# DOES EXPORT DIVERSIFICATION LEAD TO INCOME CONVERGENCE? EVIDENCE FROM CROSS-COUNTRY ANALYSIS

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## ABSTRACT

In this study, we examine the role of export diversification in the convergence of per capita income (output). By applying the dynamic system Generalized Method of Moments (GMM) estimator to a panel dataset consisting of 95 countries, we find evidence of both absolute and conditional divergence for the full sample and the subsamples based on income and regions. Thus, our findings suggest that, although high export diversification boosts the per capita income (output), it does not significantly reduce per capita income (output) gap between rich and poor countries.

## I. INTRODUCTION

The convergence hypothesis, which is based on neoclassical growth, has been traditionally developed for closed economies (see, for example, Baumol, 1986; Mankiw et al., 1992; Barro and Sala-i-Martin, 1995, 2003; Islam, 1995). An important question, which has been subsequently raised in the literature, is whether an increase in openness to international trade leads to per capita output (or income) convergence across economies (see, for example, Ben-David, 1993, 1996; Ben-David and Loewy, 1998; Rossini and Burattoni, 1996; Slaughter, 1997, 2001; Stehrer and Wörz, 2003; Felbermayr, 2005; Chatterjee and Shukayev, 2012; Song, 2014). Although seminal works by Ben-David (1996) and Slaughter (1997) highlight that there is a difference between factor price equalization and equalization of per capita income, there is limited theoretical literature examining the relationship between trade and income convergence. This aside, conclusions from existing theories are also ambiguous (see, for example, Ben-David, 1993, 1996).

Trade can either lead to income convergence or income divergence through many channels. One of these channels is factor prices (wage and rent), which are associated with factor price equalization theorem (see, for example, Samuelson, 1948; Helpman and Krugman, 1985). This theorem describes a condition whereby some limited restrictions are met such that free trade of goods lead to commodity price equalization and to subsequent equalization of factor prices. As a result, free trade does not only reduce the disparities in the prices of goods across countries but also equalizes the prices of nontradable factors. Further, Leamer and Levinsohn (1996) called it a Factor Price Convergence (FPC) theorem and according to them, "as barriers to international trade reduce, thereby prices converge since trade in goods becomes free". Thus, there is a tendency for declining variation in the factor prices across trading partners and, as a result, free trade may lead to convergence, of income across countries. However, FPC does not necessarily lead to a reduction in trade barriers which ensures income convergence. The FPC also depends on countries test, endowments, and technology.[1] For instance, Deardorff (2001) argued that countries having diverse initial endowments may end up with unequal factor prices in different diversification cones. In this case, FPC will no longer hold. Further, Baldwin (1992) contended that trade reduces (raises) capital returns and discourages (encourages) investment in poor (rich) countries, which can lead to income divergence. Grossman and Helpman (1991) argued that trade could also drive income convergence through technology spillovers. However, they found that trade boots growth in poor countries and that there are cases where trade and competition may lead to income divergence by discouraging research in poor countries.

On the empirical front, the bulk of studies provide sufficient evidence the nexus between export diversification and economic growth (see, for example, Al-Marhubi, 2000; Balaguer and Cantavella-Jorda, 2004; Herzer and Nowak-Lehmann, 2006; Lederman and Maloney, 2007; Agosin, 2007; Arip et al., 2010). The literature also explained that export diversification is an essential determinant of a total factor of productivity growth (for example see, Berthélemy and Chauvin,

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[1]   A detailed theoretical explanation trade and income convergence can be found from Slaughter (1995, 1997), and Deardorff (1986).

2000; Berthélemy and Soderling, 2001; Hammouda et al. 2010; Rath and Akram, 2017; Akram and Rath, 2017). Another group of studies (see, for instance, Murthy and Chien, 1997; McCoskey, 2002; Stroomer et al., 2003; Vollmecke et al., 2015; Li et al., 2016) examine the per capita output (or income) convergence hypothesis by emphasizing the role of international trade. However, studies on whether export diversification leads to output (or income) convergence are rare.

Thus, examining the role of export diversification in per capita income convergence/divergence is vital because export diversification is considered to be a better proxy for trade in morden trade theories (Al-Marhubi, 2000; Balaguer and Cantavella-Jorda, 2004; Herzer and Nowak-Lehmann, 2006; Lederman and Maloney, 2007; Agosin, 2007; Arip et al. 2010; Mau, 2015). Also, classical trade theories are based on multiple assumptions like perfect competition, comparative advantage, and constant return to scale, whereas the recent literature on trade found that countries appear to diversify in exports to achieve higher economic growth (Hammouda et al. 2010). In addition, it has been argued that poor countries can grow rich by modifying the compositions of their exports (or via export diversification), particularly by diversifying the economies away from primary commodities because of unfavourable and declining terms of trade, low value-addition, and slow productivity growth—the so-called Prebisch Singer hypothesis. In addition, Mau (2015) claimed that it is not just exports which influence per capita income convergence, export diversification influences it as well. For instance, Romer (1990) argued that diversification is a production factor that may help boost a poor countries' economic growth, helping them 'catch up' with the rich countries. Acemoglu and Zilibotti (1997) argued that export diversification might uplift economic growth by expanding the possibilities of spreading investment risks over a wider portfolio. Export diversification is defined as the change in the structure of a country's existing export product basket or export destination (Ali et al., 1991) or spread of production over many sectors (Berthelemy and Chauvin, 2000). In other words, export diversification can be defined as broadening the product range that a country exports, thereby equated with export growth at the extensive margin (Dennis and Shepherd, 2007).

Our contribution to the literature can be split into three folds. First, while several studies in the economic growth literature have examined the convergence hypothesis by emphasizing free trade, trade openness, or trade liberalization, none has explored the importance of export diversification in the convergence process. Thus, our study complements the literature by investigating whether export diversification leads to per capita income convergence and thereby narrows the per capita income differences between rich and poor countries. Based on the United Nations Conference on Trade and Development (UNCTAD)[2] database, we noticed that, though poor countries are rapidly diversifying their exports, they are still lagging behind rich countries.

Second, there is hardly any study examining this research question at the full sample and the subsamples based on income and regions. We divide 95 countries into developed, developing, Asia, Africa, Europe, and Latin America because we noticed a wide variation in export diversification across the levels of income and

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[2]  https://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?sCS_ChosenLang=en.

regions. In particular, the UNCTAD data shows that developed countries are more diversified in exports, as compared to developing countries. At the regional level, we noticed that the European and Latin America regions are relatively more diversified in exports, as compared to the Asian and African regions.[3] Thus, the creation of the different groups leads to more insightful evidence about convergence dynamics across these countries.

