Economics Bulletin

Volume 41, Issue 3

Should high domestic value added be policy emphasis in the era of global production sharing?: Evidence from Thailand

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Abstract

This paper examines the current emphasis on the share of domestic value added in exports ('value added ratio') as a policy guidance in trade and industry policy making in developing countries. The hypothesis is that the policy emphasis on value added ratio is inconsistent with the objective of achieving economic development through export-oriented development strategy in the era of global production sharing. The analysis focuses on two indicators of developmental outcomes: the ratio of labor income in total value added and the ratio of wage to profit. The formal empirical analysis adopts Thailand as a case study and employs a mixture of input-output analysis and panel econometrics using the input-output tables of Thailand covering 74 manufacturing sectors for 1990, 1995, 2000, 2005 and 2010. The results suggest that industries characterized by higher value added ratio do not have potential to generate greater developmental outcomes.

I am grateful to Professor Prema-chandra Athukorala for guidance and suggestion. I am thankful to editors and two referees for helpful comments.

Citation: Wannaphong Durongkaveroj, (2021) "Should high domestic value added be policy emphasis in the era of global production sharing?: Evidence from Thailand", *Economics Bulletin*, Vol. 41 No. 3 pp. 1631-1641
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Submitted: January 23, 2021. **Published:** September 17, 2021.

1. Introduction

Over the last few decades, international trade has been powered by cross-border dispersion of production processes within vertically integrated global industries, which I label 'global production sharing (GPS)' in this study. This current feature of economic globalization allows a country to specialize in different slices/tasks of the production process in line with its relative cost advantages, instead of producing a given product entirely within its national boundaries (Antràs, 2016; Athukorala, 2014; Jones, 2000). With the fragmentation of production internationally, the share of domestic value added in gross export earnings ('value added ratio') is observed to decline in many countries such as Japan and South Korea. Policy makers in these countries are seeking to increase value added ratio by formulating a number of policy instruments including tariff and non-tariff measures (Dollar et al., 2019).

In recent years, emphasis on value added ratio is also widely seen in many developing countries, for example, Indonesia and Thailand. This appears in trade and invesment policy through the promotion of a set of high value-added industries (e.g., robotics, aviation, and biofuels) using tax and other non-tax incentives (Kohpaiboon, 2020; OECD, 2019). Examples are a ban on exports of raw materials in Indonesia and tariff increases in India as a result of the "Make in India" initiative (Patunru and Raharja, 2015; Sharma, 2015). The justification of this policy emphasis is that an increase in the value added ratio will generate economic growth and benefit domestic employers.

The purpose of this paper is to assess the validity of using value added ratio as a policy guidance to promote economic development in the era of global production sharing. The key hypothesis is that, given the current era of GPS, the policy emphasis on increasing value added ratio runs counter the objective of achieving economic development. To support this hypothesis, I focus on two development indicators: the ratio of labor income in total value added and the ratio of wage to profit. These indicators are central to the development objective of achieving economic growth with equity. The model is estimated based on a balanced panel data set covering 74 manufacturing subsectors and five periods of time. The results from fixed effect estimator suggest that the value added ratio has a negative impact on labor shares of income and on the ratio of wages to profits. However, such negative and statistically significant association between two developmental outcome variables and the value added ratio disappeared when estimating the model using system GMM estimator. The paper provides evidence in support of the hypothesis of this study that industries characterized by high value added ratio do not have potential to create superior developmental outcomes.

In this paper, I employ a quantitative analysis which provides an evidence in the current context against a policy seeking to increase domestic value added relative to exports. This paper is both academically relevant and policy oriented. Thailand provides an ideal case study of the subject at hand given the pivotal role of engagement in global production networks in export-oriented industrialisation and structural shifts in export structure in the economy and the availability of data covering a period of sufficient lenge for the empirical analysis. Generalization from a single case is difficult, but the insights gained from the study would be useful for economic analysts and policy makers in other countries in assessing equity implications of emphasis on domestic value added in the era of global production sharing. This paper therefore aims to broaden our understanding of the underlying process of growth and structural adjustment in order to inform the policy debate.

