this note, we acknowledge the limitation of analysis using IMK survey since the data is not longitudinal. Thus, we cannot follow the same firm in different years, limiting the estimation using the panel dataset. Additionally, aggregating the data to sector or province level to build a panel dataset will resulting a very few observations and did not provide a meaningful result. Therefore, we decide to use data from 2015 as the basis and presented the other year in the robustness check.

Industries are classified according to the 2-digit ISIC (ISIC rev.4), which yields 24 industries represented in the sample (see Table 11 in the Appendices). Provinces are classified as location identifiers and comprise 34 different jurisdictions across the archipelago. This dataset of firm-level manufacturing establishments contains detailed information, includ-

⁹The Indonesian Census of Manufacturing is part of a decennial Economic Census that uses the Indonesian Standard Industrial Classification (ISIC) for all economic activities.

ing firm identification, sector classification, type of ownership, workforce structure (number of paid, unpaid, male, and female workers), the wage bill of workers, and financial characteristics of MSEs. Among others, firms are asked various questions about their production, output, value-added, capital, and labor. All the monetary variables are deflated using the consumer price index (CPI) with 2010 = 100.

3.5.2. Descriptive statistics

The Table (12) reports summary statistics of the variables used in this study, and the definitions of variables used in our empirical research are represented in Table (10) can be found in the appendices.

Dependent variables: firm performance

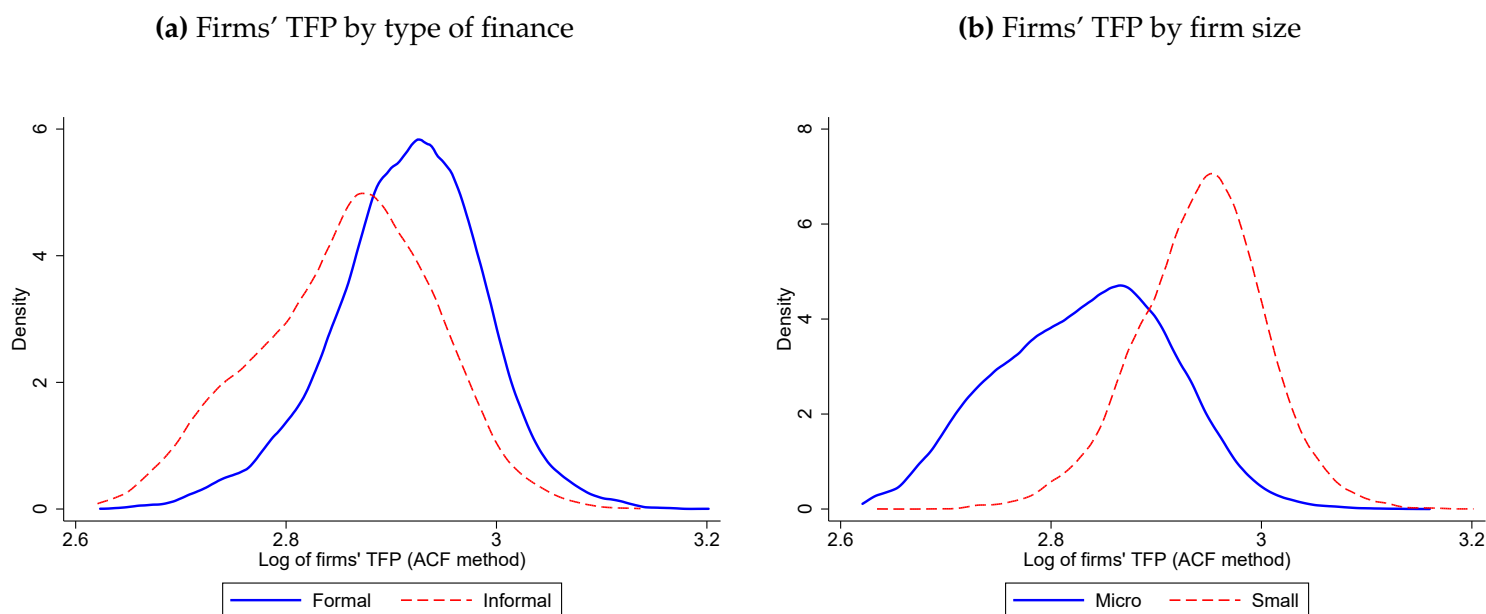
We measure the performance of MSEs by using TFP as the main dependent variables. The paper also checks other indicators that can help explain firm performance through sales, labor productivity, employment, and wages.

In this paper, we use the TFP as calculated by [Akerberg et al. \(2015\)](#) estimation of the production function. According to our descriptive analysis, we found that the average TFP of Indonesian enterprises is 2.85, which is in line with [Şeker & Saliola \(2018\)](#)'s research, who conducted a cross-country analysis of TFP performances of manufacturing firms in 69 emerging economies. Within the South East Asia region, these numbers are slightly lower than those of Vietnam (average TFP ranged from 1.16 to 4.01) but ahead of Thailand (1.06 to 2.78) and Malaysia (1.14 to 3.37).

Furthermore, when we illustrate the firms' TFP using kernel density form, we observe variation based on the source of finance and their size. In Figure 3.9a, we can see that firms with access to formal financing, such as bank lending, will have a higher productivity compared with the firms with access to informal financing or those firms which rely exclusively from internal financing. The graph provide snapshots that firms that can access formal lending will have advantage to increase their productivity. Meanwhile, if we

shows the kernel density estimation of TFP by the size, we observe that the distribution of small firms is skewed relatively to the right than micro firms, which demonstrates that, on average, companies of larger size show a higher productivity level.

Figure 3.9: Kernel density of firms' TFP (log)



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

We also calculate labor productivity as the ratio of the value of output produced and the number of workers involved¹⁰. Ideally, a measure of firm productivity that is proxied by labor productivity is used because it is an informative measure of firms' unit labor cost, which is employed by entrepreneurs to make decisions on profitable opportunities. Moreover, it indicates whether firms use and allocate resource input most efficiently for productive uses (Hsieh & Klenow, 2010).

To check the robustness of our results, we also test our estimation using other measure of firms' performance. First, we use sales revenue as an indicator for overall performance which reveals how much a company earns, and it can help firms to manage their bud-

¹⁰The more traditional approach of using value-added as the numerator is not adopted because value-added information is not available in our database. However, the use of output is acceptable and more appropriate because the output is measured at firm level.

gets effectively¹¹. Second, we use labor specification to measure firms performance by number of workers that the firms hired (employment) and the payment for their service (wage). Most MSEs, especially micro-enterprises, are family businesses. So for example, according to our dataset, the total number of workers in 2015 includes as many as 7.414.818 people, comprising (36.55%) paid workers and (63,45%) non-paid workers¹². However, this percentage varies by group of the industry, which suggests that industries with more complicated production processes are required to employ high skilled labor from non-family members.

Independent variables: structure and access to finance

To look on the determinants of firms' performance, we first look on several independent variables that relate to the structure and access to finance. First, we observe the importance of internal financing using dummy to represent this variable. From our dataset, we find evidence that internal financing sources (77%) are favored as a mean of securing financing for MSEs in Indonesia, especially during the start-up stage. While, only 23% of the surveyed firms have access to an external source of finance. This is inline with other studies that mention the role of internal financing, such as [Ayyagari et al. \(2010\)](#) and [Abe et al. \(2015\)](#), where small businesses tend to use internal funding sources, especially at start-up stage and then they substitute it with external funding when their business grows.

Second, we also include variable dummy variable of informal financing when the firms look for external finance sources such as from individual loans (26%), family loans (14.3%) and other loans (22.2%)

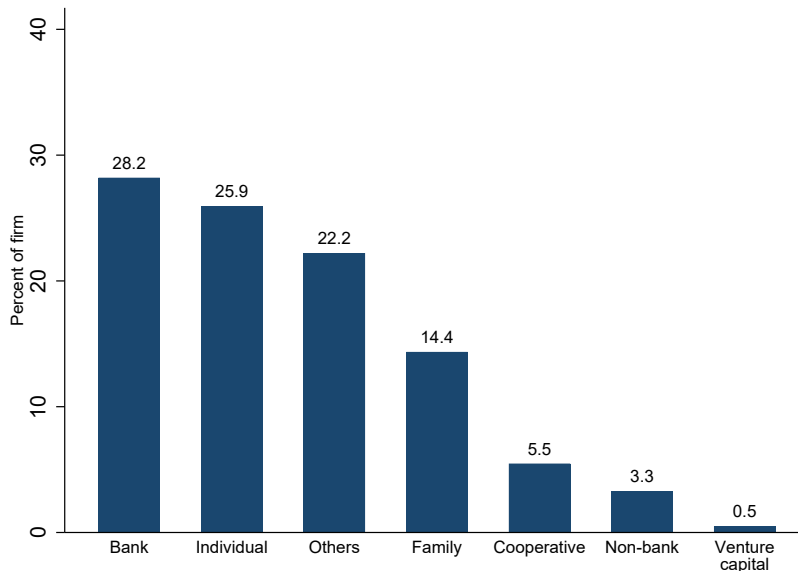
Third, we use bank lending as a proxy of formal financing sources. This is based on the bank dominance as a loan provider, as shown in our dataset that only 40% firms have their financing through formal financial institution which the majority coming from bank loans (28%), while the rest is from cooperative loans (5.5%), non-bank financial institu-

¹¹We used the indirect taxes as a proxy of sales as the higher purchase of goods or services by the consumers, the higher revenues for the firm.

