Australian Conference of Economists (ACE) 2022

Topic: The Impact of Foreign Direct Investment (FDI) on Economic Growth in Developing Economies: A Study using Dynamic Panel Data (DPD) Model

Shah Mohammad Habibul Hasan[1]

and

Paul Blacklow[2]

[1, 2] Tasmanian School of Business and Economics, University of Tasmania, Hobart, Australia
[2] Ministry of Finance, Government of the People's Republic of Bangladesh, Bangladesh

Contents of the Presentation

Next…

1.1 Introduction

UNIVERSITY of TASMANIA

- The dynamics of economic growth is an issue of continuous debate in the empirical literature. Iamsiraroj and Ulubaşoğlu (2015) have reviewed 108 empirical studies on the FDI-growth nexus and report that
  - FDI is positive and significant to economic growth in 43% of studies,
  - positive and insignificant in 26% of studies,
  - negative and significant in 17% of studies and
  - negative and insignificant in 14% of studies.
- Bruno and Campos (2013) document that
  - 50% of the FDI literature report a positive effect on economic growth,
  - 11% report a negative effect and
  - the rest 39% reveal an inconclusive result.
- Hence, the effect of FDI on economic growth is ambiguous.
- In simple terms, FDI flow, as a means of trade, links the national economy with international economies in a globalized framework. According to Barro and Sala-i-Martin (2004), traditional growth theories emphasize the importance of FDI to accelerate growth rates.

1.1 Introduction (contd..)

- Hence, various policies are adopted across the global economies to attract FDI to generate and maintain continued welfare and development.
- In the empirical literature, the FDI-growth relationship is analyzed from both micro- and macro- perspectives.
- The micro level literature relates the effect of FDI on economic growth through productivity spillover of MNEs or MNCs or transnational corporations (TNCs), having firm-specific advantages in production and costing. MNCs engage in investing abroad not due to the differences in cost of capital but because of their competitiveness in accessing certain assets in the host economy.
  - *At micro level, the effect of FDI is explained in the theory of international trade by Helpman (1948), in OLI framework by Dunning (1980), and in the knowledge-capital model by Markusen (1997).*
  - *At micro level, international trade through FDI flow is a function of size differences, endowment differences, cost of trade and investment, and their interactions between the parent & host economies.*

1.1 Introduction (contd..)

UNIVERSITY of TASMANIA

- Macro level studies relate the growth theories to explain the effect of FDI in the long-run economic growth in host economies (Razin and Sadka, 2007).
  - *Macrolevel studies explain the effects of FDI on economic growth under varying macroeconomic, institutional, financial, and local conditional frameworks, spanning multiple economies and over longer periods.*
  - *Empirical literature points to various channels through which FDI exerts its growth-enhancing effect. De Mello (1997) points that FDI may stimulate economic growth in the host country through introducing new technologies in production processes, facilitating knowledge transfers through labor training, managerial skills, and supporting organizational setup.*
  - *Moreover, the importance of absorptive capacities in terms of human capital, institutional and financial development, and economic freedom in the host economy is reiterated in the empirical literature.*
- Aitken and Harrison (1999); Görg and Greenaway (2004) argue that microlevel studies neither support the growth-promoting effect of FDI nor the spillover effects.
- Macrolevel studies also reveal inconclusive results for the FDI-growth relationship (Carkovic and Levine, 2005; Feeny et al., 2014; Herzer, 2012; Iamsiraroj and Ulubaşoğlu, 2015).

1.1 Introduction (contd..)

- The uncertainties and diversity of the FDI-growth relationship have encouraged us to carry out further investigation on this topic.

- The present study examines the FDI-growth relationship using in developing countries, focusing on LICs and LMICs (69 developing countries) by applying a linear dynamic panel (DPD) model estimation over the period from 1980 to 2017.

- The study compares whether the drivers of economic growth differ across two periods and whether there is a common set of factors to explain the growth in the selected developing economies.

Next…

UNIVERSITY of TASMANIA

1.1 Introduction

1.2 Literature Review

- 1.2.1 FDI: A Key Driver of Economic Growth
- 1.2.2 FDI Flow in Developing Countries
- 1.2.3 Positive Effects of FDI on Economic Growth
- 1.2.4 Adverse Effects of FDI on Economic Growth

1.3 Other Determinants of Economic Growth

1.4 Empirical Methodology and Data

- 1.4.1 Data Sources and Variables

1.5 Empirical Findings and Discussion

- 1.5.1 Summary Statistics
- 1.5.2 Dynamic Panel Model Estimation Results
  - 1.5.2.1 Two-Step System GMM Results
    - 1.5.2.1.1 First Sample Group (1980–1996)
    - 1.5.2.1.2 Second Sample Group (1997–2017)
  - 1.5.2.2 Iterated GMM Results (Robustness Check)

1.6 Limitations of the Study

1.7 Conclusion

1.2 Literature Review

UNIVERSITY of TASMANIA

1.2.1 FDI: A Key Driver of Economic Growth:

- FDI is an important source of external financing for both developed and developing economies. FDI flows because of the differences in capital to labor ratios between the host and home economy.
- Low savings and high labor growth in the host economy create excess demand for capital, and the opposite (high savings and poor labor growth) in the source economy results in capital flow out to the host economy to reach an equilibrium.
- The benefits of FDI in any economy are observed through its effect on the *transfer of knowledge and technology, increasing competition and production through spillover effects, and job creation* with the goal to secure better living standards of the nation through economic growth.
- The importance of FDI in promoting growth is conceptualized differently in various growth theories.
  - In the neoclassical framework, growth is mainly supply-driven based on capital accumulated through household savings, where the aggregate demand effect is completely ignored.

