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How Does the Impact of Foreign Direct Investment on Labor Productivity Affects Productive Capacity?

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Abstract:

Purpose: *The study presents policy considerations to enable the potential role of PCI indicators in facilitating the beneficial role of FDI on LP to increase competitiveness of the host economies.*
Design/methodology/approach: *Using panel data from 88 countries from 2000 to 2018, the study explores how FDI impacts LP and how these consequences differ depending on the level of PCI across two economic sectors: tradables and nontradables. Applying novel PCI, the findings demonstrate that initially FDI exacerbates LP in the above two sectors, and the improvement in PCI from FDI diminishes this detrimental impact until a threshold of PCI, then beyond that level, FDI enhances LP.*
Findings: *The latter benefit is larger in the tradable sector than in the non-tradable sector, and this beneficial effect is amplified by increased FDI inflows. A set of robustness tests were performed to corroborate the findings. Notably, the internal mechanism of PCI's eight indicators moderates the influence of FDI on LP.*
Practical implications: *Policy implications of this study reveal that, while FDI may not directly increase LP, PCI-backed FDI growth may imply an increase in LP.*

Keywords: *Labor productivity, productive capacity, tradable sector, non-tradable sector, service, threshold.*

Paper Type: *Research article.*

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1. Introduction

A sustainable labor productivity growth is instrumental for improving working environment, raising wages, and promoting business competitiveness and profitability (ILO, 2021). Labor productivity indicates the efficiency with which a worker can accomplish his work, is one of the principal sources of economic growth in the long run. In a different sense, it assesses the productivity of a nation in terms of time and labor. Labor productivity (LP) is the value that each employed person generates from each unit of input.

An example can be mentioned here to comprehend labor productivity in a more convenient way: suppose an Australian can make 15 loaves of bread per hour while a Portuguese labor may produce just 5 loaves of bread per hour. This example demonstrates that Australian labor is more productive than Portuguese labor. It indicates that more productive worker can accomplish the same amount of work in less hours than his competitors. This frees up resources that may be better used elsewhere.

Foreign direct investment (FDI) is frequently regarded as a boon to the host country's economy. The majority of governments seek foreign investment in the hopes of gaining access to new technology, creating jobs, enhancing R&D and boosting overall development of the economy (He and Sun, 2013). The latest knowledge brought in by FDI raises the productive capacity of the receiving economy as well as its innovative capabilities. Developing nations require a considerable infusion of cash from overseas investment to avoid the possible issues of poor growth and stagnant savings (Hayami and Godo, 2005). In general, emerging nations and governments embrace foreign direct investments because they bring new technology developments, greater skills, updated knowledge and more funds into the system.

FDI provides not only the necessary capital to the host economy, but it also introduces technology breakthroughs that boost worker productivity in the long run (Gui-Diby, 2014; Li and Tanna, 2018). Another good effect of foreign capital influx is the increased competitiveness that domestic enterprises face in order to compete with foreign firms. Local firms benefit from technological spillover, which boosts the recipient country's competitiveness. They copy better technology as the labor force of FDI-intensive firms are more skilled and trained (because imitation is thought to be less costly than innovation). These features distinguish foreign investment from other types of capital flow, such as foreign aid and portfolio investment, and indicate its contribution to economic development.

FDI also acts as a main instrument to upgrade LP. A productive labor force possesses both mandatory and additional dexterity, as well as the capacity to boost a country's labor productivity. In particular, FDI enhances the capacity to manufacture more keeping the resources constant, reduces production times, improves quality, and

lowers prices while improving productivity brings innovative manufacturing technologies. Thus, foreign direct investment improves worker productivity by allowing capital from foreign investors to flow into the recipient country.

Traditional FDI, which was predominantly absorbed by the manufacturing sector, commonly comprised bulk of the traded goods sector along with agriculture sector, has gradually been displaced by services FDI (known as non-traded goods sector), which includes financial services whereas agricultural FDI does not change a lot. Service sector grew dramatically in the 1990s. This worldwide tendency is not just the outcome of the growing services sector, rather it is the reflection of the nontradability of many services, which means that in order to serve the foreign market, local operations must be formed through FDI.

The service sector FDI stock has risen from 48 percent in 1990 to 57 percent in 2019 (UNCTAD, 2020b). Given the shifting industrial mix of FDI and the non-tradable nature of many services, analyzing the impact of labor productivity in the traded and non-traded goods sector separately is becoming increasingly relevant. In addition, there is a possibility to shift the determinants of this investment patterns. Therefore, considering those issues, service as non-traded goods sector and manufacturing and agriculture as traded goods sector must be compared along with the gross impact to determine how FDI benefits labor productivity.

Government initiatives to raise FDI inflow are expected to promote the service sector productivity right away, but manufacturing FDI is likely to take longer. In addition, because services are often non-traded goods, FDI in this sector is largely motivated by market-seeking goals, whereas FDI in manufacturing is motivated by international price competitiveness as measured by real unit labor costs (Riedl, 2010).

Again, FDI in services has a "double-edged" economic impact. It enhances productivity of its own industry, but it depletes manufacturing resources and slows manufacturing growth. This is especially true when it comes to foreign direct investment in business services. Despite being harmed by FDI in business services, manufacturing sectors benefit from FDI in their own industry.

Manufacturing FDI has a major impact on manufacturing growth (in South and South-East Asian nations) even though it is not obvious at the aggregate level (Doytch, 2016). According to Asada (2020), FDI, export and import of capital-intensive products, all contributed to increase labor productivity in the long run, whereas the influence in the short term was unclear.

Low LP and insufficient absorption capacity have plagued many countries, posing a combined issue for many governments, though many of them are able to attract a noteworthy amount of FDI. At the same time FDI flow changes its direction in the last few decades significantly from more export oriented traded goods sector to the

non-traded goods service sector. The empirical evidence about the impact of FDI on LP in the two sectors has been inconclusive which can be influenced by many other factors. A large portion of those factors are associated with the absorption capacity of the economy.

This paper utilized Productive capacity index (PCI) as the determinant of absorption capacity consisting of eight indicators. My study contributes by looking at the function of PCI in the links between FDI and LP at the sectoral level, which has yet to be empirically investigated.

In this way, this study provides an empirical assessment of FDI's impact on gross labor productivity, as well as a breakdown of the impact by traded goods (exportable) and nontraded goods sectors. In the existing literature of FDI, there is no cross-country empirical investigation on this topic. The intimate link between FDI inflows, PCI and LP – particularly the simultaneous impacts of FDI inflows and PCI on LP – has not been investigated in the current literature in terms of both theoretical and empirical study. However, the study of LP covers a lot of attention because it shows whether the host economies are benefiting equitably from foreign investment, where many nations have drawn sufficient FDI inflows but characterized with low productivity in any of the two sectors, and scarcity of productive capacity.

Although the existing literature analyses both LP and FDI's relationships with economic growth indicators, the indirect influence of FDI in boosting sectoral labor productivity with the help of absorption capacity indicators is rarely examined. As far as we know, the previous literature does not take into account a point where the relationship between FDI and LP changes from one direction to the other.

Paper’s contribution is made up of three parts. To begin, we calculate the impacts of FDI on aggregate labor productivity, as well as on sectors that produce the majority of traded goods (exportable) products and those that produce the majority of nontraded items. Second, the study determines a threshold level of FDI, below/above which the influence on LP changes, utilizing the interaction terms of PCI and the dynamic panel threshold regression. Third, this study uses a relatively new indicator, PCI, established by UNCTAD (2020a), to determine the FDI threshold level. This indicator is made up of eight components: human capital, natural capital, information and communication technologies (ICT), structural change, transportation, institutions, and the private sector. Those indicators basically measure absorption capacity of a host nation. Therefore, the impact of FDI on LP is mostly determined by the PCI.

2. Literature Review

Productive capacity and labor productivity:
Productive capacity index (PCI) is the dynamic and multidimensional tool, measures the status of productive capacity of a nation. PCI is the combination of eight well

established indicators to present a country's productive capacities, works as the determinants of LP. Though the contribution of those disaggregated indicators in enhancing LP is evident in the existing literature, their combined effect as a single index is yet to be documented.

Only qualitative human capital can form the knowledge societies. Because only postsecondary education and a low dropout rate may affect boosting LP, not general education years (Mate *et al.,* 2016; Arshad and Malik, 2015).

Secured institutional environment is the precondition for productivity growth (Islam, 2008). Strength and quality of institutions fosters innovation and boost up R&D capacity (Hall and Jones, 1999). Institutions ensure the economic environment where people can acquire knowledge and local firm can produce more capital goods. Good governance with large scale accountability and equitability encourages governments to accumulate social infrastructure (Del Rio, 2018, Mustafa and Jamil 2018), make the basis of incentive for economic agents, decrease transport cost, make foreign capital more accessible (Zhang *et al.,* 2018), increase efficiency of the market raise the competitiveness of the economy (Kpognon and Mamadour, 2019), all of which stimulate labor productivity.

The growth of LP depends largely on the direction of structural change. Because it helps to raise income and welcome more FDI which create more opportunities to invest in human capital (Moussir *et al.,* 2019). When it takes place in investment sector, the speed of investment gets the momentum in into ways: either cause aggregate demand to rise and thus raise labor productivity or higher investment upgrade research and development (R&D) which brings new idea and innovation and thus contribute to build up dynamic society.

However, when structural changes lead to labor market deregulation and increase short-run employment, labor-intensive strategies of local firms are encouraged, resulting in modest productivity improvements. Especially when structural changes shift resources towards service sector, innovation scope becomes limited and productivity gains slow down cause LP decrease (Pariboni and Tridico, 2020).