¹²For unpaid workers who work less than 1/3 applies regular working hours (one week) in a company/business is not included as a worker.

tions (3.3%) and venture capital (0.5%). The variable of bank loan is also important since in the MSE survey, there are a follow up questions for those firms which finance their activities by bank loan. These questions includes a)the amount of bank loan, b) share of collateral that are used to obtain the loan, and c) whether the bank loan is part of government subsidized program. In addition, we add

Figure 3.10: Credit structure of MSEs: Different types of external finance (%)

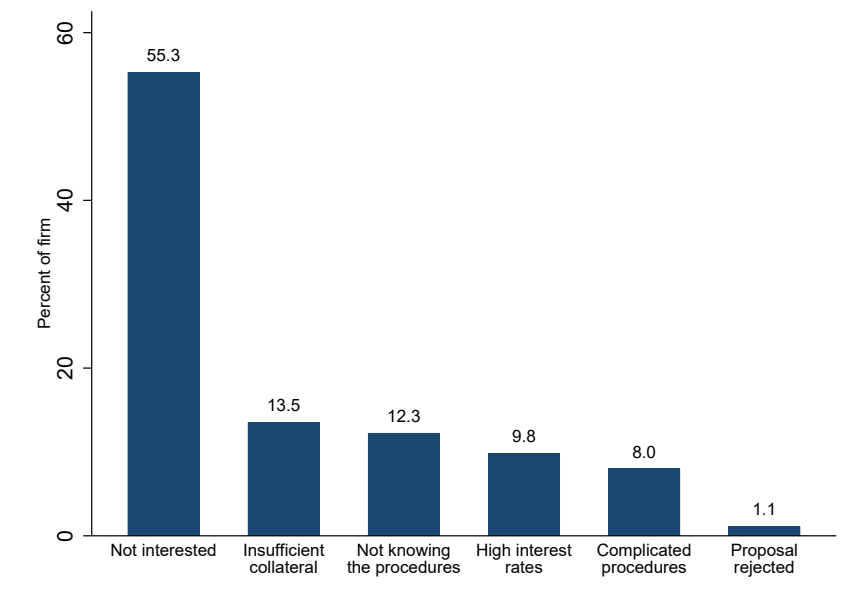


Source: Authors' calculation based on Indonesian Statistics Agency (BPS).

We also observe that there is no single dominant reason why firms do not borrow from bank. On Figure 3.11, from surveyed firms that are not borrow from the bank, more than 55% of the firms mention that they are not interested to obtain bank loan. One of the main reasons for the MSEs not to apply for a bank loan is that 55% of the owners do not want to obtain a loan from the commercial banks. Furthermore, other main reasons include high collateral requirements by the banks (notably in Java, Bali, and Sumatra) and transaction costs which can be attributed to 13.5% of respondents which indicated for instance; cost of information, cost of finance and the complexity of procedures which amounted to 12.3%, 9.8%, and 8% respectively.

Finally, we also observe the amount of interest expense as a variable to determine firms

Figure 3.11: Credit structure of MSEs: Reasons for not applying for a loan (%)



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

performance. Interest rate expense indicate that the firms are able to look for external sources of financing. However, high interest rate spending could be counterproductive to increase productivity as the firms need to allocate their resource for debt payment instead of spending on capital or additional workers. Unfortunately, we cannot differentiate the source of external financing based on the interest expense only. This is important because informal financing tend to charge higher interest rate than a formal financing sources. Therefore, to capture the effect, we use the share of interest expense to total asset, as a proxy of their interest rate.

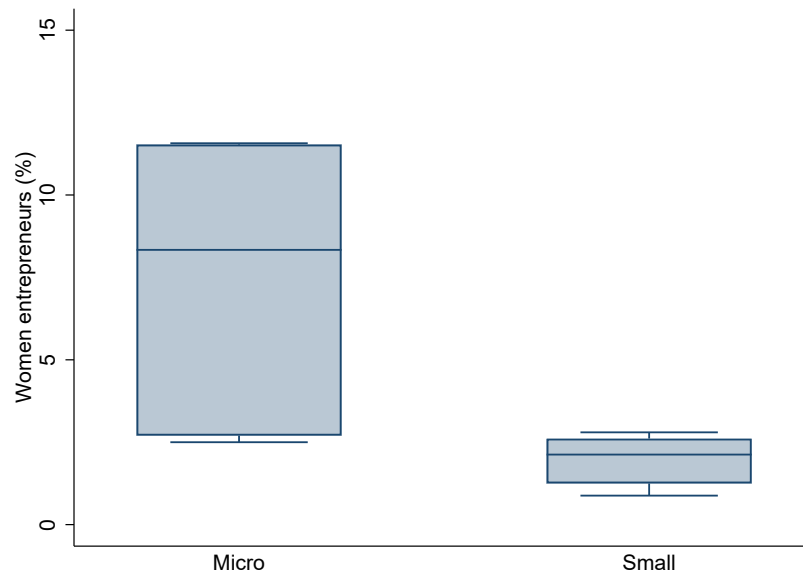
Control variables: firm characteristics

Having obtained our measure and objective to access structure-financing variables, it is essential to control firm characteristics as they reflect the creditworthiness and resources of a firm that the lender might take into account while making a decision to lend. We find that heterogeneity of firms in terms of access to credit and improve their performance may

arise due to firm characteristics, such as firm size, firm age, legal structure, and the sectors that they are belong in.

In our sample, we measure size by two definitions. First, is based the number of employment as formal definition of size by the Indonesian Statistical Agency. In this category, the majority of surveyed firms are micro firms at 88% while around 12% are small firms. Accordingly, the majority of women entrepreneurs also part of the micro sized firms, as shown in Figure 3.12.

Figure 3.12: Percentage of women entrepreneurs by firm size



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

We also use sales band as a proxy to determine the size of the firms, following [Cowling et al. \(2020\)](#). We define four category based on the monthly sales of the firms, with the lowest band is less than 5 millions IDR and the highest band is more than 90 millions IDR.

For firms age, we observe great variations in our dataset, where firms on average are 14 years old, but some firms are more than 100 years old. In line with previous research, recent studies have shown that firm age seems to have a significant effect on accessing bank financing (e.g., [Chavis et al. \(2011\)](#); [Mac an Bhaird & Lucey \(2010\)](#); [Huyghebaert & Van de Gucht \(2007\)](#)). This means that younger firms rely more on other sources of financ-

ing (e.g., loans from family and friends, internal or state-subsidized financing)¹³; whereas more mature firms use more formal financing sources including bank loans, equity and retained earnings as they already have track records, credit history and established relationships, which decrease information asymmetries for capital providers (Berger & Udell, 2002).

On the legal front, in our sample, MSEs are categorized into four main types, such as sole proprietorship, private limited company, limited partnership, and cooperative. The most common legal form under MSEs is a sole proprietorship, which represented 95% of the total sample. Nevertheless, we observed that a firm with sole proprietorship also recruits workers, most of them unpaid. While paying attention to the gender of the firm owner, we pointed out that men own most MSEs in our data, which amounted 59% of the total sample. Nevertheless, we observe the number of firms owned by women (or women entrepreneur), is increasing over our observation time from 2010 until 2015.

Finally, we add the industry classification to provide heterogeneity in sector analysis, in determining the firms' performance. In descending order, we observe from our dataset that more than 27% MSE firms is producing food products, followed by wood and cork sector by 18,8% other non-metallic mineral products by 11,4%, textiles by 9,6%, wearing apparel by 9,1%, and other sectors are less than 5% in share. We first use this industry classification as independent variable in our baseline model, but later on we also examine the firms performance in sector level analysis by applying panel data estimation as a robustness test.

Control variables: owner characteristics

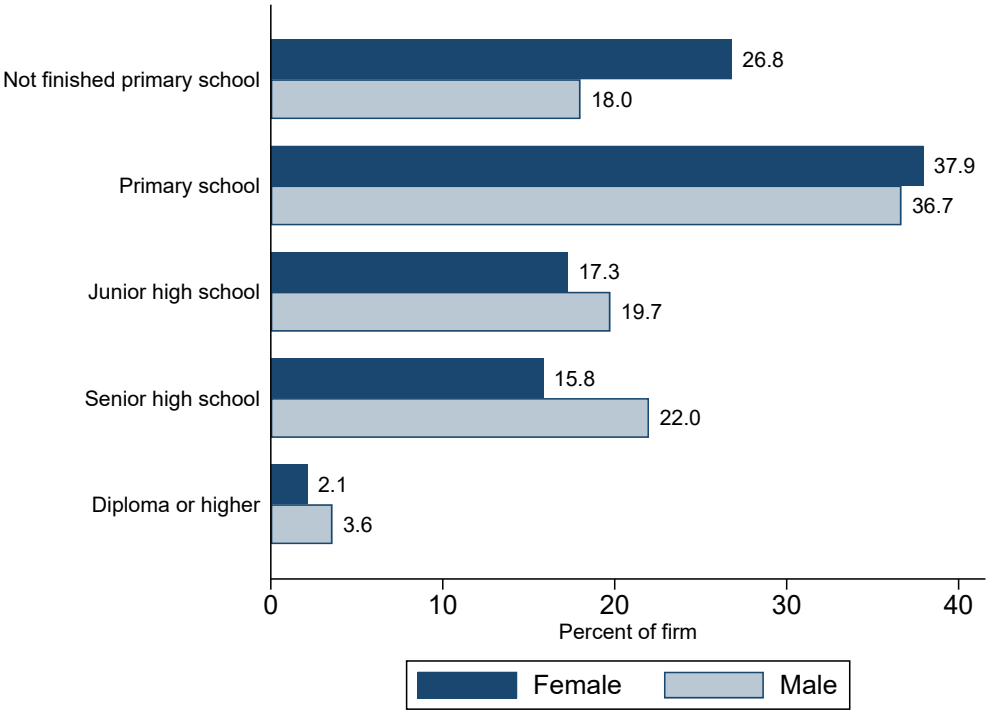
In observing owner characteristics, the education categories of the owners stands out. Within education categories, we observe that the majority of the MSEs in Indonesia are owned by less educated people, despite education is the most effective tool for human development (Wamaungo, 2011) and can help to strengthen or improve the financial in-

¹³Formal capital providers such as banks are more inclined to provide short term debt for younger firms as it is more flexible and the contract is easier to terminate in case the firm does not develop as expected (Huyghebaert & Van de Gucht, 2007).

clusion and financial literacy (Abdu, 2014). We found that 59% of the firm owners have a low level of education with no schooling or have only completed primary school education. On the other hand, only 19,5% of the owners completed high school and only 3% recorded university degree-level education.