Third, we do not only examine the income convergence hypothesis by treating export diversification as one of the determinants of income convergence, we also examine whether export diversification plays a role in Total Factor Productivity (TFP) convergence or divergence. Although per capita income is different from TFP, it can be proxied by TFP . Besides, TFP plays an important role in economic growth (see Juhro et al., 2020). To the best of our knowledge, our study is the first to empirically examine export diversification as a determinants of per capita income (output) convergence.

Our results, based on both absolute and conditional convergence tests, reveal that there is no evidence of per capita income and productivity convergence in the full sample, developed, developing, Asia, Africa, Europe, and Latin America samples. However, we find that export diversification has a positive and significant impact on per capita income and TFP. Other factors like human capital, trade openness, domestic credit to the private sector, foreign direct investment, government expenditure consumption, and gross fixed capital formation also affect per capita income and TFP.

Our paper is structured as follows. Section II presents a review of the literature. Section III presents the analytical framework for testing the convergence hypothesis. Data are described in section IV. Section V reports and discusses the results, while Section VI presents the concluding remarks.

## II. REVIEW OF LITERATURE ON CONVERGENCE

Several studies focus on per capita income (output) convergence in the literature. Table 1 shows a comprehensive list of these studies. A group of studies examined whether trade leads to per income (or output) convergence across the countries (see, Ben-David 1993, 1996; Sachs and Warner, 1995; Bernard and Jones, 1996; Slaughter, 1997; Cyrus 2004; Milanovic, 2006; Choi, 2009; Liu, 2009; Milutinović, 2016; Trofimov and Saad, 2018; among others). For instance, Ben-David (1993, 1996), Sachs and Warner (1995) presented evidence of per capita income convergence through trade for a group of relatively open countries. Rodriguez and Rodrik (2000) and Cyrus (2004) found trade-induced per capita income convergence across countries. Milanovic (2006) found evidence of income convergence during the inter-war trade disintegration period (1919–1939). Similarly, Liu (2009) found that trade induces income convergence. Choi (2009) also found that trade aids income convergence. Milutinović (2016) found that the volume of bilateral trade leads to income convergence. Trofimov and Saad (2018) found that terms of trade influences income convergence in the case of Latin America. They found mixed evidence of income convergence. On the contrary, Bernard and Jones (1996) and

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[3] See Table 1 for more details.

Slaughter (1997) found that international trade does not contribute to the per capita income convergence during pre- and post-liberalization. See Table 1 for a comprehensive literature review on per capita income convergence.

**Table 1.**
**Summary of Literature Review on Convergence**

This table provides a summary of the literature. Yes - denotes the convergence, No - denotes divergence and Mixed - stands for a mixture of convergence and divergence.

| Authors | Sample period | Countries | Methodology | Major findings |
|---|---|---|---|---|
| *Income growth convergences* | | | | Convergence |
| Li et al.(2016) | 1980-2010 | 120 Countries | Fixed effect and GMM | Yes |
| Ha and Lee (2016) | 1970-2011 | Asian countries | Fixed/random effect | No |
| Ceylan and Abiyev (2016) | 1950-2015 | EU | ESTAR, AESTAR, LM | Yes |
| King and Dobson (2015) | 1950-2009 | Latin America | Unit root test | Yes |
| Chapsaa et al. (2015) | 1995-2013 | European Union (EU) | GMM | Yes |
| Völlmecke et al. (2015) | 2003-2010 | EU | Markov chain approach | Yes |
| Ghosh et al. (2013) | 1968–2008 | Indian States | Novel approach | No |
| Próchniak and Witkowski (2013) | 1972–2010 | EU | Bayesian Approach | Yes |
| Serranito (2013) | 1960–2008 | South Europe | Unit root | Mixed |
| Pen (2011) | 1980–2006 | EU | Unit root | Yes |
| Ayala et al. (2013) | 1950-2011 | Latin America | Unit root | Yes |
| Bandyopadhyay (2012) | 1965-1997 | Indian States | Philips and Sul | Yes |
| Seya et al.(2012) | 1989-2007 | Japan | Bayesian spatial Durbin | Mixed |
| Tunali and Yilanci (2010) | 1950-2006 | MEANA | Unit root test | Mixed |
| Ucar and Guler (2010) | 1991.1-2003.4 | OECD | Seasonal Unit Root tests | Yes |
| Fung(2009) | 1967-2001 | Cross country | GMM | Yes |
| Young et al. (2008) | 1970-1998 | US | 3SLS | Mixed |
| Carmignani et al.(2007) | 1989-2004 | Cross countries | Unit root | Yes |
| Galvão and Gomes (2007) | 1951-1999 | Latin America | Unit root | Yes |
| Guetat and Serranito (2007) | 1960-2000 | MENA | Unit root | Yes |
| Maasoumi and Wang (2007) | 1965-1995 | OECD & Non-OECD | Non-parametric regression | Yes |
| Cuñado and Gracia (2006) | 1950-1999 | 43 African | Unit root | Yes |
| Laurini et al. (2005) | 1970–1996 | Brazil | Spline regression | Yes |
| Chowdhury (2004) | 1960–2001 | 9 ASEAN | | Mixed |
| Parikh and Shibata (2004) | 1970–1999 | 36 Developing | OLS regression | Yes |
| Wane (2004) | 1965–2002 | 7 WAEMU | | Yes |
| Barro and Sala-i-Martin (2003) | 1965–1995 | 86 Countries | | No |
| Fuente (2003) | 1965–1995 | 19 OECD | | Yes |
| Di Liberto and Symons (2003) | 1950–1990 | 23 OECD | Fixed effects | Yes |
| Mello and Perrelli (2003) | 1960–1985 | 100 Countries | Regression (Solow model) | |
| Mello and Perrelli (2003) | 1960–1995 | 90 Countries | Regression (Solow model) | Yes |
| Stroomer et al. (2003) | 1965-1990 | 83 countries | FCM algorithm | Mixed |
| Su (2003) | 1900-1987 | 15 OECD | Unit root, clustering algorithm | Mixed |