Another well-known conduit for transferring the benefits of FDI is ICT. Setting up ICT infrastructure and developing ICT-based knowledge may result in increased productivity. The magnitude of ICT's impact is determined by the quantity of investment made in this area. Furthermore, the influence of ICT on productivity improvements may take a certain amount of time (Maciulyte-Sniukiene *et al.,* 2020).

As a result, understanding the ICT effect period and impact disparities between comparatively high and low productivity countries is crucial for policy formulation in the ICT industry. Positive ICT impact can be detected in both the overall economy and the service sector, prompting urgent efforts to expand investment in this sector (Laddha *et al.,* 2022).

Power and energy utilization also increases labor productivity, particularly in sectors with significant use of those resources. The LP of a specific sector improves as more energy is used to make greater capital available to that industry. Similarly, increased labor employment leads to increased labor productivity if the sector is dominated by labor intensive industries (Kebede and Heshamti, 2020).

Infrastructure investment mostly contributes to labor productivity growth of non-traded goods sector. Investment in roads, highways, railroads and airports promote labor productivity of the non-traded goods sector, while the impact of investment on port remains ambiguous (Pereira and Pereira, 2020).

Private sector contributes to raise LP since research and development and innovation are the drivers of the private sector (World Bank, 2018). Growth can be aided by the private sector's efficient institutions, as well as the government's effective decisions and actions. Developing countries have the best chance of increased prosperity and improved living standards if their economies are open, export-oriented, and have a vibrant private sector (Davies *et al.*, 2014).

FDI and labor productivity:

There is a vast number of studies regarding the role of absorption capacity as the transmission channel of the spillovers of FDI. Similarly, a number of studies are available on FDI as a major determinant of labor productivity.

FDI promotes labor productivity when it brings new technology, generate more output, raise wage and improve working conditions (Asada, 2020). On the other hand, FDI erode LP when foreign firms enter into the domestic market of the host country as foreign firms take the market share from its counterparts cause domestic firms to shrink their production and forced them to maintain the average cost (Aitken and Harrison, 1999).

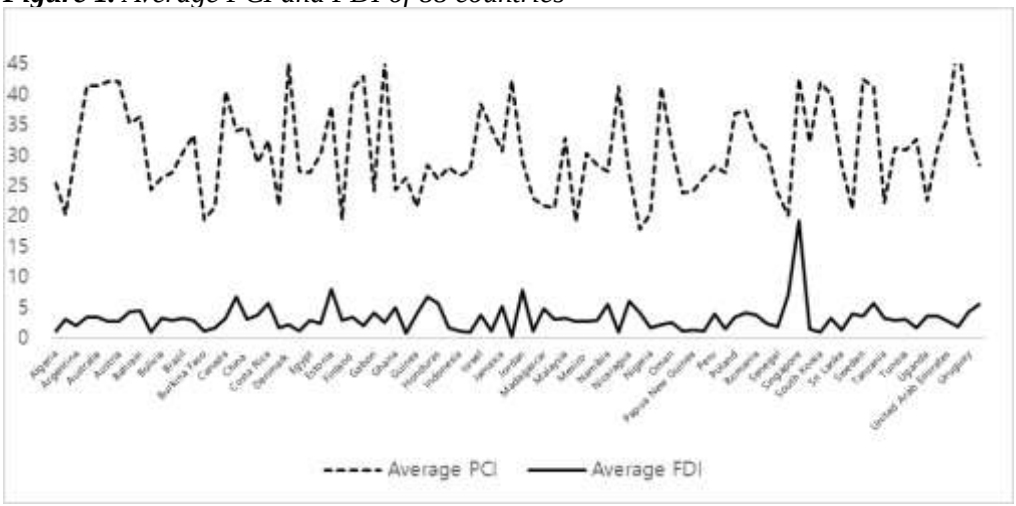
Moreover, foreign firms are large in size, more productive and use advanced technology. As a result, they generally pay higher wage to workers and thus putting pressure on domestic firms to raise wage forcing to cut number of employees, cause LP to decline.

The benefit of FDI is heavily dependent on the quality of human capital, not just the number of years of schooling (Borensztein *et al.,* 1998; Grether 1999). FDI generates updated knowledge and a certain level of absorbing capacity is needed to transfer this knowledge which cause LP to rise (Huynh et al. 2019). Countries that lack those absorption capacities lose competitiveness and cause LP to decrease (Moralles *et al.,* 2020).

Senbeta (2008) reinvestigated the impact of FDI on productivity growth using 22 Sub-Sahara African nations and documented the impact negative in the short run while the effect is positive in the long run. The author claimed that in the short run a

certain number of resources have been shifted from current production cause the effect negative. This shift of resources generates certain publicly known externalities as a result of firms' FDI into productive inputs. These externalities cause TFP rise in the long run.

Figure 1. *Average PCI and FDI of 88 countries*



Source: *UNCTAD (2020a) and World Bank (2021).*

Joint impact of FDI and productive capacity on labor productivity:
Moussir *et al.* (2019) found that the econometric analysis of the determinants of structural transformation suggest an increase in income levels to encourage diversification of FDI as well as new opportunities for innovation. The necessity to invest in education and human capital was also identified. The impact of FDI will be positive only when it is interacted with human capital (Borensztein *et al.*, 1998)

Poor quality of institutions hamper transmission channels through which FDI spillovers will be passed through (Görg and Greenaway, 2004; Lipsey, 2002) while human capital accumulation and a well-developed financial system are mentioned to be most necessary contingent factor to become eligible to receive the benefit of FDI spillovers (Sayek *et al.*, 2003).

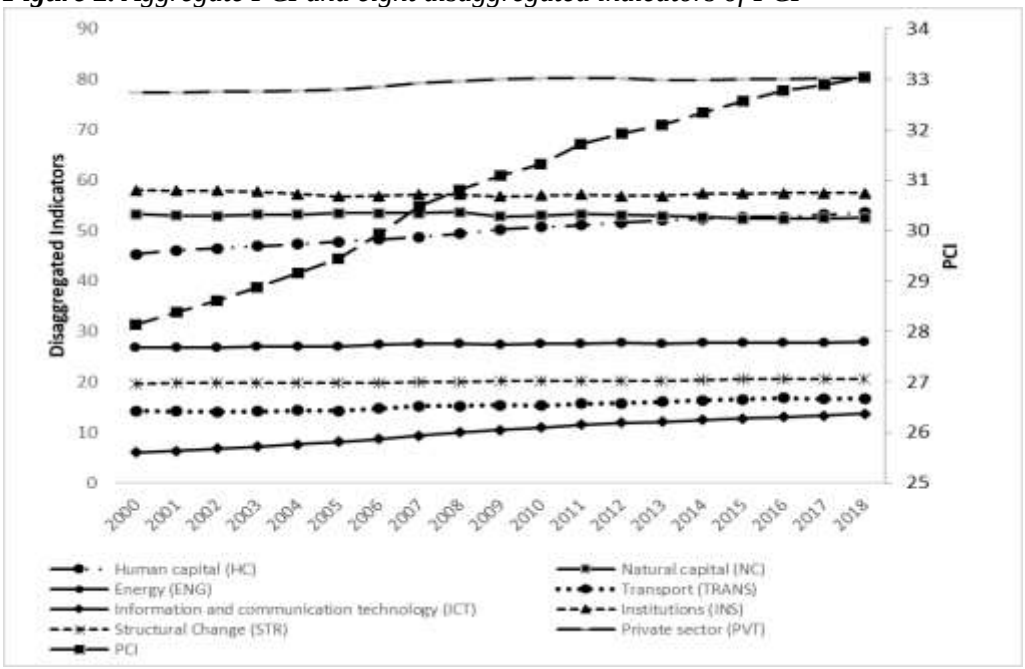
Wealthier countries attract investors because they have efficient property rights and good governance, as well as monetary and fiscal policies based on effective economic institutions, whereas poor countries lack these structures (Rodrik, 2004). Institutions have a significant impact on aggregate income, implying that poor countries that enhance property rights of entrepreneurs and investors will likely experience a long-term gain in productive capacity.

Figure 1 and 3 confirm that there is a common pattern of trend between PCI and FDI. In majority of the years investigated, the patterns of change in FDI and PCI are

fairly similar. Furthermore, the PCI has shown an increasing tendency throughout the study period, but the disaggregated indicators have shown a mixed pattern (Figure 2).

There is a good number of studies about the importance of absorption capacity to materialize the benefit of FDI. But so far there is not a single study to cover the impact of FDI on LP in the presence of a large set absorption capacity indicators like this one. Keeping this research gap in mind, we explore the role of absorption capacities in the impact of FDI on LP with the help of productive capacity index so that government can make appropriate policy in order to improve absorption capacity to utilize FDI inflows to promote LP.

Figure 2. *Aggregate PCI and eight disaggregated indicators of PCI*



Source: *UNCTAD (2020a).*

3. Empirical Model, Data and Econometric Methodology

3.1 Empirical Model and Data

The influence of FDI on labor productivity is investigated in this study. Labor productivity (LP) refers to the gross output[2] produced each labor unit (measured in terms of the number of employed employees or hours worked) over a certain time period.