Interestingly, there is the relationship between education level and gender, as shown in Figure 3.13. This figure shows that female entrepreneurs, on average, have a lower level of education. For example, female entrepreneurs accounted for 41% of all micro and small enterprises, but close to 27% of them have not completed any schooling compared to only 18% of male owners who did not finish primary school. Moreover, 16% of women entrepreneur have a senior high school degree, compared to 22% of the male owners in the same category.

Figure 3.13: Educational attainment of MSEs: By gender (%)



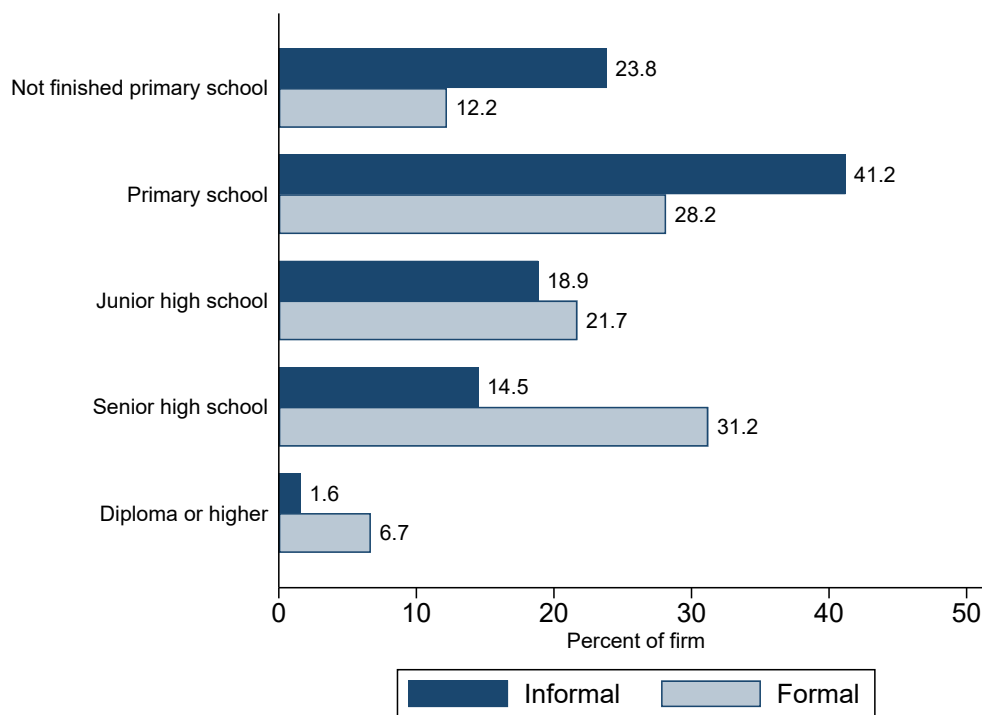
Source: Authors’ calculation based on Indonesian Statistics Agency (BPS).

Furthermore, as it can be observed in Figure 3.14, well-educated entrepreneurs have more

likely to access the formal financial institution than low educated entrepreneurs. For instance; entrepreneurs who have completed high school are more likely to have access to formal financing at 31%, compared to entrepreneur who have not finished primary school at 12%.

These differences in educational attainment suggest that more educated entrepreneurs, particularly males, have relatively better access to formal financial institutions for financing needs.

Figure 3.14: Educational attainment of MSEs: By type of finance (%)



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

3.6. 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 the gender of the owner, source

of capital, and firm productivity. We aim to investigate our main hypothesis to positively link the relationship between women entrepreneurs and bank lending to positively affect MSEs performance.

Then, we explore the probability of women entrepreneur to access credit from bank. Next, we assess the decomposition of factors for women to access bank credit, using the blinder–Oaxaca decomposition method. Finally, we check with other measures of firm performance to examine the varying impact of financing structures on firm performance.

3.6.1. Firms' productivity, women entrepreneur, and source of finance

In this part, we first run linear estimating specifications to assess the interaction between women entrepreneurs, bank lending, and firms productivity. Since our dataset is a yearly cross-sectional, we take a sample using year=2015 as our baseline, with the models mentioned in Equation 3.11.

We present in Table (3.2) the baseline result of our empirical model to assess the relationship between women entrepreneurs, 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 and gender of the owner and source of financing as the main independent variables. Columns (5-6) present the regression results on TFP using firm characteristics as the control variables; meanwhile, columns (7) explore owner characteristics as the control variables. We first set the financing structure between bank capital and full internal capital for each dependent variable as the only independent variables. Then we use control variables that include firm and owner characteristics in the equations. This empirical model includes industry-fixed effects and the province (location) fixed effect on the block to hold variation constant for our regression.

In all of our specifications, we consistently observe that gender of the owner will affect firms' productivity significantly. Our results in columns (1) to (7) show that in 2015, firms owned by women will have lower productivity between 4% to 6%, significant at 1% level confident interval rate. The results show consistency with previous literature that firms

owned by women tend to be less productive than men. To further motivate this result, Figure (3.9) 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.

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 & 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.

Columns (2) and (4) show the paper's key results on how bank capital could give an advantage to women entrepreneurs to increase their productivity. In column (2), the bank lending variables' coefficients show 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 5.9% chance of increasing TFP compared to another source of financing. In column (4), the interaction variables show that if women own the MSE and the firm seeks bank lending as their source of finance, this combination will positively increase their productivity, significant at a 1% level confident interval.

On the other hand, in columns (1) and (2), we show that firms that use only internal sources of financing have lower productivity, with a negative and statistically significant coefficient in affecting productivity. To be more precise, in column (1), firms that use only internal financing will have 2,4% lower TFP productivity, significant at a 1% level. 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

Table 3.2: Total factor productivity, gender, and access to credit in 2015

| Dependent Variable: ln(TFP Acfest) | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|--|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Main independent variables | | | | | | | |
| Gender of the owner | -0.057*** (0.002) | -0.054*** (0.002) | -0.054*** (0.002) | -0.043*** (0.003) | -0.040*** (0.003) | -0.040*** (0.003) | -0.043*** (0.003) |
| Dummy internal capital | -0.024*** (0.002) | | -0.000 (0.002) | 0.004 (0.003) | -0.003 (0.002) | -0.000 (0.002) | -0.000 (0.003) |
| Dummy bank capital | | 0.059*** (0.001) | 0.059*** (0.001) | 0.056*** (0.001) | 0.034*** (0.001) | 0.040*** (0.001) | 0.047*** (0.001) |
| Gender x internal capital | | | | -0.011** (0.004) | -0.006** (0.003) | -0.008** (0.003) | -0.009** (0.004) |
| Gender x bank capital | | | | 0.012*** (0.003) | 0.015*** (0.003) | 0.017*** (0.003) | 0.011*** (0.003) |
| Firm characteristics | | | | | | | |
| Sole proprietorship | | | | | -0.014*** (0.002) | -0.021*** (0.002) | |
| Size (1=micro, 2=small) | | | | | 0.071*** (0.001) | 0.077*** (0.001) | |
| Firm age(Log) | | | | | 0.003*** (0.000) | | |
| Firm's age: 0-2 years | | | | | | -0.015*** (0.001) | |
| Firm's age: 3-5 years | | | | | | -0.001 (0.001) | |
| Firm's age: 6-10 years | | | | | | -0.002** (0.001) | |
| Firm's age: 11-15 years | | | | | | 0.011*** (0.001) | |
| Food and beverages | | | | | | 0.003** (0.001) | |
| Wood products and furniture | | | | | | 0.002 (0.001) | |
| Textiles and leather products | | | | | | 0.001 (0.001) | |
| Non-metal and plastic products | | | | | | 0.001 (0.003) | |
| Metal and machinery products | | | | | | -0.003* (0.002) | |
| Ownership characteristics - education | | | | | | | |
| Education of the Owner | | | | | 0.015*** (0.000) | | |
| Primary school | | | | | | | 0.014*** (0.001) |
| Junior high school | | | | | | | 0.036*** (0.002) |
| Senior high school | | | | | | | 0.049*** (0.002) |
| Diploma or higher | | | | | | | 0.061*** (0.002) |
| Province cluster | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry cluster | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Observations | 48,042 | 48,042 | 48,042 | 48,042 | 48,042 | 48,042 | 48,042 |
| <i>R – squared</i> | 0.133 | 0.167 | 0.167 | 0.167 | 0.280 | 0.241 | 0.224 |

Standard errors in parentheses
 * p<0.10, ** p<0.05, *** p<0.01

productivity with access to formal financial institutions.

In columns (5) and (6), our main result also holds when we include firm-specific variables in our regression model, namely firm size, firm age, legal structure, manufacturing industry where the firms belong, and the owner's education. The coefficients on bank capital and women entrepreneurs that seek lending from the banks will have positive productivity, highly significant at the 1% level. Meanwhile, the coefficients for women entrepreneurs who use only internal financing are negative, significant at the 5% level.

For the firm characteristics, with respect to firm size, this variable is one of the most studied aspects of firm productivity (e.g., [Bartelsman & Doms \(2000\)](#) and [Ahn \(2001\)](#)). The coefficient estimates for firm size are positive and statistically significant at the 1% level in columns (5) and (6) in the Table (3.2). The result indicates that small firms positively impacted 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.

Consistently, the sole proprietorship is negatively related to firm productivity, as its coefficients are significantly negative at the 1% level in column (5 and 6). 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 & Mazzotta \(2015\)](#). Based on this result, we argue that the sole proprietorship is less likely to support firm growth and less innovative than 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.

Our result shows positive results when we examine the effect of firm age on firm productivity. Column (5) shows that the coefficient on firm age is positively significant at the 3% level with TFP in 2015. Meanwhile, in column (6), we break down this variable into five sub-categories to seek the heterogeneity of the result. Interestingly, a startup company

will tend to have lower productivity, while after ten years of operation, the firms will start to record positive productivity, significant at 1% level.

To illustrate this result, the studies of [Musamali & 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.

Finally, on ownership characteristics in column (7), we add the variable of education as the independent variable. 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 firm's productivity will increase significantly when the entrepreneur is more educated in their ability to manage financial resources.

From Table 3.2, the result suggests that there is a significant difference in performance for women entrepreneurs who also obtain bank capital. Therefore, access to bank capital is essential for women entrepreneur to increase their productivity. To further investigate if women entrepreneurs have access to external capital, the next section will observe further using probit and tobit analysis.