**Table 1.**
**Summary of Literature Review on Convergence (Continued)**

| Authors | Sample period | Countries | Methodology | Major findings |
|---|---|---|---|---|
| *Income growth convergences* | | | | Convergence |
| Dobson et al. (2002) | 1960-1990 | Latin America | Semi-parametric approach | Yes |
| McCoskey (2002) | 1960-1990 | Sub-Saharan Africa | Unit root | No |
| Zhang et al. (2001) | 1952-1997 | China | Unit root test | Yes |
| Nakamura (2001) | 1965–1990 | 50 Countries | | No |
| Ferreira (2000) | 1970-1986 | Brazil | OLS | Yes |
| Azomahou et al. (2011) | 1900-2005 | European Regions | Semiparametric partially linear | Mixed |
| Smolny (2000) | 1951–1988 | 16 Industrialized | | Yes |
| Murthy and Upkolo (1999) | 1960–1985 | 37 African | Regression (Solow model) | No |
| Murthy and Chien (1997) | 1960–1985 | OECD | Regression (Solow model) | No |
| Andrés et al. (1996) | 1960–1990 | 24 OECD | Regression (Solow model) | No |
| Evans and Karras (1996) | 1950–1990 | 54 Countries | Regression (Solow model) | Yes |
| Nonneman and Vanhoudt (1996) | 1960–1985 | 22 OECD | Regression (Solow model) | Yes |
| Islam (1995) | 1960–1985 | 22 OECD | pooled regression | No |
| Mankiw et al. (1992) | 1960–1985 | 98 countries | Regression (Solow model) | No |
| Mankiw et al. (1992) | 1960–1985 | 22 OECD | Regression (Solow model) | No |
| *Productivity convergence* | | | | |
| Rath and Akram(2019) | 1970-2014 | 73 countries | LM and RALS-LM | Yes |
| Rath, (2019) | 1968-2014 | ASEAN | LM and RALS-LM | Yes |
| Neto and Veiga (2013) | 1970–2009 | 139 countries | GMM | No |
| Kumar and Managi (2012) | 1993-2005 | Indian States | fixed/random effect model | Yes |
| Miller et al. (2002) | 1960–1989 | 83 Countries | Fixed effects | Yes |
| Lee (2009) | 1975-2004 | 25 countries | GMM | Yes |
| *Other convergence* | | | | |
| Rath (2016) | 2000-2012 | 47 Countries | GMM | No |
| Boako (2016) | 2003.1-2014.12 | Africa | Unit root | Yes |
| Chien et al. (2015) | 1994-2002 | China and 5-Asian | Structural break, cointegration | Yes |
| Naryan et al. (2011) | 1985–2008 | 120 countries | GMM | Mixed |

These studies have several shortcomings. First, there is no clear evidence in favour of the trade and income convergence hypotheses. The reasons behind this lack of evidence could be the different assumptions regarding the notion of convergence hypothesis, country groups, inclusion of different explanatory variables for economic growth, and different time periods (Azomahou et al., 2011; Dobson et al., 2002; McCoskey, 2002; Mello and Perrelli, 2003; Fuente, 2003; Barro and Sala-i-Martin, 2003; Wane, 2004; Próchniak and Witkowski, 2013; Völlmecke et al., 2015; Chapsaa et al., 2015; Li et al., 2016). Thus, this lack of evidence further motivates us to re-examine the trade and per capita income convergence across countries. Second, the majority of the studies in the literature focus on output convergence but a little attention has been paid to trade and total factor productivity convergence across countries or regions (Miller et al., 2002;

Lee, 2009; Kumar and Managi, 2012; Neto and Veiga, 2013, Rath and Akram, 2019; Rath, 2019). There are also a few prominent studies that connect the convergence literature to non-economic factors (Narayan et al., 2011; Chien et al., 2015; Rath, 2016; Boako, 2016). Third, the above-reviewed studies have completely ignored the role of export diversification in the trade and income convergence hypotheses. Thus, our study bridges these research gaps by examining the trade, per capita income, and total factor productivity convergence hypotheses by considering the role of export diversification across 95 countries.

## III. ANALYTICAL FRAMEWORK

The neoclassical growth theory predicts convergence, which is nothing but a transitional growth path or a steady state (Solow, 1956; Swan, 1956). The Solow-Swan growth model is based on the assumption of diminishing returns of capital accumulation (Solow, 1956; Swan, 1956). This model infers that the initial differences in per capita income and capital endowments disappear in the long run because of declining growth rates, as countries approach the steady-state position. In the steady state, diminishing returns are compensated by technological progress, which is a primary source of long-run economic growth (Solow, 1956; Swan, 1956). In contrast, the new endogenous growth theories are more relevant to explaining the divergence in long-run economic growth by emphasizing knowledge or human capital accumulation (Barro and Sala-i-Martin, 1995). It is well known in cross-country analysis that convergence depends on the degree of international knowledge spillovers, which allow lower per capita income countries to catch-up with high per capita income countries. The next section examines the notions of $\sigma$ and $\beta$ convergence, following Barro and Sala-i-Martin (1995).

### A. σ Convergence

This section outlines the $\sigma$-convergence technique, which shows whether a group of the countries are converging by testing whether the standard deviation of their per capita output is declining over a period of time. We quantify $\sigma$-convergence through the coefficient of variation by taking a logarithm of per capita output of economies. The standard deviation of each country's per capita output is given by:

$$S.D. = \sqrt{\frac{1}{n}\sum_{i=1}^{n}\left[ln(y_{i,t}) - \ln(\bar{y})\right]^2}, where \ ln(\bar{y}) = \frac{1}{n}\sum_{i=1}^{n}\ln(y_{i,t}) \tag{1}$$

### B. Models Specification for Absolute and Conditional Convergence

To examine the absolute and conditional ($\beta$) convergence hypotheses, we use a dynamic panel data model (system-GMM) estimator. There are two advantages in using the dynamic panel data model. First, it includes a complete set of country-specific effects as exogenous variables; the fixed effects specification avoids the omitted variable bias problem, which arises due to the heterogeneity across countries. Second, it takes into account possible endogeneity of the predictors of

covergence(Castellacci and Archibugi, 2008; Narayan et al., 2011; Rath, 2016).[4] In this paper, we test the cross-country converbence of per capita income and total factor productivity through the following equation:

$$\ln\left(y_{i,t}\right) - ln(y_{i,t-\tau}) = \beta ln(y_{i,t-\tau}) + \delta lnx_{i,t-\tau} + \mu_i + \lambda_t + \varepsilon_{i,t} \tag{2}$$

where $y_{i,t}$ is the per capita income of country $i$ for period $t$; $x_{i,t-\tau}$ is a vector of determinants of per capita income growth; $\mu_i$ is a country-specific effect; $\lambda_t$ is a time-specific constant and $\varepsilon_{i,t}$ is an error term. If $\beta$ coefficient is negative and statistically significant, then it suggests evidence of convergence and vice versa. $x_{i,t-\tau}$ and $\mu_i$ are used as a long-run rate convergence of per capita income growth, whereby $\mu_i$ indicates the country-specific effect of other factors that are not captured by $x_{i,t-\tau}$. Note that, without $x_{i,t-\tau}$, a negative $\beta$ implies absolute convergence. We can write Eq. (2) as follows:

$$y_{i,t} = \eta y_{i,t-\tau} + \delta lnx_{i,t-\tau} + \mu_i + \lambda_t + \varepsilon_{i,t} \tag{3}$$

where $\eta=1+\beta$ and $y_{i,t}=lny_{i,t}$. We remove the country- and time-specific effects ($\mu_i$ and $\lambda_t$) by differencing Eq. (3) as follows:

$$y_{i,t} - y_{i,t-\tau} = \eta(y_{i,t-\tau} - y_{i,t-2\tau}) + \delta ln\,(x_{i,t-\tau} - x_{i,t-2\tau}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \tag{4}$$

