Misallocation in Thai Manufacturing: Trends, Patterns and Its Determinants

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***Abstract*—The main purpose of this paper is to measure the level of misallocation of industries in Thai manufacturing from 1997 to 2017 with a view to formulate prudential policy to promote productivity improvement. A measurement of misallocation proposed in [1] is used. Estimates of misallocation over the past two decades are further used in our balanced panel-data econometric analysis to identify its key determinants. The key findings suggest that most of industries experienced a decrease in misallocation over the past two decades. Nonetheless, the magnitude of changes varies across industries. The panel-data econometric analysis suggests that the changes of misallocation is negatively and significantly related to export output and import penetration ratios. Misallocation in industries in which a number of firms are export and/or import tends to be lower. Interestingly, the role of multinational enterprises can lower misallocation but taking place in more liberal trade environment. The main policy inference, therefore, is in favor of further trade liberalization to encourage firms to globally integrated and entice multinational enterprises.**

***Index Terms*—Total factor productivity, misallocation, Thai manufacturing.**

I. Introduction

Productivity growth is at the center in determining long-term economic growth. Nonetheless, determinants of productivity growth remain empirical challenges. It is especially true for middle-income countries whose policymakers express their worrisome on growth prospect as reflected by the fear of middle-income trap often cited as the top- policy priority. This occurs even when the middle-income trap concept is at best the presumption without any theoretical and empirical support so far [1]. Generally, productivity is measured by changes in output given intermediates and primary inputs (i.e. labor and capital) used. It is often referred to total factor productivity (TFP). Clearly, changes in TFP at the factory level usually reflect productivity improvement there. At the national level, productivity improvement changes could be a result of either changes in TFP at individual firms, those of firm composition in which higher productive ones expand but less productive one's contract or both. Among the sources of TFP changes, the change in firm composition is worth to be discussed in length for two reasons.

Firstly, a number of empirical studies often known as firm heterogeneity literature formalized by [2][1] point to the fact that productivity varies substantially across firms since the new millennium. Changes in firm composition, therefore, are on par important to changes in technological capability at the factories in explaining TFP changes.

Secondly, resource misallocation induced by the government policy is highlighted in the productivity improvement literature in a number of empirical resources (e.g. [1], [3], [4]). In particular, there are various policies resulting misallocation and inefficiency in the market. They included trade policy, taxes, subsidies, labor market restriction, and financial market distortion.

In the context of developing countries, trade policy deserves special attention. While a series of multilateral agreements in the 1980s and 1990s resulted a substantial tariff reduction worldwide, the speed of tariff cuts was much slower for developing countries. In addition, tariff structure in these countries is cascading tariff structure that tariff rates escalate from raw materials to finished goods. This is done with attempting to keep less efficient firms so that they can learn and improve their international competitiveness later. This is more or less consistent with the concept of infant industry argument and the import substitution industrialization strategy[2].

The recent studies on firm heterogeneity literature strengthen the above argument further. In particular, keeping trade protection keep less efficient firms co-existing with the efficient ones. This could result misallocation of resources. Trade protection lowers industry productivity as it discourages firms from exporting and lowers expected profit. It allows the least efficient firms to stay in business. In addition, keeping the less efficient ones survival inflate prices of factor inputs like workers as both firm groups are competing for the limited resources.

Against this backdrop, this thesis aims to measure misallocation and identify its key determinants with a view to provide prudential policies for promoting the overall productivity. Following the general practice in literature, [1] model (henceforth referred to as HK model for brevity) is used to identify misallocation. HK model's misallocation is measured by the deviation of the marginal revenue product of input reflect resources are used in the ways that are not optimal and be associated with a loss in TFP at the aggregate level. The source of misallocation into distortions can be further decomposed into output and capital markets.

Thailand is chosen as a case study for two reasons. Firstly, Thailand as developing country with trade policy reform

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[1] Now firm heterogeneity framework becomes a theoretical workhorse in an empirical study on international trade.

[2] This strategy was popular during period 1960s and 1970s. The success of East Asian economies in the 1970s and 1980s. It has been accepted by international institutions (i.e. IMF, World Bank), and has been issue as XVII (B) in GATT.