3.6.2. Women entrepreneur and bank lending

Impact of women entrepreneurs on the probability of access to credit

In this part, 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 bank capital, using the year 2015 as the baseline. We follow the form of this basic econometric model in Equation 3.12. 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 (3.3). Columns (1-3) show the results of estimating 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 to improve access to financial services for both men and women, 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 11 and 14 percentage points lower than that of male-owned small businesses and micro-enterprises, accordingly. 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 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 more significant 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 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' standard 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 over-representation 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 handi-

Table 3.3: Access to credit and the role of woman entrepreneur

| Dependent variable | Tobit models: External financing ratio | | | Probit models: Bank capital | | |
|---------------------|--|----------------------|----------------------|-----------------------------|----------------------|----------------------|
| | All firms (1) | Micro firms (2) | Small firms (3) | All firms (4) | Micro firms (5) | Small firms (6) |
| Woman entrepreneur | -0.137*** (0.015) | -0.143*** (0.014) | -0.110*** (0.038) | -0.040*** (0.003) | -0.022*** (0.002) | -0.070*** (0.017) |
| Firm size(log) | 0.336*** (0.014) | 0.367*** (0.017) | 0.207*** (0.050) | 0.058*** (0.001) | 0.050*** (0.005) | 0.056*** (0.020) |
| Firm age(Log) | -0.041*** (0.005) | -0.047*** (0.007) | -0.006 (0.012) | -0.006*** (0.001) | -0.001 (0.001) | -0.006 (0.006) |
| Sole proprietorship | -0.117*** (0.017) | -0.130*** (0.030) | -0.116*** (0.027) | -0.042*** (0.006) | -0.043*** (0.009) | -0.136*** (0.027) |
| Primary school | 0.010 (0.023) | 0.020 (0.026) | -0.058* (0.035) | 0.010*** (0.003) | 0.006 (0.003) | -0.001 (0.026) |
| Junior high school | 0.077*** (0.021) | 0.083*** (0.024) | 0.040 (0.044) | 0.031*** (0.003) | 0.019*** (0.007) | 0.045** (0.021) |
| Senior high school | 0.078*** (0.017) | 0.095*** (0.020) | -0.009 (0.031) | 0.047*** (0.002) | 0.033*** (0.007) | 0.064*** (0.024) |
| Diploma or higher | 0.082*** (0.025) | 0.087*** (0.033) | 0.037 (0.050) | 0.058*** (0.006) | 0.044*** (0.009) | 0.099* (0.053) |
| Province cluster | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry cluster | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 46,425 | 42,930 | 3,495 | 48,042 | 37,566 | 3,079 |
| Pseudo R^2 | 0.097 | 0.070 | 0.074 | 0.139 | 0.049 | 0.058 |

Notes: The definition of the variables used in the regressions are given in Table (10). 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 errors. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

crafts. This explanation is in line with the study of [Tambunan \(2017\)](#); (ii) because of these simple and small-scale activities, no particular 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 con-

sistent 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 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 4.1%, consistent with the increasing likelihood of having external sources of financing. Further, sole proprietorships have a lower probability of obtaining credit than other legal ownership forms.

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.

Decomposition of gender role to obtain bank lending

In this part, we empirically employ Blinder–Oaxaca decomposition, following the work of [\(Cowling et al., 2020\)](#). Using the method, we can separate the gender differences in credit demand that is explained by the institutional, individual and behavioral characteristics of businesses run by men and women, from those attributed to gender discrimination.

Table 3.4 reports the results for Blinder–Oaxaca decomposition for external financing ratio and bank lending. The predicted likelihood for women entrepreneurs to increase their

external finance is 7.7%, and the probability for men is 3.7%, both significant at 1% level. The overall difference of 4.0% is also significant at 1% level, indicating that female owners have a notably higher willingness to seek external finance than male owners.

Around less than half of this overall difference (1.6%, $p < 0.01$) is attributed to the model predictors, which means that given the business and owner characteristics, women would have a higher propensity to increase their external financing ratio in the first place.

Nevertheless, the unexplained part shows that a female entrepreneur is 2.8% more likely to apply for finance ($p < 0.05$) even if he runs the same business as a comparable male entrepreneur. The latter coefficient estimate clearly shows that a higher external financing ratio for women entrepreneurs is also driven by other factors unrelated to personal and firm-specific demographics.

For bank lending, we obtain a similar positive result. The predicted likelihood for women entrepreneurs applying for bank loans is 10.5%, and the probability for men is 3.5%, both significant at 1% level. The overall difference of 7.0% is also significant at 1% level, indicating that female owners have a notably higher willingness to seek bank lending than female owners.

Almost half of this overall difference (3.1%, $p < 0.01$) is attributed to the model predictors, which means that given the business and owner characteristics, women would have a higher propensity to seek bank finance in the first place. The unexplained part, never the less, shows that a female entrepreneur is 3.9% more likely to apply for finance ($p < 0.05$) even if she runs exactly the same business as a comparable male entrepreneur. The shows that higher loan demand by women entrepreneurs is also driven by other factors unrelated to personal and firm specific demographics.

The result from Blinder–Oaxaca decomposition method is very encouraging. The result shows that in 2015, women entrepreneurs had a higher propensity to increase their external financing ratio and apply for bank lending than their male counterparts.

Table 3.4: Decomposition of gender to access finance

| Dependent variable | External financing ratio | | Bank lending | |
|-----------------------|--------------------------|-----------------------|---------------------|-----------------------|
| | Overall effect | | Overall effect | |
| Female-led MSEs | 0.077*** (0.002) | | 0.105*** (0.003) | |
| Male-led MSEs | 0.037*** (0.001) | | 0.035*** (0.002) | |
| Female-male | 0.040*** (0.003) | | 0.070*** (0.003) | |
| Endowment Effect | 0.016*** (0.001) | | 0.031*** (0.001) | |
| Discrimination Effect | 0.024*** (0.002) | | 0.039*** (0.003) | |
| Independent variable | Individual effect | | Individual effect | |
| | Endowment (1) | Discrimination (2) | Endowment (3) | Discrimination (4) |
| Employment (Log) | 0.016*** (0.001) | 0.026*** (0.002) | 0.028*** (0.001) | 0.019*** (0.003) |
| Firm age(Log) | 0.000 (0.000) | -0.016*** (0.000) | -0.000 (0.000) | -0.023*** (0.000) |
| Sole proprietorship | 0.000 (0.000) | -0.016*** (0.000) | 0.001*** (0.000) | -0.054*** (0.000) |
| Primary school | 0.000 (0.000) | -0.002** (0.000) | 0.000 (0.000) | 0.001*** (0.000) |
| Junior high school | -0.000 (0.000) | 0.002** (0.000) | 0.000** (0.000) | 0.001* (0.000) |
| Senior high school | 0.000 (0.000) | 0.000 (0.000) | 0.001*** (0.000) | 0.001*** (0.000) |
| Diploma or higher | 0.000 (0.000) | 0.000 (0.000) | 0.000** (0.000) | 0.000** (0.000) |
| Province cluster | Yes | Yes | Yes | Yes |
| Industry cluster | Yes | Yes | Yes | Yes |
| Observations | 48,042 | 48,042 | 48,042 | 48,042 |

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

3.6.3. Robustness test

This part shows 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. Finally, we explore the baseline regression using an alternative base year from the MSE's survey.

Alternative productivity measure

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 (3.11) to include other performance-related variables to assess the impact of access to finance and how the firm is managed, giving us:

$$FP_{itl} = \alpha_i + \beta_1 \text{Financing source}_{itl} + \beta X_{itl} + \mu_i + \nu_l + \epsilon_{it} \quad (3.15)$$

Where $FP_{i,t,l}$ is a measure of firm performance. It can be measured by sales, employment, and wages paid by the firm i in the period t at location l . We use $t=2015$ as a baseline year for analysis in this specification. Financing source is the dummy variable that takes the value 1 if firms finance their activity by bank lending (or internal finance) and zero otherwise. $X_{i,t,l}$ is a vector of firm i 's control variables at a period t and location l that could affect the probability of obtaining a loan. The following variables are also considered: μ_i is a firm-level fixed effect, ν_l is a set of province fixed effects, and $\epsilon_{i,t,l}$ is the error term.

The Table (3.5) presents the results of the other alternatives. Our result shows that measuring firm performance by sales or employment rather than productivity does not significantly alter the main results in the Table (3.2), 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 in all specifications, the gender of the owner affects firms' productivity measures. Women entrepreneurs consistently have negative and significant coefficients affecting productivity, sales, employment, and the real wage.

Furthermore, in column (1), we observe that bank capital can improve productivity measured by [Levinsohn & Petrin \(2003\)](#) method, even after controlling for a set of firm-level

Table 3.5: Robustness test using alternative measures of firm performance

| | (1) | (2) | (3) | (4) | (5) |
|-----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | ln(TFP_LP) | ln(Labor_prod) | Firm sales (log) | ln(Employment) | ln(Real wage) |
| Gender of the owner | -0.488*** (0.035) | -0.555*** (0.035) | -0.861*** (0.038) | -0.306*** (0.007) | -0.661*** (0.042) |
| Internal Capital | -0.069** (0.025) | -0.079*** (0.026) | -0.123*** (0.037) | -0.044** (0.019) | 0.129** (0.047) |
| Bank capital | 0.520*** (0.022) | 0.549*** (0.021) | 0.681*** (0.017) | 0.132*** (0.012) | 0.307*** (0.023) |
| Gender x bank capital | 0.040 (0.038) | 0.074* (0.038) | 0.227*** (0.043) | 0.153*** (0.019) | 0.116* (0.064) |
| Size | 0.123*** (0.034) | 0.407*** (0.031) | 1.704*** (0.031) | 1.297*** (0.028) | 1.091*** (0.027) |
| Firm age(Log) | 0.054*** (0.005) | -0.083*** (0.005) | -0.069*** (0.008) | 0.014*** (0.003) | 0.019** (0.009) |
| Sole proprietorship | -0.204*** (0.020) | -0.224*** (0.022) | -0.316*** (0.038) | -0.091*** (0.021) | -0.277*** (0.030) |
| Primary school | 0.217*** (0.012) | 0.224*** (0.012) | 0.253*** (0.013) | 0.030*** (0.004) | 0.232*** (0.017) |
| Junior high school | 0.519*** (0.020) | 0.533*** (0.020) | 0.596*** (0.022) | 0.063*** (0.007) | 0.433*** (0.019) |
| Senior high school | 0.673*** (0.015) | 0.695*** (0.014) | 0.795*** (0.013) | 0.100*** (0.006) | 0.577*** (0.028) |
| Diploma or higher | 0.635*** (0.033) | 0.683*** (0.035) | 0.900*** (0.042) | 0.217*** (0.012) | 0.644*** (0.035) |
| Province cluster | Yes | Yes | Yes | Yes | Yes |
| Industry cluster | Yes | Yes | Yes | Yes | Yes |
| Observations | 48,042 | 48,042 | 48,042 | 48,042 | 15,268 |
| <i>R – squared</i> | 0.187 | 0.236 | 0.383 | 0.498 | 0.368 |

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

variables. Consequently, bank lending led to an estimated 52% increase in productivity at the 1% significance level. However, the interaction variable between gender and bank capital is positive but insignificant in this specification.

