NBC Working Paper[1]

EXPORT DIVERSIFICATION AS THE SOURCE OF LONG-TERM GROWTH MODEL

Empirical Evidence from Cambodia

Challenges and Policy Recommendations

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Overview

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The source of growth is variously generated by many factors. Export is played as one of the significant sources of driving growth. Exports are a source of external balance stability and endogenous growth for small open economies, as well as low- and middle-income countries. However, typically, exports in developing countries have been concentrated on a specific group of products and market destinations. They specialize in producing and trading goods and services in which they have a comparative advantage. The exported sectors are mostly labor-intensive with low value-added production. Highly concentrated exports, of course, generate growth. Yet, in the long run, the process of economic transformation might not only be associated with the level of exports but also with an expanding export base. It is often argued that diversification is one of the main engines of the long-term growth model. For instance, [1] has identified diversification as a production factor, whilst [2] claims that diversification may increase income by expanding the possibilities of spreading investment risks over a wider portfolio. Theoretically and practically, long-term growth does not always require higher growth, but the ability to build a resilient path of growth is fundamentally required. Among those, export diversification potentially enables risk mitigation and is less sensitive to volatility. In this regard, the aim of expanding the export base is one of the main agendas for governments to establish long-run economic policies. However, promoting export diversification is not always an easy task since rational and clear policy directions have to be stated, effective implementations of policies, especially structural policies, need to be enforced, and well-coordination among public and private institutions has to be efficiently assured.

Cambodia, one of the small open economies, has become increasingly linked to the global value chain (GVCs). The economy has enjoyed and maintained its growth momentum, with an annual average growth of 7.7% over the last two decades, pre-Covid-19**.** This resilient growth has been significantly and increasingly fueled by its export momentum. Over the last two decades, the country's exports have exponentially increased, reflecting an emerging trend in the manufacturing sector. Textile products have become a long-standing foothold of the country's exports, accounting for more than 70% of the country's exports. The EU and US are two of the main trading partners in terms of textile products, followed by the UK, Japan, and China. Interestingly, in the last few years, the country's exports have diversified to other non-garment products such as electrical parts, vehicle spare parts, bicycles, rubber, and other agricultural products including cassava, maize, bananas, mangos, and cashew nuts. The US and China account for one of the main market destinations for non-garment manufacturing exports. Despite promising export performance and increasing critical links to GVCs, Cambodia has limited manufacturing in GVCs by concentrating on the textile industry in the last 20 years, with the slow progress of diversification. Transitioning to advanced manufacturing GVCs presents a much bigger challenge for Cambodia compared to other regional countries such as Thailand and Malaysia [3]. A few key remaining challenges, among many others, have been prohibiting the progress of export diversification in Cambodia, including (1) the high cost of doing business; (2) low-skilled labor; (3) a poor business environment blocking linkages between FDI and domestic firms; and (4) low digital adoption and adaptation. To accelerate and build the resilient path of growth, especially in the post-COVID-19 period, these chronic challenges will need to be structurally addressed.

The underline objective of this study is to empirically observe the significant impact of export diversification on economic growth in Cambodia. In addition, challenges in limiting

diversification are also tackle in this study along with policy suggestions to accelerate and build resilient growth for Cambodia's economy.

I. Export Diversification and Economic Development: Stylized Facts

1.1 Literature Reviews and Countries' Experiences

Plenty of studies have claimed the significant role of export diversification in economic growth. [4] constructed structural models of economic development and claimed that countries should diversify from primary exports into manufactured exports in order to achieve sustainable growth. Endogenous growth models such as [5] emphasize the importance of learning-by-doing in the manufacturing sector for sustained growth. Referring to export diversification, there could be knowledge spillovers from new techniques of production, new management, or marketing practices, potentially benefiting other industries [6]. Indeed, [7] illustrated the clear relationship between export diversification and economic growth in the long run. Using disaggregated export data, the study claimed that overall diversification increases at low levels of development but declines as the country matures beyond the middle-income point. [8] analyzed in a conventional cross-sectional country growth regression adds various measures of export concentration to the basic growth equation and does find that export diversification promotes economic growth. [9] also claimed that export diversification has a stronger effect on per capita income growth when a country's exports grow faster than alone, using the cross-sectional regression analysis. A new literature review by [10], [11], and [12] theoretically and empirically analyzed the benefits of export diversification and exports in general for economic growth. In their framework, economic growth is not fueled by comparative advantage but by countries' diversification of their investments into new activities.

In recent years, the *resource curse* has cited another view on export diversification. [13] argued that resource-rich, low-income countries should diversify into resource-based manufacturing or processing of primary commodities instead of following the conventional path of low-skill manufacturing. For instance, both mining and forestry have developed into knowledge-intense sectors with high technological content with upstream as well as downstream activities. Similarly, the global growth of fresh food products has led to increasing vertical diversification (processing of those products) but also horizontal diversification into nearby product groups such as cut flowers or specialty fresh vegetables for many low-income countries.

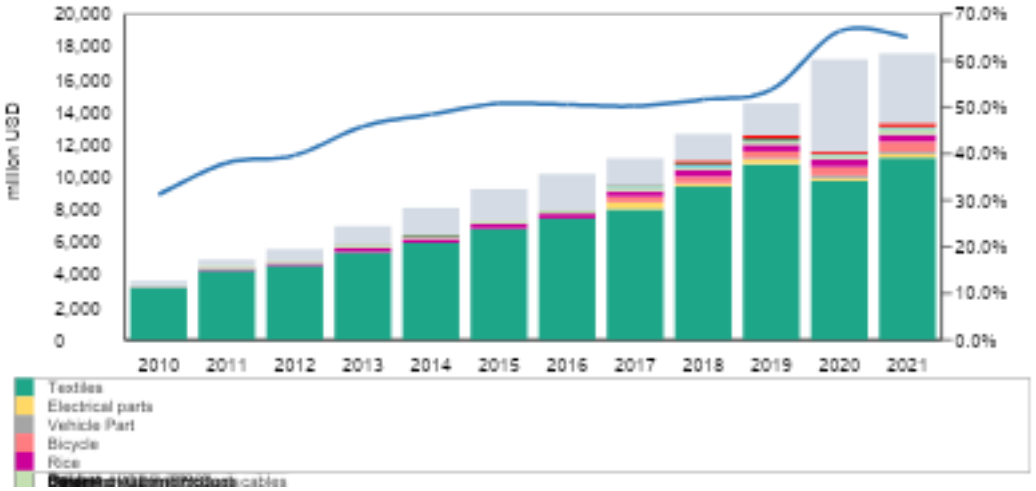
Both Thailand and Malaysia have made good moves in terms of export diversification in the past 3 decades. Besides increasingly linking to GVCs through manufacturing exports, both have expanded their value chains through their resource-based sectors, such as palm oil and rubber in Malaysia and agricultural products and fish in Thailand, and have upgraded into even higher value-added products. China's perhaps one of the most unprecedented stories of economic development in recent history. From the beginning of its 1978 reforms, much of China's development planning had focused on modernizing its industrial base. Within the last four decades, FDI inflows into China have played a significant role in the economic growth, because they provided the Chinese economy with access to finances, advanced technologies or modern management methods. Within this last few decades, China's exports have remarkably expanded and diversified. Electronic and manufacturing and other high-tech products represent one of the top export products. The country is deeply integrated into the

GVCs via both product and geopolitical diversification, where the economy has been fueled by labor-intensive export-oriented manufacturing activities. Empirically, [14] studied the impact of export diversification on Chinese economy. The empirical result revealed that Chinese economic growth benefits are linked to diversification of export products.

1.2 Export and Export Diversification in Cambodia

Over the last decades, the country's exports have substantially expanded both in goods and services. From USD 4 billion in 2010, total merchandise export value increased almost 5-fold to USD 17 billion in 2021 (Figure 1). As of 2021, the country's exports have accounted for 65% of GDP (Annex 1, Figure 1). The US market has become one of the main trading partners, accounting for almost 43% in 2021, followed by the EU (20%), and China (9%) (Annex 1, Figure 2).

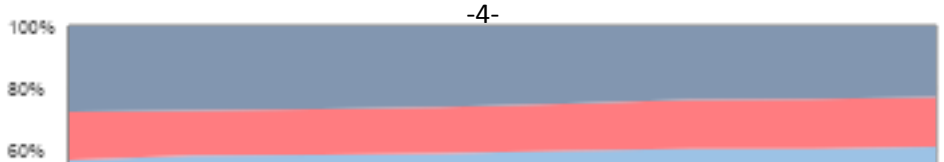
Figure 1: Cambodia's export by products (2010-2021)



Source: Ministry of Economy and Finance (MEF)

Strong export momentum has been fueled by a long-standing foothold in the export of textile products such as clothes, shoes, bags, and so on, which account for nearly 70% of the country's exports (Figure 3). The US and EU are two of the main trading partners in terms of textile products, accounting for 43.1% and 24.2% of total textile exports in 2021, followed by Japan (8.0 %), the UK (5.7%), and China (2.7%) (Annex 1, Figure 3). Since the restoration of peace and the resumption of normalized political and economic relations with the global community in the mid-1990s, export-oriented garment manufacturing has emerged. The 1999 bilateral textile agreement with the US linked quota access to factories' compliance with international labor standards, the first—and only—time the US has implemented such an explicit linkage. From 1999 to 2005, annual increases in U.S. quotas were made conditional on compliance monitoring of factory operations by the ILO In 2001, Cambodia's access to the EU market became both quota-free and duty-free under the EU's Everything But Arms generalized system of preferences for least-developed countries (including Cambodia).