See, excellent treatment of the concept of infant industry in Corden 1993.

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remains a challenging issue for policymakers. In particular, the average Thai tariff rate was relatively higher than other middle-income countries in the region. The effort to streamline the range of tariff rates to three rates including 0-1 percent for raw materials, 5 percent for intermediates, and 10 percent for finished products is at best far from complete. Almost one fifth of tariff lines remain 20 percent tariff rate or more. Hence, effective protection seems to vary across industries ([5]).

Secondly, Thailand has experienced poor growth performance since 2005. Many points to the low productivity growth in the manufacturing. Given the nature of tariff structure discussed above, misallocation can be one possible explanation. Despite immense policy relevant, this issue has act systematically examined empirically.

To the best of our knowledge so far, there have been two studies examining Thailand, i.e. [6] and [7]. Both are the cross-sectional analysis, i.e. the former uses the 2007 industrial censuses of Thai manufacturing (data for 2006) collected by National Statistical Office (NSO) and three years (1997, 2007, and 2012) are pooled to form the data set. The limitations of a cross-section data set are that each industry represents a single data point, so it's difficult to control for unobserved industry specific differences. Long-term averages tend to ignore changes that may occur over time. These limitations can be avoided by using panel data sets compiled by pooling cross-industry and time series data. Particularly, in the nature of misallocation that could be found when the adjustment is yet completed.

This thesis contributes to the existing literatures in twofold. First, this thesis is the first systematic panel data analysis of misallocation in Thai manufacturing using census data on 1997, 2007, 2012, and 2017. Second, guided by relevant works in economic development literature, four variables capturing competitive pressure on firms are introduced into the empirical model. They include effective rate of protection (*ERP*), import penetration ratio (*EOR*), export orientation (*MPR*) and producers' concentration ratio (*HHI*), all of which are related to competitive pressures firms are facing, over and above other controlling variables. Clearly, *HHI* is to capture the domestic competition. *ERP* is measured the incentive structure granted by tariff structure. Similar to many East Asian economies, Thailand long introduced tariff exemption schemes to promote export-oriented activities. Hence, high tariff can co-exist with intensive international trade. Hence, *EOR* and *MPR* are also introduced. To the best of our knowledge so far the set of explanatory variables in this thesis would be the most comprehensive in the existing literature.

II. Analytical Framework

Misallocation plays a crucial role in explaining income differences across countries. Given an economy's resource endowment (physical capital, human capital, and knowledge, etc.), the way in which these resources are allocated across firms and industries attributes to the country's output and productivity. When they are well allocated, they are efficiently utilized (maximizing productivity) and then maximize output and social welfare. By contrast, any departures could lower levels of output and productivity. In a well-functioning economy, resources will be allocated from less productive to more productive firms at the point that marginal revenue products of inputs are equal across firms. According to Equation 1, the firm *i*'s production is Cobb Douglas production function. The level of output (y_i) is determined by one factor employed that is labor (we assume labor is the firm's only input for the sake of simplicity), and the firm's level total factor productivity that reflects differences in productivity across firms (heterogeneity firms), denoted by l_i, and A_i, respectively.

$$y_i = A_i f(l_i) \tag{1}$$

Any operating firms face fixed cost denoted by *c* measuring in units of output. Both wage rate (*w*) and fixed cost (*c*) are common, and taken as given by, all firms. Solving the profit maximization problem, the equilibrium allocation of resources across firms follow the condition; each firm has a unique optimal employment level l_i* that is set to equate marginal revenues and marginal costs.

$$\pi_i = p_i y_i - w l_i - c \tag{2}$$

FOC;

$$\frac{d\pi_i}{dl} = 0 \Rightarrow \frac{d(p_i y_i)}{dl} - \frac{d(w l_i)}{dl} - \frac{dc}{dl} = 0 \tag{3}$$

$$\frac{d(p_i y_i)}{dl} = \frac{d(w l_i)}{dl} \tag{4}$$

$$MRPL_i = w \tag{5}$$

In addition, the derived revenue function is an increasing function with the firm's productivity level A_i, and its positive effect on revenue is further strengthened by additional workers as expressed in Equations 6.