In column (2), the bank capital can also improve labor productivity, even after controlling for firm-level variables. Consequently, bank lending led to an estimated 55% increase in labor productivity at the 1% significance level. Meanwhile, the interaction variable between gender and bank capital is positive and significant at a 1% level in this specifications, showing that women entrepreneur who seeks lending from the bank will increase their labor productivity by 7,4%.

We find evidence that bank lending can improve sales (column 3) in our data, even after controlling for a set of firm-level variables. Consequently, bank lending led to an estimated 68% increase in sales at the 1% significance level. The gender and bank capital interaction variable are also positive and significant at a 1% level, increasing sales by 22.7%, respectively. 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 (4), we then explore whether changes in employment can explain our results. Employment increases significantly by about 13% if the firm borrows from banks. Meanwhile, the interaction between gender and bank capital can increase employment by 15.3%, significant at a 1% level. 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.

Lastly, our result also significantly impacts real wages when assessing the link between access to bank lending and wages, as presented in columns (5). Bank lending could increase the real wage by 30% while the interaction variables between gender and bank capital have a more modest increase to real wage at 11.6%, significant at 1% level.

In terms of additional controls, although they have retained more or less the similar sign

and significance as our basic econometric specification results. The same Table (3.5) highlights some interesting interpretations that reinforce the previous results. 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 than 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.

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. 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 & Cameron \(2012b\)](#) when dealing with Indonesian data.

Table (3.6) 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 bank lending, women entrepreneur, and firm performance as measured by TFP using the ACF method. Our main variables for bank lending 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. Moreover, consistent with the results in Table (3.5), the coefficients are significant for the interaction term of bank lending with women entrepreneurs. Finally, column (3) shows that the main baseline result remains robust when measuring labor productivity, with significant coefficients for gender, bank lending, size, age, legal status, and owner's edu-

Table 3.6: Robustness test: excluding Java island

| | (1) | (2) | (3) |
|-----------------------|----------------------|----------------------|----------------------|
| | ln(TFP) | ln(TFP_LP) | ln(Labor_prod) |
| Gender of the owner | -0.045*** (0.002) | -0.493*** (0.038) | -0.564*** (0.039) |
| Internal Capital | -0.004** (0.002) | -0.003 (0.022) | -0.016 (0.022) |
| Bank Capital | 0.035*** (0.001) | 0.525*** (0.025) | 0.553*** (0.024) |
| Gender x bank capital | 0.014*** (0.002) | 0.094* (0.047) | 0.123** (0.044) |
| Size | 0.066*** (0.002) | -0.013 (0.040) | 0.290*** (0.031) |
| Firm age(Log) | 0.004*** (0.000) | 0.049*** (0.007) | -0.089*** (0.007) |
| Sole proprietorship | -0.017*** (0.002) | -0.226*** (0.017) | -0.245*** (0.019) |
| Primary school | 0.013*** (0.001) | 0.205*** (0.021) | 0.207*** (0.020) |
| Junior high school | 0.031*** (0.002) | 0.488*** (0.026) | 0.496*** (0.027) |
| Senior high school | 0.042*** (0.001) | 0.649*** (0.019) | 0.663*** (0.019) |
| Diploma or higher | 0.045*** (0.003) | 0.622*** (0.041) | 0.657*** (0.043) |
| Province cluster | Yes | Yes | Yes |
| Industry cluster | Yes | Yes | Yes |
| Observations | 30,342 | 30,342 | 30,342 |
| <i>R – squared</i> | 0.259 | 0.130 | 0.176 |

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

cation.

Alternative baseline period

The non-longitudinal data is the main limitation of the Micro and Small Manufacturing Firms Survey dataset. Therefore, we could not follow the same firm in different years to make a panel data analysis. For that reason, we can only do an empirical test using linear regression and choose one year as a baseline. In this case, we choose data from 2015 as it contains more complete surveyed firm in one annual period¹⁴.

To provide robustness in the result, in this part, we are estimating equation 3.11 again with a dataset from a different year. We run the specifications using six years of data from 2010 to 2015. We present the result of these estimations in table 3.7.

From the table, in all specifications, we found that most of the baseline year results are consistent. First, we observe that gender of the owner is negative and significant in affecting productivity. If the gender of the owner is female, the TFP will be lower between 3.7% to 7.8% in our observation period, compared to the male owner.

Our main interest in bank capital remains positive and significant in affecting productivity. This means that firms that receive financing from banks will be more productive by 3.3% to 4.0%, compared to firms that do not borrow from banks. The interaction variable between gender and bank is also positive and significant in every year of observation, except for 2014.

Two probable reasons caused the result to differ in 2014. The first possibility is that Indonesia had a major political event for the elections of the president during the year. Second, the year 2014 also marks the fall of commodity prices in Indonesia, which caused an economic slowing down since Indonesia relies on its growth to commodity export such as palm oil and coal. Nevertheless, the result shows that in most years, women entrepreneurs who borrow from the bank will increase their productivity.

¹⁴For example, dataset from 2011 and 2012 are based by sample in quarterly period rather than directly annual data, makin the total number of surveyed firms fall more than half observation in other years.

Table 3.7: Robustness test: Alternative baseline year

| Dependent Variables: ln(TFP) | (1) 2010 | (2) 2011 | (3) 2012 | (4) 2013 | (5) 2014 | (6) 2015 |
|------------------------------|----------------------|----------------------|----------------------|---------------------|----------------------|----------------------|
| Gender of the owner | -0.062*** (0.014) | -0.077*** (0.021) | -0.078*** (0.012) | -0.037* (0.018) | -0.050** (0.020) | -0.040*** (0.003) |
| Internal Capital | -0.001 (0.003) | -0.003 (0.005) | 0.011 (0.006) | 0.006* (0.003) | 0.007 (0.008) | -0.003 (0.002) |
| Bank capital | 0.039*** (0.006) | 0.033*** (0.005) | 0.041*** (0.005) | 0.038*** (0.004) | 0.040*** (0.007) | 0.034*** (0.001) |
| Gender x internal capital | 0.000 (0.007) | 0.012 (0.007) | 0.019*** (0.006) | -0.012** (0.005) | -0.003 (0.007) | -0.006** (0.003) |
| Gender x bank capital | 0.041** (0.015) | 0.042** (0.017) | 0.041*** (0.009) | 0.027** (0.010) | 0.025 (0.016) | 0.015*** (0.003) |
| Sole proprietorship | -0.009*** (0.002) | -0.005* (0.003) | -0.008 (0.006) | -0.005 (0.005) | -0.019*** (0.004) | -0.014*** (0.002) |
| Size | 0.071*** (0.009) | 0.073*** (0.011) | 0.077*** (0.012) | 0.078*** (0.009) | 0.077*** (0.008) | 0.071*** (0.001) |
| Firm age(Log) | 0.001 (0.003) | 0.002 (0.003) | 0.003 (0.002) | 0.001 (0.003) | 0.000 (0.003) | 0.003*** (0.000) |
| Education of the Owner | 0.016*** (0.003) | 0.014*** (0.002) | 0.013*** (0.002) | 0.015*** (0.002) | 0.016*** (0.003) | 0.015*** (0.000) |
| Observations | 48,730 | 14,806 | 16,214 | 33,336 | 50,420 | 48,042 |
| <i>R – squared</i> | 0.383 | 0.407 | 0.383 | 0.357 | 0.333 | 0.280 |

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

We found variable for internal capital remained negative and not significant for most of the year we observed. However, for the interaction between the gender of the owner and internal capital, the result is mixed. We obtained positive and significant results in 2012, but the coefficients turned negative and significant in 2012 and 2015. The variable remains insignificant for the years 2010, 2011, and 2014.

For firm characteristics variables, our result in table 3.7 shows that size of the firm and the education of the owner remains highly positive and significant in affecting productivity. Meanwhile, the legal status and firm age result is not held every year.

This exercise shows that our main interest variable of bank lending and women entrepreneurs remains hold in affecting productivity. For a more robust analysis using micro and small manufacturing dataset, the Indonesian Statistical Agency should consider a longitudinal

data collection, similar to the survey for medium and large enterprises. Alternatively, the agency should also consider adding questions on financing resources for those medium and large enterprises.

3.7. Conclusion and policy recommendations

We used a dataset from MSEs enterprises provided by Indonesia's central statistics agency (Badan Pusat Statistik, BPS) to analyze the role of bank lending, women entrepreneurs, and firm performance in Indonesia. Our findings suggest that men entrepreneurs do perform better than women entrepreneurs. This finding is thus consistent with the fact that women-owned firms face a disadvantage in the market for small-business credit. However, obtaining a formal loan decreases the gap in the performance of women and men-owned firms. Furthermore, using Blinder–Oaxaca decomposition method, we can prove that women entrepreneurs are more likely to demand external access from bank capital.