1.2 Literature Review (contd..)

- However, the endogenous growth framework augments a demand-driven investment model that includes human capital and R&D as the endogenous drivers of growth.
- The distinctive feature between exogenous and endogenous growth models is that the former assumes constant returns to scale with diminishing marginal product of capital per capita, but the latter assumes constant or increasing returns to scale with non-diminishing marginal product of capital per capita.
- The non-diminishing growth effects of FDI are evident through its impact on human capital and spillover effects (Lucas, 1988; Romer, 1986). Thereby, the endogenous growth model opens the opportunity of investment (FDI) in a liberalized economy to generate higher economic growth.
- The financing gap model of the World Bank states that long-run growth can be achieved through the growth rate of investment demand from private and government spending (even at times of crisis) that can be sourced externally (Mallick and Moore, 2008). Foreign capital is thus considered the most important demand-driven factor for long-run economic growth in a capital-constrained economy.

- Furthermore, the empirical literature identifies two channels to explain the FDI-growth relationship.

1.2 Literature Review (contd..)

- The direct channel affects growth through the accumulation of factors of production (labor and capital): that is, the formation of domestic capital (Almfraji and Almsafir, 2014; Azman-Saini et al., 2010; Mallick and Moore, 2008; Thompson, 2008).

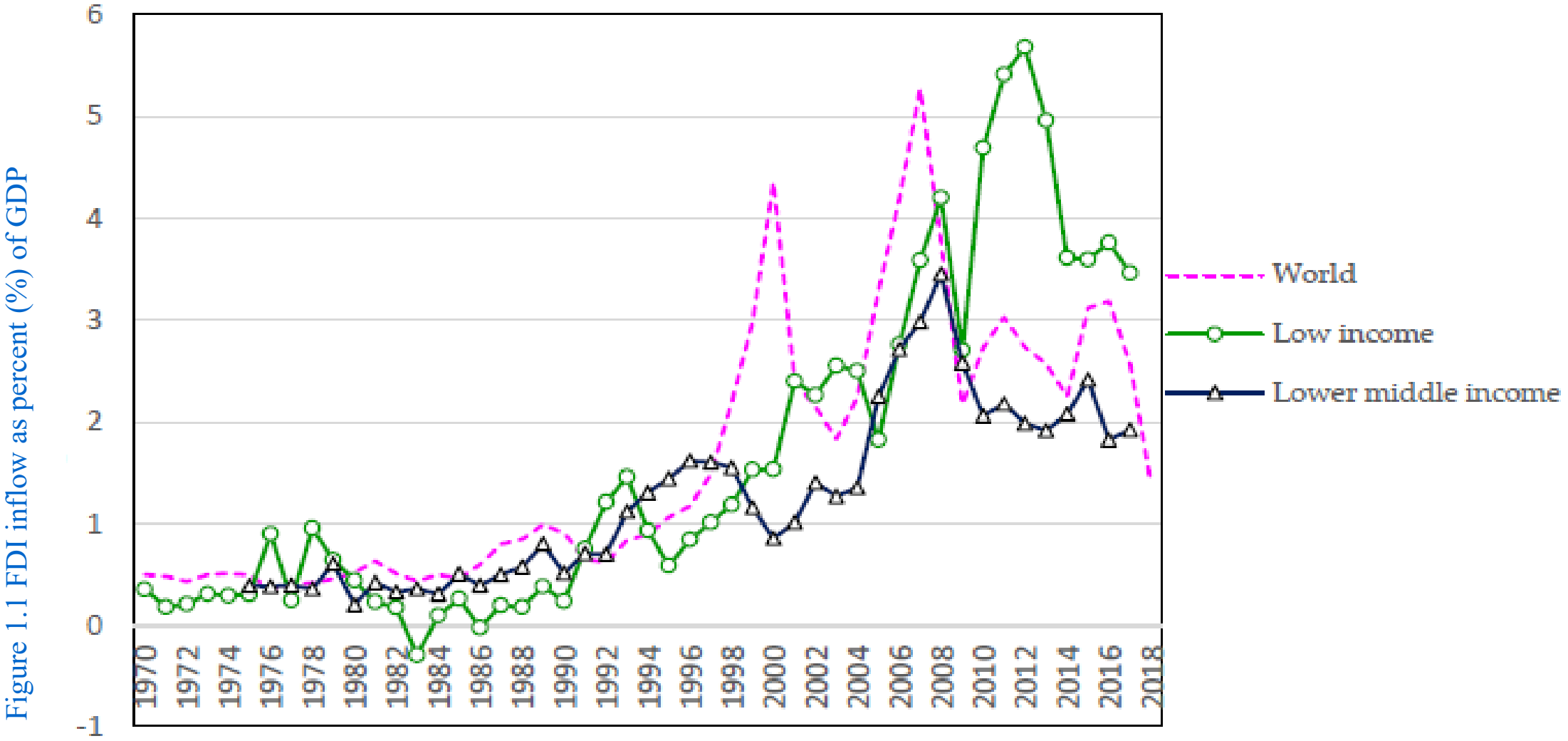
- In contrast, the indirect channel works through total factor productivity (TFP) growth: that is, the incorporation of new technologies, know-how, and labor productivity growth (Almfraji and Almsafir, 2014; Azman-Saini et al., 2010; Iamsiraroj and Ulubaşoğlu, 2015).

- However, Makiela and Ouattara (2018) argue that FDI promotes growth through the accumulation of inputs rather than through TFP growth. Therefore, the debate on the channel of the FDI-growth relationship is still open.