$$\frac{d(p_i y_i)}{dA} > 0, \qquad \frac{d^2(p_i y_i)}{dA dl} > 0 \tag{6}$$

The conditions on the revenue function are increasing in the firm's productivity level A_i, and productivity and labor are complements. This implies that there will be a critical productivity level ($\underline{A}$) such that $A_i < \underline{A}$ profits will be negative. That is, the firm will operate if the productivity level $A_i \geq \underline{A}$. Firms with higher values of A_i should be allocated a greater amount of labor. The allocation of inputs that maximizes output will equate the marginal products of labor across all firms. Therefore, thinking about factors that interfere the marginal revenue products of input vary across firms is a useful way to identify possible sources of misallocation (see Fig. 1).

Fig. 1 shows the equilibrium in hiring labors by firms in a given industry. To maximize their own profit, firms hire labor (*l**) up to the point that marginal benefit of hiring labors equals to its corresponding marginal cost (*MRPL* = *w*). The marginal revenue product of labor (*MRPL*) is combination of $MR_L \times MP_L$ (firm's marginal revenue multiplied by firm's marginal product) which represent the firm's labor demand. At the equilibrium, all firms will hire labors up to the point where ($MRPL_1 = MRPL_2 = MRPL_3 = w$).

If firms operate in a perfectly competitive environment, price firms are facing is given. MRPL is often referred to

VMPL. If they are in the imperfectly competitive environment e.g. monopolistic competition, firm have some market power and face downward sloping output demand curve. Firms with more productivity (MPL is higher than the other might lower their price to gain market share. To do so, they need more labor input. In the absence distortion, more labor is allocated to firms with more productivity to the point that the marginal revenue product of labor must be equal across firms ($MRPL_1 = MRPL_2 = MRPL_3 = w$) *efficient allocation of labor* is realized. Then economy will obtain the largest amount of output because reallocating a unit of labor from less to high productive firms; $MP_L^{High} > MP_L^{Low}$. The amount of output given up from low productive reducing one more unit of labor is less than the amount of output that can be obtained by high productive firm increasing one more unit of labor.

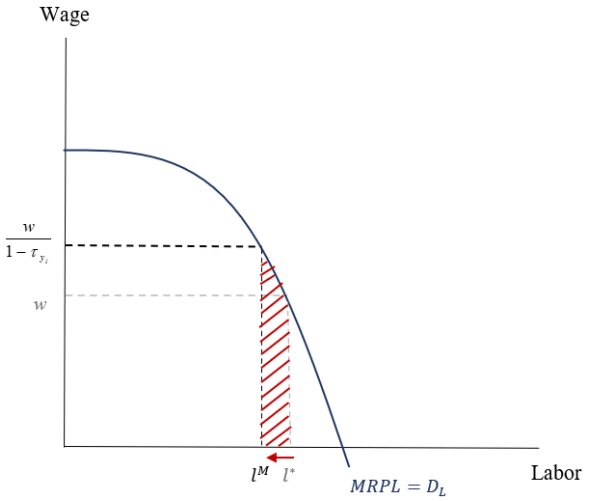

Fig. 1. Misallocation of labor across firms.

To the extent, resources allocation are driven by distortions rather than firm's productivity (A_i), we give example from [1]. A profit function of Firm i^{th} under the existent of distortion.

$$\pi_i = \left(1-\tau_{y_i}\right) p_i y_i - wl_i - \left(1+\tau_{k_i}\right) Rk_i \tag{7}$$