Our empirical results also indicate that credit plays a vital role within the community to enhance the productivity of MSE businesses. Moreover, we found a significant positive effect of MSE finance on sales and employment within the supported firm. This finding suggests that inclusive financing, which targets micro and small firms and women entrepreneurs, tends to be associated with economic and social gains, leading to overall progress towards sustainable development goals through gender equality and decent jobs.

Through various robustness test and checking our estimation with another baseline year, we are confident that providing better access to finance will benefit women entrepreneur to thrive.

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 suggests where reform efforts should be focused. A more inclusive approach, for example reaping the

potential of digital finance to improve access to credit, will benefit MSEs.

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 economy's potential 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 benefit 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 and 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.

Conclusion

In this dissertation, we explore empirical analysis to provide evidence on the relationship of policy reform, commodity price shocks, and gender to the labor demand, wage structure, and firms' performance on manufacturing firms in Indonesia. Thanks to manufacturing data for: (a) Micro and small enterprises, and (b) Medium and large enterprises, the analysis provided here will help to understand better the impact of economic shocks to labor market equilibrium.

The first chapter explores the source of wage inequality between skilled and unskilled workers in a microeconomics environment. We contribute to growing recent literature arguing that financial liberalization in developing countries increases income inequality. We explore how financial liberalization through reducing barriers to entry for financial entities has affected the wage skill premium or the wage difference between skilled and unskilled workers. We suggest that through capital-skill complementarity theory, financial liberalization will allow firms to increase their capital and relatively increase the skilled worker's wage to increase the skill premium.

After controlling for different firm characteristics, we found that the financial reforms will increase the skill premium. We also found only large firm that will enforce the positive relationship between financial reform and skill premium. Overall, the financial reform also have positive impact to the firm performance, increasing their productivity and sales. Financial reforms will affect the wage for skilled labor while at the same time decreasing their relative demand. These results are robust even after controlling for different financial liberalization index and controlling for the Asian financial crisis.

The second chapter tries to assess the relationship between the movement in the price

for main agricultural products in Indonesia, palm oil, to the labor demand and wage structure in Indonesia's manufacturing firms. We explore a rich dataset of firm-level data in Indonesia for medium and large enterprises in analyzing the relationship to find several main findings.

First, we observe that a rise in palm oil prices will lead to an increase in the sales of palm oil processing firms, reduce demand for labor (primarily the skilled worker), and increase the wage for skilled labor. Meanwhile, we cannot find evidence that change in palm oil price will affect skill premium in palm oil processing firms.

Second, we found the finding is more relevant to the period after the Asian Financial Crisis. We observe that labor demand and wage was negatively affected by the Asian Financial Crisis. Third, found evidence that palm oil price changes during the commodity boom and bust period will affect overall manufacturing firms. A rise in palm oil prices will increase the sales and wage of the labor.

Fourth, looking at the firms' characteristics, we found that smaller and domestic-oriented firms will benefit from increasing palm oil prices. They will have a higher sale, increasing demand for labor, and could provide higher wages for their labor. Finally, on the industry level, we found that when palm oil prices increase, the palm-oil-related industry and other industries will enjoy higher sales, increase demand for labor, and would be able to provide higher wages.

The final chapter analyze the role of women entrepreneurs and bank lending to firm performance in Indonesia. Our findings suggest that men entrepreneurs do perform better than women entrepreneurs. This finding is thus consistent with the fact that women-owned firms face a disadvantage in the market for small-business credit. However, obtaining a formal loan decreases the gap in the performance of women and men-owned firms. Furthermore, using Blinder-Oacaxa decomposition method, we can prove that women entrepreneurs are more likely to demand external access from bank capital.

Our empirical results also indicate that credit plays a vital role within the community to enhance the productivity of MSE businesses. Moreover, we found a significant positive effect of MSE finance on sales and employment within the supported firm. This find-

ing suggests that inclusive financing, which targets micro and small firms and women entrepreneurs, tends to be associated with economic and social gains, leading to overall progress towards sustainable development goals through gender equality and decent jobs. Through various robustness test and checking our estimation with another baseline year, we are confident that providing better access to finance will benefit women entrepreneur to thrive.

The conclusion of this dissertation are relevant for policymaker in Indonesia. We noted that the government could undertake a policy reform that will improve access to financial support, especially for firm owned by women. The labor market in Indonesia also really affected by fluctuations in global commodity price. For this reason the government need to take extra effort in providing social security system for labor, especially the unskilled one, to reduce wage inequality among labors. Therefore they will be more resilient should the country experiencing shocks such as economic crisis, commodity bust, or even the health pandemic.

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Appendices

.1. Appendix A

Table 8: Descriptive statistics

| Variables | (1) N | (2) Mean | (3) Standard Deviation | (4) Min | (5) Max |
|-------------------------------|----------|-------------|---------------------------|------------|------------|
| Firm | 298,448 | 26,102 | 14,354 | 1,750 | 55,770 |
| Credit controls | 298,448 | 2 | 0 | 2 | 2 |
| Interest rate controls | 298,448 | 2.949 | 0.220 | 2 | 3 |
| Entry barriers | 298,448 | 2.525 | 0.499 | 2 | 3 |
| Banking supervision | 298,448 | 0.460 | 0.498 | 0 | 1 |
| Privatization | 298,448 | 0.331 | 0.470 | 0 | 1 |
| International flow of capital | 298,448 | 1.986 | 0.341 | 1 | 3 |
| Security markets | 298,448 | 2 | 0 | 2 | 2 |
| Skilled wage (ln_ws) | 250,394 | 9.389 | 1.065 | -4.867 | 18.63 |
| Unskilled wage (ln_wu) | 298,149 | 8.798 | 0.871 | -0.367 | 16.95 |
| Average wage (ln_wage) | 298,268 | 8.901 | 0.883 | 0.114 | 16.96 |
| Skill premium (ln_ws_wu) | 250,275 | 0.496 | 0.915 | -16.53 | 9.431 |
| Skill share | 298,448 | 0.154 | 0.154 | 0 | 1 |
| Relative demand | 258,933 | -1.834 | 1.057 | -10.74 | 5.597 |
| Foreign ownership | 298,448 | 0.0686 | 0.253 | 0 | 1 |
| Government ownership | 298,448 | 0.0969 | 0.296 | 0 | 1 |
| Size | 298,448 | 4.232 | 1.202 | 0.693 | 11.66 |
| Medium | 298,448 | 0.665 | 0.472 | 0 | 1 |
| Large | 298,448 | 0.316 | 0.465 | 0 | 1 |
| Import share | 276,775 | 0.0557 | 0.151 | 0 | 1 |
| Export share | 276,780 | 0.0834 | 0.254 | 0 | 1 |
| Age | 298,448 | 5.045 | 4.189 | 0 | 15 |
| Sales (log) | 276,779 | 14.09 | 2.202 | 0 | 23.91 |
| TFP Acfest | 153,797 | 2.057 | 0.141 | -3.480 | 2.820 |