2. The issue

With increasing fragmentation of production and trade in intermediates between countries, the ratio of domestic value added to gross export revenue tends to fall. Policy makers in many developing countries including Thailand are seeking to increase domestic value added in the country relative to exports. This concern originates from the view that a lower per-unit value added ratio will result in a smaller total value added of exports and thus a smaller Gross Domestic Product (GDP) (Dollar et al., 2019). Tariff and non-tariff barriers are among policy instruments commonly used to increase value added ratio. These policy tools run counter to the development path among developing countries driven by export-led growth strategy.

There are two key reasons why promoting high value-added industries to increase the domestic value added ratio in exports could be questionable from an economic development perspective for a developing countries (relatively labor abundant) like Thailand. First, under export-oriented industrialization, the key to the success of a developing country depends on its ability to produce goods and services to meet the demand from international buyers. Typically, a developing country endowed with abundant labor can reap gains from greater economic integration by focusing on labor-intensive goods (e.g., clothing, footwear, toy, and sporting goods) and assembly activities. In general, the production process of these goods relies heavily on imported inputs in order to meet high quality standards and global competition. With the intensive use of imported inputs, per-unit domestic value added in these sectors is low, but a developing country has a comparative advantage in producing these goods, especially at the beginning of development process. Policy intervention to increase domestic value added could stifle this development strategy.

Second, tasks/slices undertaken within global production networks tend to be relatively more labor intensive compared to producing goods from beginning to end within a country (Barrientos, Gereffi, & Rossi, 2011; Timmer, Erumban, Los, Stehrer, & de Vries, 2014). This means that industries with low domestic value added have potential to generate domestic employment which is important for economic development in a relatively labor abundant country. Therefore, from this theoretical perspective, policy guidance based on domestic value added seems not consistent with developing countries' comparative advantage in the era of global production sharing.

3. Methodology

3.1 The model

The relationship between value added ratio and two indicators of development gains is estimated using a balanced panel data set covering 74 subsectors in the manufacturing sector in Thailand using data for five intermittent years (1990, 1995, 2000, 2005, and 2010). Value added ratios are estimated using input-output tables by using the methodology described in Appendix A. The econometric model is as follows:

$$\left.\begin{matrix} INSHARE_{it} \\ WPROFIT_{it} \end{matrix}\right\} = \alpha + \beta_1 DVA_{it} + \beta_2 GPN_{it} + \beta_3 PROD_{it} + \beta_4 (DVA_{it} \times GPN_{it}) + \mu_i + v_t + \varepsilon_{it} \quad (1)$$

where $INSHARE$ is the share of labour income in total value added and $WPROFIT$ is the ratio of wage to profit, the subscripts i and t refer to industry and year. The explanatory variables are listed below.

DVA	Value added ratio
GPN	Global production network orientation
$PROD$	Productivity
α	A constant term
μ	Industry fixed effects
v	Year fixed effects
ε	An error term

I exploit the panel structure of my dataset to estimate the model and address unobserved heterogeneity. It is important to note that the purpose of Equation (1) is not to find the determinants of these two developmental outcomes but to examine the role of domestic value added on two development indicators. For the labor share equation, some variables (e.g., minimum wage) can explain differences in the labor income share across industries but they do not vary across the industries during the period under studies. For the wage to profit equation, investment promotion plan could be included but, until 2017 when the new industry promotion plan was launched, such promotion plan only varies across provinces, not industries. Therefore, industry fixed effects are included to control for unobserved differences across industries. Year dummies are included to capture unobservable time fixed effects. In addition, the interaction term between domestic value added and GPN is included in the model to examine whether the relationship between value added ratio and developmental outcomes vary across industries with different degree of engagement in global production networks. The hypothesis is that the negative effect of value added ratio on developmental outcomes is larger among GPN-oriented industries because value added ratio among these industries is generally low.