Figure 2: Share of garment investment in total FDI (2014-2021)

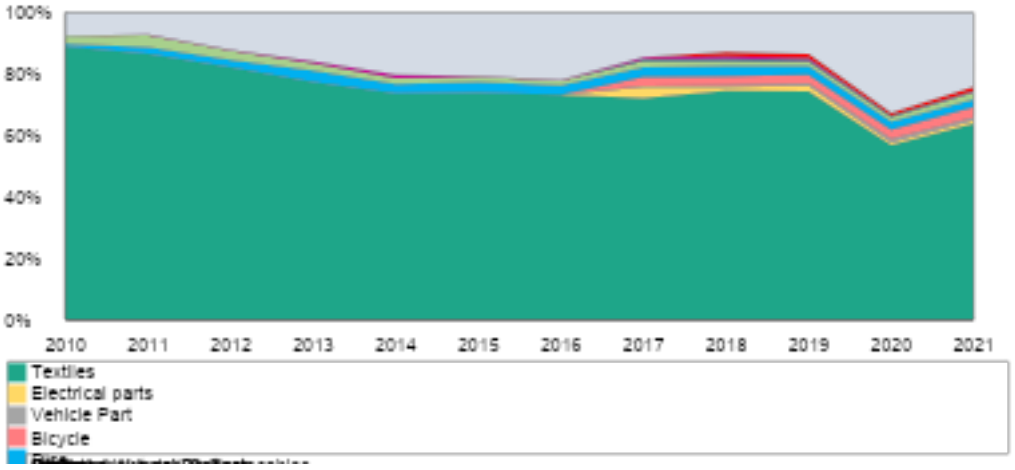


Source: National Bank of Cambodia (NBC)
Note: Capital investment in textiles manufacturing includes garments, footwear, and bags

The country has attracted foreign direct investment, including from Hong Kong, China, Taiwan, Korea, and other countries, given its low cost of production and the abundant labor market, as well as its access to garment quotas. Capital investment in the textile industry accounted for an average of almost 20% of total foreign capital investment during the period of 2014–2021 (Figure 2). Since then, the garment manufacturing industry has led Cambodia to increasingly link to GVCs and has become one of the key engines for growth and job creation.

Interestingly, in the last few years, the country's exports have diversified to other non-garment products such as electrical parts, vehicle spare parts, bicycles, rubber, and other agricultural products including cassava, maize, bananas, mangos, and cashew nuts[2]. The US and China occupy one of the main market destinations for non-garment manufacturing exports, accounting for 42.6% and 19.3%, respectively, in 2021 (Annex 1, Figure 4). As of 2021, non-garment manufacturing exports accounted for 35.6% of the total country's exports.

Figure 3: Share of exported products to total country's export (2010-2021)



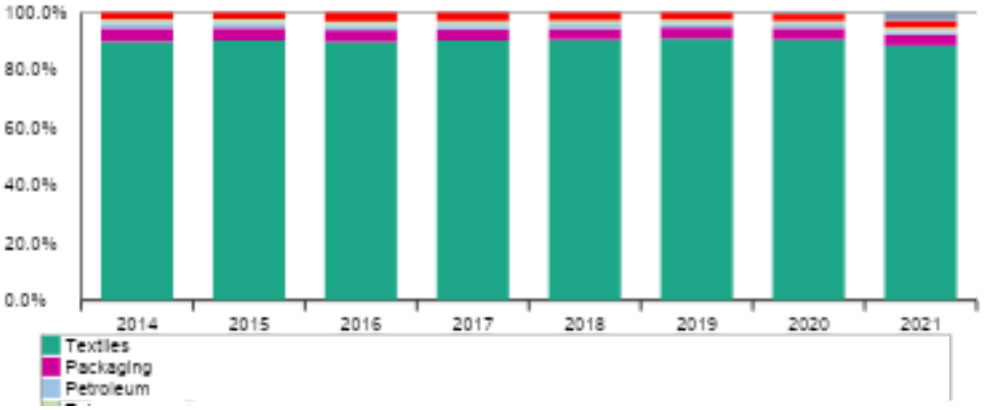
Source: Ministry of Economy and Finance (MEF)

From USD 496 million in 2014 to USD 986 million in 2021, capital investment in the non-garment manufacturing industry increased significantly. This represents 11.5% of the overall capital investment in the manufacturing industry as a whole (Figure 4). A potential

[2] *In this study, non-garment export refers to total country exports excluding textile products.*

factor in absorbing investment inflows into non-garment manufacturing is cheap labor as well as market access. In the past few years, manufacturing in the fields of food processing, wood processing, and solar energy has rapidly emerged.

Figure 4: Share of capital investment in non-garment in FDI to total manufacturing industry (2014-2021)

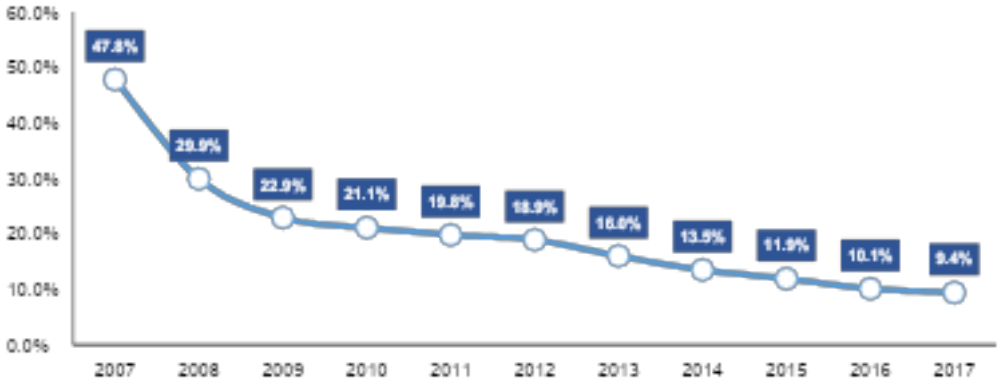


Source: National Bank of Cambodia (NBC)

1.3 Export Diversification and Economic Development in Cambodia

On the back of the restoration of peace and political stability, Cambodia has enjoyed a high rate of growth, with an annual average growth rate of 7.7%, pre-COVID-19 pandemic. The growth momentum has been generated by various sources. Significantly, as one of the small open economies in the region, growth is fueled by external-driven sectors, especially the export manufacturing sector. With its deep integration into the regional and global stage, Cambodia has become one of the most attractive investment destinations, especially in the garment manufacturing sector, given its abundant resources. This has led to substantially expanding the country's exports, increasingly linked to GVCs. The industry has greatly contributed to the country's economic development through various aspects, especially job creation and poverty alleviation. Employment in the textile sector has increased rapidly over the last 20 years. In fact, over 700,000 people were employed in the textile manufacturing industry in 2019 [15]. With decent economic growth, the poverty rate has noticeably declined to only 9.4% in 2017 from 47.8% in 2007 (Figure 5).

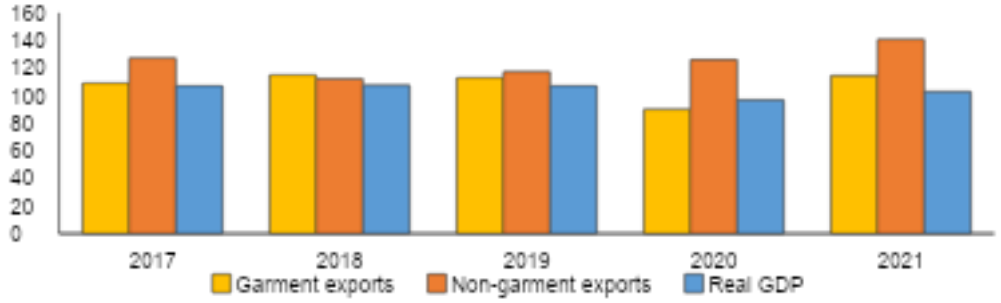
Figure 5: Poverty rate (2007-2017)



Source: Ministry of Planning (MoP)

Despite its strong momentum, the country's exports themselves revealed low diversification progress in terms of both products and markets. For more than two decades, the country has heavily relied on the textile manufacturing industry for low-value-added production. Even though the production has remarkably diversified into some emerging non-garment manufacturing industries, the progress is sluggish and limited. Theoretically and practically, high concentration or low diversification of exports leads the economy to be highly exposed to exogenous shocks. For instance, amid the outbreak of COVID-19, the economy was devastated in 2020 and has historically recorded negative growth over the last 2 decades given its heavy dependence on the garment industry. The export of textile manufacturing has unprecedentedly plummeted due to the decline in external demand, caused by the cancellation of orders by Cambodia's trading partners. Besides, non-garment manufacturing remained robust despite a plunge in external demand. Evidently, export diversification potentially helps mitigate any unprecedented shocks and reduce volatility. Diversification is even more demanding, especially in the new transition (post-COVID-19) where the global economic architecture is changing.

Figure 6: Cambodia's Export and Economic Performance (Index 2016 =100)



Source: Ministry of Economy and Finance (MEF), National Institute of statistic (NIS) and Author's calculation

II. Empirical Model for Export Diversification and Growth in Cambodia

2.1 Model Specification and Data Collection

Export diversification is expected to build a resilient path of growth and sustainably ensure economic development in Cambodia. An empirical analysis is introduced to statistically capture this relationship. To explore the relationship between export diversification and growth, this study follows the Solow growth model [16], which is known as the Cobb-Douglass production function [17] [18] [19]. The production function can be determined as a function of export diversification, technology, physical capital stock, human capital, FDI, and trade openness. However, a simple production function can be written as follows:

$$Y_t = A_t K_t^{\theta} H_t^{\varphi}, \; 0 < \theta + \varphi < 1 \quad (1)$$

Where Y is output, K is the capital stock, and H is human capital, and i denotes time. Meanwhile, θ and φ denote the share of physical capital stock and human capital, respectively, and A represents a function of productivity parameter. Based on function of productivity, (1) can be induced as below:

$$A_t = F\left(X_t T_t O_t F_t\right) = X_t^{\alpha} T_t^{\omega} O_t^{\delta} F_t^{\gamma} \quad (2)$$

Where X is the export diversification, T is technology, O is trade openness, and F is foreign direct investment. Combining (1) and (2), the new equation can be written as:

$$Y_t = X_t^{\alpha} T_t^{\omega} O_t^{\delta} F_t^{\gamma} K_t^{\theta} H_t^{\varphi} \quad (3)$$

Where $\alpha, \omega, \delta, \gamma, \theta$ *and* φ denote the elasticity of production function with respect to *X, T, O, F, K and H* respectively. (3) can be transformed into log-linearized equation as below:

$$\ln ln\, Y_t = c + \alpha lnX_t + \omega lnT_t + \delta lnO_t + \gamma lnF_t + \theta lnK_t + \varphi lnH_t + \varepsilon_t \quad (4)$$

Where

- $\ln ln\, Y_t$ is the natural log of Real GDP, representing Cambodia's economy at time *"t"*
- lnX_t is the natural log of export diversification index of Cambodia at time *"t"*
    - Export diversification index is calculated by using Herfindahl–Hirschman Index (HHI). The HHI index is a common measures of market concentration. In this case HHI = $\sum_{i=1}^{n} \left[\frac{s_i}{S}\right]^2$. Where *i= 1,2,….,n* is the number of products to be exported, s_i is exported products and *S* is total export. HHI is valued between 0 and 1. 0 means most diversified export and 1 means most concentrated export.
- lnT_t is the natural log of fixed broadband subscription, representing technological development in Cambodia at time *"t"*.
- lnO_t is the natural log of degree of openness of Cambodia at time *"t"*. Degree of openness is calculated as $\frac{(Export+Import)}{GDP}$.
- lnF_t is the natural log of net foreign direct investment inflow into Cambodia at time *"t"*.
- lnK_t is the natural log of gross fixed capital formation of Cambodia at time *"t"*, representing physical capital stock.
- lnH_t is the natural log of human development index of Cambodia at time *"t"*
- ε_t is error term

All relevant data is derived from a variety of sources, including the Ministry of Economy and Finance (MEF), the World Bank, the United Nations Development Program (UNDP), the National Institute of Statistics (NIS), and internal calculations (Table 1).