[2]*In this study gross output refers to the summation of real value added of tradable and non tradable sectors.*

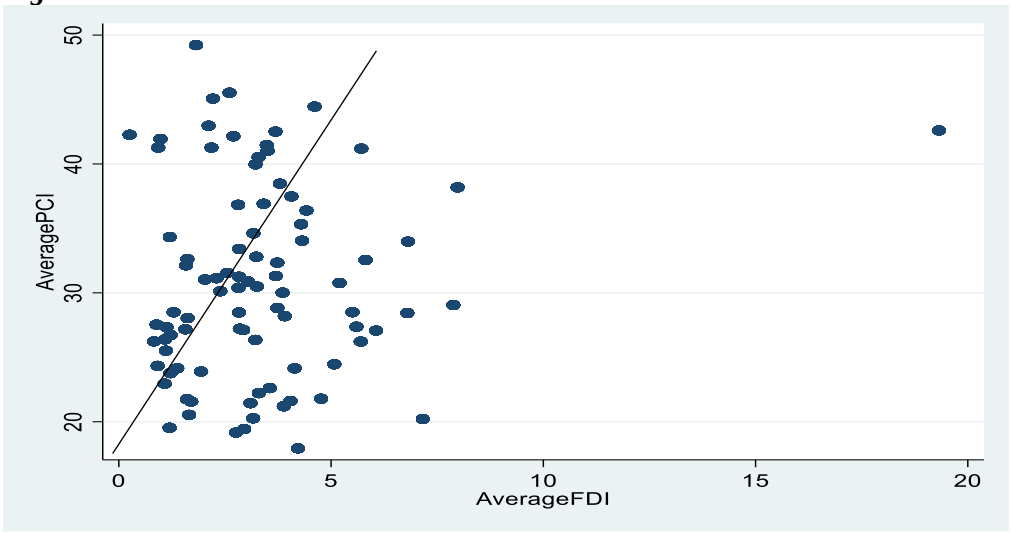
However, in this study, labor productivity LP_{it} represents the dependent variables: aggregate LP and LP of the tradable and non-tradable sector; LP has the functional relationship with the vector of explanatory variables X'_{it}.

$$LP=f(FDI,POPGROWTH,INFLATION,FINANCE,GDPPC,OPENNESS \quad (1)$$

$$LP_{it}= \alpha_0+Z'_{it}\beta+\mu_i+ \lambda_t+\varepsilon_{it} \quad (2)$$

Where *i* denotes cross-sectional units or individual countries, *i= 1, 2, 3, ... M* and *t* is the time period, *t= 1, 2, 3.....T* and $Z_{it}= Z_{it1}, Z_{it2}, Z_{it3} \ldots Z_{itm}$ represents the vector of independent variables, $\beta=\beta_1, \beta_2, \beta_3 \ldots, \beta_n$ stands for a series of N regression parameters where β_m= (m= 1, 2, 3 ... n) shows the mean change in LP_{it} per unit increase in Mth explanatory variables X_{itm}= (m= 1, 2, 3, ... N) while α_0 is the intercept, μ_i and λ_t are the unobserved time invariant country-fixed effect errors and time variant errors, respectively. μ_i will control omitted country fixed characteristics that does not change over time whereas λ_t will control unobserved time variant shocks. Here *i* indicates respective country and *t* for time periods. The error component (ε_{it}) encompasses any additional unobserved time-variant and time invariant sources in the extent of the LP that are not accounted for by the model.

Figure 3. *Relation between FDI and PCI*



Source: *Author calculations using World Bank (2021) data.*

We investigate the effects of FDI inflows and PCI as well as their interactive effects on LP using the following model:

$$LP_{it} = \alpha_0 +\alpha_1 FDI_{it} +\alpha_2 PCI_{it} +\alpha_3 FDI_{it}*PCI_{it} +Z'_{it}\beta_j++\mu_i+ \lambda_t +\varepsilon_{it} \quad (3)$$

In equation (3), the standalone impact of FDI is captured by α_1 while the interactive

impact of FDI with PCI is indicated by α_3. Here LP is the labor productivity of either tradable (TRLP) or non-tradable (NTRLP) sector or the sum of both. Measuring labor productivity in the both tradable (exportable) and non-tradable sectors are required for my calculations. Data of sectoral real value added per employed person (defined as the net output of a sector —measured in constant USD— after summing up all outputs and deducting intermediate inputs) is collected from WDI (World development indicators) to measure the above two measurements. It is expected that FDI will supply the recipient nations with more knowledge and technology, allowing workers to become more trained and so increase labor productivity.

Following Selaya and Thiele (2008) the sum of value added per unit of labor in the agriculture and industry sector are the proxies we developed to measure labor productivity in the tradable (exportable) sector while in case of the non-tradables sector value added per worker in the services sector is treated as the proxy.

This distinction between tradable and non-tradable sector is based on the idea that agriculture, industry, and services account for the majority of the economy's gross output, and that service sector belongs to the non-tradable production, while tradable production is primarily in the agricultural and industrial sectors.

A handful number of existing studies were reviewed by Tica and Druiciz (2006) measuring the productivity differences on terms of trade and mentioned that not a single study (out of 58 studies) considers service sector as the exporting or tradable while agricultural, industrial or both are considered as tradable.

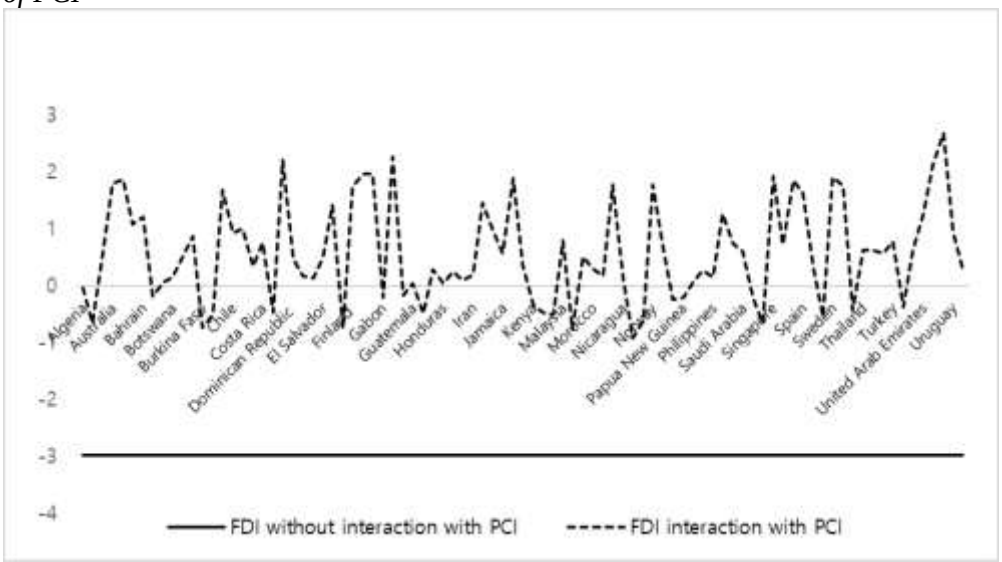
When applied to developing nations, where agriculture and manufacturing trade dominates (such as, exporting of primary agricultural goods, agro-industry based secondary goods and least technology intensive manufacturing goods) and is much larger in volume than trade in service sector, the argument covers a lot of attention.

Data on real Value Added per worker in the three sectors (Agriculture, Industry, and Service) are collected from World Bank (2021) and, these indicators will be utilized as proxies for levels of sectoral labor productivity throughout the rest of the study.

FDI and productive capacity index (PCI) are the major explanatory variables in this study. FDI is measured as the net inflows as proportion to GDP, extracted from World Bank (2021). PCI is comprised of eight constituents (Human capital (HC), natural capital (NC), energy (ENG), transport (TRANS), information and communication technology (ICT), institutions (INS), private sector (PVT), structural change (STR)) and acts as sources of absorption capacity of a country helps enhancing LP.

We further interact FDI and PCI (FDI*PCI). The intuition is that countries with higher productive capacity are able to receive more FDI, thus augments LP.

Figure 4. *Marginal effects of FDI on Aggregate labor productivity at different levels of PCI*



Source: *Author calculation using World Bank (2021) data.*

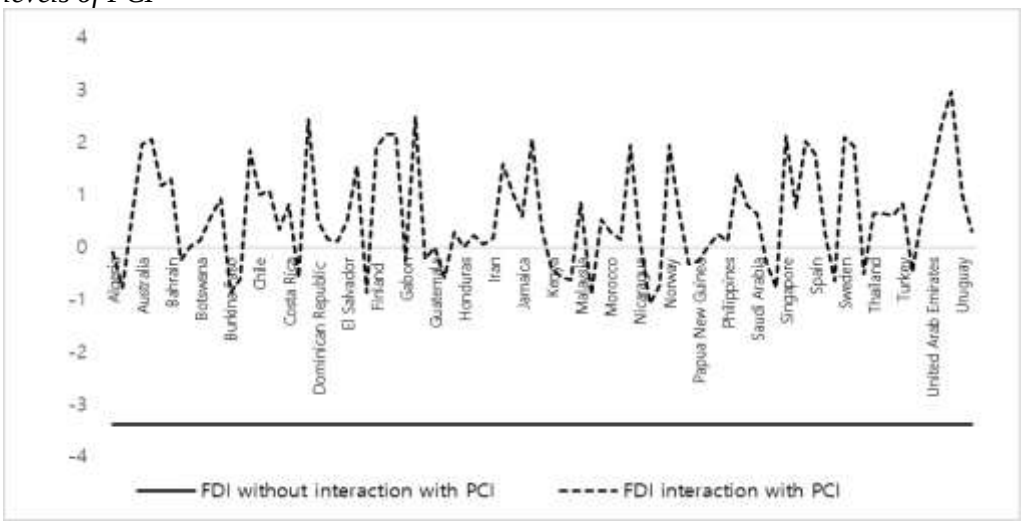
FDI∗PCI captures the interaction between FDI and PCI. The marginal effect of FDI on LP in the presence of PCI is calculated by taking the partial derivative of equation (3) with regard to FDI. The equation (4) has been developed following Schneider *et al.* (2019):

$$\frac{\partial(LP_{it})}{\partial(FDI_{it})} = \alpha_1 + \alpha_3 PCI_{it} \quad (4)$$

The sign of α_1 can be either positive or negative as both type of impacts exists in the literature. But the sign of α_3 should be positive. Because a rise in PCI either lessens the negative effect or strengthens the positive of FDI and the direction of this effect will change after a certain threshold of PCI. Finally, Z is a series of control variables comprising of population growth (POP), Inflation (INF), trade openness (OPEN), and private credit as share of GDP (CREDIT). The choice of those variables is justified as follows:

Population growth (POP): A skilled, trained and technologically advanced labor force is the key to productivity growth (Heshmati and Rashidghalam, 2018, pp. 259-286). When population growth rises, the size of the labor force also enlarges, since more people engaged to the economic activities (Maesta *et al.*, 2016). Thus, rise in population growth is detrimental to productivity as more labor equally needs other factors of production too. But conversely, population growth cause labor productivity to grow when this increased population contributes by adopting new technology or inducing innovations (Hamza, 2015).