1.2.2 FDI Flow in Developing Countries:

- FDI inflow as a share of global GDP has grown from about 0.5% in 1970 to over 3% in 2008 and to 4.1% in 2015. Since then, a declining trend has been evident, reaching a value of 2% in 2018.

1.2 Literature Review (contd..)



Source: Calculations based on the data from the World Development Indicators database (World Bank, 2020a).

1.2 Literature Review (contd..)

- In 2018, developing countries received approximately 54% ($706 billion) of global FDI, whereas developed countries have received a share of approximately 43% ($557 billion). Although there are ups and downs in the FDI flow both in developing and developed economies, FDI flow is found to be more resilient in developing economies compared to developed economies (UNCTAD, 2019).

- The growing share of FDI and relative stability of FDI flow in developing countries suggests the it as the most important source of external financing contributing to the economic growth in developing countries (UNCTAD, 2019).

- Figure 1.1 above illustrates that LMICs received a greater share of FDI till 1999. After 1999, LICs became the major recipient of FDI compared to LMICs. This suggests the recent prevalence of favorable policies in LICs to attract FDI.

1.2 Literature Review (contd..)

1.2.3 Positive Effects of FDI on Economic Growth:

- The positive effect of FDI on growth is assumed through the existence of positive externalities, spillover effects, productivity gains, backward and forward linkages, transfer of knowledge and technological know-how, and access to the global market by the host and recipient countries.

- The relationship also depends on reinvestment of the productivity gains, the extent of the positive or negative impact on productivity, and the scope and size of the domestic sectors (Curwin and Mahutga, 2014).

- Li and Liu (2005) argue that the new technology wrapped in FDI increases the host country's productivity through spillover effects in different sectors of the economy and increases the efficiency of domestic investment. The authors found a strong association between FDI inflow and export growth in transition economies.
- The positive effect of FDI depends on whether favorable policies (such as trade policies, labor market policies, free entry and exit, and financial policies) are in place to materialize its complementary effect.

1.2 Literature Review (contd..)

- Kobrin (2005) argues that policy liberalization is a rational decision of policymakers to benefit from FDI inflow and to avoid the opportunity costs of being a closed economy and may act as an external force (coercive pressure) to adopt neoliberal policies for the sake of the national interest. The positive impact of FDI on economic growth has prompted governments in developing countries alone to make 1,029 policy changes between 1992 and 2001.

- Yabi (2010) reports that due to heterogeneity among country characteristics, FDI flow does not secure economic growth. However, considering the heterogeneity in country characteristics, De Mello (1999) argues that the positive effect of FDI on economic growth depends on the ratio of FDI's complementary and substitution effect on domestic investment.
- Nair-Reichert and Weinhold (2001) found a causal relationship between FDI and growth, which is heterogeneous across the economies.
- Moreover, the positive effect of FDI on growth can be seen through its effect on the privatization of domestic firms.
  - Privatization acts as a tool for economic modernization through the transformation of inefficient state-owned firms to more productive ones (Hunya, 2000).

1.2 Literature Review (contd..)

- Megginson and Netter (2001) argue that although there is a debate about the growing impact of net productivity gaps between domestic and foreign firms in transition economies, firms privatized by foreign capital may become more productive and promote faster economic growth than the domestically privatized firms.

1.2.4 Adverse Effects of FDI on Economic Growth:

- In the sociological literature, some argue that dependence on FDI slows down economic growth, while others argue that FDI enhances economic growth but less than domestic investment (Firebaugh, 1992).
- According to Curwin and Mahutga (2014), the early dependency research on FDI ('dependistas') reveals a growth-enhancing effect of FDI in the short run but growth retarding effect in the long run.

- Kobrin (2005) argues that policy liberalization is a rational decision of policymakers to benefit from FDI inflow and to avoid the opportunity costs of being a closed economy and may act as an external force (coercive pressure) to adopt neoliberal policies for the sake of the national interest. The positive impact of FDI on economic growth has prompted governments in developing countries alone to make 1,029 policy changes between 1992 and 2001.

1.2 Literature Review (contd..)

- Amin (1974) argues that increasing dependencies on FDI (as a larger share of GDP) prevents the forward and backward linkages between foreign and domestic firms and slows down the growth rate. The situation is further worsened due to profit expatriation: that is, the extraversion nature of TNCs. Reis (2001) opines that the profit repatriation nature of MNCs is critical and subdues the general welfare in the host economy.
- Curwin and Mahutga (2014) opine that FDI prevents economic development in the host economy through the *'disarticulation'* process, linked to the tendency of foreign firms to procure a larger share of intermediate inputs from external sources rather than domestic sources.
  - Evans and Timberlake (1980); Stokes and Anderson (1990) argue that FDI penetration fosters uneven growth in different sectors of the economy. The higher concentration of FDI in the capital-intensive sector boosts productivity but with fewer job opportunities, resulting in uneven growth across other sectors. Hence, FDI-supported sectors become more developed and productive without any effect on other sectors (Dixon and Boswell, 1996).
  - Eventually, the less productive traditional sectors become prone and offer low wages to their workers, which provokes foreign firms to offer a slightly higher wage than local firms to attract skilled domestic workers. Finally, disarticulation leads to an overflow of labor migration to urban areas in search of marginal employment in the informal or service sectors, affecting overall economic growth (Evans and Timberlake, 1980; Stokes and Anderson, 1990),

1.2 Literature Review (contd..)

- The empirical literature also argues that FDI has little or no positive effect on long-term economic growth (Carkovic and Levine, 2005).
  - De Mello (1997) reports a negative effect of FDI on GDP in the short run and heterogeneous effects in the long run across economies.
  - de Vita and Kyaw (2009) opine that FDI is growth enhancing in LMICs and upper-middle-income countries, but it does not affect growth in LICs.
- In this context, the present study examines the impact of FDI on economic growth in LICs and LMICs.