Ref. [1] suppose that there exist two distortions that affect the firm's profit function. They are output distortion (τ_{y_i}) and capital distortion (τ_{k_i}). In equilibrium, firm *i* will optimally hiring labor (*l**) to maximize its profits as follows:

$$\frac{d\pi_i}{dl} = 0 \Rightarrow \frac{d((1-\tau_{y_i})p_i y_i)}{dl} - \frac{d(wl_i)}{dl} - \frac{d((1+\tau_{k_i})Rk_i)}{dl} = 0 \tag{8}$$

$$\frac{d((1-\tau_{y_i})p_i y_i)}{dl} = \frac{d\left(wl_i\right)}{dl} \tag{9}$$

$$MRPL_i = \frac{w}{1-\tau_{y_i}} \tag{10}$$

The existent of distortion, the marginal revenue of labor varies across firms. Term of $(1-\tau_{Y_{si}})$ capture the subtractive revenue of the firm relative to other firms. When the firms face distortion, they were able to keep less of their revenue. The consequence of this, the firms responds to distortions by choosing a smaller labor and shrinking in size. Resource are used in ways that are not optimal, there is misallocation exist.

III. Data and Methodology

A. Measurement of Misallocation

This thesis employs [1] model to estimate the degree of misallocation in each industry. Their model uses the dispersions of TFPR (firms' revenue-based TFP levels) as a proxy of misallocation. TFPR is calculated by geometric average of firm's marginal revenue product of labor and capital. We estimate the dispersions of TFPR in each industry classified by 4 Digit International Standard of Industrial Classification (ISIC) Rev. 3 and using census data on 1997, 2007, 2012, and 2017.

Each firm differentiated product (Y_{si}) is produced by firms with heterogeneous productivity (A_{si}) using labor (L_{si}) and capital stock (K_{si}) with Cobb-Douglas technology:

$$Y_{si} = A_{si} K_{si}^{\alpha_s} L_{si}^{1-\alpha_s} \tag{11}$$

where α_s presents industry capital share and (1-α_s) presents industry labor share, which are the same across firms within an industry. The U.S. labor share is obtained from the NBER-CES Manufacturing Industry Database.

Each firm potentially faces difference output and capital distortions denoted by ($\tau_{Y_{si}}$) and ($\tau_{K_{si}}$), respectively. With these wedges, profit expected by the firm is written as Equation 12. The variable *w* and *R* denote common wages and rental price facing all firms, respectively. $P_{si}Y_{si}$ is firm's value added and wL_{si} is wage compensation.

$$\pi_{si} = \left(1-\tau_{Y_{si}}\right) P_{si} Y_{si} - wL_{si} - \left(1+\tau_{K_{si}}\right) RK_{si} \tag{12}$$

Marginal revenue products of labor ($MRPL_{si}$) and capital ($MRPK_{si}$) are computed as Equation 13 and 14.

$$MRPL_{si} = w\frac{1}{1-\tau_{Y_{si}}} \tag{13}$$

$$MRPK_{si} = R\frac{1+\tau_{K_{si}}}{1-\tau_{Y_{si}}} \tag{14}$$

Revenue productivity of firm *i* is measured as geometric average of firm's marginal revenue product of labor and capital:

$$TFPR_{si} \propto \left(MRPK_{si}\right)^{\alpha_s} \left(MRPL_{si}\right)^{1-\alpha_s} \tag{15}$$

$$TFPR_{si} = \left[\frac{R}{\alpha_s}\right]^{\alpha_s} \left[\frac{1}{1-\alpha_s}\right]^{1-\alpha_s} \frac{(1+\tau_{K_{si}})^{\alpha_s}}{1-\tau_{Y_{si}}} \tag{16}$$

$$TFPR_{si} = \frac{\sigma}{\sigma-1}\left[\frac{MRPK_{si}}{\alpha_s}\right]^{\alpha_s} \left[\frac{MRPL_{si}}{w(1-\alpha_s)}\right]^{1-\alpha_s} \tag{17}$$

The first 2 terms are different across industries but are constant within an industry. We can imply that the deviation of ($TFPR_{si}$) come from the firms facing the different distortions. The final fraction captures the distortions. Term of $(1+\tau_{K_{si}})$ captures the additional cost of a unit of capital to the firm relative to other firms. Whereas, term of $(1-\tau_{Y_{si}})$

captures the subtractive revenue of the firm relative to other firms. When the firm faces higher input cost and/or higher taxes on revenues, the firm has higher costs than expected or be able to keep less of the revenue. Then $TFPR_{si}$ will deviate from the efficient level. The magnitude of dispersion of $TFPR_{si}$ reflects the degree of misallocation. Note that the elasticity of substitution between output across firms (σ) equals 3. Rental price of capital (R) is 10 percent comprising depreciation rate (5 percent) and interest rate (5 percent).