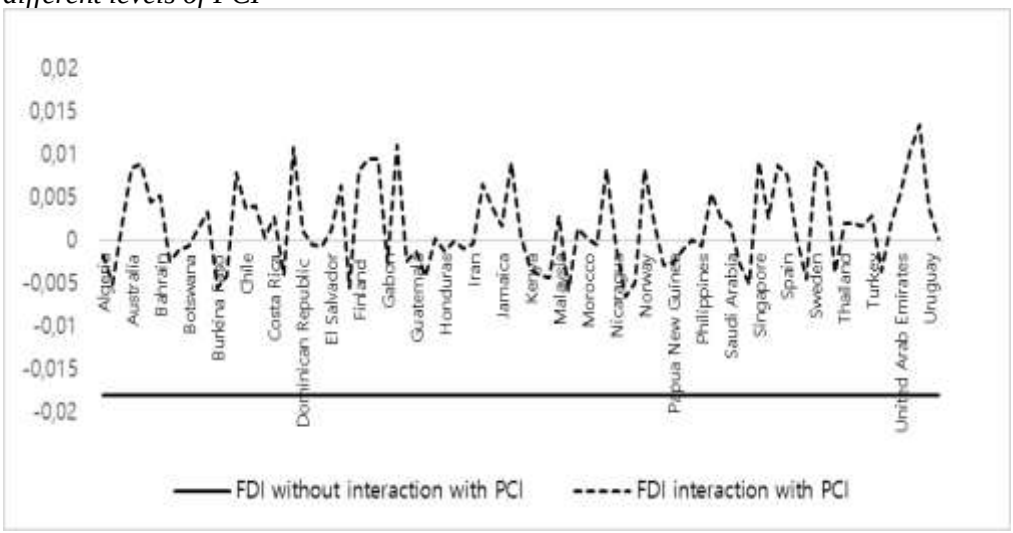
Figure 5. *Marginal effects of FDI on tradable sector labor productivity at different levels of PCI*



Source: *Author calculation using World Bank (2021) data.*

Inflationary forces (INF) also shift resources away from productive sectors and toward less productive ones, a phenomenon known as inflationary costs, lowering labor productivity (Jarrett and Selody, 1982). Inflation, on the other hand, increases nominal income while lowering the real value of private debt (Huynh, 2021), boosting LP. In my study, consumer Price Index (CPI) is used as the proxy for inflation, derived from the WDI (World Bank, 2021).

Figure 6. *Marginal effects of FDI on Non tradable sector labor productivity at different levels of PCI*



Source: *Author calculation using World Bank (2021) data.*

Openness (OPEN) measures the degree to which an economy is open to the rest of the world, is believed to be helpful to that economy. Particularly, importing new equipment and other capital goods from developed countries are thought to strengthen the knowledge base of the economy, leading to technological advancement of the host country and resulting in higher labor productivity. Moreover, the more a country exports, the higher its competitiveness will be, resulting in increased productivity.

The more open a country is, the more FDI it can attract and the more efficient its domestic market and government institutions becomes (Kose *et al.*, 2009a; Kose *et al.*, 2009b). Trade openness is measured as the proportion of import and export to GDP, extracted from WDI (World Bank, 2021). But, on the other hand, if more open economies divert its resources from the more productive sectors to the less productive ones or if unskilled and semiskilled labor dominates the economy, LP may decline (Ismail *et al.*, 2011).

Ratio of domestic private credit to GDP (CREDIT), derived from the WDI, is used to assess financial strength (World Bank, 2021). The stronger a country's financial system is, the better its savings are channeled into the economy, resulting in higher capital accumulation and technological growth (Levine, 1997; Hyunh, 2021). Thus, increased financial growth of an economy boosts productivity. As a result, we regard financial development to be a determining factor in productivity.

In another sense, productivity growth can be hampered by the rapid expansion of the financial sector (Cecchetti and Kharroubi, 2012). This is due to the fact that high collateral/low productivity projects benefit disproportionately from financial sector expansion (Cecchetti and Kharroubi, 2015). Productivity growth can be benefited through financial sector improvement up to a certain point, but additional expansion of this sector reduces growth. Larger financial sector expansion competes with the rest of the economy for scarce resources. Because it necessitates not only physical but also human capital.

The sample spans 18 years, from 2000 to 2018, and includes a total of 88 economies (58 of them are lower, lower middle and upper middle income and 30 are high income countries). Our sample could not go beyond 2018 or before 2000 since PCI data is available only from 2000 to 2018. The selection of nations, their number, and the sample period is entirely dependent on data availability limits at the time of the study. Annex Table A1 shows the summary statistics for my variables, whereas Annex Table A2 gives a description of the nations.

3.2 Estimation Methodology

The problem of endogeneity is a major topic in FDI and productivity literature. The data set requires panel data estimation, as there are multiple countries and time periods, implying that the data set contains both the time series and cross-sectional

dimensions. In general, if ε_{it} and Z_{it} are interrelated, a consistent estimate can be obtained by using instrumental variables estimation. The key idea is to design an instrument that has been significantly linked with Z_{it} while remains independent of ε_{it}. By using instrumental variable, one can overcome the issue of endogeneity i.e., the correlation between ε_{it} and Z_{it}.

However, in case of absence of correlation between Z_{it} and ε_{it} (corr $Z_{it}\varepsilon_{it} = 0$), Z_{it} itself may be employed as an instrument, and all simple estimators such as OLS are therefore specific forms of GMM approach.

Due to the dynamic and persistent nature of the outcome variable, the present value of LP relies heavily on its past status. As a result, instead of employing static methodologies such as OLS, fixed effect (FE), or random effect (RE), the aforementioned equation (3) is estimated applying GMM approach of Arellano and Bond (1991). GMM provides few advantages over other panel models. First, GMM is often used for panel data analysis with a view to solve endogeneity problems that frequently arises in panel data estimates (Blundell and Bond, 1998).

The model considers the explanatory variable, FDI, to be endogenous, providing skewed findings if the OLS is used. An explanatory variable is said to be endogenous when it is correlated to the error term (Arellano and Bover, 1995). Endogeneity emerges with an intercept of the equation in case of association between an explanatory variable and the error term.

Though FDI is thought to impact a country's labor productivity, certain other independent variables are seen to be reliant on labor productivity. For example, it can be expected that inflation influences labor productivity, while that labor productivity, in turn, influences inflation in an economy via wage. Endogeneity issues arise in this situation.

Secondly, GMM approach notices time invariant and variant effects as well as reverse causation and simultaneity bias. Lastly, GMM estimator fulfills two additional requirements: first, the error term (ε_{it}) does not exhibit serial correlation [AR(1) and AR (2)]; Second, the validity of the instruments, i.e. the instruments that are designed to solve the endogeneity issue, needs to be verified with the Hansen and Sargan tests (the higher the p values, the more valid the instrument). In order to remove serial correlation in the error term and to validate instruments, the Hansen test of overidentification and the Arellano and Bond (1991) test are used.

As expressed in equation (5), dynamic approach including lagged dependent variable (LP_{it-1}) as an explanatory variable, ordinary least square method (OLS) provides biased and inconsistent outcome (Köster and Pelster, 2017). GMM method tackles persistent nature of the regressand and unobserved heterogeneity. GMM estimators rectify these problems using lagged values of LP (LP_{it-1}) in levels and differences, as well as lagged values of other independent variables that may lead to endogeneity.

To tackle all these issues, in my estimation, we use the GMM estimators initiated by Arellano and Bond (1988) for dynamic panel data. The study retains the criterion of using fewer instruments than groups because of the difficulty of having too many instruments. The study also examines where the instruments should be collapsed in order to limit instrument proliferation and the number of lags of the endogenous variables (Roodman, 2009).

Furthermore, the dataset is reconstructed in order to accommodate a condition for the empirical technique to be used. As a result, the use of the GMM technique necessitates a greater number of nations than the respective number of time periods in case of each nation of the panel. A one period lagged dependent variable (LP_{it-1}) is added as an explanatory variable to control for potential persistency in the LP and to account for the likelihood that the scale of the LP may stay smooth over time.