Next…

1.3 Determinants of Economic Growth

- The inclusion of explanatory variables is driven by data availability, the economies and regions studied.

- Variables of the FDI-growth studies are presented in Figure 1.2, and the importance of these growth determinants are discussed below.

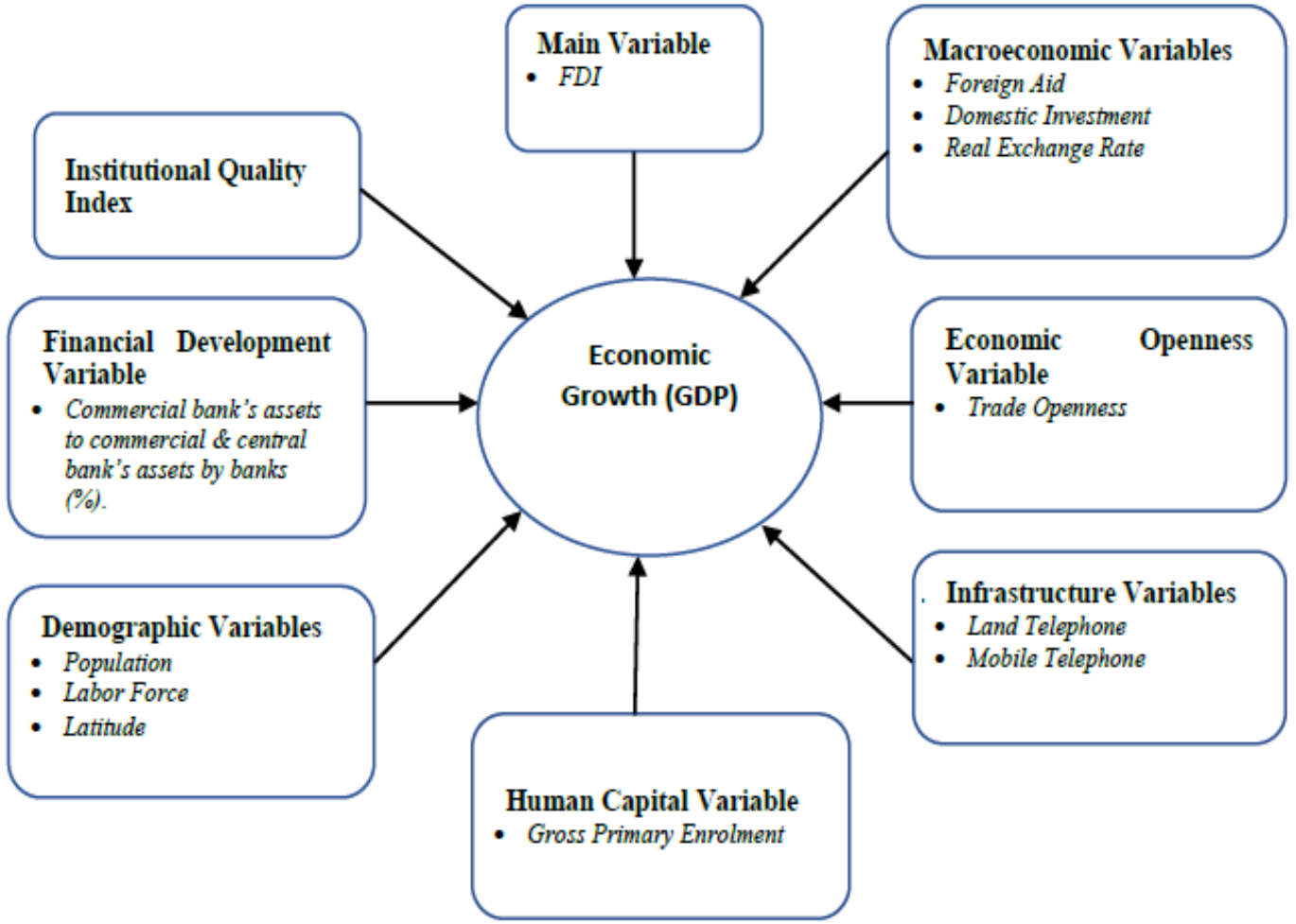


Figure 1.2 Determinants of economic growth

1.3 Determinants of Economic Growth (contd..)

UNIVERSITY of TASMANIA

1.3.1 Foreign Aid:

- The effect of ODA or aid on growth is still mired in the empirical literature. Both aid and FDI supplement domestic savings and are assumed to contribute to growth.
- The contribution of aid to economic growth seems to be channeled through its early effect on infrastructure development and intermediate effect on human capital development, investment, and consumption (Arndt et al., 2015).
- Focusing on the immediate effect of aid on infrastructure development and its subsequent impact on growth, Clemens et al. (2011) confirm a systematic, moderate (positive) growth bonus from aid inflows into the recipient country.
- Various aspects of the aid-growth nexus are considered in the empirical literature, such as the
  - geographical location of the recipient country (Dalgaard et al., 2004),
  - prevailing economic policies in the host (Burnside and Dollar, 2000),
  - types of data (time series or panel) used for analysis (Hansen and Tarp, 2001) and
  - the inclusion of explanatory variables (Rajan and Subramanian, 2008).