We are unable to estimate Eq. (4) using the ordinary least squares (OLS) method, when both $x_{i,t-\tau}$ and $x_{i,t-2\tau}$ are endogenous. Moreover, lagged dependent variables are correlated with the composite error term through period $t$-$\tau$. Therefore, like Arellano and Bond (1991), we take all of the past values of the explanatory variables as instruments in the regression. Since we set $\tau$ to 1, Eq. (4) can be written as:

$$\ln\left(y_{i,t}\right) - ln(y_{i,t-\tau}) = \beta ln(y_{i,t-\tau}) + \delta lnx_{i,t-\tau} + \varepsilon_{i,t} \tag{5}$$

which we estimate using the system-GMM estimator. To estimate the convergence rate, we set $\lambda = {}^{(1 + \beta)}/_{\tau}$. The vector $x_{i,t-\tau}$ contains macroeconomic variables (i.e. export concentration, trade openness, general government final consumption expenditure, human capital, foreign direct investment, domestic credit to the private sector, and gross fixed capital formation).


## IV. DATA

Our full sample is chosen based on data availability. Our sample include 95 countries, out of which 69 are developing and 26 are developed countries (see, Appendix A). Further, we divide these 95 countries into the Asian, African, European, and Latin American regions. The Asian, African, European, and Latin American regions consists of 16, 24, 25, and 19 countries, respectively. We use annual data on per capita Gross Domestic Product (GDP) (to proxy for per capita income), total factor productivity, export concentration (to proxy for export

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[4]  See these studies for more details of absolute and conditional convergence.

diversification, which indicates that higher value of export concentration leads to the lower diversification and vice versa), human capital, general government final consumption expenditure, trade openness, foreign direct investment, gross fixed capital formation, and domestic credit to private sector over the period of 1970 to 2010. The determinants of economic growth based on the extended growth theory are chosen following recent works by Kumar and Pacheco (2012), Arazmuradov et al. (2014), Chapsaa et al. (2015), Völlmecke et al. (2015), Li et al. (2016), Iyke (2017, 2018), and Ho and Iyke (2020). The data sources and description of the variables are illustrated in Appendix B.

## V. RESULTS

Before discussing the convergence test results, we first discuss the correlation among the variables in order to identify potential multicollinearity. Table 2 shows the correlation matrix. We find that most of the variables are correlated by less than 5% to each other. This implies that there is no evidence of multicollinearity among the explanatory variables.

**Table 2.**
**Correlation Matrix**

This table reports the correlation values between the explanatory variables. The results reported in this table show that there is no exact and perfect correlation between the explanatory variables as values of the same are below 0.50. Thus, we do are not concerned about multicolinerty issues. Finally, ***, and ** denote the 1%, and 5% level of significance, respectively.

| Variables | Export concentration | Human capital | Credit to private sector | Foreign direct investment | Govt. expenditure | Trade openness | Gross fixed capital formation |
|---|---|---|---|---|---|---|---|
| Export concentration | 1.00 | | | | | | |
| Human capital | -0.43*** | 1.00 | | | | | |
| Credit to private sector | -0.42*** | 0.04*** | 1.00 | | | | |
| Foreign direct investment | -0.08*** | 0.15*** | 0.12*** | 1.00 | | | |
| Govt. expenditure | -0.13*** | 0.25*** | 0.30*** | 0.05** | 1.00 | | |
| Trade openness | -0.07*** | 0.24*** | 0.20*** | 0.45*** | 0.05** | 1.00 | |
| Gross fixed capital formation | -0.01 | 0.13*** | 0.21*** | 0.17*** | -0.01 | 0.17*** | 1.00 |

Second, we describe the summary statistics of the variables used in our analysis. Table 3 shows that the average log per capita income values are around 8.70, 10.35, and 8.08 for the full sample, developed and developing countries, respectively. Clearly, the per capita income of the developed countries is higher than that of the developing countries. Similarly, at the regional level, the average log per capita income values are around 10.34, 8.99, 7.28, and 8.62, resepectively, for Europe,

Asia, Africa, and Latin America. This shows that the African region has the lowest per capita income as compared to the other regions. We also found that the average TFP of the developed countries is around 0.80, whereas that of the developing countries is around 0.53. At the regional levels, Europe, Asia, and Latin America have a relatively higher TFP. In terms of export diversification, we found that the developed countries and Europe are relatively diversified in their exports. Based on the standard deviation, we find evidence of heterogeneity in income across the panels. Table 3 also shows the summary statistics of other variables like human capital, credit to the private sector, trade openness, government consumption expenditure, foreign direct investment, and gross fixed capital formation.

**Table 3.**
**Summary Statistics**

This table reports the summary statistics of the variables for the period 1995 to 2017.