These two dependent variables (INSHARE and WPROFIT) are central to the contemporary policy debate in developing countries in the era of economic globalization. The ratio of wage of total value added (GDP) is related to the concept of poverty while the ratio of wage to profit can be seen as a proxy for inequality. Wage is total compensation received by employees. Profit is defined as the difference between total value added and wages and salaries, depreciation, and indirect taxes. These two proxies are not perfect measures of

poverty and inequality. However, they provide useful information about how wages, the major source of income of workers, are distributed across factors of production. Labor share in total income is often used in several studies to capture the pro-poor bias in the process of industrialization (Case & Deaton, 2020, Daudey & García-Peñalosa, 2007). Labor is the main wealth owned by the poor. As such, an increase in labor share in value added under export-oriented industrialization in a developing country should be associated with poverty reduction. In addition, there is evidence that an increase in income inequality is closely associated with the share of income allocated to capital relative to the share of income accruing to labor (Piketty, 2014; World Bank, 2020).

3.2 Data

Engagement in global production network (GPN) is measured in terms of the share of exports of parts and components and final assembly within production network to total manufacturing exports of each industry. Trade based on GPN is trade in parts and components, and assembled end products within the production networks. The data are compiled at the 5-digit level of the Standard International Trade Classification (SITC) based on SITC Revision 3. Lists of parts and components are derived by mapping parts and components in the intermediate products subcategory of the UN Broad Economic Classification (BEC) with SITC Rev. 3 (Athukorala, 2014). Final assembled goods are estimated as the difference between exports of parts and components and total exports of that product categories. Productivity ($PROD$) is measured by the real value added per worker. It captures both total factor productivity (TFP) and capital deepening. Unfortunately, data are not available to estimate TFP at the required level of industry disaggregation. Productivity is measured in natural logarithm.

Table 1 reports summary statistics. Value added ratio across 74 manufacturing sectors decreased from 64.39% in 1990 to 60.23% in 2010. This manifests a decreasing role of domestically produced intermediate (domestic content) in production process. Therefore, Thailand is experiencing a fall in value added ratio, similar to other countries which have engaged in network trade any countries in the last decades. The coefficient of variation (CV) across industries indicate that value added ratio varies across industries. GPN orientation at industry level of Thai manufacturing increased from 0.78% in 1990 to 0.91% 2000. After that, it fell to 0.83 in 2010. This can be partly explained by the 2008 Global Financial Crisis that slowed down global trade. GPN orientation shown in Table 1 is particularly low because there are numerous sectors that do not engage in GPNs. In addition, the ratio of wage to total value added does not change significantly over time. It fell from 30.37% in 1990 to 28.80% in 1995 and increased to 31.31 in 2005. The ratio of wage to profit has declined from 68.53% in 1990 to 66.23% in 2000 and fell further to 64.96% in 2010.

Table 1: Summary statistics

	1990	1995	2000	2005	2010	All
Value added ratio (%)	64.39	64.03	61.81	59.09	60.23	61.71
	(18.80)	(18.92)	(18.78)	(18.72)	(18.17)	(18.68)
Productivity (log)	9.56	9.68	9.20	9.55	9.96	9.59
	(2.41)	(2.23)	(2.20)	(1.36)	(1.28)	(1.92)
GPN orientation (%)	0.78	0.82	0.91	0.87	0.83	0.84
	(3.06)	(2.98)	(3.50)	(2.95)	(2.66)	(3.03)
The ratio of wage to total	30.37	28.80	29.81	31.31	29.55	29.97
value added (%)	(10.92)	(10.21)	(09.10)	(09.44)	(09.21)	(09.78)
The ratio of wage to profit (%)	68.53	64.48	66.23	68.79	64.96	66.59
	(40.78)	(36.38)	(36.71)	(35.49)	(33.82)	(36.55)
Number of sectors	74	74	74	74	74	74

Notes: Simple mean and standard deviation (in parenthesis) are reported for each indicator.