1.3 Determinants of Economic Growth (contd..)

- According to Dalgaard et al. (2004), although aid generates long-run productivity growth, the size and magnitude of the effect depend on institutional, geographic, or climate variables.
- However, Rajan and Subramanian (2008) find little evidence in favor of a positive correlation between aid and growth, even after controlling for institutional and policy aspects, geographical settings, time horizon, and econometric specifications.

1.3.2 Domestic Investment:

- DI is a key component of growth in the Solow model (Mankiw et al., 1992; Solow, 1956) and is considered an important determinant of growth.
- The empirical literature investigating the impact of DI on growth is assessed through the crowding-in or crowding-out effects of FDI on DI.
- Tan and Lean (2010) showed a bidirectional relationship between growth and DI, both in the short- and long run. DI affects economic growth through its positive impact on exports.
- Proponents of the crowding-in effect of FDI on DI include Al-Sadig (2013); Borensztein et al. (1998); Ndikumana and Verick (2008); Ramirez (2010); Tang et al. (2008).

1.3 Determinants of Economic Growth (contd..)

- However, some authors opine that FDI does not support DI (Morrissey and Udomkerdmongkol, 2012; Mutenyo et al., 2010; Titarenko, 2005).
- Others found a mixed effect or no effect at all (Adams, 2009; Agosin and Machado, 2005; Apergis et al., 2006). Conversely, the crowding-out effect of FDI and its subsequent negative impact on growth is suggested by Huang (1998, 2003).

1.3.3 Real Effective Exchange Rate:

- The real exchange rate (RER) measures the ratio of the price of tradable goods to that of non-tradable goods, while the nominal exchange rate measures the relative price of two currencies.
- It is generally argued that maintaining the exchange rate at an appropriate level is important concerning the long-run equilibrium growth. Any deviation from the long-run equilibrium value of the exchange rate would hurt economic growth.
- The generally accepted prevailing view is that a depreciated currency promotes growth. The positive link between exchange rate undervaluation (depreciation) and growth is channelled through savings rate and interest rates (Dooley et al., 2003) or investment rates and real wages (Levy-Yeyati and Sturzenegger, 2009).

1.3 Determinants of Economic Growth (contd..)

- Rodrik (2007) argues that RER depreciation stimulates economic growth in developing countries, where the tradable goods sector is favored over non-tradables due to institutional weakness and market failures, preventing income convergence across the sectors. However, Glüzmann et al. (2012) argue that currency depreciation has no impact on the tradable sectors. Rather, it supports higher domestic savings and investment, generates employment opportunities, and income redistribution in developing countries.
- On the contrary, a positive correlation between RER appreciation and growth is suggested in the Balassa-Samuelson effect, arguing that fast-growing LICs tend to appreciate their currency. Bussière et al. (2015) opine that although appreciation causes lower growth, it promotes significant growth in emerging economies in the presence of a productivity boom or a capital surge.
- However, Kappler et al. (2013) argue that larger appreciation causes a reduction in the country's savings and exports, leading to a deterioration of the current account with little impact on GDP growth. The proponents of the negative relationship between growth and RER appreciation include Acemoglu et al. (2001); Dollar (1992); Easterly (1993, 2001); Gala (2007).

1.3 Determinants of Economic Growth (contd..)

- Freund and Pierola (2008); Hausmann et al. (2005); Rodrik (2007) report a growth-promoting impact of a depreciated equilibrium exchange rate. Aguirre and Calderón (2005); Razin and Collins (1997) suggest that moderate undervaluation promotes growth, but larger undervaluation and overvaluation reduces growth, and the relationship is asymmetric and non-linear. Montiel and Servén (2009) opine that the precise channel of the effect of RER on growth is still unclear.

1.3.4 Trade Openness

- The neoclassical growth model by Solow (1956) explains the link between trade openness and growth through comparative advantages and resource endowments. According to this model, growth momentum can be achieved by the exogenous factor of technological change, but trade policies do not affect growth.
- In the endogenous growth framework, technological change is endogenized, which contributes to economic growth through international trade. Some of the proponents of the positive effect of open trade on economic growth are Chang et al. (2009); Jouini (2015); Kim (2011).

1.3 Determinants of Economic Growth (contd..)

- However, trade openness alone cannot generate growth: it requires evaluation of the contemporary and future macroeconomic strategies to achieve sustainability in trade.
  - According to the WTO (2003); Zahonogo (2016) open trade promotes better utilization of resources by allowing an economy to specialize in production processes in which it enjoys a comparative advantage & may achieve economies of scale, resulting in an increase in income level & efficiency in resource allocation.
  - Openness also facilitates strengthening and deepening of the local financial sectors to play its role in mobilization and efficient allocation of resources from investment. Therefore, trade openness requires a favorable business environment and macroeconomic stability in the host economy to promote growth (Newfarmer and Sztajerowska, 2012).
- Moreover, the effect of trade liberalization is neither immediate nor costless. Open trade may hurt economic growth. Lucas (1988); Young (1991) claim that trade openness hampers growth if an economy tends to specialize in a sector in which it has comparative disadvantages or where the opportunity of innovation or the process of imitation (learning by doing) is exhausted.
- Trade facilitates the transfer of technological knowledge, import high-tech capital goods or intermediate products, which depends on absorptive capacities in the host economy.