Proposing a one-step and two-step GMM framework for estimating panel regression coefficients, Arellano and Bond (1988) argue that using the orthogonal relationship that prevail between lagged values of dependent variables and the error term, additional instruments can be obtained in a dynamic model. According to Sargan-Hansen's optimum GMM framework, the first-difference of the model is utilized to make the individual effects least, and thus estimates are derived using two or more period lagged dependent variables as instruments (Baltagi and Kao, 2000).

In this analysis, the two-step system generalized methods of moment (S-GMM) is applied as it corrects for heteroscedasticity (Meniago and Lartey, 2021). The distinction between difference and system GMM is that the latter contains an extra moment condition to account for modest stationarity on primary conditions and offer efficient and unbiased estimators. Thus, for persistent data, the System GMM is superior.

However, in this study, we adopt the two-step S-GMM estimate approach to ensure that any endogeneity problems are addressed. SGMM may be used to express the model as a dynamic model, as demonstrated below:

$$LP_{it} = \alpha_0 + \alpha_4 LP_{it-1} + \alpha_1 FDI_{it} + \alpha_2 PCI_{it} + \alpha_3 FDI_{it} * PCI_{it} + Z'_{it}\beta_j + \varepsilon_{it} \quad (5)$$

The GMM allows for the removal of country-specific effects, by considering the first-differences of the above equation,

$$y_{it} - y_{it-1} = \alpha(y_{it-1} - y_{it-2}) + \beta(X_{it} - X_{it-1}) + (\epsilon_{it} - \epsilon_{it-1})$$

As a result, there are no conceivable biases owing to unobserved fixed country effects. Instruments are required to address (1) endogeneity of regressors and (2) the issue posed by generating the new disturbance term ϵ_{it}-ϵ_{it-1}, which correlates with the lagged dependent variable y_{it}-y_{it-1}. The assumptions of S-GMM entails the weak exogeneity between independent variables and the error term implying that there is

no serial correlation between the two. Thus, the GMM dynamic panel estimator uses the following moment conditions:

$$E\ [y_{it-s}.\ (\epsilon_{it}-\epsilon_{it-1})]=0 \text{ for } S>=2;\ t = 3\ldots\ldots\ldots T$$

$$E\ [X_{it-s}.\ (\epsilon_{it}-\epsilon_{it-1})]=0 \text{ for } S>=2;\ t = 3\ldots\ldots\ldots T$$

The instruments for the first-differenced equation are two or more lags of the endogenous variables to minimize the problem of having too many instrument variables in the S-GMM. In case of level form of the equation, the appropriate instrument will be the first difference of the endogenous variable. As Brambor *et al.* (2006) highlight, the overall effects of FDI, PCI, and LP will be investigated by quantifying the marginal effects of the key variables.

3.2.1 Dynamic panel threshold regression

The dynamic panel threshold regression technique proposed by Kremer *et al.* (2013) has been utilized to find out the probable nonlinear connection between FDI and labor productivity. Hansen's (1999) original static panel threshold estimation and the Caner and Hansen (2004) cross-sectional instrumental variable (IV) threshold model were expanded by Kremer et al. (2013), who used generalized methods of moments (GMM) type estimators to deal with the endogeneity problem.

The estimate technique entails finding and choosing the threshold value with the least sum of squared residuals. The slope coefficients may then be calculated using the generalized method of moment (GMM) for the previously employed instruments and the previously computed threshold.

The dynamic panel threshold model to analyze the effect of FDI on LP integrated with PCI can be defined as follows:

$$LP_{it}=\rho LP_{it-1}+\beta_L FDI_{it}\ I(PCI_{it}\leq\gamma)+\beta_H\ FDI_{it}I(PCI_{it}>\gamma)+\theta Z_{it}+\mu_i+\varepsilon_{it} \quad (6)$$

where subscripts i=1,…,N represents the country and T = 1,…, T indexes time. μ_i is the country specific fixed effects and the error term is ε_{it}. I(.) is the indicator function indicating the regime defined by the threshold variable PCI and the threshold level γ and FDI is treated as the regime dependent variable. Z_{it} is an m-dimensional vector of explanatory regressors that might contain lags in y and other endogenous variables. The explanatory variable vector is divided into two subsets: Z_{1it}, which contains exogenous variables that are uncorrelated with ε_{it}, and Z_{2it}, which contains endogenous variables that are associated with ε_{it}.

3.2.2 PMG approach

Pesaran, Shin, and Smith (1999) developed the Pooled Mean Group (PMG) estimator to assess the robustness of S-GMM estimates. The PMG estimator allows for heterogeneity in short-term parameter between groups while requiring

homogeneity in long-term coefficient among nations. The PMG estimator has the problem of being unable to handle the endogeneity of model variables. The error correction model based on the PMG estimator is as follows:

$$\Delta LP_{it} = \varphi S_{it-1} + \sum_{j=1}^{p} \partial_{ij} \Delta X_{it-j} + \eta_{it} + \xi_{it}, \text{ where } S_{it-1} = Y_{it-1} - \Theta X_{it-1} \quad (7)$$

where LP is the labor productivity, S_{it-1} denotes the deviation from long-run equilibrium for group i at any point of time, and φ is the error-correction coefficient which measures the speed of adjustment over time. The vector captures the long-run coefficients that do not change between groups and indicates the long-run elasticity of labor productivity with respect to each variable in X_{it-1}. The vector ∂ represents the X variables' short-run responses; η_i is an unobserved country-specific time-invariant impact, and ξ_{it} is the observed error term. The accuracy of PMG estimates is determined by the amount and importance of the error-correction coefficient φ (negative and less than 2).

4. Estimation Results

Initially, since the number of instruments is fewer than the number of groups, there is no evidence that the two-step S-GMM is susceptible to instrument proliferation. Furthermore, the significance of AR(1) and insignificance of AR(2) and insignificance of Hansen statistics indicate that all the required diagnosis tests are satisfied.

4.1 Baseline Results

Table 1 represents the baseline estimation results of two step system GMM where 1st column shows results of the whole panel and 2nd and 3rd column provide the outcome of the tradable and non-tradable sectors respectively. Outcome of each column confirms the inverse relationship between FDI and LP. It means the rise in FDI cause LP to decrease. The results are similar in case of aggregate LP as well as for the tradable and nontradable sector LP.

The magnitudes of the FDI coefficients in columns (2) and (3) suggest that FDI erodes LP on a large scale in both the tradable and nontradable sectors, although FDI has a far lower negative impact in the nontardable goods sector (column 3) than in the tradables. A 1% increase in FDI decreases aggregate LP by 2.97 units and tradable sector LP by 3.38 units and non-tradable sector LP by only 0.018 units.

The negative correlation between FDI and LP is consistent with the Aitken and Harrison (1999), Grether (1999), Konings (2001) and Vahter (2004), Gorg and Greenaway, 2004 and Mühlen, 2013, Moralles et al. 2020). This is my first addition to the existing literature.

Table 1. *Baseline results*

	(1) LP	(2) TRLP	(3) NTRLP
LP_{it-1}	0.0349		
	(0.283)		
$TRLP_{it-1}$		0.0612	
		(0.255)	
$NTRLP_{it-1}$			-0.658***
			(0.0270)
	(0.108)	(0.107)	(0.00142)
FDI*PCI	0.115***	0.129***	0.000639**
	(0.0329)	(0.0335)	(0.000296)
POP	0.239	0.268	-0.00586
	(0.371)	(0.422)	(0.00466)
INF	0.0611***	0.0566***	0.00496***
	(0.0215)	(0.0212)	(0.000147)
CREDIT	-0.167*	-0.155	0.00384***
	(0.101)	(0.106)	(0.000635)
OPEN	-0.0821*	-0.0770	0.00641***
	(0.0439)	(0.0483)	(0.000271)
Constant	24.80***	22.29***	3.731***
	(5.664)	(5.041)	(0.0474)
N	1408	1408	1408
AR(1)	0.021	0.017	0.004
AR(2)	0.628	0.635	0.309
Hansen OIR	0.164	0.244	0.124
Instruments	13	13	13

Note: *Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.*
Source: *Own study.*

The coefficient of interest (the coefficients on the FDI variable and the FDI-PCI interaction terms) shows that FDI has a negative and direct impact on aggregate labor productivity, and that these benefits become positive in countries with good productive capacities which is an index of eight indicators. Thus, the mediating effect of PCI on the impact of FDI on the LP is validated by the positive sign of the interaction term. It substantiates the hypothesis that the negative impact of FDI on

LP is weakened by better productive capacity. This finding can be interpreted by the fact that FDI efficacy being restricted in nations with low levels of natural and human capital, insufficient transport and institutional strength, a less developed private sector, and inferior ICT technology, as well as poor structural transformation and energy storage (Alfaro, 2009; Ferreira and Silva, 2015; Yoong and Frederico, 2020; Moralles *et al.*, 2020).

Furthermore, the PCI coefficient sign is negative, indicating that increasing productive capacity affects aggregate productivity as well as productivity in two of its sectors. These findings are explained by the rising share of developing nations in the panel, as well as their PCI levels being significantly lower than the threshold level.

The negative sign of FDI(α_1) coefficient and the positive sign of its interaction term with productive capacity (α_3) in specifications (1), (2) and (3) show that FDI initially decreases gross as well as sectoral labor productivity, and the improved PCI mitigates this negative impact until a PCI threshold is reached, above which point FDI enhances LP. This outcome is referred to as the second addition to the existing literature. Figure (4), (5) and (6) confirm that the standalone impact of FDI (α_1) on LP is negative in both sectors and at the aggregate level whereas this effect interacting with PCI (α_3) is positive in all three cases.