B. Determinants of Misallocation

The empirical model used to examine the determinants of misallocation is expressed in Equation 18. Our econometric procedure in this study is fixed effect (FE) estimation and using the balanced panel data of all four years (1997, 2007, 2012, and 2017).

$$Sd(TFPR_{si})_{st} = \alpha_1 ERP_{st} + \alpha_2 EOR_{st} + \alpha_3 MRP_{st} + \alpha_4 MNEs_{st} + \alpha_5 ERP_{st} \times MNEs_{st} + \alpha_6 HHI_{st} + \alpha_7 EOS_{st} + \varepsilon_{st} \quad (18)$$

where s = 1, 2, 3, …S is the industry unit, and t = 1, 2, 3, 4 is the yearly time unit.

ERP_{st}(+) = Effective rate of protection of industry

EOR_{st}(-) = Export output ratio of industry

MPR_{st}(-) = Import penetration ratio of industry

$MNEs_{st}$ (-) = Market share of multinational enterprises in industry

HHI_{st}(-) = Hirschman Herfindahl producer concentration of industry

EOS_{st}(-) = Economies of scale of firms in industry

ε_{st} = Error term

To calculate EOR_{st} and MPR_{st}, gross output series are from NESDB. They are reported at the 4 Digit- International Standard of Industrial Classification (ISIC) Rev. 3. Note that gross output is reported in constant and current values so that we can calculate price indices at 4 digits ISIC. They are used to convert three censuses into real terms. Export and import data come from the UN Comtrade database. They are is classified in Harmonized System (HS); the standard concordance is used to convert it into ISIC.

To calculate ERP the inter-industry linkage relationship is from Thailand's input–output table by the National Economic and Social Development Board (NESDB).[3] The latest input–output table (2010) is used for all 3 years of the ERP calculation. This is done to ensure that any changes in ERP reflect those in tariffs instead of changes in the input–output relationship. The 2006 ERP set reflects the pre-FTA era. The major FTA import sources include ACFTA, TAFTA, JTEPA, and AEC[4]. Substantial tariff commitments took place after 2006 (90% in 2010 for the ACFTA, 93% of tariff lines in 2010 for the TAFTA, and 100% in 2010 for the AEC). In the case of the JTEPA, there are two tariff cuts, i.e. before and after 2011. Hence, the effect of FTAs is captured in the other two series (the 2011 and 2016 ERP). Note that ERP in this study is industry-specific time variants over three periods.

The existence of multinational enterprises ($MNEs_{st}$) is measured by the market share of foreign firms in a given industry. The 10 percent proportion of foreigners holding shares in the enterprise is the divided criteria[5]. If any enterprises have foreigners holding more than 10 percent of shares, it is considered as MNEs and considered investment as FDI. For calculate HHI_{st} and EOS_{st}, we use information from each census from National Statistical Office (NSO), Thailand 1997, 2007, 2012 and 2017.

IV. Results and Discussion

A. Degree of Misallocation

Four key inferences can be drawn. Firstly, from 1997 to 2017 the degree of misallocation did not change significantly. Firstly, from 1997 to 2017 the degree of misallocation did not change significantly. The degree of misallocation slightly decreases when comparing to the period before FTA except in 2012 misallocation is worse compared to another period. The degree of misallocation fell from 1.23 in 1997 to 1.08 in 2007 and then fluctuated between 1.31 in 2012 and 1.09 in 2017 (see Fig. 2). Note that the 2012 figure might be affected by the 2011 Great Flood on observed data. Tariff reform launched and implemented in the 1990s contributed to the declining misallocation found between 1997 and 2007. From 2007 where trade liberalization in Thailand was shifted toward FTAs, misallocation virtually remained unchanged. The TFPR dispersion does not show any systematic patterns before or after entry to the FTA. It seems FTAs Thailand has committed so far did not significantly improve resource allocation. This result is consistent with the findings that Thailand expressed reluctant to open up her market to her FTA partners. Liberalization through FTA is often associated with a long transition period. Exception lists in an FTA are likely to be those in other FTAs (see [8]-[10]).