1.3 Determinants of Economic Growth (contd..)

- If economies lack absorptive capacities, selective protection and trade regulation is required to prevent an adverse impact on growth (Kim and Lin, 2009).
- It is also argued in the empirical literature that a threshold of trade openness is required for its impact on growth.
  - Kim and Lin (2009) suggest a threshold level of trade openness to explain the trade-growth relationship: rich countries gain positively by being more open to international trade, but LICs are negatively affected at a higher level of openness.
  - Zahonogo (2016) found an inverted U-shaped relationship (non-linear) between trade openness and growth in SSA economies.
  - Trejos and Barboza (2015) argue that trade openness is not the main driving force for the growth miracle in Asia.

1.3.5 Infrastructure

- From an academic point of view, the seminal paper by Aschauer (1989) was the first to report the growth-promoting impact of infrastructure spending in the United States with an output elasticity value of infrastructure spending of 0.38–0.56.

1.3 Determinants of Economic Growth (contd..)

- In an endogenous growth framework analysis, Fedderke et al. (2006) report a robust effect (direct and indirect) of infrastructure spending on economic growth in South African countries, the indirect effect being through increased marginal productivity of capital. Infrastructure development is also associated with a direct increase in labor productivity and an indirect increase in TFP.
- Better infrastructure relates to a better absorptive capacity to attract FDI and generate economic growth. According to Sahoo (2006), the growth-enhancing effect of FDI in South Asian countries is positively related to infrastructure availability.
- Empirical studies reveal a positive and significant relationship between infrastructure development and growth in developing countries (Canning and Fay, 1993; Easterly and Rebelo, 1993; Röller and Waverman, 2001).
  - In the empirical literature, infrastructure is proxied by different variables, such as per capita electricity consumption in kilowatts (Bhavan et al., 2011; Vadlamannati et al., 2018), fixed telephone line or subscription (Akhtaruzzaman et al., 2017; Ali et al., 2010; Asiedu, 2002; Blonigen and Piger, 2014; Brzozowski, 2006; Iamsiraroj, 2016; Lectard and Rougier, 2018; Röller and Waverman, 2001; Wisniewski and Pathan, 2014), paved roads per square kilometer (Alfaro et al., 2008; Su and Liu, 2016), and even a composite index of several variables.

1.3 Determinants of Economic Growth (contd..)

- Based on the empirical literature, this study includes land telephone subscriptions per 100 people and mobile telephone subscriptions per 100 people as proxies for the level of infrastructure in developing economies.

1.3.6 Human Capital

- Human capital (HC) reflects the absorptive capacity of foreign capital. It is regarded as the stock of skills and expertise possessed by the labor force and is considered an asset or resource that can be employed for productivity gains.
- HC is the main driver of R&D that can foster economic convergence by facilitating the absorption of new technologies and even the improvement of existing technologies and the creation of new products (Teixeira and Queirós, 2016).
- In growth accounting, HC is included assuming that a higher level of education generates increased productivity, and productivity differential results due to differences in the level of education (Goldin, 2016). The HC variable is integrated and analyzed in the Solow model by Barro (1991); Mankiw et al. (1992) to measure the absorptive capacity in the host economy.

1.3 Determinants of Economic Growth (contd..)

- Moreover, HC is a critical factor of the growth rate of output in the endogenous growth model (Lucas, 1988).
- HC is an important factor for long-run growth, either as a direct input into research (Romer, 1990) or through its positive externality effects (Lucas, 1988).
- Human capital is usually proxied by primary, secondary, or tertiary school enrolment (SEC) ratios. According to Azman-Saini et al. (2010); Mankiw et al. (1992), school enrolment is found to contribute to positive growth in the Solow model. The inclusion of interaction terms of FDI and human capital reveals a conditional relationship between economic growth and FDI (Azman-Saini et al., 2010; Borensztein et al., 1998; Li and Liu, 2005), suggesting a marginal effect of FDI on economic growth, based on the education level of the labor force in the host economy.
- This study includes gross primary enrolment as a proxy for human capital to examine its effect on growth in developing economies.

1.3 Determinants of Economic Growth (contd..)

UNIVERSITY of TASMANIA

1.3.7 Population and Labor Force:

- The exogenous growth model assumes that population growth retains lower capital per worker, leading to slower growth. Moreover, by augmenting human capital and physical capital in the Solow model, Mankiw et al. (1992) confirm that higher population growth results in lower steady-state growth.
- The proponents of endogenous model comply with the empirical evidence of a negative correlation between population growth and output growth, arguing that a stable population is compatible with long-run growth (Strulik, 2005).
- Empirical studies on population and economic growth reveal contradictory results leading to different views . Huang and Xie (2013) argue that although current population growth hurts growth, its lagged value has a positive effect indicating a long-run relationship between the variables.
- In agrarian low-income economies, population growth leads to diminishing returns to fixed capital, which results in declining per capita growth.

1.3 Determinants of Economic Growth (contd..)

- Becker et al. (1999) opine that a growing population can be utilized to generate higher growth in high-income economies through specialization and investment in human capital.
- The effect of population growth is not instantaneous: while increased population means an increased labor force, the growing population does not become an effective labor force (a factor of production) immediately. Therefore, poorer economies may suffer in the short and medium-term due to their increasing populations, but in the long run, these economies may benefit from demographic dividends if these future productive adults are invested into and specialized.
- Kelley and Schmidt (1999); Mierau and Turnovsky (2014) argue that population growth due to low mortality rate stimulates economic growth, but population growth from high fertility slows down economic growth.
- The present study includes the total population and labor force (total population available for work aged between 15 and 64 years old) as explanatory variables.