| Variables | Full sample | | Developed | | Developing | | Europe | |
|---|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| lnPer-capita income | 8.70 | 1.52 | 10.35 | 0.73 | 8.08 | 1.25 | 10.34 | 0.74 |
| Total factor productivity | 0.60 | 0.23 | 0.80 | 0.13 | 0.53 | 0.22 | 0.79 | 0.12 |
| Export concentration | 0.29 | 0.20 | 0.14 | 0.09 | 0.34 | 0.20 | 0.13 | 0.07 |
| Human capital | 2.51 | 0.67 | 3.18 | 0.33 | 2.26 | 0.59 | 3.19 | 0.33 |
| Credit to private sector | 54.01 | 44.53 | 94.50 | 46.91 | 38.74 | 32.41 | 93.23 | 45.47 |
| Trade openness | 81.17 | 50.82 | 88.64 | 55.90 | 78.36 | 48.49 | 88.93 | 56.93 |
| Govt. expenditure | 16.12 | 5.59 | 19.52 | 3.31 | 14.85 | 5.73 | 19.36 | 3.27 |
| Foreign direct investment | 4.06 | 6.82 | 5.50 | 10.54 | 3.52 | 4.59 | 5.56 | 10.54 |
| Gross fixed capital formation | 21.90 | 6.10 | 22.19 | 3.73 | 21.78 | 6.80 | 22.21 | 3.65 |
| Observation | 2185 | | 598 | | 1587 | | 575 | |
| | Asia | | Africa | | Latin America | | | |
| lnPer-capita income | 8.99 | 1.23 | 7.28 | 1.04 | 8.62 | 0.70 | | |
| Total factor productivity | 0.58 | 0.19 | 0.49 | 0.22 | 0.59 | 0.20 | | |
| Export concentration | 0.31 | 0.21 | 0.41 | 0.23 | 0.28 | 0.15 | | |
| Human capital | 2.46 | 0.44 | 1.77 | 0.46 | 2.45 | 0.33 | | |
| Credit to private sector | 64.01 | 36.23 | 28.901 | 31.06 | 37.77 | 23.61 | | |
| Trade openness | 102.06 | 78.97 | 66.73 | 27.02 | 66.65 | 29.81 | | |
| Govt. expenditure | 15.02 | 5.69 | 15.42 | 6.95 | 13.29 | 4.33 | | |
| Foreign direct investment | 3.53 | 5.00 | 2.94 | 4.77 | 3.85 | 2.90 | | |
| Gross fixed capital formation | 26.18 | 6.37 | 20.57 | 7.28 | 20.67 | 4.50 | | |
| Observation | 368 | | 552 | | 437 | | | |

To examine whether export diversification leads to convergence of per capita income and TFP, we check whether per capita income growth across the full sample and the subsamples based on income and region are significantly different in the initial period (i.e.1995). We use a one-sample *t*-test technique to test the mean differences of per capita income across the countries in the initial year. That is, we test the null hypothesis of no mean per capita income difference in the initial period. Similarly, we repeat a one-sample *t*-test for TFP to check the robustness of our results. The results in Table 4 support the rejection of the null hypothesis,

which implies that the per capita income and TFP growth in 19995 are significantly different across the subsamples.

### Table 4.
#### One Sample *t*-Test for Per-Capita Income and Total Factor Productivity Growth

In this table, we explain the one-sample *t*-test.

| One sample Test | Test value=0 | | | | 95% confidence interval of difference | |
|---|---|---|---|---|---|---|
| lnPer-capita income | T | Df | Sig. (2-tailed) | Mean | Lower | Upper |
| Full sample | 53.89 | 94 | 0.00 | 8.46 | 8.14 | 8.77 |
| Developed | 65.09 | 25 | 0.00 | 10.10 | 9.78 | 10.42 |
| Developing | 51.98 | 68 | 0.00 | 7.83 | 7.53 | 8.13 |
| Europe | 62.59 | 24 | 0.00 | 10.09 | 9.76 | 10.42 |
| Asia | 26.20 | 15 | 0.00 | 8.68 | 7.98 | 9.39 |
| Africa | 32.84 | 23 | 0.00 | 7.06 | 6.61 | 7.50 |
| Latin America | 51.93 | 18 | 0.00 | 8.42 | 8.08 | 8.76 |
| **Total factor productivity** | | | | | | |
| Full sample | 24.14 | 94 | 0.00 | 0.64 | 0.59 | 0.69 |
| Developed | 33.05 | 25 | 0.00 | 0.80 | 0.76 | 0.85 |
| Developing | 17.83 | 68 | 0.00 | 0.58 | 0.51 | 0.64 |
| Europe | 31.86 | 24 | 0.00 | 0.80 | 0.75 | 0.86 |
| Asia | 13.24 | 15 | 0.00 | 0.62 | 0.52 | 0.73 |
| Africa | 9.69 | 23 | 0.00 | 0.54 | 0.42 | 0.65 |
| Latin America | 10.30 | 18 | 0.00 | 0.68 | 0.54 | 0.82 |

*A. Sigma Convergence*
Next, we estimated sigma convergence of per capita income and TFP using Eq. (1). In Figure 1, we plot the Coefficient of Variation (CV) of per capita income and TFP. From Figure 1, we can see that the CV of per capita income was 131.73% in 1995 and has increased to 135.80% in 2002. After, 2002, it has declined to 126.11% in 2017. We see a similar pattern for the CV of TFP. Overall, the CV of per capita income and TFP indicate aweak evidence of sigma convergence as there is a slight decline in the CV of both indicators from initial year (i.e. 1995) to recent year (i.e. 2017).

**Figure 1.**
**Coefficient of Variation (CV) in Per Capita Income**

This figure has the coefficient of variation in per capita income from 1995 to 2017.
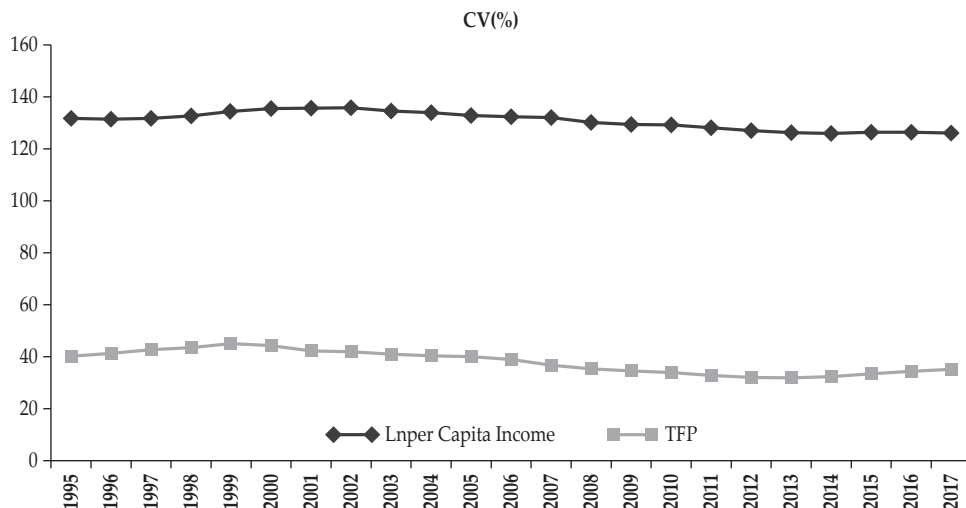


*B. Absolute Convergence*

Having discussed the sigma-convergence test results, we now discuss the absolute and conditional beta-convergence test results for full sample and the subsamples, which are reported in Table 5. Before discussing these results, it is essential to understand the economic motivation behind the absolute and conditional convergence of per capita income. On the one hand, absolute convergence is nothing but the different growth patterns of per capita income in the initial period. On the other hand, conditional convergence occurs when the growth of per capita income not only depends on the initial per capita income but also on other factors such as export concentration, human capital, foreign direct investment, trade openness, export diversification, government consumption expenditure, domestic credit to private sector, and gross fixed capital formation. Table 5 shows evidence in support of absolute and conditional divergence of per capita income and TFP for the full sample. The results further indicate the absence of both absolute and conditional convergence in the developed, developing, Asia, Africa, Europe, and Latin America panels.