Table 1: Variables and Sources of Data

Variable	Notation	Data	Source
Dependent variable	Y	Real Gross Domestic Product (Billion USD) [20] [21]	NIS
Independent variable	X	Export diversification calculated by using *HHI index* [22]	MEF and Author Calculation
Control variables	T	Fixed broad subscription (per 100 people) [23] [24]	World Bank
	O	Degree of openness calculated as: *trade volume/GDP* [25] [26]	MEF, NIS and Author Calculation
	F	Net foreign direct investment (Billion USD) [27]	World Bank
	K	Gross fixed capital formation (Billion USD) [28] [29]	NIS
	H	Human development index [30] [31]	UNDP

2.2 Estimation Methodology

Due to limited observations where the sample spans the period 2000–2019, the study employs Bayesian with Markov chain Monte Carlo (MCMC) inference instead of using a frequentist approach, e.g., OLS. Unlike the classical approach, the Bayesian approach is concerned with how a prior is updated given the likelihood of obtaining the desired posterior distribution. In the case of a small sample size, Bayesian estimators provide more trustworthy results than traditional approaches, such as the maximum likelihood estimator (MLE) [32].

Given the fact that the data for Gross Domestic Product (GDP) representing the economy (dependent variable) is censored, this research study also incorporates the Standard Tobit Model, developed by [33], to capture the censored data[3]. The combination between the Standard Tobit Model and Bayesian statistics based on MCMC inference is called the Bayesian Tobit Model, introduced by [34].

Posterior is computed by the multiplication between prior and the likelihood by Bayes' Theorem.

$$p(x) = \frac{\pi(\Omega)p(x|\Omega)}{p(x)} = \frac{\pi(\Omega)p(x|\Omega)}{\int p(x)p(\Omega)d\Omega} \quad (5)$$

where x is a vector of the observed data and Ω is the unknown parameters. The posterior probability conditional on x is $p(\Omega|x)$ and $p(\Omega)$ is likelihood function. However, the

[3] GDP (in value) data only takes a positive value. The initial number starts with some positive number. This kind of data is called censored data. Censored data can be above or below a specific threshold, or both. The Standard Tobit Model is used to deal with censored data.

integration, $\int p(x)p(\Omega)d\Omega$, is even more complicated in a high dimension. In this case, MCMC inference has become one of the popular sampling methods in approximating the posterior distribution by sampling from the conditional posterior distribution using the Gibbs sampling algorithm. Using Bayesian with MCMC inference, (4) can be transformed to a simple regression as below:

$$y_i^* = x_i'\beta + \varepsilon_i \tag{6}$$

where y_i^* is limited dependent variable. It is observed where it exceeds the value of the below censored. In this case the below censored is 1.30[4]. $\beta = (\alpha, \omega, \delta, \gamma, \theta, and\ \varphi)$ is a vector of regression parameter (the coefficient of the explanatory variables) and $x_i = (lnX_t, lnT_t, lnO_t, lnF_t, lnK_t, and\ lnH_t)$ is a vector of explanatory variables. The prior distribution of (β, σ^2) are assumed to have a multivariate normal distribution and inverse gamma distribution (IG), respectively. This can be written as:

$$\beta|\sigma^2 \sim N(\beta_0, \sigma^2 B_0)\ ,\ \sigma^2 \sim IG(\frac{n_0}{2}, \frac{S_0}{2}) \tag{7}$$

where β_0 is $K\times1$ known constant vector, B_0 is a $K\times K$ known constant matrix, and $n_0\ and\ S_0$ are shape and scale of parameters respectively. If $y^* = (y_1^*, y_2^*, ... y_n^*)'$, and $x_i' = (x_1, x_2, ... x_n)$ and $\varepsilon_i = (\varepsilon_1, \varepsilon_2, ... \varepsilon_n)' \sim N(0, \sigma^2)$, $n_1 = n_0 + n$. Given y^*, the joint posterior distribution can be derived by Bayes' Theorem:

$$\pi(y_c^*, \beta, \sigma^2|y_0) \propto \pi(y_c^*, y_0|\beta, \sigma^2)\pi(\sigma^2)\pi(\beta) \tag{8}$$

Then joint posterior distribution of $\pi(y_c^*, \beta, \sigma^2|y_0)$ is given:

$$\pi(y_c^*, \beta, \sigma^2|y_0) \propto (\sigma^2)^{-\left(\frac{n_1}{2}+1\right)} \times exp\left\{-\frac{1}{2}\sum_{i=1}^{n}\frac{1}{\sigma^2}\left(y_i - x_i'\beta\right)^2\right\}$$

$$\times exp\left\{-\frac{1}{2}\left(\beta - \beta_0\right)'\frac{1}{\sigma^2 B_0}\left(\beta - \beta_0\right) - \frac{S_0}{2\sigma^2}\right\} \tag{9}$$

Conditional Posterior distribution of β

$$\pi(\beta|y_c^*, \sigma^2, y_0) \propto exp\left\{-\frac{1}{2}\sum_{i=1}^{n}\frac{1}{\sigma^2}\left(y_i - x_i'\beta\right)^2 - \frac{1}{2}\left(\beta - \beta_0\right)'\frac{1}{\sigma^2 B_0}\left(\beta - \beta_0\right)\right\}$$

[4] The below censored data of dependent variable (Real GDP) is 1.30, the logarithm of Real GDP at the beginning of observation, the year 2000

$$\times exp\{-\frac{1}{2}\left(\beta-\beta_1\right)'\frac{1}{\sigma^2 B_1}\left(\beta-\beta_1\right)\}$$

(7)

where $B_1^{-1}=B_0^{-1}+\sum_{i=1}^{n}\tilde{x}_i'\tilde{x}_i$, $\beta_1=B_1(B_0^{-1}\beta_0,+\sum_{i=1}^{n}\tilde{x}_i'\tilde{y}_i^*)$

Conditional Posterior distribution of σ^2

$$\pi(\sigma^2|y_c^*,\beta,y_0)\propto(\sigma^2)^{-\left(\frac{n_1}{2}+1\right)}exp\left\{-\frac{1}{2\sigma^2}\left[\sum_{i=1}^{n}\left(y_i-x_i'\beta\right)^2+S_0\right]\right\}$$

$$\times exp\left\{-\frac{S_1}{2\sigma^2}\right\} \quad (8)$$

The conditional posterior distribution of (7) and (8) could be written as

$$\beta|\sigma^2,y^*\sim N(\beta_1,\sigma^2B_1) \quad (9)$$

$$\sigma^2|y^*\sim IG(\frac{n_1}{2},\frac{S_1}{2}) \quad (10)$$

Let $y_c^*=\left(y_{c,1}^*,y_{c,2}^*,.....,y_{c,n-k}^*\right)'$ and $y_0=(y_{0,1},y_{0,2},.....,y_{0,k})'$ denote $(n-k)\times 1\ and\ k\times 1$ vectors of censored dependent variables and observed dependent variables, respectively. Then, we sample from the conditional posterior distributions using Gibbs Sampling algorithm:

Algorithm Gibbs Sampling (Standard Tobit Model)

1) Initialize $\beta\ and\ \sigma^2$.
2) Sample $y_c^*|\beta,\sigma^2,y_0$

   Generate $y_{c,i}^*|\beta,\sigma^2\sim TN_{(-\infty,d)}\left(x_i'\beta,\sigma^2\right)$, $i=1,2,.....,n-k$, for censored observations, where $TN_{(a,b)}\left(\mu,\tau^2\right)$ denotes a normal distribution N (μ,τ^2) truncated on the interval (a,b). d is the threshold where y is observed.
3) Sample $(\beta,\sigma^2)|y_c^*,y_0$

   3.1 Sample $\sigma^2|y_c^*,y_0\sim IG(\frac{n_1}{2},\frac{S_1}{2})$

   3.2 Sample $\beta|\sigma^2,y_c^*,y_0\sim N(\beta_1,\sigma^2B_1)$
4) Go to 2 and Repeat (Iterative process).

Using MCMC inference, diagnostic tests are always required to conduct. Raftery and Lewis Test and Heidelberger and Welch Test, by default, report the stationary and convergence of the MCMC chain. In addition, some figures have also been accessed, namely trace plots, running mean plots, kernel density plots, and autocorrelation plots. The plots indicate the convergence and stationary processes of the MCMC chain. Non-convergence

indicates a poor mixing chain and considers increasing the iteration. If non-convergence is still detected despite a very long iteration, it is a result of poor model specification. Reparameterization can be considered to obtain a good model specification.

III. Empirical Findings

A million iterations are drawn from the conditional posterior distribution[5]. The summary output has two major consistent parts. Firstly, the MCMC output consists of the posterior mean and standard deviation of the mean, as well as the quantile of interest of each variable. Secondly, diagnostic tests have also been attached, indicating how well the model specification is. Table 2a and 2b indicate the MCMC output and quantile of interest, respectively.