1.3 Determinants of Economic Growth (contd..)

UNIVERSITY of TASMANIA

1.3.8 Latitude

- Latitude is the angular distance of a place (north or south) from the earth's equator, expressed in absolute value. This study assumes that economic performance is influenced by geographical location and climatic conditions.
- The role of latitude to economic growth is assumed through the establishment of economic institutions by the settlers.
- Since European settlers colonized the temperate regions, it is assumed that better institutions were created there and contributed to economic growth in those regions.
- However, in the present era of globalization, geographical location seems not to be a constraint for investment and growth as long as economic gains are concerned. Acemoglu et al. (2005) find no causal link between geography and economic growth.

1.3 Determinants of Economic Growth (contd..)

UNIVERSITY of TASMANIA

1.3.9 Financial Development

- According to Schumpeter (1911) the financial institutions (mainly the banking system) play a pivotal role in mobilizing savings to productive investment, capital accumulation, risk management, facilitating transactions to encourage innovation and, therefore, economic growth and development .
- According to Patrick (1966), the causal link between financial development and growth is either demand-driven or supply-driven.
  - The demand-driven approach implies the emergence of financial systems, including their assets, liabilities, and relevant services, into the economy due to the demand of economic agents (savers and investors).
  - The development of financial systems and institutions is more or less automatic, passive, and permissive in the economic growth process.
  - Therefore, because of economic growth, the financial system emerges, widens, and becomes efficient.

1.3 Determinants of Economic Growth (contd..)

- The supply-driven approach states the emergence of financial institutions and their services in advance of their demand.
  - This leads to the transfer of resources from traditional non-productive sectors to productive sectors to stimulate and promote the response of the entrepreneurs in those sectors.
  - A supply-driven financial system may thus induce financing innovation and economic growth, akin to the view of Schumpeter.
- The emergence of financing driven by either demand or supply varies among industries and sectors, and their interaction may result in sustained growth. Initially, supply-driven financing may induce growth, but later on, as growth continues, demand-driven financing becomes dominant instead of the supply-driven one.
- Financial development is considered as a means to encourage economic growth through its allocative role (Wu et al., 2010), increasing liquidity and portfolio diversification to reduce risks (Saint-Paul, 1992), reducing the transaction costs of external financing to local firms (Rajan and Zingales, 1998), allowing exit options for economic agents and efficiency gain in financial intermediation (Arestis et al., 2001).

1.3 Determinants of Economic Growth (contd..)

- Alfaro et al. (2004, 2010); Carkovic and Levine (2005); Hermes and Lensink (2003) opine that a well-developed financial system is the precondition to materialize FDI-induced growth in host economies. Alfaro et al. (2004) and Azman-Saini et al. (2010a) also opine that the positive impact of FDI on growth depends on the extent of financial development.
- Some of the empirical studies report a mixed effect between financial development and growth. Masten et al. (2008) report a non-linear growth effect in Central and Eastern European (CEE) countries. Others claim a negative or insignificant effect of financial development on growth in developing countries (Kar et al., 2011; Narayan and Narayan, 2013). However, Sinha and Macri (2001) do not find any positive relationship between financial development and growth in Asian countries.
- When assessing the role of financial development on growth, financial development is measured using two broad categories: the credit market/banking sector and the stock/equity market. Although both the markets affect growth, the stock market is linked to portfolio investment and the credit market to FDI.

1.3 Determinants of Economic Growth (contd..)

- Arestis et al. (2001); Durusu-Ciftci et al. (2017) argue that a credit market-based financial system promotes more growth than that based on the stock market. This study includes commercial-central bank assets (CBA) as a proxy of the financial development variable, following Beck et al. (2000) and King and Levine (1993).
- The CBA is a ratio of commercial bank assets divided by commercial bank plus central bank assets and measures the degree to which commercial banks versus the central bank allocate society's savings.

1.3.10 Institutional quality (IQ)

- Institutional quality (IQ) is a long-term determinant of growth.
- According to North (1981), "institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction."
- Acemoglu and Robinson (2010) pinpoint the role of institutions in growth mechanisms by arguing that economic institutions depend on political institutions or processes and the distribution of political power in society.

1.3 Determinants of Economic Growth (contd..)

- Flachaire et al. (2014) described political institutions as a deep factor of growth that influences economic institutions and other covariates. The interaction of political power, political institutions, and economic institutions determine economic growth in a society.
- Economic institutions determine not only the current potential economic performance but also the future distribution of resources. Acemoglu et al. (2005) opine that good economic institutions can influence economic outcomes by shaping economic incentives.
  - Institutions consist of a set of rules, norms, and behavioral features that constrain the behavior of economic agents to maximize the welfare in society. It represents the absorptive capacity in the host country to attract FDI and has a synergistic effect on domestic firms (Jude and Levieuge, 2017).
  - IQ is generally measured on a range of perception-based indicators, such as rule of law, property rights, economic freedom, and corruption. Rodrik et al. (2004) suggest that it is a stock variable that is a cumulative outcome of past policies and does not represent permanent characteristics as defined by North (1981).

1.3 Determinants of Economic Growth (contd..)

- A stable political environment helps to ensure credible and smooth economic processes, maintain a stable business environment, and maximize profit by reducing transaction costs, resulting in investment decisions by foreign firms in the host economy. Hence, political stability is assumed to have a positive and significant effect on FDI inflow. The
- Economic freedom, another measure of IQ, has a positive effect on growth (Adkins et al., 2002; Dawson, 2003). Some argue that political freedoms (civil liberties) reduce income inequality and promote growth (Barro, 1999; Easterly and Levine, 2003; Gradstein et al., 2001; Sylwester, 2002).
- Corruption, another important measure of IQ, causes an inefficient allocation of resources, market distortion, and increased business cost, discouraging FDI inflow.