**Table 5 .**
**Summary of Convergence Results**

This table has results on Absolute Convergence (AC) and Conditional Convergence (CC). Values in parentheses are significance levels.

| Countries/Dependent variables | AC | CC |
|---|---|---|
| **lnPer capital income** | | |
| Full sample | No (1%) | No (1%) |
| Developed | No (1%) | No (1%) |
| Developing | No (1%) | No (1%) |
| Europe | No (1%) | No (1%) |
| Asia | No (1%) | No (1%) |
| Africa | No (1%) | No (1%) |
| Latin America | No (1%) | No (1%) |
| **Total factor productivity** | | |
| Full sample | No (1%) | No (1%) |
| Developed | No (1%) | No (1%) |
| Developing | No (1%) | No (1%) |
| Europe | No (1%) | No (1%) |
| Asia | No (1%) | No (1%) |
| Africa | No (1%) | No (1%) |
| Latin America | No (1%) | No (1%) |

Our results presented in Table 6 indicate that the coefficients of initial per capita income are positive and statistically significant at the 1% level in all the panels, which implies the existence of absolute divergence. This finding implies that the per capita income of developing countries is not growing at a faster rate to catch up with the per capita income of developed countries. Further, we noticed that the initial per capita income affects the income per capita growth positively in developed and developing countries. The magnitude of the impact of the initial per capita income on the income per capita growth for developing countries is larger than for developed countries. This implies that initial per capita income leads to more divergence for developing countries within the group. At the regional level, we found that initial per capita income affects income per capita growth positively in Asia, Africa, Europe, and Latin America. However, the initial per capita coefficient is larger for the Latin American region as compared to Asian, African, and European regions. This outcome suggests that initial per capita income leads to more divergence for the Latin American countries within the group. To check the validity of the model, we applied the Sargan and Autocorrelation (AR) tests. The p-values associated with the Sargan test statistic are mostly greater than 0.10, meaning that we failed to reject the null hypothesis that overidentified restrictions are valid. The AR statistic also revealed robust evidence against autocorrelation at the 1% level of statistical significance.

**Table 6.**
**Results of Absolute Convergence Based on Per Capita Income**

This table presents the results of absolute convergence of per-capita income. The diagnostic test statistics like Sargan test and autocorrelation are also presented. Finally, ***, ** and * denote the 1%, 5% and 10% level of significance, respectively.

| Variable | Full sample | Developed | Developing | Europe |
|---|---|---|---|---|
| lnInitial per-capita income | 0.98***(0.00) | 0.95***(0.00) | 0.99***(0.00) | 0.96***(0.00) |
| Constant | 0.22***(0.00) | 0.48***(0.00) | 0.08***(0.00) | 0.47***(0.00) |
| Sargan test | 94.90 (1.00) | 26.69 (1.00) | 68.55 (1.00) | -2.83***(0.00) |
| AR | 0.05 (0.95) | 1.19 (0.23) | -1.60 (0.11) | 24.89 (1.00) |
| Countries | 95 | 26 | 69 | 25 |
| Observations | 2090 | 572 | 1518 | 550 |
| Variable | Asia | Africa | Latin America | |
| Initial per-capita income | 0.96***(0.00) | 0.98***(0.00) | 0.99***(0.00) | |
| t-statistics | 0.33***(0.00) | 0.13***(0.00) | 0.05* (0.10) | |
| Sargan test | 14.56 (1.00) | 22.96 (1.00) | 18.49 (1.00) | |
| AR | 0.07 (0.94) | -0.70 (0.48) | 1.61 (0.11) | |
| Countries | 16 | 24 | 19 | |
| Observations | 352 | 528 | 418 | |

To further check the robustness of our results, we use TFP as an alternative measure of per capita output. In Table 7, we observe that the coefficients of initial TFP are positive and statistically significant for the full sample and the subsamples, which indicate an absolute divergence. Also, we find that the initial TFP affects TFP growth relatively more in the developed countries as compared to the developing countries. Moreover, we noticed that the coefficient of initial TFP is relatively larger for Europe and Latin America, implyinh that the initial per capita TFP leads to more divergence within these groups. The AR and Sargan test results showed that our model is free from autocorrelation and that the overidentified restriction is valid in all the sub-panels.

**Table 7.**
**Results of Absolute Convergence Based on Total Factor Productivity**

This table presents the results of the absolute convergence of total factor productivity growth. The diagnostic test statistics like Sargan test and autocorrelation are also presented. Finally, ***, ** and * denote the 1%, 5% and 10% level of significance, respectively.

| Variable | Full sample | Developed | Developing | Europe |
|---|---|---|---|---|
| lnInitial total factor productivity | 0.89***(0.00) | 0.91***(0.00) | 0.85***(0.00) | 0.92***(0.00) |
| Constant | 0.06***(0.00) | 0.07***(0.00) | 0.07***(0.00) | 0.06***(0.00) |
| Sargan test | 94.79 (1.00) | 25.51 (1.00) | 68.68 (1.00) | 24.48 (1.00) |
| AR | -1.43 (0.15) | 1.81 (0.68) | 0.77 (0.43) | -1.52 (0.13) |
| Countries | 95 | 26 | 69 | 25 |
| Observations | 2090 | 572 | 1518 | 550 |
| Variable | Asia | Africa | Latin America | |
| lnInitial total factor productivity | 0.86***(0.00) | 0.83***(0.00) | 0.89***(0.00) | |
| t-statistics | 0.07***(0.00) | 0.07***(0.00) | 0.05***(0.00) | |
| Sargan test | 15.20 (1.00) | 23.05 (1.00) | 18.89 (1.00) | |
| AR | -1.18 (0.23) | 1.00 (0.31) | -0.42 (0.66) | |
| Countries | 16 | 24 | 19 | |
| Observations | 352 | 528 | 418 | |

## C. Conditional Convergence

We then estimate the conditional convergence using Eq. (5) by applying the system-GMM. The results, which are presented in Table 8, confirmed the divergence of per capita income across all panels. The full sample results show that initial per capita income, export diversification, human capital, credit to the private sector, trade openness, and foreign direct investment gross fixed capital formation are major determinants of income divergence.