Table 2a: MCMC Output

Description	Mean	SD	Naive SE	Time-series SE
(Intercept)	3.377	0.598	0.001	0.001
X	***-0.325***	***0.129***	***0.000***	***0.000***
K	0.130	0.135	0.000	0.000
O	0.284	0.252	0.000	0.000
F	0.115	0.036	0.000	0.000
T	0.045	0.027	0.000	0.000
H	1.703	0.987	0.001	0.002
sigma2	0.002	0.001	0.000	0.000

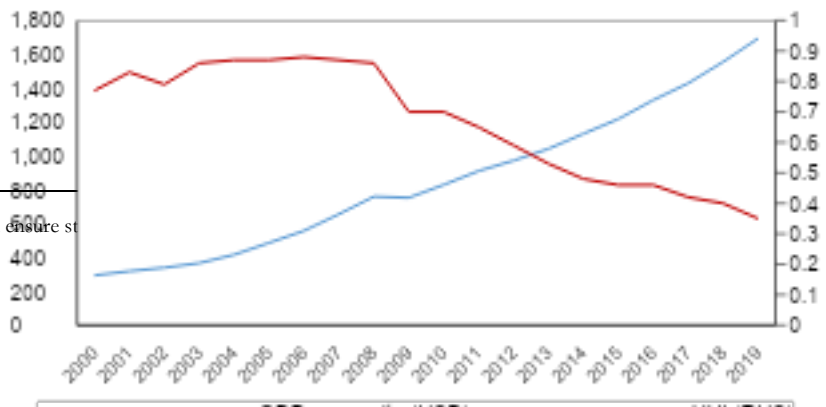
Table 2b: Quantile of Interest

Description	2.5%	25.0%	50.0%	75.0%	97.5%
(Intercept)	2.280	2.986	3.344	3.730	4.659
X	-0.578	-0.407	-0.326	-0.244	-0.068
K	-0.139	0.045	0.131	0.216	0.396
O	-0.225	0.126	0.286	0.445	0.776
F	0.042	0.093	0.116	0.138	0.184
T	-0.012	0.028	0.046	0.063	0.097
H	-0.109	1.058	1.650	2.289	3.823
sigma2	0.001	0.001	0.002	0.002	0.005

Source: Author's Calculation

Based on Table 2a, export concentration indicates a significant negative relationship with Cambodia's economy (Figure 7). In other words, diversification positively generates growth. The coefficient α is significantly large, 0.325. The positive correlation intuitively indicates the country's stylized facts where Cambodia has increasingly linked to GVC.

Figure 7: HHI index and GDP per capita of Cambodia



[5] A very long chain will ensure st

Note: Lower HHI indicates more diversified
Source: National Institute of Statistic (NIS) and Author's calculation

Hence, this empirically reveals that the more diversified, the better for growth. This positive relationship is in line with many empirical studies such as [7], [8], [10], [11] and [12], which claim that export diversification does potentially fuel growth. Besides, the control variables such as K, O, F, T, and H also indicate a positive correlation. This is undeniably consistent with the economic prior, according to which capital, openness, investment, technological progress, and human capital are the sources of long-term growth.

Again, the diagnostic test is critical in determining the MCMC simulation's convergence and stability. The convergence and stability reflect a good model specification. Based on the empirical results, there is evidence of convergence, reflected by a good mixing chain and a stable running mean (Annex 2). In addition, based on table 2b, the estimated mean of each variable approaches 50.0% in the 95% credible interval. This indicates a normal distribution, especially *X*, representing export diversification. Overall, the model has converged and reported stability in the MCMC chain. Hence, the empirical result is statistically applicable to interpret.

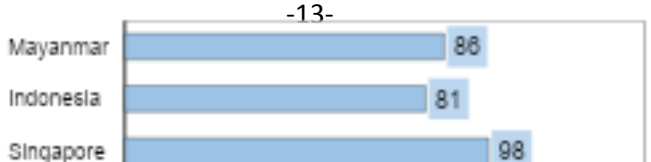
IV. Key Challenges in Limiting Diversification

Despite a remarkable expansion of export volume and an increasing critical link to GVCs, the country's exports have experienced limited diversification in terms of products and markets. Textile products have displayed a long-standing foothold in the total country's exports over the last 20 years. This slow diversification has presented a systematic issue in accelerating and building a resilient path of growth, especially in the long-term. A few significant constraints in limiting the speed of diversification. Those remaining challenges can be derived from (1) the high cost of doing business; (2) low-skilled labor; (3) a poor business environment blocking linkages between FDI and domestic firms; and (4) low digital adoption and adaptation.

4.1 High Cost of Doing Business

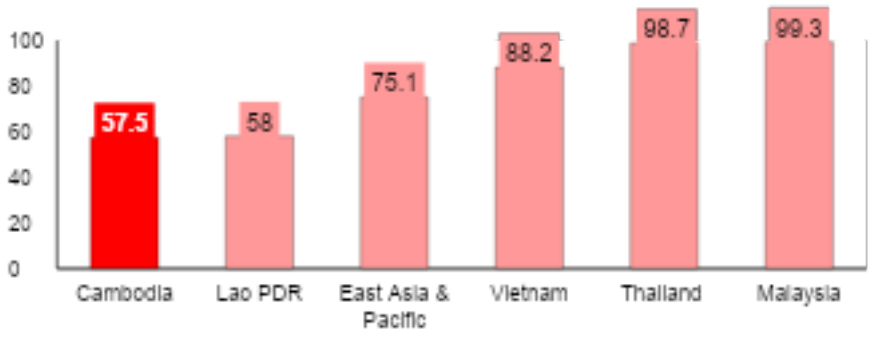
The cost of doing business significantly matters for production. The high cost of doing business is still one of the remaining concerns in Cambodia. In fact, the cost of energy in Cambodia remains relatively high compared to other regional peers. Cambodia still imports a large share of its energy from abroad, 30% in 2020, despite an increase in domestic power generation capacity and access to electricity. Electricity prices are among the most expensive in Southeast Asia due to a shortage of integrated high-voltage transmission systems and the high cost of imported diesel fuel [35] (Figure 8). In addition, the procedure of getting electricity is also taking quite a long time; this also creates another barrier for the investment climate (Figure 9).

Figure 8: Average Electricity Price for Industry (2017), as of USD/MWh



Source: UNESCAP

Figure 9: Getting Electricity Score (2020)



Note: Getting electricity is the simple average of its procedure, time cost and reliability of supply and transparency of tariff index. The maximum score is 100. Close to 100 means getting electricity is much faster and easier.
Source: Doing Business, 2020

Indeed, the quality and reliability of electricity supply are key concerns for the investment climate. The high cost of energy is a significant constraint on production activities and also the potential for moving up the value chain.

Moreover, transport and logistics also pose another burden to the investment climate as they are highly associated with trading activities. Logistic in Cambodia is less developed compared with neighboring countries due to the lack of a reliable network of transportation, telecommunications, warehousing, trucking services, and related infrastructure. Based on the assessment of the World Bank, the Logistic Performance Index of Cambodia ranked 98th with a score of 2.7 (5 being the perfect score), relatively low compared to regional countries. In that, customs, infrastructure, and logistic competence have the lowest performance (Figure 10a & 10b).

Figure 10a: Cambodia's Logistic Performance Index (2018)

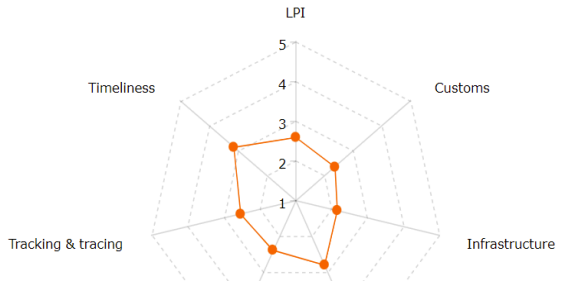
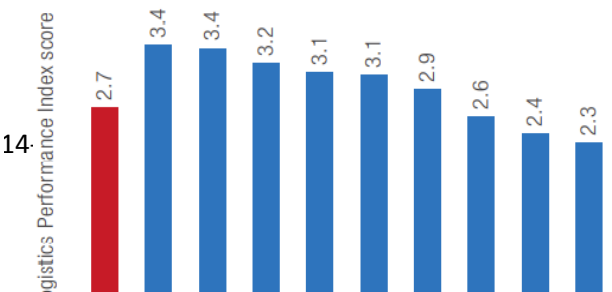


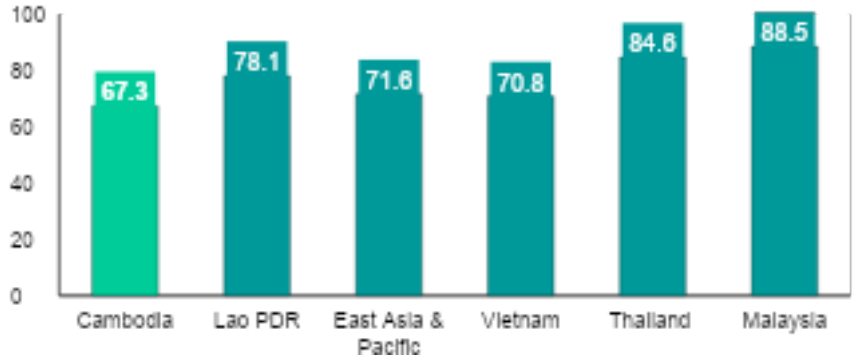
Figure 10b: World Bank Logistic Performnace Index (2018)



Source: World Bank, 2018 Source: World Bank, 2018

In this regard, transport and logistic costs in Cambodia are relatively high compared to regional peers such as Vietnam and Thailand. Cambodia's export costs are about 33% higher than those of Thailand and 30% higher than those of Vietnam [36]. In addition, based on the Doing Business Report 2020, trading across borders in Cambodia ranked 118th with a score of 67.3 out of 100. This relatively lower score compared to neighboring countries reflects the high cost of logistics, including border compliance and documentary compliance (Figure 11). This presents a constraint on exported sectors in moving goods across borders and limits the entrance to GVCs.