Concerning the marginal impacts of PCI and FDI, we find that higher PCI increases sectoral LP, validating Azenui's (2021) claim that PCI causes LP to grow. These effects are consistent at the highest, mean, and lowest levels of FDI. First column of Table 1 indicates that the marginal effects of FDI on LP at the lowest, mean and highest levels PCI are -1.0627, 0.5703 and 3.08 respectively. It means if FDI as percentage of GDP increases by 1%, LP with the interaction of PCI at its lowest level decreases by 1.0627 units; but LP with the interaction of PCI at its mean and highest-level increases by 0.5703 and 3.08 units respectively. The effect of FDI on LP then becomes positive at the highest level of PCI.

Similarly, according to the second and third columns, the marginal effects of FDI on LP at the lowest, mean, and highest levels PCI are -1.235, 0.597, and 3.41 respectively in the tradable sector and -0.0074, 0.0017, 0.0156 in the non-tradable sector respectively. The tradable sector results imply that when FDI as the proportion of GDP rises by 1%, LP with the interaction of PCI at its lowest level falls by 1.235 units; however, LP with the interaction of PCI at its mean and highest levels rises by 0.597 and 3.41 units, respectively. At the highest level of PCI, the effect of FDI on LP becomes positive. The non-tradable sector outcome of the 2nd column can be explained in the same way as it is done above.

Table 2 shows how PCI influences the impact of FDI on LP in the panel of 88 countries. The negative impact of FDI on LP may be found in nations with lower PCI such as Niger, Mali, Ethiopia, Burkina Faso, Sierra Leone, Nigeria, Angola.

Table 2. *Country wise estimations of Labor Productivity*

	Country Name	Avg. PCI	Non-tradable LP	Tradable LP	Aggregate LP
			$\alpha_1+\alpha_3$*avg. PCI		
1	Algeria	25.511	-0.002	-0.088	-0.040
2	Angola	20.269	-0.005	-0.764	-0.643
3	Argentina	31.036	0.002	0.625	0.595
4	Australia	41.464	0.008	1.970	1.794
5	Austria	42.151	0.009	2.059	1.873
6	Bahamas	35.327	0.005	1.178	1.089
7	Bahrain	36.390	0.005	1.315	1.211
8	Bangladesh	24.336	-0.002	-0.240	-0.175
9	Bolivia	26.351	-0.001	0.020	0.056
10	Botswana	27.220	-0.001	0.132	0.156
11	Brazil	30.491	0.001	0.554	0.532
12	Brunei Darussalam	33.410	0.003	0.931	0.868
13	Burkina Faso	19.534	-0.006	-0.859	-0.728
14	Cameroon	21.570	-0.004	-0.596	-0.493
15	Canada	40.534	0.008	1.850	1.687
16	Chile	33.977	0.004	1.004	0.933
17	China	34.620	0.004	1.087	1.007
18	Colombia	28.824	0.000	0.339	0.341
19	Costa Rica	32.551	0.003	0.820	0.769
20	Cote d'Ivoire	21.753	-0.004	-0.573	-0.472
21	Denmark	45.067	0.011	2.435	2.209
22	Dominican Republic	30.020	0.001	0.494	0.478
23	Ecuador	27.339	-0.001	0.148	0.170
24	Egypt, Arab Rep.	27.123	-0.001	0.120	0.145
25	El Salvador	30.128	0.001	0.508	0.491
26	Estonia	38.185	0.006	1.547	1.417
27	Ethiopia	19.435	-0.006	-0.872	-0.739
28	Finland	41.030	0.008	1.914	1.744
29	France	42.965	0.009	2.164	1.967
30	France	42.965	0.009	2.164	1.967
31	Gabon	24.143	-0.003	-0.265	-0.198
32	Germany	45.529	0.011	2.494	2.262
33	Ghana	24.461	-0.002	-0.224	-0.161
34	Guatemala	26.238	-0.001	0.006	0.043
35	Guinea	21.617	-0.004	-0.590	-0.488
36	Guyana	28.435	0.000	0.289	0.296
37	Honduras	26.221	-0.001	0.004	0.041
38	India	28.044	0.000	0.239	0.251
39	Indonesia	26.726	-0.001	0.069	0.099
40	Iran	27.539	0.000	0.174	0.193
41	Israel	38.471	0.007	1.584	1.450
42	Italy	34.330	0.004	1.050	0.974
43	Jamaica	30.771	0.002	0.590	0.565

44	Japan	42.265	0.009	2.073	1.887
45	Jordan	29.055	0.001	0.369	0.367
46	Kenya	22.956	-0.003	-0.418	-0.334
47	Madagascar	21.785	-0.004	-0.569	-0.469
48	Malawi	21.444	-0.004	-0.613	-0.508
49	Malaysia	32.799	0.003	0.852	0.798
50	Mali	19.162	-0.006	-0.907	-0.770
51	Mexico	30.392	0.001	0.542	0.521
52	Morocco	28.482	0.000	0.295	0.301
53	Namibia	27.374	-0.001	0.152	0.174
54	New Zealand	41.270	0.008	1.945	1.772
55	Nicaragua	27.073	-0.001	0.113	0.139
56	Niger	17.943	-0.007	-1.064	-0.911
57	Nigeria	20.534	-0.005	-0.730	-0.613
58	Norway	41.271	0.008	1.945	1.772
59	Oman	31.546	0.002	0.690	0.654
60	Pakistan	23.773	-0.003	-0.312	-0.240
61	Papua New Guinea	24.149	-0.003	-0.264	-0.197
62	Paraguay	26.390	-0.001	0.025	0.061
63	Peru	28.193	0.000	0.258	0.268
64	Philippines	27.178	-0.001	0.127	0.151
65	Poland	36.911	0.006	1.382	1.271
66	Romania	32.345	0.003	0.794	0.746
67	Saudi Arabia	31.141	0.002	0.638	0.607
68	Senegal	23.898	-0.003	-0.296	-0.226
69	Sierra Leone	20.215	-0.005	-0.771	-0.649
70	Singapore	42.604	0.009	2.117	1.925
71	South Africa	32.136	0.003	0.767	0.722
72	South Korea	41.940	0.009	2.031	1.849
73	Spain	39.971	0.008	1.777	1.623
74	Sri Lanka	28.494	0.000	0.297	0.303
75	Sudan	21.205	-0.004	-0.644	-0.535
76	Sweden	42.514	0.009	2.105	1.915
77	Switzerland	41.193	0.008	1.935	1.763
78	Tanzania	22.222	-0.004	-0.512	-0.418
79	Thailand	31.248	0.002	0.652	0.620
80	Tunisia	30.891	0.002	0.606	0.578
81	Turkey	32.620	0.003	0.829	0.777
82	Uganda	22.612	-0.004	-0.462	-0.374
83	Ukraine	31.309	0.002	0.660	0.627
84	United Arab Emirates	36.830	0.006	1.372	1.262
85	United Kingdom	44.454	0.010	2.356	2.138
86	United States	49.224	0.013	2.971	2.687
87	Uruguay	34.044	0.004	1.013	0.941
88	Vietnam	28.502	0.000	0.298	0.304

Source: *Own study.*

Then, when PCI rises in nations like Honduras, Guatemala, Bolivia, Paraguay, this negative effect fades. Non-tradable sector needs higher level of PCI than tradable sector to find the positive FDI effects. The effect is positive in nations and territories with higher PCI, such as Canada, Finland, Sweden, South Korea, Australia, Japan and Singapore. This result (Table 3) is consistent with that of the low income and high-income countries as the coefficient of PCI is negative for low-income nations and start becoming positive for high income countries[3]. This outcome also is in line with the dynamic panel threshold estimation results as below the threshold level of PCI the FDI effect is positive but very weak while the impact become seven-fold stronger in case of PCI above the threshold level.

Table 3. *Dynamic panel threshold estimation*

	(1) LP	(2) TRLP	(3) NTRLP
LP_{it-1}	0.0451***		
	(0.00305)		
$\widehat{\beta_L}$	-0.0176***	-0.0163***	-0.000127***
	(0.00243)	(0.00242)	(0.00000602)
$\widehat{\beta_H}$	0.0690***	0.0670***	0.00400***
	(0.00380)	(0.00343)	(0.0000969)
POP	0.0298**	0.0287**	0.00106***
	(0.0152)	(0.0133)	(0.0000488)
INF	0.0514***	0.0474***	0.00450***
	(0.000240)	(0.000190)	(0.000000562)
CREDIT	-0.138***	-0.134***	-0.00208***
	(0.000990)	(0.000771)	(0.00000199)
OPEN	-0.0411***	-0.0454***	0.00471***
	(0.000181)	(0.000183)	(0.00000155)
$TRLP_{it-1}$		0.0497***	
		(0.00259)	
$NTRLP_{it-1}$			-0.209***
			(0.000133)
Constant	15.02***	12.73***	2.844***
	(0.0561)	(0.0400)	(0.000384)
N	1584	1584	1584

Note: *Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*
Source: *Own study.*

[3]*This result is suppressed here to save space. The result will be provided upon request.*

Table 4. *Dynamic panel threshold estimates*

Threshold Parameter (level = 90) for service sector

	Threshold	Lower	Upper
$\hat{\gamma}$	41.07999	21.66781	42.11135

Threshold Parameter (level = 90) for tradable sector

	Threshold	Lower	Upper
$\hat{\gamma}$	23.02312	21.4238	42.19418

Threshold Parameter (level = 90) for whole panel

	Threshold	Lower	Upper
$\hat{\gamma}$	23.02312	21.4238	42.19418

Source: *Own study.*

As equation (4) = 0, the PCI threshold values for the overall economy, tradable sector, and non-tradable sector are 25.86, 26.19, and 28,17, respectively, suggesting that when PCI is below this level, FDI narrows LP, while when PCI is above this level, FDI expands LP.