.2. Appendix B

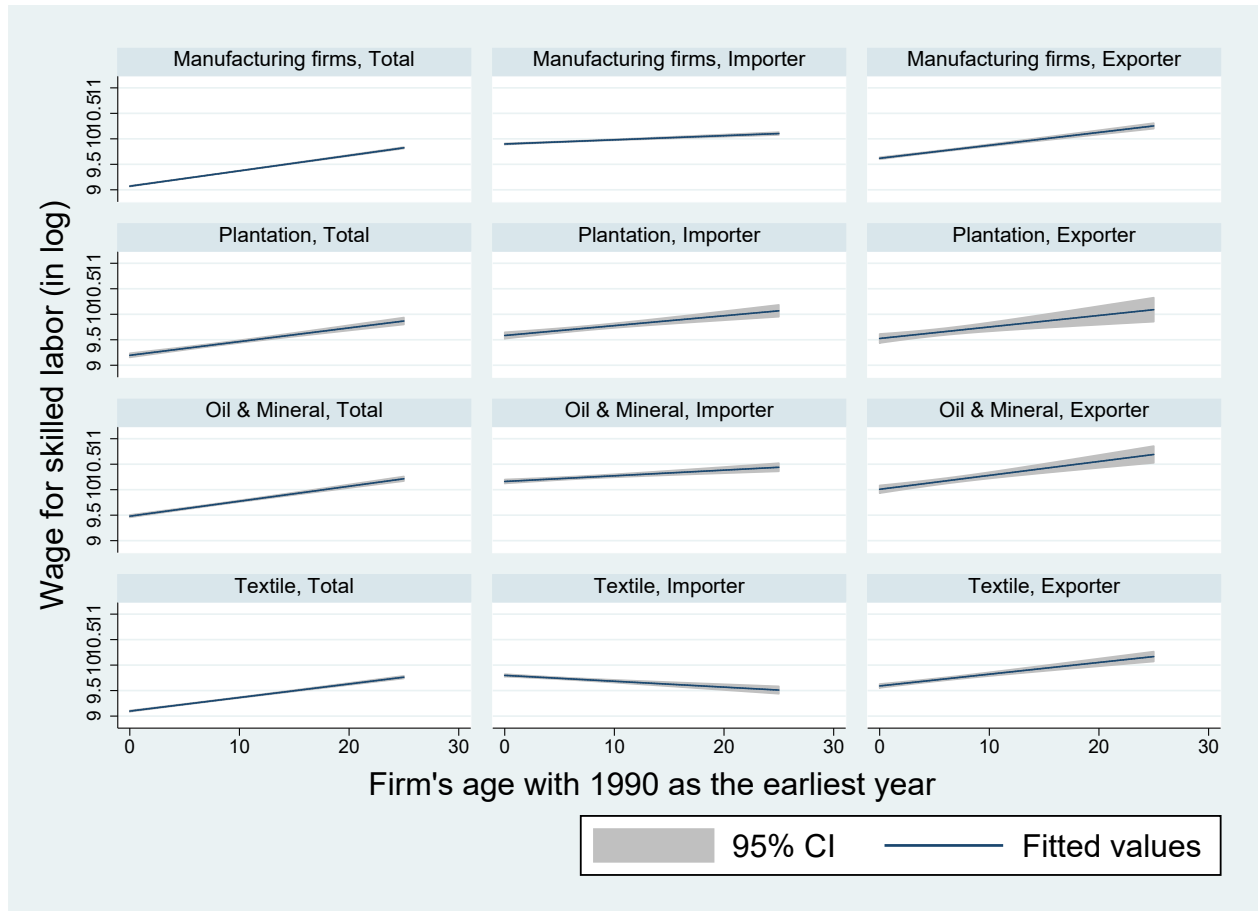
.2.1. Additional Table

Table 9: Descriptive statistics

| | Variables | N | Mean | Standard Deviation | Min | Max |
|-------------|------------------------------|---------|----------|--------------------|---------|---------|
| Firm levels | Skilled wage - $\ln(ws)$ | 329,055 | 9.454 | 1.039 | -5.550 | 18.27 |
| | Unskilled wage - $\ln(wu)$ | 411,602 | 8.954 | 0.976 | -2.726 | 16.94 |
| | Average wage - $\ln(wage)$ | 566,901 | 0.96197 | -5.0978 | 16.9631 | |
| | Skill premium - $\ln(ws/wu)$ | 328,687 | 0.379 | 0.880 | -15.79 | 8.703 |
| | Sales (log) | 527,587 | 14.7044 | 2.347798 | 0 | 25.629 |
| | Importer (FM == 1) | 412,222 | 0.174 | 0.379 | 0 | 1 |
| | Exporter (FX==1) | 412,222 | 0.0676 | 0.251 | 0 | 1 |
| | Foreign Ownership | 412,222 | 0.0455 | 0.208 | 0 | 1 |
| | Government Ownership | 412,222 | 0.0583 | 0.234 | 0 | 1 |
| | Size | 412,219 | 3.980 | 1.037 | 0.693 | 10.62 |
| | Skill share | 412,219 | 0.151 | 0.160 | 0 | 1 |
| Tariff | Output tariff_1990 | 123 | 22.2552 | 10.99933 | 0 | 56.85 |
| | Output tariff_2015 | 175 | 8.127829 | 11.35043 | 0 | 139.71 |
| | Input tariff_1990 | 123 | 4.351125 | 6.281429 | 0 | 36.5132 |
| | Input tariff_2015 | 175 | 3.791264 | 6.287708 | 0 | 46.5281 |
| Price | Price palm oil | 26 | 530.3 | 233.1 | 199.2 | 1,171 |
| | Price rubber | 26 | 71.34 | 46.90 | 22.12 | 215.3 |
| | Price crude oil | 26 | 46.21 | 34.26 | 10.41 | 114.5 |
| | Price coal | 26 | 55.03 | 30.21 | 25.10 | 123.8 |

.2.2. Additional Graphs

Figure 15: Skilled wage trend by industry and trade status



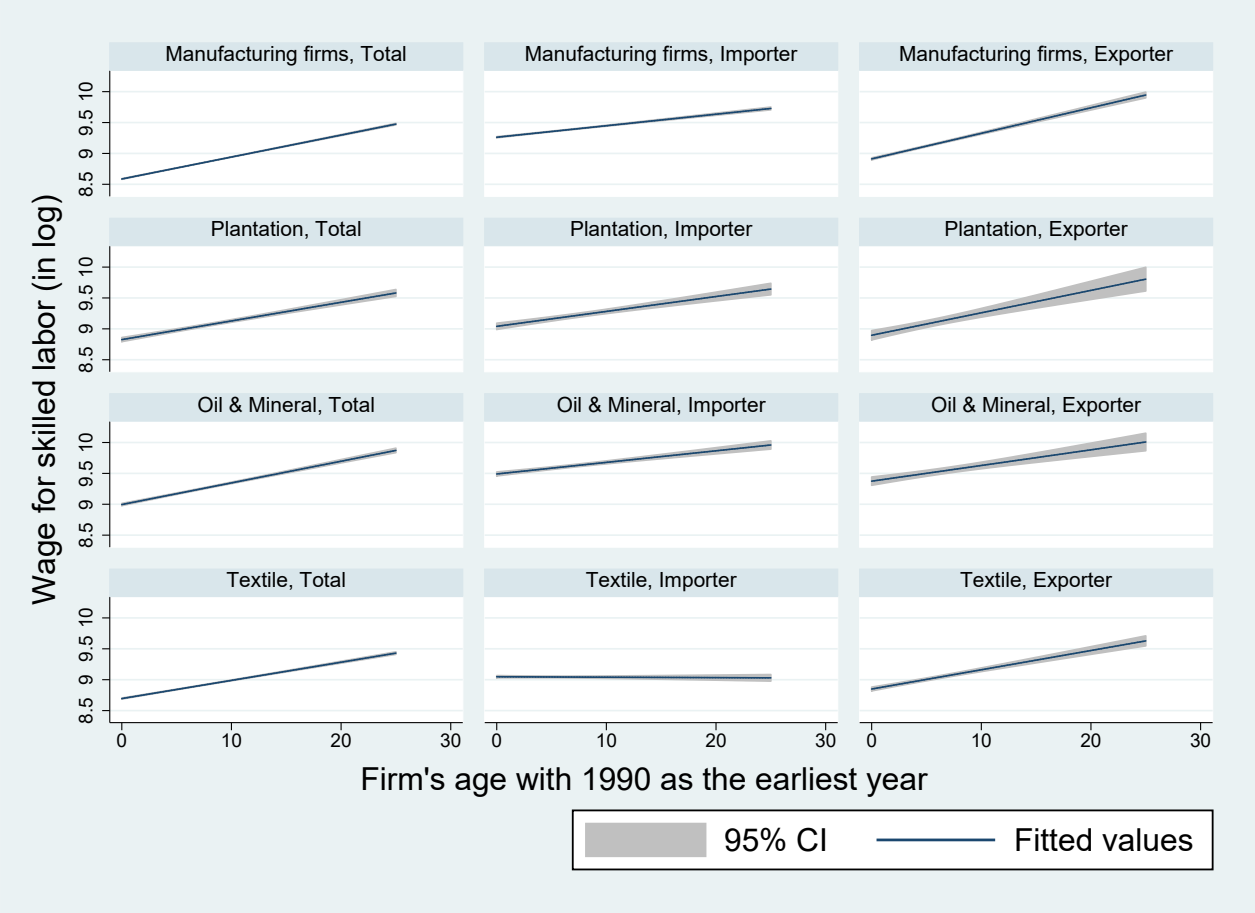
Source: Authors' calculation based on Indonesian Statistics Agency (BPS).

.3. Appendix B

.3.1. Data definition

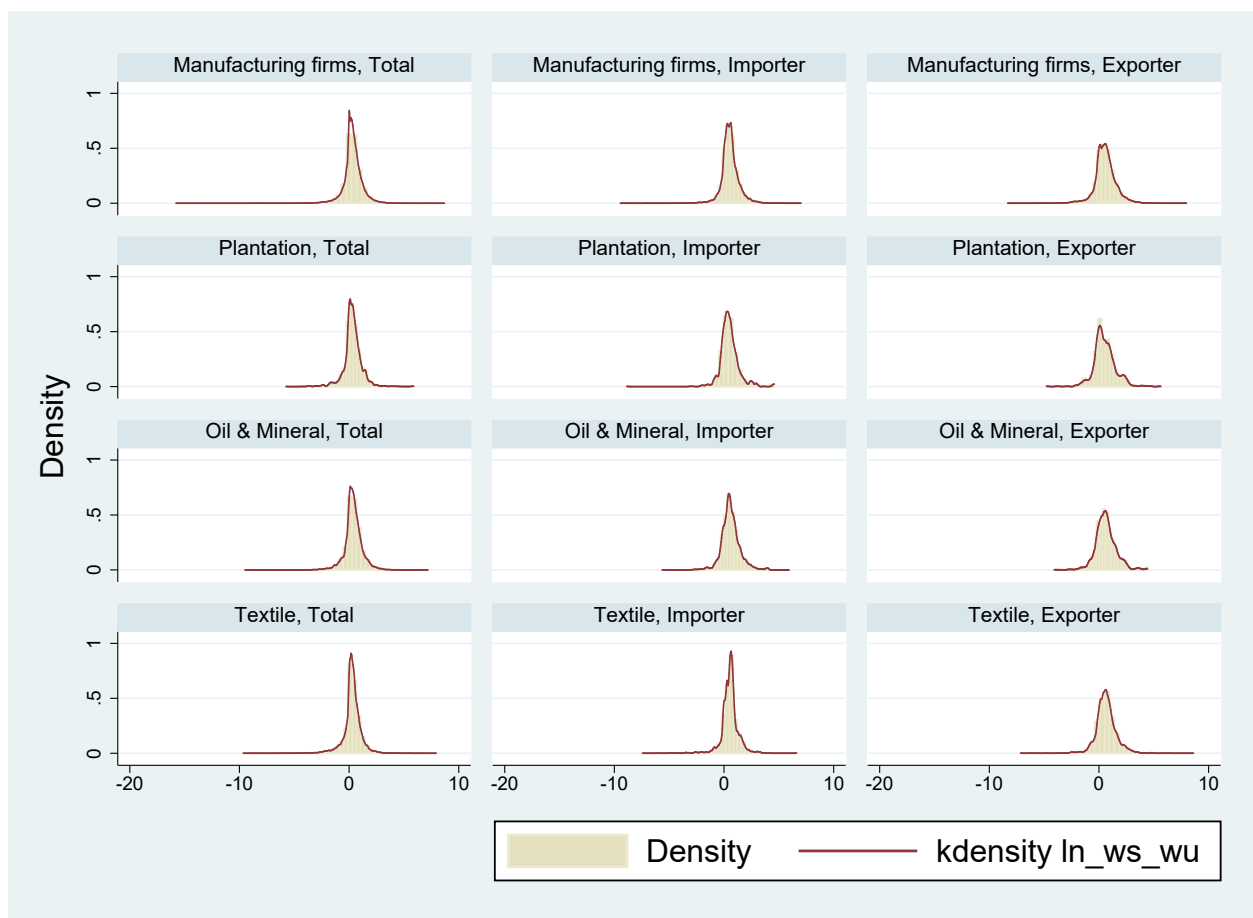
.3.2. List of variables included in the analysis