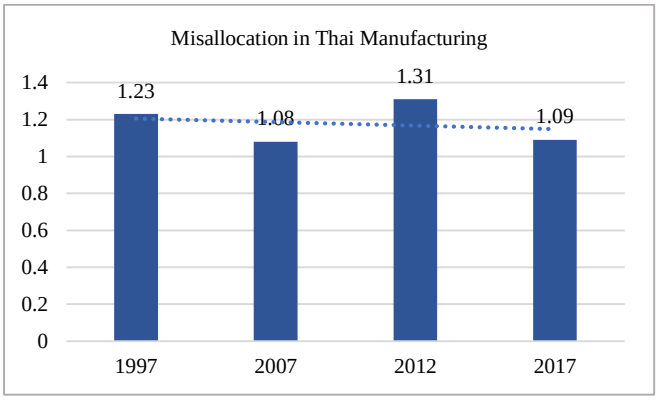

Fig. 2. The Degree of Misallocation in Thai Manufacturing (weighted Average).

Source: Author's calculation

Secondly, as a consequence of the cascading tariff structure, the degree of misallocation for finished goods like food (ISIC 15), textiles (ISIC 17), garment (ISIC 18), and leather products (ISIC 20) are likely to be higher than the others. The

[4] ACFTA is ASEAN-China FTA, TAFTA is Thailand-Australia FTA, JTEPA is Japan-Thailand Economic Partnership Agreement, AEC is ASEAN FTA.

[5] This criterion follows Organization for Economic Co-operation and Development (OECD) and IMF.

estimated results consistent with the effective rate of protection (*ERP*). The consumption goods such as foods and textiles are subject to high *ERP* as opposed to the others.

Thirdly, when the misallocation estimates are decomposed according to sources, i.e. output and capital distortion, it is output distortion fell from 1.50 in 1997 to 1.21 in 2017 (see Table I). Trade liberalization directly affects output (and input) prices so that its effect is likely to appear in a decline in output wedges. By contrast, capital distortion slightly increased during the considering periods. Its mean increased from 3.55 in 1997 to 3.74 in 2017. When we consider capital distortion by dividing the firm size using number of employments (see Figure 3). We find that small and medium-sized enterprises are more likely to face capital distortion than large enterprises. A possible explanation would be the credit constraint in Thailand small and medium enterprises have been experiencing since the Asian financial crisis. Argued in [11], such credit constraints attributed to the yet recovery of private investment in Thailand after 10 year of the crisis.

TABLE I: DISTORTIONS IN OUTPUT AND CAPITAL MARKETS

Year	Output Distortion		
	Weighted Average	Median	S.D.
1997	1.50	1.71	0.38
2007	1.43	1.64	0.31
2012	1.49	1.65	0.48
2017	1.21	1.42	0.24
Average	1.41	1.61	0.35
Year	Capital Distortion		
	Weighted Average	Median	S.D.
1997	3.55	3.09	0.96
2007	3.68	3.49	1.12
2012	3.93	3.78	1.30
2017	3.74	3.62	1.17
Average	3.73	3.50	1.14

Source: Author's Calculation.

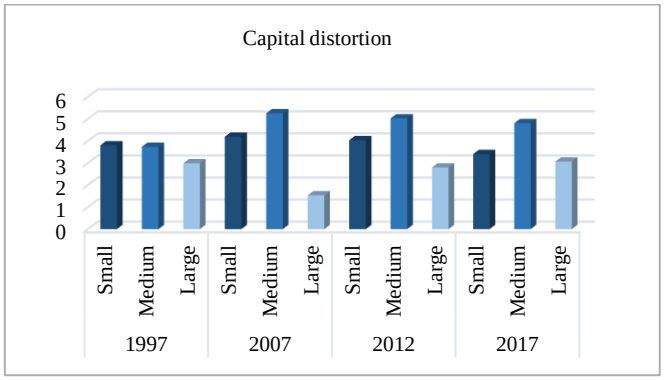

Fig. 3. Capital distortion classified by firm size.
Source: Author's calculation
Note: Size is divided by the number of workers. In all three size, small-size enterprises are less than or equal 50 workers. Medium-sized enterprises are 51 to 250 workers, and large-size enterprises is 250 workers or more.