This intriguing results can be explained by the following three factors:

First, FDI initially diminishes LP because the negative impact of FDI on LP (countries with poor absorption capacity are not able to capitalize those FDI gains and, thus, cause labor productivity to decrease) outweighs the positive impact (introduction of new technology, knowledge and updated production process to the host country and higher wage provided by foreign firms push domestic firms to pay more, resulting higher productivity of workers).

Second, FDI widens LP when the positive effect of FDI on LP outweighs the negative effect, particularly through the channel of improving PCI, because the positive impact of FDI on LP has been established in existing studies (Dua and Garg 2019; Asada, 2020).

Third, the negative coefficients of PCI (α_2) and positive coefficients of the FDI-PCI interaction term (α_3) in specifications (1), (2) and (3) suggest that though PCI decreases LP, the inverse impact of PCI starts mitigating as FDI inflows increase.

The negative effect of PCI on labor productivity can be attributed by the fact that a

certain level of productive capacity needed to enhance LP. Since 66% countries of my panel are lower, lower middle or upper middle income, most of those nations possessed with low levels of productive capacities which is also in line with the literature (Ferreira and Silva 2015; Yoong 2020; Hanushek and Woessman, 2020).

This evidence is also proven by the table of dynamic panel threshold estimates (Table 4). This is the third contribution of the study to the existing literature. The entire impact of PCI is equal to the sum of direct impact (α_2) and indirect impact (α_3*FDI), as shown in the equation (3). The indirect benefit stems from FDI's positive influence on PCI development.

Fourth, additional factors of LP, such as inflation, financial strength, and population growth, have been demonstrated in the context of the panel. It has been discovered that domestic private credit and trade openness reduce labor productivity. In my analysis, the growing influence of private credit on LP demonstrates the convexity of credit returns (Alfaro, 2009; Selaya and Thielez, 2008[4]). Wang (2012) argues that trade openness and FDI may exacerbate LP by putting skilled and unskilled workers in direct competition. These results are in line with the existing literature (Qayyum *et al.*, 2008; Ismail *et al.*, 2011; Fatima *et al.*, 2020) who found that trade openness erodes productivity if the economy exhibits low human capital.

We discover that population growth and inflation have a positive impact on LP. The positive impact of population growth on LP in my study reaffirms its function in widening LP, which is backed up by Hamza (2015). Meanwhile, contrary to, the positive sign of inflation coefficients is not inconsistent with Freeman and Yerger (2000).

4.2 Dynamic Panel Threshold Estimation

We utilize a dynamic panel threshold estimation procedure to determine the threshold level of PCI at which the direction of the impact of FDI on LP changes. The results of dynamic panel threshold estimations are shown in Table 4. The projected productive capacity PCI threshold is shown in the upper section of the Table, along with the 90 percent confidence interval. The regime-dependent coefficients of FDI on LP are displayed in the middle section where PCI is the threshold variable. The marginal effect of the low (high) FDI regime is denoted by $\widehat{\beta_L}(\widehat{\beta_H})$.

The projected PCI threshold for the whole economy is 23.02, which is within the confidence interval. As a result, the low regime corresponds to values of the transition variable, PCI, that are less than or equal to the threshold parameter, while the high regime corresponds to values of the transition variable that are greater than

[4]*In this paper financial development is proxied by M2 as percentage of GDP instead of private credit as percentage of GDP in my analysis.*

or equal to the threshold parameter. Below the threshold level of PCI ($\widehat{\beta_L}$= -0.0176) FDI effect on LP is positive but very weak. More specifically, a 1% rise in FDI reduces LP by 1.76 percent in the low-regime of PCI.

FDI is positively linked with LP too above the threshold ($\widehat{\beta_H}$=0.690), and an increase of 1% in FDI boost LP in the high regime of PCI by 6.9 percent. These results support my previous results as the threshold value of PCI for which the direction of FDI effect on LP changes from positive to negative is 23.02. The signs of other explanatory variables are quite consistent with the baseline regression results of Table 1.

The threshold level of PCI for tradable and non-tradable sectors are 23.02 and 41.08 respectively. Threshold regression results are partially in line with the base line results (Table 1) as the threshold level of PCI for which the direction of FDI impact takes turn from negative to positive are 26.19 in tradable sector but in case of non-tradable sector the threshold level of PCI of the baseline results (28.17) differs sufficiently with that of dynamic panel threshold results (Table 4).

The results also indicate that FDI affects LP significantly both below and above the threshold of PCI while the latter effect is about seven-fold higher than the former one (In case of aggregate and tradable sector) which implies that countries with PCI above the threshold are capable of accelerate LP at a large scale. But contrary to the previous results, below the threshold level of PCI the effect of FDI on LP is negative in non-tradable sector. It means FDI promotes LP in service sector if the PCI exceeds 41.08 and deteriorates LP below this threshold which does not match with the baseline result.

4.3 Analysis on Institutional Quality Disaggregated by Eight Constituents

We deconstruct PCI into eight parts for estimating equations (1), to see how each aspect of PCI moderates the effect of FDI on LP. All dimensions of PCI except natural capital enhance LP and mitigate the negative impact of FDI on LP, according to the findings reported in Table 5.

These findings add to the growing body of literature about how better absorption capacity might mitigate the impact of FDI on LP. To begin with, FDI inflows brings human capital and this skilled worker brings new technology enhances LP. Secondly, FDI promotes institutional strength and develops infrastructure since domestic governments with large reception of FDI may have more freedom in implementing policies related to mitigate institutional weakness, logistic shortfalls and promote good governance, leading to increased economic welfare, which makes redistributive policies more effective to enlarge LP. Third FDI makes private sector more efficient which in turn promotes LP. Fourth, FDI brings forth new and updated technology to ICT sector and those technologies improve LP. Fifth, FDI helps many economies to

shift from an agriculture based to an industry-oriented economy. As a result of this structural adjustment, LP has risen.

Table 5. *Robustness with Segregated PCI*

	(1) LP	(2) LP	(3) LP	(4) LP	(5) LP	(6) LP	(7) LP	(8) LP
LP_{it-1}	0.255	-0.155	-0.446***	-0.721**	0.123	0.0771	-0.593***	-0.0230
	(0.297)	(0.335)	(0.166)	(0.342)	(0.308)	(0.323)	(0.139)	(0.456)
FDI	-2.320**	-5.212	-2.554***	3.180	-0.874*	-1.525*	-8.025***	-3.213*
	(0.983)	(3.899)	(0.677)	(1.966)	(0.507)	(0.833)	(2.687)	(1.758)
HC	-0.127**							
	(0.0597)							
FDI*HCI	0.0587***							
	(0.0191)							
POP	0.210	-0.370	0.394	-0.444	0.192	-0.0132	1.170	0.811
	(0.350)	(0.542)	(0.262)	(2.920)	(0.314)	(0.244)	(0.974)	(0.814)
INF	0.0484**	0.0502	0.104***	0.119***	0.0551**	0.0697***	0.115***	0.0806**
	(0.0222)	(0.0347)	(0.0135)	(0.0342)	(0.0224)	(0.0244)	(0.0149)	(0.0370)
CREDIT	-0.118	-0.149	-0.329***	-0.514***	-0.155	-0.213**	-0.452***	-0.243
	(0.104)	(0.144)	(0.0569)	(0.196)	(0.109)	(0.0970)	(0.100)	(0.149)
OPEN	-0.0788*	-0.375***	-0.0851***	-0.112*	-0.0704	-0.0620	-0.111***	-0.0764
	(0.0443)	(0.0812)	(0.0249)	(0.0616)	(0.0496)	(0.0394)	(0.0322)	(0.0733)
NC		-0.187						
		(0.311)						
FDI*NC		0.112						
		(0.0784)						
ENG			-0.198**					
			(0.0910)					
FDI*ENG			0.114***					
			(0.0246)					
TRANS				1.006				
				(0.858)				
FDI*TRANS				-0.165				
				(0.121)				
ICT					-0.325**			
					(0.127)			
FDI*ICT					0.145***			

					(0.0408)			
INS						-0.101**		
						(0.0504)		
FDI*INS						0.0373***		
						(0.0141)		
PVT							0.0538	
							(0.227)	
FDI*PVT							0.108***	
							(0.0330)	
STR								-0.159
								(0.297)
FDI*STR								0.191***
								(0.0689)
constant	19.25***	51.31**	32.24***	26.73***	18.52**	22.74***	30.87**	21.66**
	(6.004)	(23.40)	(3.501)	(6.766)	(7.288)	(5.688)	(14.09)	(9.983)
N	1408	1408	1408	1408	1408	1408	1408	1584
AR(1)	0.024	0.083	0.029	0.061	0.016	0..018	0.020	0.099
AR(2)	0.424	0.203	0.711	0.084	0.591	0.506	0.460	0.645
Hansen OIR	0.394	0.247	0.113	0.986	0.434	0.123	0.153	0.113

Note: *Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$*
Source: *Own study.*

4.4 Robustness with Alternative Control Variables

Table 6 shows the similar impact of FDI and PCI on LP using alternative control variables. As part of the robustness test, instead of using consumer price index (CPI) as a measure of inflation, we employ GDP deflator (DEF). The current literature offers various proxies to the financial development, inflation and globalization. Thus, we apply money supply (M2) instead of private credit as the proportion to GDP, openness is proxied by export (EXP) expressed as ratio of GDP. The results are consistent with Table 1 for the whole economy as well as traded goods and non-traded goods sector. Despite the value of the coefficient is small, the sign remains unchanged.