Figure 11: Across borders Score of Cambodia (2020)



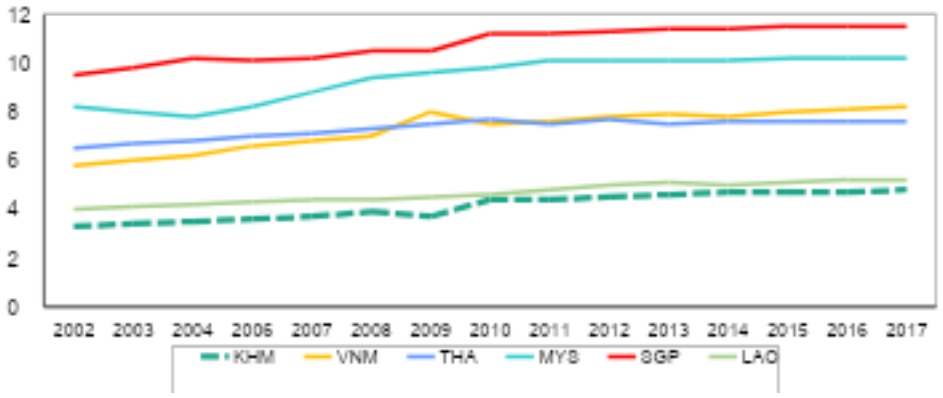
Note: Across border score the simple average of the time and cost for documentary compliance and border compliance to export and import. The maximum score is 100. Close to 100 means the lower cost import and export.
Source: Doing Business, 2020

4.2 Low Skilled Labor

Despite the abundance of young population, skilled labor remained low. With low or unskilled labor, there is another constraint for the country in absorbing high value-added FDI and moving up the value chain. In comparison with regional countries, Cambodia still has the lowest year of schooling (Figure 12). In 2020, only 8.5% of the working-age population was expected to have completed secondary education and 1.5% to have completed tertiary

education, which is lower than in most comparable-income countries[6]. University graduates represent 4.8% of the population aged 25 years and older, while the ASEAN average is 12.9%[7]. In addition, the returns on education are low: workers with only one year of education earn similar wages to those with 11 years of education. This suggests that the education system is not a solution for the current workforce, and instead an effective skills development system is needed to address current skills gaps [37].

Figure 12: Mean Year of Schooling in Some Selected ASEAN Countries



Note: KHM = Cambodia, VNM = Vietnam, THA = Thailand, MYS = Malaysia, SGP = Singapore and LAO = LAO PDR
Source: Lee-Lee (2016); Barro-Lee (2018) and UNDP HDR (2018)

Cambodia has not yet established and implemented an effective system to upskill the existing workforce, contributing to the skill deficit. The public and private skills development systems are fragmented and small. Instead of developing a feedback mechanism to identify what skills employers need or creating a results-based incentive for training institutions, reform so far has focused on setting standards[8]. The most recent World Bank Enterprise Survey revealed a majority of firms said an inadequately trained workforce was among their top three constraints, but exporters were twice as likely to report this constraint as non-exporters (42% compared to 21%)[9]. According to a National Employment Agency survey, insufficient skills led to lower worker productivity and hurt business in many ways, like: delays in developing new products and services, increased workload for skilled workers, difficulties in meeting customer service objectives and quality standards, and business lost to competitors[10].

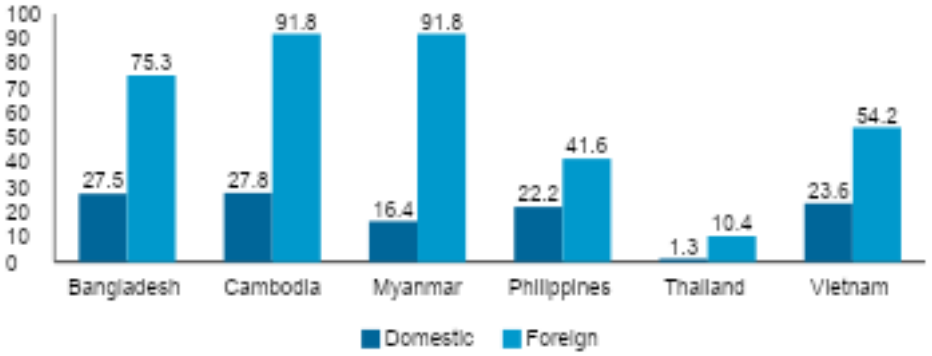
4.3 Poor Business Environment Blocks Linkages Between FDI and Domestic Firms

The backward linkages in Cambodia have been limited in the past two decades, despite a rise in the manufacturing sectors. Even though FDI has fueled Cambodia's export over the last decades, quality of FDI appears to be an issue, where FDI firms in Cambodia do not create backward linkages. It is true that strong productivity spillovers can occur from upstream linkage with FDI firms; however, it is not yet formed in Cambodia. About 91.8% of

[6] Projected educational attainment for the total population is based on historical school enrollment and completion statistics. Barro and Lee (2021)
[7] UNESCO. UIS.Stat. Available at: data.uis.unesco.org
[8] World Bank (2019)
[9] World Bank (2019)
[10] World Bank staff calculations based on National Employment Agency (2014 and 2015) and World Bank (2019) data.

production inputs for manufacturing firms in Cambodia are externally-imported compared to 10.4% in Thailand, 54.2% in Vietnam and 75.3% in Bangladesh (Figure 13).

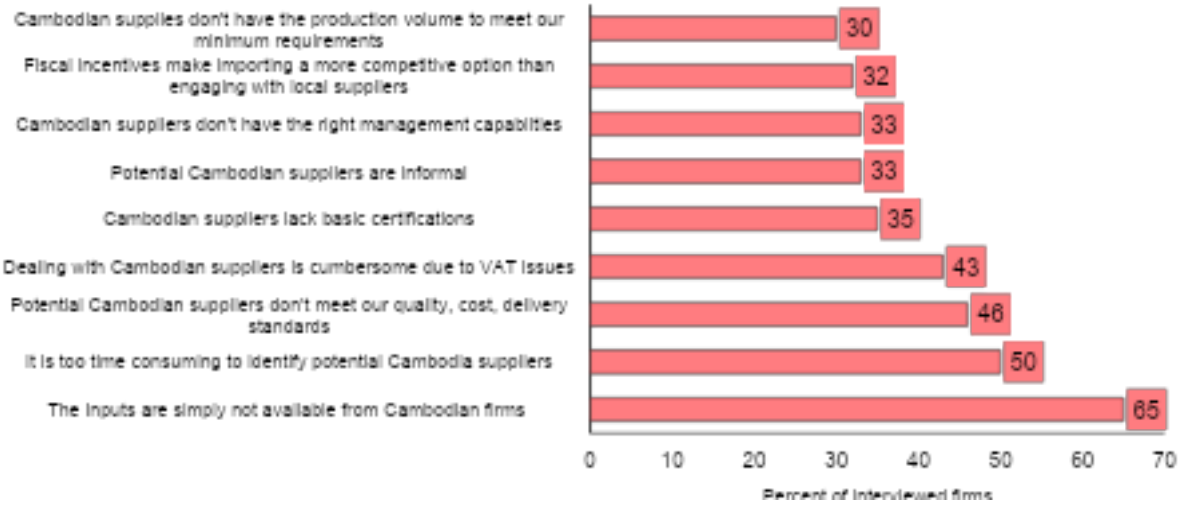
Figure 13: Percent of foreign inputs in total production inputs, manufacturing firms, 2013-2016



Note: Foreign ownership is 10% or more foreign ownership share
Source: World Bank staff calculations using data from World Bank Enterprise Surveys and Cambodia Economic Diversification Study (World Bank 2019a)

A recent World Bank survey found significant capacity and business-climate constraints for foreign-owned manufacturing firms to source locally. More than 50% of the surveyed foreign-owned firms claimed that the production inputs they require are not available in Cambodia (Figure 14).

Figure 14: Business Environment Constraints Inhibit Backward Linkages from FDI to Domestic Firms



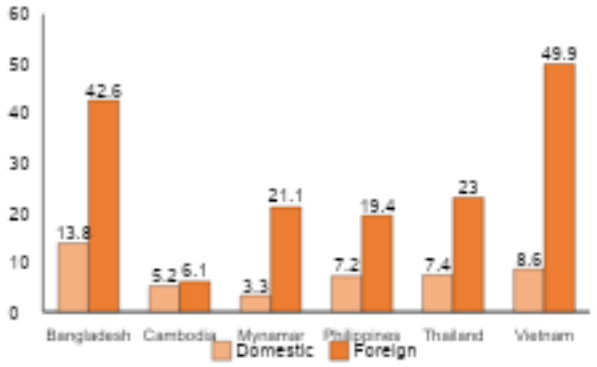
Source: World Bank staff calculations using data from World Bank Group 2017 FDI Survey and Cambodia Economic Diversification Study (World Bank 2019)

Even if it is locally accessed, foreign-owned firms said that identifying local suppliers is too time-consuming, 50% of total respondents, and when they do find potential suppliers, the suppliers often do not meet the quality, cost, and delivery standards required, 46% of total respondents [38]. On top of this, a concerning issue is that companies with Qualified

Investment Project (QIP) status are likely to import production inputs from abroad as they are exempt from paying value-added tax (VAT) on imports and claiming a VAT refund when dealing with local suppliers would be too time-consuming, 43% of total respondents[11]. The above business environment has influenced the transition to and upgrading in more advanced manufacturing GVCs of Cambodia.

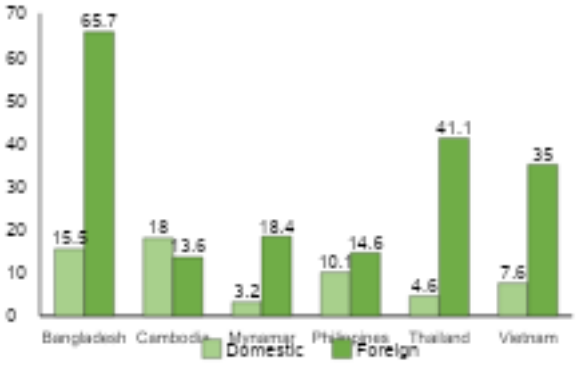
In addition to limited backward linkages, the potential technology spillovers from foreign-owned firms in Cambodia are also extremely low. Foreign firms with quality certificates or technology licensed from foreign firms are relatively low in Cambodia compared to regional countries, providing limited opportunities for technology transfer. In Cambodia, around 6.1% of foreign enterprises have an internationally recognized quality certification and only 13.6% use technology licensed from foreign companies.

Figure 15: Percent of firms with an internationally recognized quality certification



Source: World Bank staff calculations using data from World Bank Group 2017 FDI Survey and Cambodia Economic Diversification Study (World Bank 2019)

Figure 16: Percent of manufacturing firms using licensed from foreign companies



Source: World Bank staff calculations using data from World Bank Group 2017 FDI Survey and Cambodia Economic Diversification Study (World Bank 2019)

4.4 Low Digital Adoption

Despite substantial progress in the delivery of basic digital infrastructure, Cambodia still has a long way to go in digital adoption and technological readiness. With very little infrastructure remaining after the civil conflict, Cambodia bypassed rebuilding the fixed line market and quickly launched into alternative technologies with mobile phones.