Fourthly, the degree of misallocation in Thailand seems large as opposed to other countries. The average of TFPR's dispersion over past period for Thailand is 1.18 which is larger than those for Vietnam (0.79), China (0.68), India (0.68), Japan (0.55) and U.S. (0.45). In general, the dispersion of TFPR in developed countries are lower than that in developing countries. Interestingly, the finding that the TFPR dispersion in Thailand was higher than other developing countries seems a bit puzzle. One possible explanation is economic modernization in Thailand has started since 1960 much earlier than the other three developing countries. In addition, the economy shifted toward more export-oriented through several effective tariff exemption schemes. In this circumstance, import-competing sectors can continue their operation under the cascading tariff structure. Hence, TFPR dispersion tends to be widened in Thailand as opposed to the other three developing countries.

B. Determinants of Misallocation

Table II presents the estimated results of empirical model discussed above. Columns A and B report the FE estimated results of empirical model and robustness check model, respectively.

TABLE II: DETERMINANTS OF MISALLOCATION

Explanatory Variables	Baseline case (A)	Robustness check (B)
ERP_{st}	0.022 (0.823)	0.127 (0.009) ***
EOR_{st}	-0.331 (0.002) ***	-0.334 (0.001) ***
MPR_{st}	-0.354 (0.003) ***	-0.324 (0.005) ***
$MNEs_{st}$	-0.275 (0.000) ***	-0.234 (0.002) ***
$ERP_{st} * MNEs_{st}$	0.405 (0.081) *	
HHI_{st}	-0.007 (0.650)	-0.006 (0.693)
EOS_{st}	-0.020 (0.050) **	-0.021 (0.042) **
Constant	0.733 (0.000) ***	0.733 (0.000) ***
Observation R-squared	440 0.1984	440 0.1914

Source: Author's Calculation.
Note: *, **, and *** are statistically significant at 10%, 5%, and 1% levels, respectively.

Coefficients associated with EOR_{st} and MPR_{st} negative and statistically significant at 1 per cent. Whether firms participate in the global economy affect their ongoing productivity. Those participating in the global economy intensively tend to experience productivity improvement comparing with those involving solely in the domestic market. Prior exporting, firms must pass productivity threshold in order to cover fixed and sunk costs incurred. This is known in the firm heterogeneity literature as learning to export. When firms start exporting, they are in a better position to experience productivity improvement. It includes benefiting scale economies from the enlarged market, facing intense competitive pressures, observing and adopting advanced technology used elsewhere, all of which are collectively referred to as learning from export. To a large extent, the argument above is also applicable for importing materials from abroad. The link between a number of firms participating in the global economy and misallocation exists because all firms must compete primary inputs (e.g. workers, capitals) that are often limited. The more productive the firms the better position they can compete for the limited inputs. All other things being equal, this could inflate prices of these inputs and drive some less productive firms out of business.

The coefficient corresponding to ERP_{st} alone turns out to be positive but statistically insignificantly different from zero.

But its interaction with MNEs is positive and statistically significant. One sensible explanation of them is that while trade policy seems to alter economic incentives in favor certain industries against the others, whether such distortion results misallocation depends on firms' interaction to each other. The highly protected industries (high *ERP*) would induce MNEs to set up their affiliates and benefit from the rent. In these industries, indigenous firms might enter but producing products not directly competing with MNE affiliates. In such a circumstance, TFP would vastly vary across firms thereby resulting misallocation. There are some exceptions where size of domestic market is not large enough for MNEs to set up their affiliates. Hence, indigenous firms might enter and compete intensively with each other.