4. Results

Table 2 reports the results from fixed effects estimator. Columns 1 and 2 present the results on the ratio of labor income to total value added (labor income share). The coefficient on value added ratio is negative and statistically significant at the 1% level. This means that a 1-percentage point increase in value added ratio is associated with a 17-percentage point decrease in the share of wage in total value added. Note that the labor income share ranges between 4 to 63, with the mean of 30. The coefficients of other control variables are not statistically significant even at the 10% level. The coefficient of the interaction term between value added ratio and global production network is small negative but not statistically significant.

According to Column 3 of Table 2, the coefficient on value added ratio is negative and statistically significant at the 1% level. It suggests that a 1-percentage point increase in value added ratio is associated with a 80-percentage point decrease in the share of wage in total value added. Note however that the share of wage to profit ranges between 8 and 305, with the mean of 67. Moreover, the coefficient of the interaction term between value added ratio and GPN is negative and statistically significant at the 10% level. This indicates that the negative impact of domestic value added is larger among industries significantly engaged within global production networks which is consistent with theoretical reasoning discussed in Section 2.

Table 2: Regression results

	The ratio of labor income in total value added (%)		The ratio of wage and profit (%)	
	(1)	**(2)**	**(3)**	**(4)**
Value added ratio (DVA)	-0.172***	-0.171***	-0.807***	-0.748***
	(0.050)	(0.045)	(0.182)	(0.174)
Ln productivity ($PROD$)	-0.068	-0.068	-0.492	-0.463
	(0.189)	(0.226)	(0.757)	(0.868)
Global production network orientation (GPN)	0.131	0.201	1.478	4.645**
	(0.305)	(0.507)	(1.214)	(1.952)
$GPN\ X\ DVA$		-0.001		-0.066*
		(0.009)		(0.035)
1995	-1.755**	-1.757**	-5.092	-5.206*
	(0.833)	(0.814)	(3.131)	(3.130)
2000	-1.054	-1.06	-4.744	-5.287*
	(0.879)	(0.825)	(3.590)	(3.175)
2005	0.025	0.016	-4.205	-4.587
	(0.851)	(0.846)	(3.457)	(3.256)
2010	-1.478	-1.480*	-6.806*	-6.894**
	(0.906)	(0.839)	(3.484)	(3.227)
Constant	48.82***	48.71***	133.9***	128.7***
	(4.539)	(4.906)	(16.72)	(18.87)
Observations	370	370	370	370
Adjusted R-squared	0.747	0.746	0.728	0.731
Industry fixed effects	Yes	Yes	Yes	Yes

Notes: Standard errors are reported in parentheses; time (year) dummy with the year 1990 as the base dummy; table reports within R-square, ***, **, * indicate significance level at 1, 5, and 10%, respectively.

The findings suggest that an increase in value added ratio is associated with worsening poverty and increasing inequality. This is presumably because industries characterized by high value added ratio are relatively capital-intensive (e.g., cement and concrete products) and do not have potential to generate domestic employment. In addition, the coefficient on GPN orientation is small positive but statistically insignificant. This indicates that greater economic integration through GPNs does not worsen poverty and inequality.

In order to address the endogeneity issue (especially, omitted variable bias and simultaneity), the model is re-estimated using system GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998). This estimator is suitable for this dataset due to large panel units and small period of time. System GMM allows lagged first differences to be used as instruments in the levels equations. Note that the two assumptions of the GMM method (absence of second-order serial correlation and valid over-identifying restriction) are met. Table 3 reports the results.

Table 3: The result using the System GMM estimator, lags(1)

	The ratio of labor income in total value added (%)	The ratio of wage and profit (%)
	(1)	**(2)**
Lagged dependent variable (1)	0.550*** (0.098)	0.379*** (0.094)
Value added ratio (DVA)	-0.015 (0.061)	0.002 (0.253)
Ln productivity $(PROD)$	0.044 (0.417)	0.133 (1.648)
Global production network orientation (GPN)	0.388 (0.420)	2.497* (1.424)
1995	-0.469 (0.857)	-3.111 (3.379)
2000	1.130 (0.916)	1.772 (3.554)
2005	2.135** (0.859)	-2.306 (3.555)
Constant	12.81*** (6.939)	38.100 (24.706)
Observations	296	296
Industry fixed effects	Yes	Yes

Notes: Standard errors (GMM) are reported in parentheses, time (year) dummy with the year 1990 as the base dummy, table reports within R-square, ***, **, * indicate significance level at 1%, 5%, and 10%, respectively.