**Table 8.**
**Results of Conditional Convergence Based on Per-Capita Income**

This table presents the results on conditional convergence for all the panels. The astericks *, **, *** denote the significance level at the 1%, 5%, and 10%, respectively.

| Variables | Full sample | Developed | Developing | Europe |
|---|---|---|---|---|
| lnInitial per-capita income | 0.98***(0.00) | 0.97***(0.00) | 0.97***(0.00) | 0.99***(0.00) |
| ΔExport concentration | -0.05***(0.00) | -0.04 (0.64) | -0.02***(0.00) | -0.04 (0.69) |
| ΔHuman capital | 0.04***(0.00) | 0.02 (0.44) | 0.05***(0.00) | 0.02 (0.64) |
| ΔCredit to private sector | -0.001***(0.00) | -0.0003***(0.00) | -0.001***(0.00) | -0.001***(0.00) |
| ΔTrade openness | 0.001***(0.00) | 0.0002*(0.06) | 0.001***(0.00) | 0.0002***(0.00) |
| ΔGovt. expenditure | -0.001***(0.00) | -0.004***(0.00) | -0.001***(0.00) | -0.003***(0.00) |
| ΔForeign direct investment | 0.001***(0.00) | 0.001***(0.00) | 0.001***(0.00) | 0.001***(0.00) |
| ΔGross fixed capital formation | 0.002***(0.00) | 0.002***(0.01) | 0.003***(0.00) | 0.002*(0.09) |
| Diagnostic checking | | | | |
| AR | 1.50 (0.63) | 1.67 (0.12) | 1.90 (0.11) | -1.70 (0.87) |
| Sargan test | 90.69 (1.00) | 23.83 (1.00) | 64.73 (1.00) | 23.25 (1.00) |
| Variables | Asia | Africa | Latin America | |
| Initial per-capita income | 0.96***(0.00) | 0.71***(0.00) | 0.98***(0.00) | |
| ΔExport concentration | 0.19 (0.63) | 0.12***(0.00) | -0.004 (0.96) | |
| ΔHuman capital | 0.05 (0.79) | 0.24**(0.02) | 0.03 (0.42) | |
| ΔCredit to private sector | -0.004 (0.26) | 0.0003 (0.21) | -0.002 (0.29) | |
| ΔTrade openness | 0.0004 (0.93) | 0.0002**(0.03) | 0.001**(0.02) | |
| ΔGovt. expenditure | -0.005 (0.58) | 0.001 (0.64) | -0.003***(0.00) | |
| ΔForeign direct investment | 0.002***(0.00) | -0.003 (0.20) | 0.002***(0.00) | |
| ΔGross fixed capital formation | 0.003***(0.00) | 0.001***(0.01) | 0.004***(0.00) | |
| Diagnostic checking | | | | |
| AR | 0.13 (0.89) | -1.03 (0.30) | 1.91 (0.11) | |
| Sargan test | 8.97 (1.00) | 14.17 (1.00) | 17.05 (1.00) | |

Moreover, we found that export concentration has a negative and significant impact on per capita income growth for the full full sample, developing countries, and African samples. These findings imply that lowering export concentration boosts the per capita income growth in these countries. In contrast, we did not find any significant impact of export concentration on per capita income growth for the developed, European, Asian, and Latin American samples. In addition, human capital affects per capita income growth for the full sample, developing countries, and African samples, whereas it did not have any significant impact for the rest of the samples. Surprisingly, our result revealed that the coefficients

of domestic credit to the private sector are negative, which implies that domestic credit does not drive per capita income growth convergence. The reason could be that, in some of the countries, as the money markets were liberalized, the interest rates significantly increased, which would mean that the intermediation role of the commercial banks via channelling savings to the private sector for investment and consequently boosting per capita income growth failed to materialize. The other reason might be due to lack of investment opportunities in the sense that, although the countries have witnessed private sector credit growth owing to the liberalization of the financial sector, the credit boom has been directed at personal consumption rather than at making new investments in technologies and in research and development. We also found that government consumption expenditure harms per capita income growth for all samples but Asia and Africa. Thus, consistent with Iradian (2003), this implies a larger government size harms per capita income growth. We found that trade openness promotes per capita income growth in all samples except Asia. Moreover, gross fixed capital formation has a positive and significant impact on per capita growth for all samples. The p-values associated with the Sargan and AR tests, which are also reported in Table 8, indicate that the overidentifying restrictions are valid and that there is no autocorrelation problem in these estimates.

As a robustness check, we re-estimate the Eq. (5) by replacing per capita income with TFP. The results, which are presented in Table 9, suggest that there is evidence of TFP growth divergence for the full sample and the subsamples. This is consistent with the estimates that are based on per capita income growth in Table 8. Likewise, export concentration, human capital, Foreign Direct Investment (FDI), domestic credit to the private sector, trade openness, government consumption expenditure, and gross fixed capital formation are the major factors driving TFP growth. Again, these findings are consistent with the results reported in Table 8, where we found evidence of conditional divergence. In a nutshell, we found strong evidence in favor of absolute and conditional divergence of per capita income and TFP for most of the sub-panels.

**Table 9.**
**Results of Conditional Convergence Based on Total Factor Productivity**

This table presents the results on conditional convergence for all the panels. The astericks *, **, *** denote the 1%, 5%, and 10% significance levels, respectively. Finally, the Sargan test statistics and autocorrelation are valid.

| Variables | Full sample | Developed | Developing | Europe |
|---|---|---|---|---|
| Initial total factor productivity | 0.88*** (0.00) | 0.68***(0.00) | 0.85***(0.00) | 0.74***(0.00) |
| ΔExport concentration | -0.03***(0.00) | -0.03 (0.70) | -0.02***(0.00) | -0.09**(0.05) |
| ΔHuman capital | 0.003** (0.05) | -0.08***(0.00) | 0.04*(0.07) | -0.06***(0.01) |
| ΔCredit to private sector | -0.0001***(0.00) | -0.008 (0.91) | -0.0002***(0.00) | -0.0001 (0.28) |
| ΔTrade openness | 0.0002***(0.00) | 0.0001 (0.46) | 0.0004***(0.00) | 0.00003 (0.82) |
| ΔGovt. expenditure | -0.0005***(0.01) | 0.003**(0.02) | -0.001***(0.00) | 0.002 (0.30) |
| ΔForeign direct investment | -0.0002 (0.57) | 0.00005 (0.55) | 0.0003***(0.00) | -0.0001 (0.16) |
| ΔGross fixed capital formation | 0.00*** (0.00) | 0.01***(0.00) | 0.002***(0.00) | 0.004***(0.00) |
| Diagnostic checking | | | | |
| AR | 0.82 (0.41) | -1.12 (0.25) | 0.96 (0.33) | -1.06 (0.28) |
| Sargan test | 89.87 (1.00) | 21.40 (1.00) | 62.89 (1.00) | 20.43 (1.00) |