Figure 16: Unskilled wage trend by industry and trade status



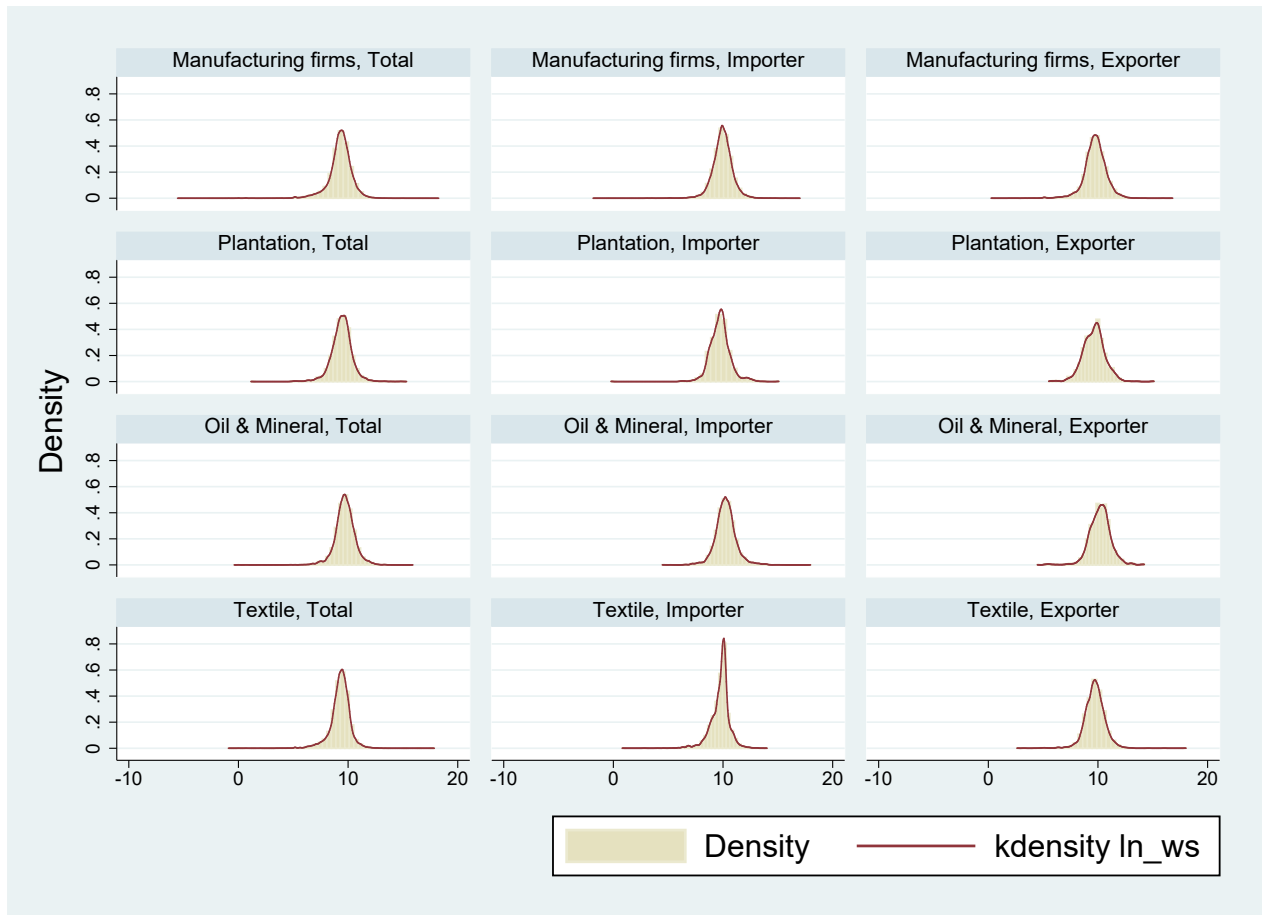
Source: Authors' calculation based on Indonesian Statistics Agency (BPS).

Figure 17: Skill premium density by industry and trade status



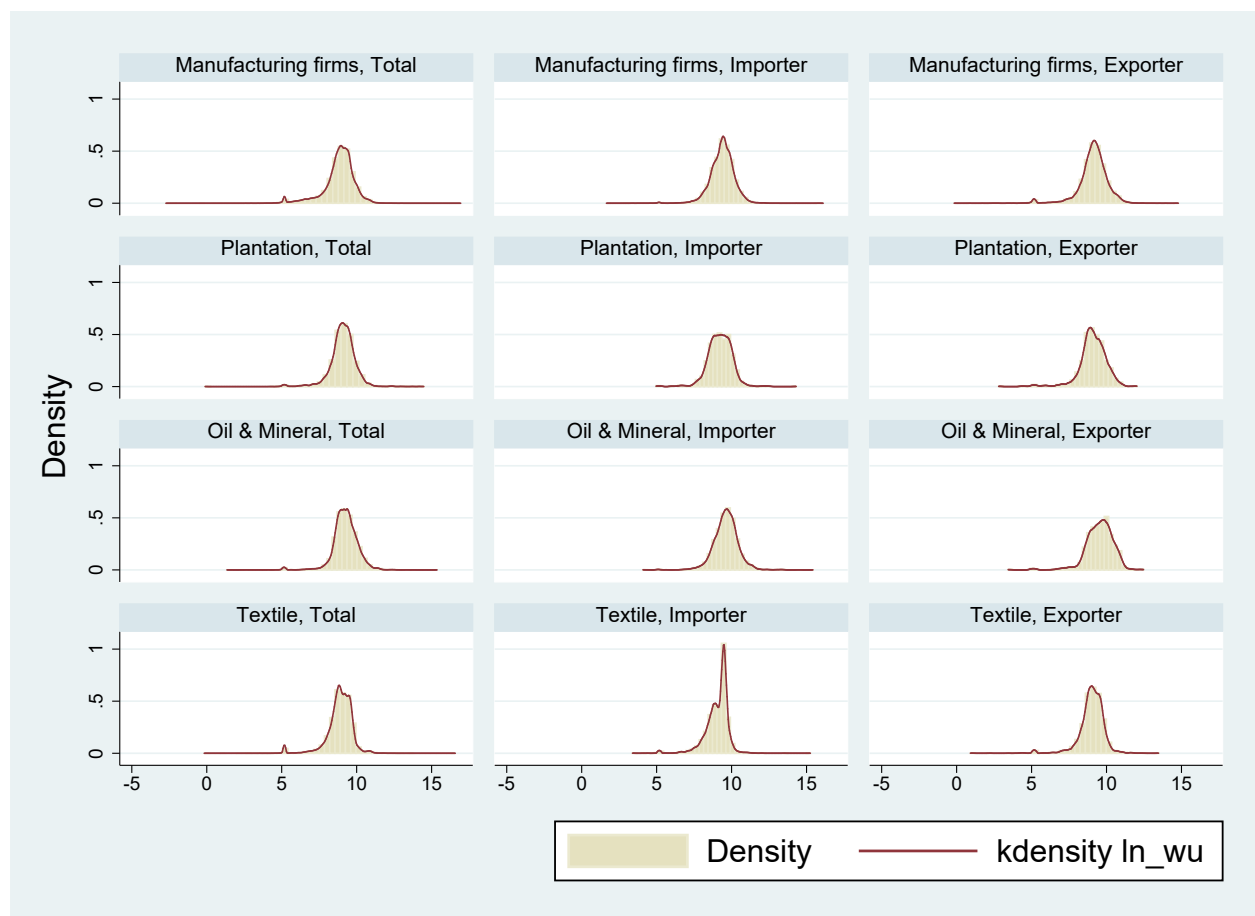
Source: Authors' calculation based on Indonesian Statistics Agency (BPS).

Figure 18: Skilled wage density by industry and trade status



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

Figure 19: Unskilled wage density by industry and trade status



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

Table 10: 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 which is deflated by the CPI for two-digit ISIC industries based in the constant year 2010 prices. | BPS |
| Electricity (log) | Cost of the entire electricity consumption for a company/ business, such as for lighting and running the engine. We used it to control for unobserved productivity shocks. | BPS |
| Capital (log) | It is calculated by the log of fixed assets (rupiah) deflated by the CPI for two-digit ISIC industries based in the constant year 2010 prices | BPS |
| Revenue (log) | It is the total income generated by the sale of goods or services related to the company's core operations deflated by CPI based on year 2010. | BPS |
| TFP (log) | Total Factor Productivity of firm "i" in year "t". | Authors' calculation |
| Labor productivity (log) | The ratio of total output to the number of workers used to produce the output. | Authors' calculation |
| Sales (log) | We used indirect taxes as a proxy to measure the sales, which means the taxes imposed on consumers by manufacturers to the purchase of goods/services. For instance; value-added tax, property tax, customs and export taxes, excluding the tax paid by the company for tax withholding workers' remuneration. | BPS |
| Employment (log) | It is the sum of all male and female employed by the establishment. It includes both paid and unpaid workers. | Authors' calculation |
| Real wage (log) | It includes all salaried workers, which is deflated by the CPI based on year 2010. | BPS |
| <u>Independent & control Variables</u> | | |
| Formal financing ^a | Dummy variable that takes on the value one if the firm relies on external sources from banks, cooperatives, non-bank financial institutions (NBFI), venture capital companies to finance either working capital or a new investment, zero otherwise (Individual, families and others loans). | Authors' calculation |

(Continued)

Table 10 – Variable description (*Continued*)

| Variable name | Definition and Description | Data Source |
|------------------------|--|----------------------|
| 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 finance (inheritance, savings, own remittance or/and liquidation of assets) and zero otherwise. | Authors' calculation |
| Firm size (employees) | A firm is defined as micro (1-4 employees) and small size (5-19 employees). Size is a vector of dummy variables, micro and small, that takes the value one if a firm is micro and zero otherwise. | BPS |
| Firm age (years) | The years that have passed since the establishment began its operations. It is calculated as the difference between the survey year and the year on which the firm began operation. | Authors' calculation |
| 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 |
| 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.

.3.3. Industry classification

Table 11: Industry classification, 2010 - 2015

| 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).

.3.4. Summary Statistics

Table 12: 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 |

Table 13: 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..