As reported in Column 1 of Table 3, it is found that the coefficient on value added ratio is negative but not statistically significant. Also, as shown in Column 2 of Table 3, the coefficient on value added ratio is small positive but not statistically significant. The size of the coefficients in these two columns is also smaller than the results reported in Table 2. Other than the coefficient on lagged dependent variable, the coefficient on global production network orientation in the ratio of wage to profit equation is statistically significant at the 10 percent level. While the results between FE estimation and system GMM estimation are different, it should be noted that the results from FE could be biased due to small periods of time and endogeneity. Since there is no evidence of weak instruments, system GMM estimation is likely to be more appropriate. Thus, the findings do not support the view that industries characterized by higher domestic value added have greater potential to generate developmental outcome.

I perform a set of robustness check. First, I include two industry-level control variables, namely total employment and total export. The findings withstand an inclusion of additional control variables – that is, there is no significant relationship between value added ratio and the share of labor income in total value added and the share of wage to profit. Second, I drop processed foods sector (e.g., canned fruit and tuna) from the sample because value added ratio among these industries are very high due to intensive use of domestic contents in the production process. The results from both estimation methods still hold.

5. Conclusion

This paper has examined the appropriateness of using the share of domestic value added (value added ratio) of exports in assessing the effectiveness of trade and industrial policy in promoting developmental outcomes: the share of labor income in total value added and the ratio of wage to profit. The empirical analysis adopts Thailand as a case study and employs a mixture of input-output analysis (to measure domestic value added) and panel econometrics to model the relationship between the value added ratio and the two developmental outcomes across 74 manufacturing subsectors for the period 1990 to 2010. It is found that higher value added ratio is not found to promote developmental outcomes. It is important to note that these findings by no means imply that value added ratio does not matter for economic development. However, an undue emphasis on industries with high value added through policy intervention (e.g., export ban, tariff and non-tariff barriers measures) may run counter the objective of raping developmental gains from globalization driven by engaging in global production networks.

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Appendix A: The Input-Output Model

This section describes the methodology of calculating value added ratio. For a non-competitive input-output system, the Leontief balance equation can be written as

$$X = (I - A^d)^{-1}F \quad (1)$$

where X is a matrix of gross output, A^d is a matrix of the domestic I-O coefficient, F is a matrix of final demand, and $(I - A^d)^{-1}$ is an output multiplier.

It is assumed that industry uses both domestically produced input and imported input. Total import requirement matrix is $M = R(I - A^d)^{-1}$ where R is diagonal matrix of imported input coefficients. An element of matrix M, m_{ij}, is the total amount of imports i needed to produce one unit of commodity j. Total import required to produce a unit of commodity j is

$$m_{Tj} = \sum_{i=1}^{n} m_{ij} \quad (2)$$

Let e_j be a value of total exports from sector j. Let us assume that there is no difference in using imports in producing a unit of output whether the product is sold within the economy or exported to the foreign market. Thus, each unit of export of commodity j, e_j, is embodied with imports used by sector j, m_{Tj}. It yields

$$m_{Tj}^{e} = m_{Tj} e_j \quad (3)$$

where m_{Tj}^{e} is the total value of imports embodied in the export of commodity j.

Let e_j^n be net-export earnings of sector j. This is estimated by:

$$e_j^n = e_j - m_{Tj} e_j = (1 - m_{Tj}) e_j \quad (4)$$

Lastly, dividing (4) by gross exports yields value added ratio

$$DVA = e_j^n / e_j \quad (5)$$