Figure 17: Mobile Cellular Subscription (in 100 inhabitants)

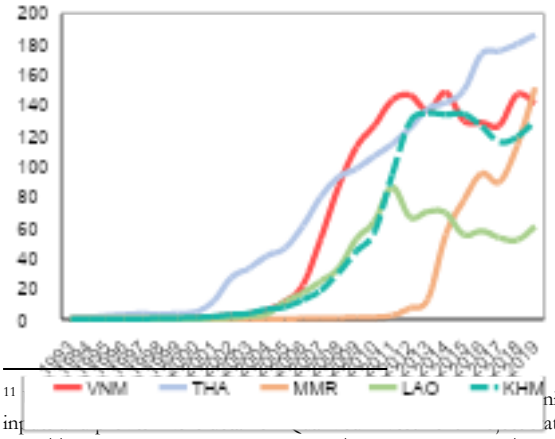
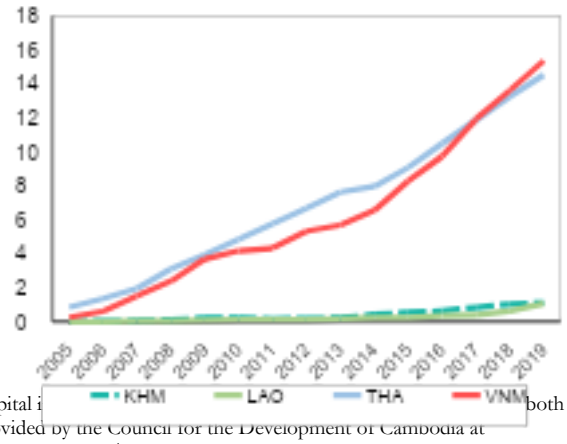


Figure 18: Fixed Broadband Subscription (In 100 inhabitants)



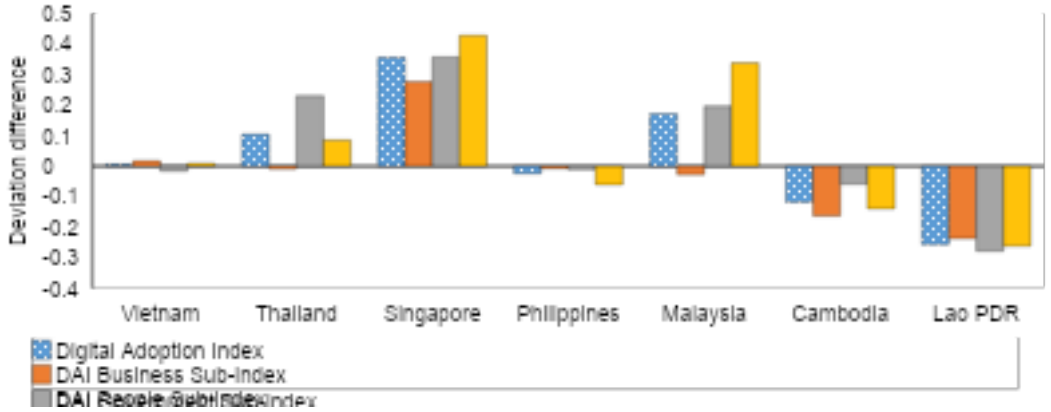
[11] nimum capital i both in atus is provided by the Council for the Development of Cambodia at http://www.cambodiainvestment.gov.kh/investment-scheme/investment-incentives.html/

Source: World Bank Source: World Bank

Mobile cellular subscriptions increased from less than 1 per 100 inhabitants in 1993 to 130 in 2019, similar to the countries in the region. In contrast, fixed broadband subscriptions are relatively low, at around 1.1 per 100 inhabitants in 2019. Low fixed-broadband adoption in Cambodia may be due to a combination of factors, including limited availability of optical fiber in rural areas, the low number of households with a computer, and the relatively low price of mobile-broadband internet compared to fixed-broadband internet.

Despite remarkable progress in the delivery of basic digital infrastructure and emerging digital adoption by people in recent years, overall digital adoption and readiness are relatively low compared to other regional peers, leading only Lao PDR, particularly about adoption by businesses and government (Figure 19).

Figure 19: Digital Adoption Index (and sub-index) in Cambodia relative to global average (2016)



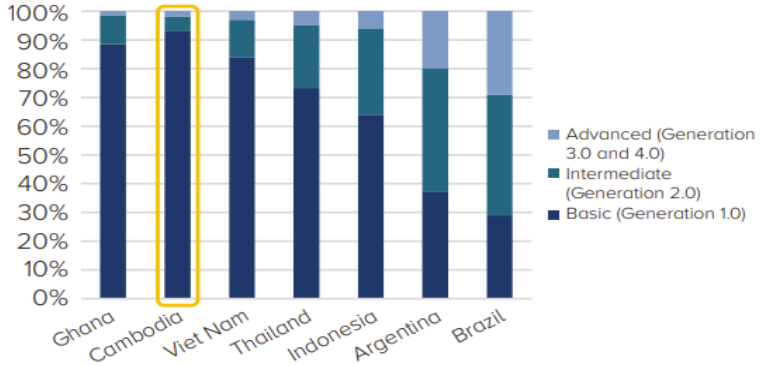
Source: World Bank

Specifically, digital adoption at the firm level appears to be lagging other countries, presents an additional constraint. Based on the study, a small number of firms in Cambodia (1-3%) have adopted digital technologies at an advanced level, while most of the companies show a basic level of technology adoption (90-96%)[12] [39]. Several factors contribute to

[12] Advanced – firms use digital technologies across various operations; digital technologies used by the firms are at least as advanced as their competitors; actively engaged in innovation and R&D. Intermediate – firms have started to use some advanced digital technologies in specific operations but some competitors are ahead; they are motivated to engage in innovation but constrained by limited resources. Basic – firms perform many activities through manual work (and paper-based processes) without the use of digital tools; they lack the resources to engage in innovation

limiting the adoption of new technologies by firms, including a lack of awareness of digital technologies and their benefits, the high-cost perception of technologies, aversion to the use of new technologies, skills gaps, limited access to training and technical assistance, and constrained access to finance (Figure 20).

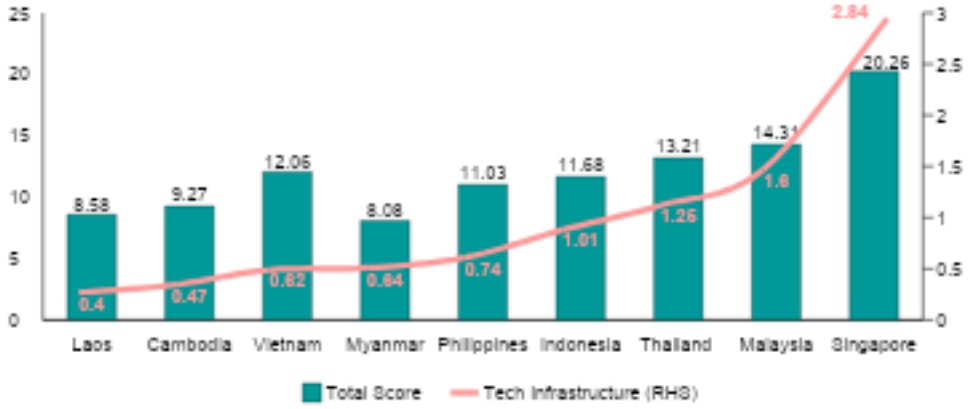
Figure 20: Adoption of advanced technologies in Cambodia and other developing countries



Note: In Cambodia and Indonesia the categories used were low, moderate and advanced technology adoption.
Source: Policy Links based on information from focus group discussions conducted with industry stakeholders (Cambodia and Indonesia); and UNIDO (2019b). Industrial Development Report 2020. Industrializing in the digital age. Overview. Vienna

Notwithstanding the development of telecommunication infrastructure over the last several years, the improvement of infrastructure is still limited, relative to the countries in the region, in which CISCO assessed that the technology infrastructure in Cambodia attained the score of only 0.47 out of 4.00, leading only Laos and Myanmar in the region (Figure 21). In addition, based on Telecommunication Infrastructure Development Index assessed by the United Nation in 2020 (Figure 22), Cambodia received 0.54 score out of 1.00, which is in the moderate level compared to the global scale.

Figure 21: Digital Readiness Index Score of Countries in ASEAN

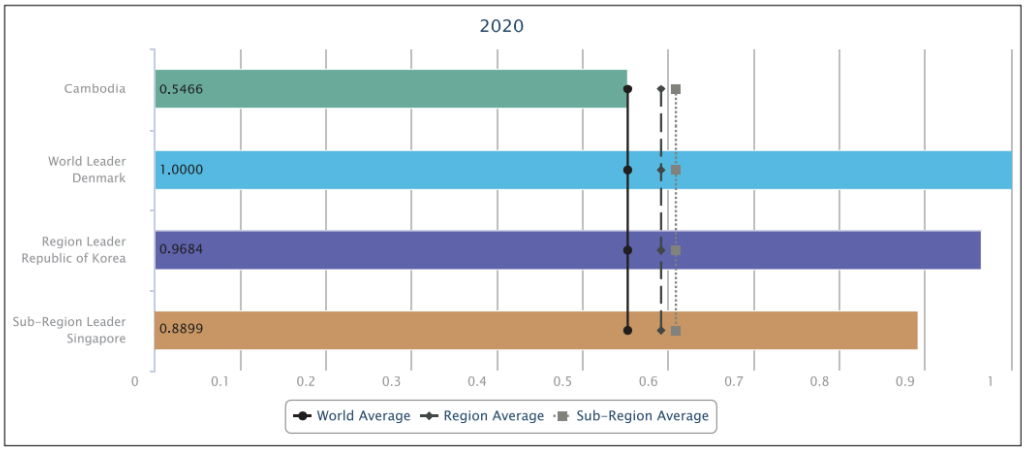


Note:

- *Total Score: Scoring scale 0-25, where 0 = lowest and 25 = highest*
- *Technology infrastructure: Scoring scale 0-4, where 0 = lowest and 4 = highest*

Source CISCO, Digital Readiness Index 2019

Figure 22: Telecommunication Infrastructure Index of Cambodia, 2020



Note: Scoring scale 0-1, where 0 =lowest and 1= highest
Source: United Nations E-Government Survey, E-Government Development Index (EGDI) 2020