By contrast, for the more liberal industries (low *ERP*), decision to set up affiliates of MNEs is derived from economic fundamentals such as skillful workers, large domestic markets, existence of supporting industries. This seems to be in line with the country's comparative advantage. Hence, productivity differential between MNE affiliates and indigenous firms would be narrow. The latter is in a better position to benefit advanced technology associated with the former. Overtime, productivity gap between these two firm groups would be small (see [12]-[14]).

The coefficient corresponding to EOS_{st} is negative and statistically significant at 5 per cent. It shows industries with a large number of firms have economies of scale tend to experience lower misallocation. Economies of scale are the cost advantages or cost reductions that occur when firms increase production. Fixed costs are spread throughout the production unit, resulting in lower fixed costs. Sometimes firms can negotiate to lower its variable costs as well. The lower its per-unit costs give a competitive advantage as lower prices. It occurs whenever a firm produces more, becomes more efficient (e.g. technical improvements, managerial efficiency), access to large networks, or financial ability. More productive firms are usually achieved economies of scale; They can take advantage of more efficient equipment. They can afford specialists that has the skill and experience as well as demand a high salary. They have cheaper access to capital as big firms have higher credit ratings. That is, unproductive firms that are unable to achieve economies of scale facing higher costs and are likely to exit.

For robustness check, we drop the interaction term between ERP and MNEs out of model. The estimated result show that the coefficient corresponding to ERP become positive and statistically significant affect the dispersion of TFPR. This finding reconfirms the conclusions in studies in favor of trade liberalization. Trade protection allows domestic but less efficient local firms to sell their products under the highly protected domestic market. Resources will be allocated to the protected sector and results misallocation.

V. Conclusions and Limitations

This thesis measures the level of misallocation of industries in Thai manufacturing from 1997 to 2017. A measurement of misallocation proposed in [1] is used. Estimates of misallocation over the past two decades are further used in our balanced panel-data econometric analysis to identify its key determinants especially trade and investment policy as they play a crucial role on influencing allocative efficiency of resource. The key finding suggests; first, Misallocation estimates declined remarkably from 1997 to 2007 and then remained virtually unchanged. Most of industries experienced a decrease in misallocation, except the industries for consumption goods such as foods and textiles are likely to be higher misallocation as opposed to the others. Second, Thailand exhibited the high level of misallocation as opposed to other countries including developing countries like India, China and Vietnam. Finally, the panel-data econometric analysis suggests that the changes of misallocation are negatively and significantly related to the global market participation, misallocation in industries in which a number of firms are export and/or import tends to be lower. Interestingly, the role of multinational enterprises can lower misallocation but taking place in more liberal trade environment.

The main shortcomings of this thesis are first the assumption of all firms in same sector use the same Cobb–Douglas production function. The variation in capital-to-labor ratios will be interpreted as misallocation. In fact, they could be using different production function and the difference in capital-to-labor ratios might seemingly reasonable reflecting producer production functions heterogeneity, rather than misallocation. This points to the room for improvement for future projects.

Second, the BOI promotion in Thailand using tax holidays temporary exemption from corporate income tax and import tax on capital equipment, raw materials and intermediate inputs are based on selective basis depending on investment size, export orientation, new facility location, and whether the investment is in a priority sector. Their impact on the profitability of investments differs widely by firm and sector in the economy. This could generate misallocation. This point is suitable for direct approach. Although, it seems impossible to do in this kind of thesis, they are certainly important questions. These questions will be investigated for future projects.

VI. Policy Implication

The results point out for further trade policy liberalization encourage firms to globally integrated and entice multinational enterprises. Trade policy liberalization would not only facilitate the technology spillover of MNEs, but also allow firms to be engaged in international trade with exporting finished goods, importing intermediates or both. This finding allows to conclude that it orders to eliminate a part of resource misallocation it is a good idea to continue external trade liberalization by further both output and input tariffs cuts, lowering the level of non-tariff barriers and easing market access.

Conflict of Interest

The author declares no conflict of interest.

Author Contributions

There is only one author for this work.

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