**Table 9.**
**Results of Conditional Convergence Based on Total Factor Productivity**
**(Continued)**

| Variables | Asia | Africa | Latin America |
|---|---|---|---|
| Initial per-capita income | 0.51***(0.00) | 0.73***(0.00) | 0.88***(0.00) |
| ΔExport concentration | -0.75 (0.40) | -0.05***(0.00) | -0.04 (0.35) |
| ΔHuman capital | 0.07 (0.27) | -0.02 (0.56) | 0.01 (0.79) |
| ΔCredit to private sector | -0.001***(0.00) | -0.001***(0.00) | -0.0001 (0.44) |
| ΔTrade openness | 0.001 (0.14) | -0.002**(0.02) | 0.001**(0.03) |
| ΔGovt. expenditure | -0.004 (0.27) | -0.0004***(0.00) | -0.002*(0.08) |
| ΔForeign direct investment | 0.001 (0.47) | 0.0004**(0.03) | 0.0001 (0.65) |
| ΔGross fixed capital formation | 0.005***(0.01) | 0.001**(0.04) | 0.003***(0.00) |
| Diagnostic checking | | | |
| AR | 0.13 (0.89) | 0.99 (0.31) | 0.32 (0.74) |
| Sargan test | 8.97 (1.00) | 16.57 (1.00) | 16.86 (1.00) |

Several studies (see Devpura and Narayan, 2020; Haroon and Rizvi, 2020; Iyke, 2020a,b; Mishra et al., 2020; Narayan, 2020a; Narayan, Devpura, and Hua, 2020; Narayan, Phan, and Liu, 2020; Phan and Narayan, 2020; Prabheesh et al., 2020; Rath, and Akram, 2020; Salisu and and Akanni, 2020; Vidya and Prabheesh, 2020; Salisu and Sikiru, 2020; among others) argued that global markets and economies have been disrupted by the coronavirus pandemic. Recent studies have also shown that exchange rate market bubble activity has increased due to COVID-19 (Narayan, 2020b) and exchange rates have become more resilent due to the pandemic (Narayan, 2020c). We expect this disruption in global economic activities to have a significant impact on per capita income and TFP convergence across countries. However, we are not able to test this due to lack of sufficient data. We leave this hypothesis for future research.

## VI. CONCLUSIONS

This paper examines the effect of international trade on the convergence of per capita income by emphasizing the role of export diversification. While the traditional export-led growth hypothesis emphasizes more on exports, it does not identify the role of exports in growth convergence across countries. The novelty of our paper was to examine the impact of export diversification on per capita income convergence. This research question was important from the perspective of lower-income countries' point of view as these countries are diversifying their export commodity baskets to gain from international trade. If the per capita income growth of poor countries catches up with the rich countries through higher export diversification then poor countries should emphasize trade diversification. We examined this idea using annual data from 1995 to 2017 for 95 countries belonging to both developed and developing countries.

The sigma convergence test results clearly indicated a weak per capita income and TFP convergence. Further, the absolute convergence test results revealed that per capita income has diverged in most of the panels, namely the full sample,

developed, developing, Asia, Africa, Europe, and Latin America. The conditional convergence test results also showed per capita income divergence for the full sample and the subsamples. In addition, our results clearly revealed that export diversification is one of the key factors that lead to per capita income divergence for both the full sample and the subsamples (based on income and regions).

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## Appendix A.
## List of Countries

| Full sample | Developed | Developing |
|---|---|---|
| Angola, Argentina, Armenia, Australia, Austria, Bahrain, Barbados, Benin, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Republic, Chile, China, Colombia, Costa Rica, Cote d Ivoire, Croatia, Czechia, Denmark, Dominican Republic, Ecuador, Egypt, Eswatini, Finland, France, Gabon, Germany, Greece, Guatemala, Honduras, Hungary, Iceland, India, Indonesia, Iran , Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Luxembourg, Malaysia, Mauritius, Mexico, Mongolia, Morocco, Mozambique, Namibia, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Republic of Moldova, Romania, Russian Federation, Rwanda, Saudi Arabia, Senegal, Sierra Leone, Singapore, South Africa, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Tajikistan, Thailand, Togo, Tunisia, Turkey, Ukraine, United Kingdom, Uruguay, Venezuela, Zimbabwe | Australia, Austria, Bulgaria, Croatia, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, United Kingdom | Angola, Argentina, Armenia, Bahrain, Barbados, Benin, Bolivia, Botswana, Brazil, Burkina Faso, Burundi, Cameroon, Central African Republic, Chile, China, Colombia, Costa Rica, Cote d Ivoire, Dominican Republic, Ecuador, Egypt, Eswatini, Gabon, Guatemala, Honduras, India, Indonesia, Iran, Israel, Jamaica, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Malaysia, Mauritius, Mexico, Mongolia, Morocco, Mozambique, Namibia, Nicaragua, Niger, Nigeria, Panama, Paraguay, Peru, Philippines, Qatar, Republic of Moldova, Russian Federation, Rwanda, Saudi Arabia, Senegal, Sierra Leone, Singapore, South Africa, Sri Lanka, Sudan, Tajikistan, Thailand, Togo, Tunisia, Turkey, Ukraine, Uruguay, Venezuela, Zimbabwe |

| Europe | Asia | Africa | Latin America |
|---|---|---|---|
| Australia, Austria, Bulgaria, Croatia, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, United Kingdom | Bahrain, China, India, Indonesia, Iran, Israel, Jordan, Kuwait, Malaysia, Philippines, Qatar, Saudi Arabia, Singapore, Sri Lanka, Thailand, Turkey | Angola, Benin, Botswana, Burkina Faso, Cameroon, Central African Republic, Cote d Ivoire, Egypt, Gabon, Kenya, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Togo, Tunisia, Zimbabwe | Argentina, Barbados, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela |

**Appendix B.**
**List of Variables and Data Sources**

| Variables | Source |
| --- | --- |
| Per capita income (constant 2010 US$) | World Bank |
| Total factor productivity | Penn World Table 9.1 |
| Human capital | Penn World Table 9.1 |
| Export concentration | UNCTAD |
| Foreign direct investment net inflow % to GDP | World Bank |
| Trade openness as % GDP | World Bank |
| Domestic credit to private sector as % to GDP | World bank |
| General government final consumption expenditure as % to GDP | World bank |
| Gross fixed capital formation as % to GDP | World bank |