V. Policy Recommendations

5.1 Lowering cost of doing businesses

Bring down the cost of production is one of the main agendas in promoting the business environment and speeding up economic and export diversification. Therefore, two remaining issues should be well-addressed:

a. **Energy sector:** energy consumption is highly associated with the development of the economy. To ensure energy consumption at a reasonable and lower cost, a few significant areas should be considered:
   - ***Stable and sustainable energy supply***: ensuring the supply of energy on a nationwide scale to meet the demand, especially for industry. To achieve this objective, a few measures should be taken:
     - o review energy supply forms for key industrial areas, ensuring the supply of electricity is in accordance with the most stable requirements and sustainability that allow plants to effectively plan their own manufacturing
     - o ensure the stable supply and distribution of electricity to economic poles and major industrial hubs, especially in the night time, ensuring effective production
     - o increase the installed capacity of power
     - o review estimates of long-term electricity needs and energy sector development plans compared to new visions for white development Economies and industries, including reviewing options to supply adequate energy, especially for supplying key strategic industrial areas
   - ***Investment in renewable energy infrastructure:*** to meet the present and future energy demands. Hence, a few measures could be taken:
     - o encourage investment and provide incentives in clean energy and renewable energy sectors that have a low environmental impact, such as solar, hydropower, wind, bio-mass, gas, green energy, and so on, through collaboration between public and private partnerships
     - o encourage special economic zones, industrial hubs, and SMEs to provide electricity via solar systems in addition to the energy supplied by public-private energy distributors

    - study the need for electricity imports in the medium and long term and consider the possibility of replacing those imports by adding additional domestically-energy suppliers, using renewable energy such as solar

b. **Logistic sector:** boosting infrastructure and logistic efficiency. Several measures could be implemented to improve infrastructure and logistics efficiency while also ensuring low and affordable logistic costs in Cambodia:
    - study the needs of infrastructure for each priority sector and prioritize the construction of the infrastructures clearly
    - organize a cooperation framework between special economic zones and the government to prioritize sectors around special economic zones and build support infrastructure that suits those priorities
    - accelerate the completion of the preparation of the " **Comprehensive Intermodal Transportation Master Plan for 2022-2030"**
    - encourage the use of railways and waterways for transportation of goods, containers, especially from ports to special economic zone
    - promote the effective use of major national roads to support domestic transport and exports
    - review and edit customs procedures by fully using digital technology

5.2 Addressing skill gap

Human capital is another key aspect for Cambodia in enhancing economic development and the country's competitiveness through economic and export diversification. A few areas can be addressed to move the country's value chain from a labor-intensive economy to a capital-intensive economy:

- ***Building human capital:*** building human capital refers to the promotion of existing labor through upgrading skills and enabling new skills, especially for prioritized sectors, for instance, the industry sector. By accomplishing these objectives, a few measures could be considered:
    - continue to modernize education and skills in both the curriculum and activities to implement both support materials
    - develop and build knowledge and skills through increasing the number of STEM and TVET students
    - continue to integrate education and expertise into the curriculum
    - continue to support the private sector in engaging in new skills and training
- ***Improving work productivity:*** improving work productivity refers to the promotion of labor productivity in the context of absorbing and taking advantage of the advancement of digital technology. Therefore, a few measures can be considered:
    - encourage and promote the abortion of technological progress in the production and value chain
    - continue to promote cross-institutional coordination mechanisms, professional relations, and working conditions
    - establish a particular and specific training program with the need for skill changes

5.3 Promoting Backward linkages

Blocking linkages between FDI and domestic firms has limited backward linkages and also discouraged the country's diversification. To move up the value chain and promote the country's diversification, two specific areas should be addressed:

- ***Strengthening the domestic value chain:*** Cambodia's domestic production value chain is still not yet intertwined, especially with the domination of foreign firms over local firms. To strengthen the domestic value chain, a few measures could be taken:
    - offer the support in terms of providing training programs to strengthen local supplier capabilities in a specific value chain
    - set a potential priority value chain for replacing imports and supporting local companies to improve production capacity by providing incentives
    - encourage processing industries, especially processing and intermediate products
- ***Increasing demand for domestic products:*** Obviously, demand for domestic products, especially raw materials, are limited and has been facing challenges, both quality and prices. Therefore, to increase demand for domestic products, a few measures could be taken:
    - implement a domestic product purchase campaign to encourage people/firms to consume local products
    - provide incentives to firms that purchase local raw materials for their production factors
    - restrict imported products that do not comply with standards or local technical requirements
    - reduce imports in sectors where Cambodia has the potential to manufacture

5.4 Accelerating digital adoption

Technological progress plays an essential role in enhancing productivity as well as bolstering long-term growth. **"Cambodia Digital Economy and Society Policy Framework 2021-2035"** will serve as the roadmap to accelerate digital transformation in Cambodia. A few key areas have to be further ensured:

- close the digital divide by coordinating investment in and use of connectivity infrastructure
    - improve spectrum reallocation and management to support additional mobile broadband deployment
    - expand the network coverage and accelerate the speed of broadband, both mobile and fixed-broadband
    - further promoting the digital payment system and fintech
- promote digital government, with a focus on digital public services, with the goal of lowering costs and other business constraints
- further improve digital businesses
    - promote the adoption of digital technologies, particularly at the firm level
    - enabling entrepreneurship and the startup ecosystem
- supports the development of digital skills
    - basic digital/ICT skills refer to skills needed to use digital technologies (e.g., sending an email, finding work-related information on the internet, the ability to use digital apps and no-specialized software, awareness, and the ability to stay in cyberspace)
    - digital/ICT Complementary skills refer to the soft skills required to carry out work in a technology-rich environment and to address the expanding number of opportunities for ICT-enabled collaborative work

- advanced and specialist skills refer to skills required to drive innovation and to support digital infrastructure and the functioning of the digital ecosystem (e.g., programming software, developing applications, and data analytics)

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Annex 1: Cambodia's Exports

Table 1: Cambodia's Export by Products (in Million USD)

Products	2016	2017	2018	2019	2020	2021
Garment	**7,636**	**8,330**	**9,591**	**10,840**	**9,768**	**11,191**
Clothing	6,567	7,026	7,822	8,266	7,420	8,018
Shoes	774	880	1,040	1,265	1,117	1,392
Bags	140	268	556	1,079	965	1,495
Other textile products	155	157	173	230	266	287
Non-garment	**2,290**	**2,887**	**3,034**	**3,908**	**7,446**	**6,380**
Electrical part	165	162	177	134	166	210
Vechicle spare parts	80	134	149	175	157	139
Bicycle	343	361	376	412	527	631
Timber	3	16	8	8	7	9
Veneer	0	0	0	0	2	4
Plywood	8	62	104	126	183	270
Other articles from wood	5	22	46	106	159	281
Rice(husked)	300	335	419	420	469	423
Cassava	35	44	47	29	24	42
Maize	0	0	0	1	0	0
Beans	1	1	1	0	1	0
Banana	0	6	18	49	113	168
Mango	1	2	3	3	4	10
Cashew nuts	0	1	2	8	10	5
Rubber	160	249	216	219	272	399
Sugar	46	75	82	66	53	49
Fishing products	1	1	1	0	0	0
Other agricultural products	5	13	14	14	16	33
Cigarette	19	20	22	18	7	6
Insulated wire and optical cables	41	40	56	77	133	226
Steel and aluminium cans	6	3	0	2	2	1
Others products	1,071	1,340	1,295	2,039	5,142	3,475
Total Export	**9,926**	**11,217**	**12,625**	**14,748**	**17,214**	**17,572**

Source: Ministry of Economy and Finance

Annex 1: Cambodia's Exports (Cont.)

Figure 1: Share of exports by aggregated products

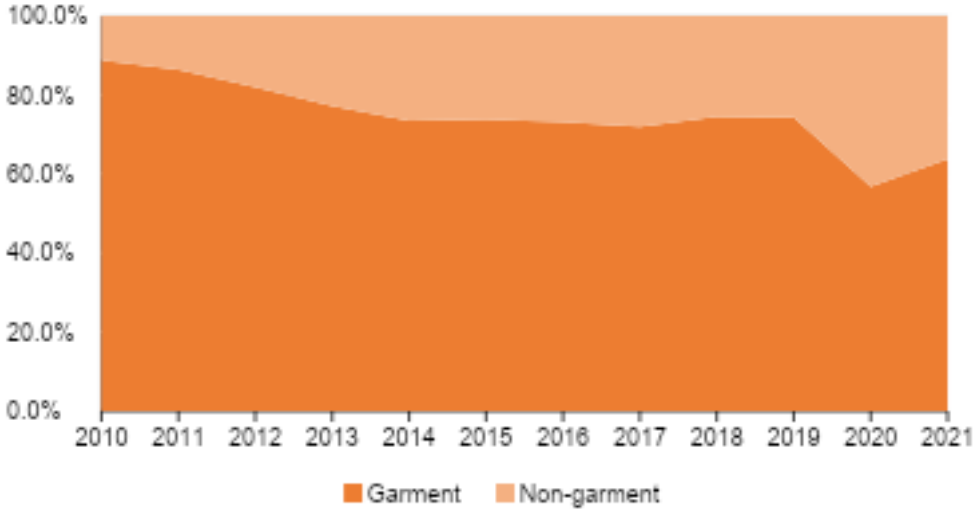
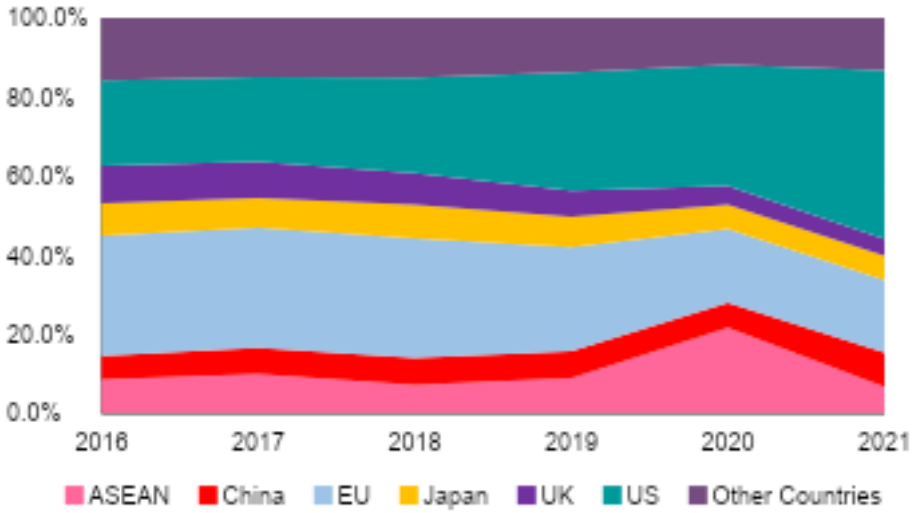