4.5 Robustness with PMG Approach

To test the sensitivity of baseline estimates, equation (3) is estimated utilizing the PMG estimator. Table 7 elaborate the results. The outcome keeps the consistency with that of S-GMM estimates of Table 1 except non-tradable sector. It is also found that there is a long run relationship exists between FDI and LP in traded goods sector. The magnitude and significance of the error-correction coefficients shown at the lower part provide the evidence that PMG estimates are very much consistent, reliable and converge well to long run. Impact of FDI on LP with the interaction of

PCI under PMG also largely supports my baseline results.

Table 6. *Robustness with alternative variables*

	(1) LP	(2) TRLP	(3) NTRLP
LP_{it-1}	0.670***		
	(0.200)		
$TRLP_{it-1}$		0.618***	
		(0.223)	
$NTRLP_{it-1}$			0.190
			(0.214)
FDI	-5.524***	-5.739***	-0.406***
	(1.665)	(1.899)	(0.151)
PCI	-0.679***	-0.708***	-0.0455***
	(0.225)	(0.249)	(0.0164)
FDI*PCI	0.182***	0.189***	0.0142***
	(0.0549)	(0.0627)	(0.00539)
POP	-0.832	-0.856	-0.0328
	(0.751)	(0.763)	(0.0322)
DEF	-0.00161	-0.00176	-0.000124**
	(0.00143)	(0.00139)	(0.0000619)
M2	0.181***	0.188***	0.0318***
	(0.0666)	(0.0677)	(0.00382)
EXP	-0.00504	-0.0137	0.0201***
	(0.123)	(0.154)	(0.00539)
Constant	14.56**	14.78**	1.091**
	(6.010)	(6.649)	(0.434)
N	1492	1492	1408
AR(1)	0.024	0.029	0.082
AR(2)	0.831	0.829	0.733
Hansen OIR	0.402	0.543	0.083
Instruments	13	13	12

Note: *Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$*

Source: *Own study.*

Table 7. *Robustness check with PMG approach*

	(1) LP	(2) TRLP	(3) NTRLP
	LONG RUN		
FDI	-0.0628***	-0.0624***	-0.000619
	(0.0109)	(0.0109)	(0.000679)

PCI	-0.0414*	-0.0369*	-0.00233***
	(0.0214)	(0.0210)	(0.000885)
FDI*PCI	0.00293***	0.00288***	0.0000461**
	(0.000353)	(0.000352)	(0.0000201)
POP	0.0195	0.0207	-0.000586
	(0.0132)	(0.0132)	(0.000480)
INF	0.0391***	0.0347***	0.00452***
	(0.00138)	(0.00137)	(0.0000711)
CREDIT	-0.0776***	-0.0765***	-0.00209***
	(0.00657)	(0.00647)	(0.000273)
OPEN	-0.0956***	-0.100***	0.00420***
	(0.00367)	(0.00364)	(0.000156)
	SHORT RUN		
ECT	-1.272***	-1.275***	-1.180***
	(0.0315)	(0.0316)	(0.0182)
D.FDI	0.469	0.445	0.0217
	(0.511)	(0.509)	(0.0206)
D.PCI	0.243***	0.239***	0.00626*
	(0.0634)	(0.0627)	(0.00324)
D.(FDI*PCI)	-0.00749	-0.00689	-0.000427
	(0.0173)	(0.0173)	(0.000658)
D.POP	-0.276	-0.199	-0.0756*
	(1.254)	(1.193)	(0.0457)
D.INF	0.125***	0.133***	-0.00744***
	(0.00842)	(0.00826)	(0.000220)
D.CREDIT	0.0445***	0.0368***	0.00898***
	(0.00748)	(0.00736)	(0.000381)
D.OPEN	0.0775***	0.0765***	0.00167***
	(0.00306)	(0.00308)	(0.000145)
Constant	22.93***	19.97***	2.792***
	(0.548)	(0.477)	(0.0425)
N	1584	1584	1584

Note: *Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$*
Source: *Own study.*

5. Final Implications and Policy Recommendations

World-wide, FDI is tied to a variety of macroeconomic and technological variables which differs depending on the nation that is receiving the investment. Till date LP effect of FDI is not examined on a sector-by-sector basis using specific panel data. The backdrop of this current analysis is built on a sparse body of evidence about LP and FDI.

The study examined the direct and indirect effects of foreign direct investment (FDI) in the traded goods sector and non-traded products sector of 88 countries over the period 2000-2018. The main findings suggest that FDI has a negative direct effect on LP based on different representations of FDI and LP. In terms of indirect impacts, PCI indicators accumulate and modify FDI to provide a largely favorable net effect on LP.

An initial negative impact is reversed when the domestic economy uses human capital, information and communication technology, energy more intensively (perhaps even more intensively than before) and overcome institutional and infrastructural backwardness, and has an efficient platform to boost competitiveness and create more access to foreign markets.

Therefore, the higher labor productivity is caused by their increased dominance in a particular sector. Based on my analysis, we demonstrate that productivity of both developing and developed countries depends not only on factor accumulation (physical and human capital, ICT), but also on domestic technological change, technology diffusion via institutional quality and macroeconomic policy variables such as trade openness, inflation, GDP per capita growth, and population growth.

Based on S-GMM and dynamic panel thresholds results, we find that FDI inflows degrade labor productivity, and that improvements in productive capacity indicators mitigate this negative impact until a threshold is reached, after which FDI improves labor productivity.

Furthermore, the positive effect is amplified by increased FDI inflows. Surprisingly, PCI mitigates the impact of FDI on LP through the mechanisms of good exploitation of and human resources and ICT, effective institutions, gradual structural change, adequate transportation and energy storage, and an enhanced and efficient private sector. These findings significantly support the necessity of PCI in coping with high levels of LP by taking advantage of FDI inflows. The results are robust to varying specifications, contextual factors, and the endogeneity of FDI reception.

The findings of this study have a variety of policy implications. Boosting an economy's growth requires enacting policies that encourage foreign direct investment. Studies have shown that foreign direct investment can increase labor productivity in host countries, as well as facilitate the creation of efficient and

productive markets for traded and nontraded goods. Several other factors of increasing labor productivity should be utilized, since they have a significant correlation with foreign direct investment.

In addition to increasing their FDI attractiveness, governments should make sure that they implement measures that will enhance the quantity, quality, and technical level of hosts' economies, as assessed by PCI. Thus, FDI benefits will be maximized while economic development is sustained for the long term. A significant propensity of policy moves is revealed in the relationship between foreign direct investment and labor productivity in an economy, proving the concept that higher labor productivity leads to higher economic development.

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Annex:

Table A1. Descriptive statistics

Variables	Observations	Mean	Std. Dev.	Minimum	Maximum
LP	1,672	97185.29	10137.35	89302.09	129495.60
TRLP	1,672	67944.66	9358.35	61032.85	98825.01
NTRLP	1,672	29240.62	990.16	27857.67	31160.33
FDI	1,672	3.34	3.74	-20.85	32.30
PCI	1,672	30.82	7.72	16.62	52.64
FDI*PCI	1,672	105.33	136.40	-880.73	1270.62
POP	1,672	1.60	1.37	-1.85	15.18
INF	1,672	99.97	28.14	62.50	156.54
CREDIT	1,672	57.94	5.62	44.83	64.62
OPEN	1,672	75.27	3.34	70.49	81.83

EXP	1,632	37.10	25.38	7.63	228.99
DEF	1,672	119.46	179.23	5.15	4027.00
M2	1,672	58.89	5.60	47.03	67.66
EXP	1,672	37.10	1.75	33.93	39.84
HC	1,672	49.82	15.15	18.66	89.13
NC	1,672	52.97	7.49	36.43	75.91
ENG	1,672	27.41	6.47	12.10	46.10
TRANS	1,672	15.36	6.47	4.00	47.96
ICT	1,672	10.11	6.43	2.78	30.21
INS	1,672	57.29	20.13	17.83	99.73
PVT	1,672	79.16	7.26	57.53	94.23
STR	1,672	20.11	5.95	5.90	48.67

Table A2. Name of the countries

Countries				
Algeria	Costa Rica	South Korea	Nicaragua	Spain
Angola	Cote d'Ivoire	India	Niger	Sri Lanka
Argentina	Denmark	Indonesia	Nigeria	Sudan
Australia	Dominican Republic	Iran	Norway	Sweden
Austria	Ecuador	Israel	Oman	Switzerland
Bahamas	Egypt	Italy	Pakistan	Tanzania
Bahrain	El Salvador	Jamaica	Papua New Guinea	Thailand
Bangladesh	Estonia	Japan	Paraguay	Tunisia
Bolivia	Ethiopia	Jordan	Peru	Turkey
Botswana	Finland	Kenya	Philippines	Uganda
Brazil	France	Madagascar	Poland	Ukraine
Brunei Darussalam	Gabon	Malawi	Portugal	United Arab Emirates
Burkina Faso	Germany	Malaysia	Romania	United Kingdom
Cameroon	Ghana	Mali	Saudi Arabia	United States
Canada	Guatemala	Mexico	Senegal	Uruguay
Chile	Guinea	Morocco	Sierra Leone	Vietnam
China	Guyana	Namibia	Singapore	
Colombia	Honduras	New Zealand	South Africa	