Figure 2: Share of total exports by market destinations



Source: MEF

Figure 3: Share of garment exports by market destinations

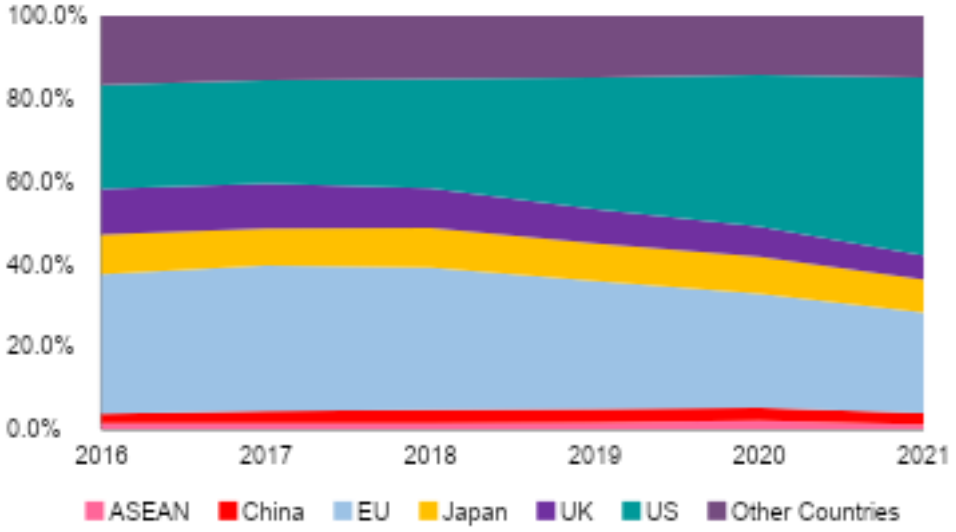
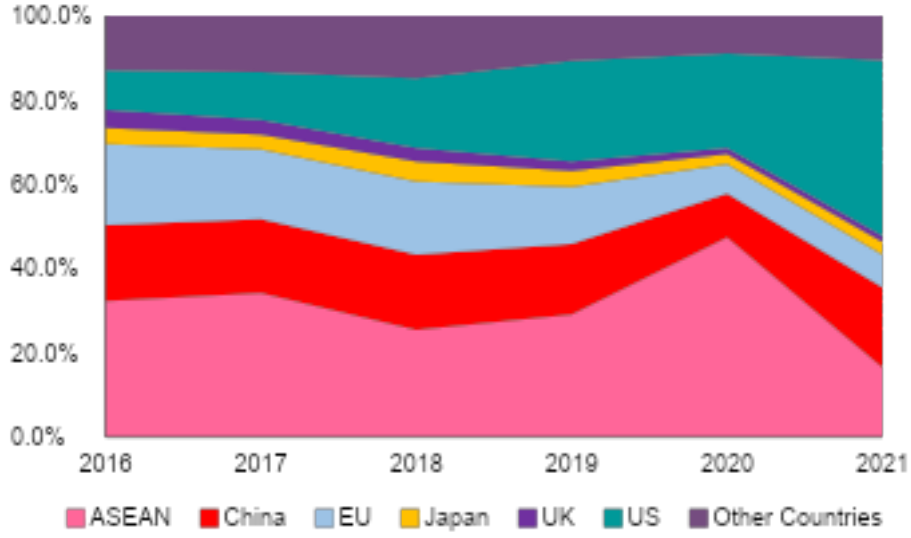


Figure 4: Share of non-garment exports by market



Source: MEF

Annex 2: Diagnostic Plots

Figure 1: Trace plots

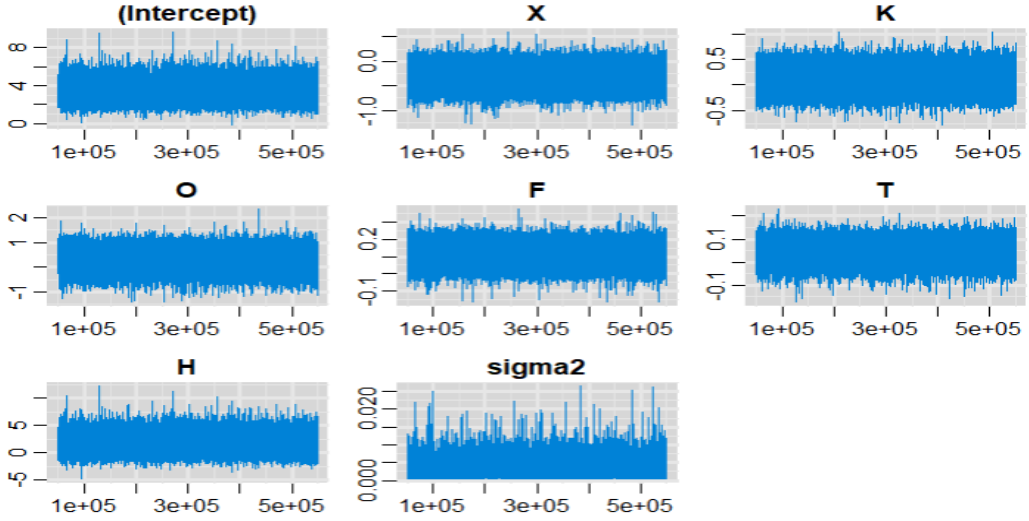


Figure 2: Running mean plots

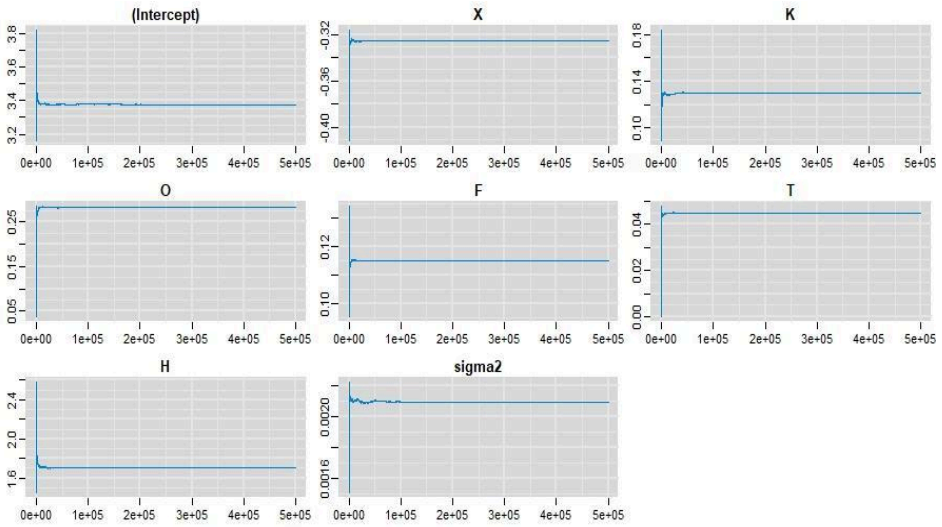


Figure 3: Kernel density plots

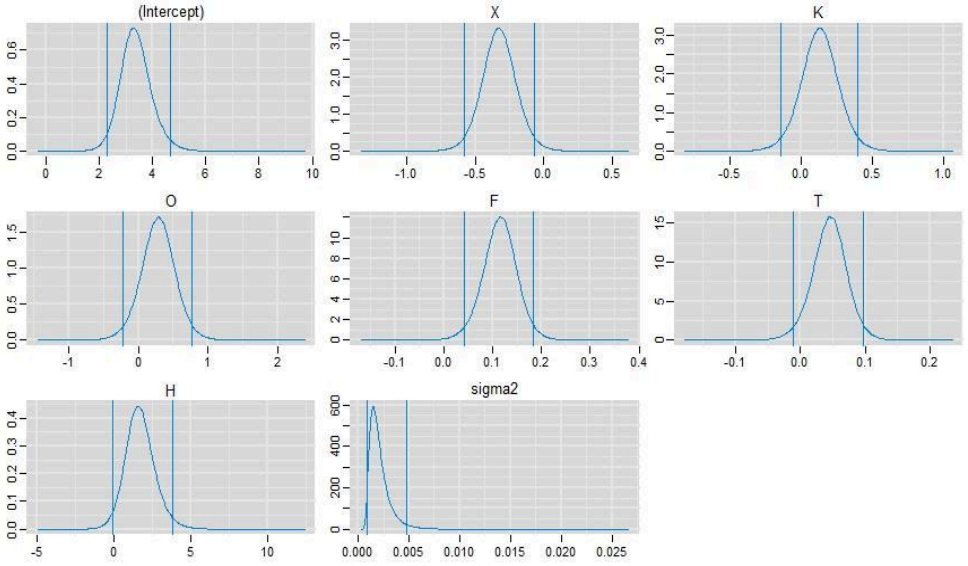
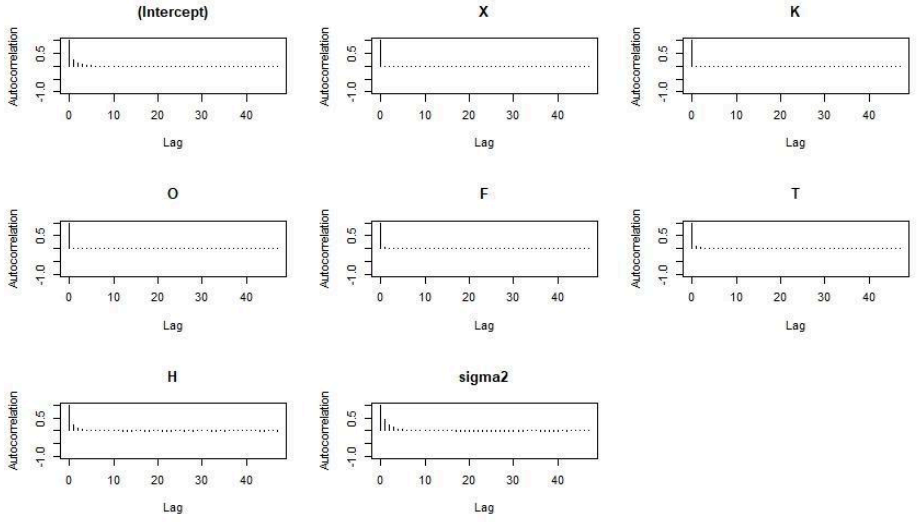


Figure 4: Autocorrelation plots



Source: Author's calculation