Next…

1.4 Empirical Methodology and Data

Data Sources and Variables

- This study analyzes the effects of FDI on economic growth in 69 developing countries, covering the period from 1980 to 2017.
- Due to the lack of sufficient data on mobile telephone, financial development, and institutional quality variables before 1996, the sample of the study is divided into two time periods: 1980 to 1996 and 1997 to 2017.
- Two infrastructure variables are used: total land telephone subscriptions and total mobile telephone subscriptions.
- All the variables are transformed into their natural logarithm form. Due to the data limitations, mobile telephones, financial development, and the institutional index are included in the second period.
- All the data (except the real exchange rate) are obtained from the World Development Indicators, Global Financial Development, and Worldwide Governance Indicators databases of the World Bank (2020a, 2020b, 2020c), respectively.
- The real exchange rate data is obtained from the Bruegel datasets by Darvas (2012). The data on the latitude variable is obtained from the CIA (2020).

1.4 Empirical Methodology and Data

UNIVERSITY of TASMANIA

1.4.1 Implementation of Generalized Method of Moments (GMM):

- The purpose of this study is to examine the determinants of FDI using panel data on developing countries. The panel data enables us to control for the unobservable time-invariant confounders & also accounts for the lagged reciprocal relationships/causation (Allison et al., 2017). To that end, important determinants of FDI must be specified in a tractable way and within an econometric framework. This section details the empirical model and estimation technique applied in the study.
- Static panel data estimation can be conducted using pooled least squares or fixed effects (FE), or random effects (RE) model to address the biased estimates in OLS because of the correlation between the error term (ε_{it}) and the unobserved error (u_i). The FE and RE models are expressed as follows:

  Fixed effect model: $y_{it} = (\alpha + u_i) + \mathbf{X}_{it}\boldsymbol{\beta} + v_{it}$ (1.1)

  Random effect model: $y_{it} = \alpha + \mathbf{X}_{it}\boldsymbol{\beta} + (u_i + v_{it})$ (1.2)

- The static effect model would yield biased estimates if the lagged values of the explanatory variables affect the current value of the dependent variable (FDI) as a potential source of endogeneity.
- Moreover, due to biased estimation in the static model in presence of past realization/lagged value of the LHS variable along with the present value of the RHS variables, and to address the issues of unobserved heterogeneity and potential endogeneity, the dynamic panel model (DPD) is estimated for this study.
- In econometrics, dynamic panel models are preferably estimated by instrumenting lagged variables with the GMM (see Hansen, 1982). Since it is difficult to find a suitable instrument, conventionally instruments are drawn from within the dataset.

- Dynamic panel estimation involves Arellano–Bond (AB)/difference GMM estimation by Arellano and Bond (1991) or Arellano–Bover/Blundell–Bond (ABB)/system GMM estimation by Arellano and Bover (1995); Blundell and Bond (1998)

1.4 Empirical Methodology and Data (contd…)

1.4.1 Implementation of Generalized Method of Moments (GMM):

- The general model for GMM estimators can be written as:

$$y_{it} = \alpha y_{i,t-1} + \mathbf{X}_{it}\boldsymbol{\beta} + \varepsilon_{it} \quad (1.3)$$

$$\varepsilon_{it} = u_i + v_{it} \quad (1.4)$$

$$E(u_i) = E(v_{it}) = E(u_i v_{it}) = 0 \quad (1.5)$$

- The disturbance term (ε_{it}) is composed of two orthogonal elements: the FE (u_i) and idiosyncratic shocks/errors (v_{it}). Equation 1.3 is also written as below (by subtracting $y_{i,t-1}$ in both sides and rearranging).

$$\Delta y_{it} = (\alpha - 1) y_{i,t-1} + \mathbf{X}_{it}\boldsymbol{\beta} + \varepsilon_{it} \quad (1.6)$$

- Applying the first-difference transformation for difference GMM (dGMM) estimation, equation 1.3 eliminates fixed effect (u_i) and is rewritten as:

$$\Delta y_{it} = \Delta y_{i,t-1} + \Delta \mathbf{X}_{it}\boldsymbol{\beta} + \Delta v_{it} \quad (1.7)$$

- Anderson and Hsiao (1981) suggest that first-differencing (FD) the static model eliminates any individual-specific effect, but the lagged dependent variable remains endogenous. Therefore, they suggest using the two-period lagged difference of dependent variable ($\Delta y_{i,t-2} = y_{i,t-2} - y_{i,t-3}$) as an instrument for the one-period lagged difference dependent variable ($\Delta y_{i,t-1} = y_{i,t-1} - y_{i,t-2}$). This is done because of the possible correlation between the one-period lagged difference dependent variable ($\Delta y_{i,t-1} = y_{i,t-1} - y_{i,t-2}$) with the one-period lagged difference error term ($\Delta v_{it} = v_{it} - v_{i,t-1}$). That is, $y_{i,t-1}$ is correlated with $v_{i,t-1}$.
- Besides, the predetermined variables (not strictly exogenous) may become endogenous, being related to $v_{i,t-1}$. Hence, longer period lag regressors may be used as instruments, being orthogonal to the error term.

1.4 Empirical Methodology and Data (contd…)

1.4.1 Implementation of Generalized Method of Moments (GMM):

- Due to the problems associated with the first-difference transformation, in sGMM, transformation is done based on forward orthogonal deviations (FoD) or orthogonal deviations proposed by Arellano and Bover (1995). In FoD, data transformation is achieved by subtracting the average of all forward/future observations of any variable from its current observation. This computation is applied for all the observations except the last one of each variable: thus, data loss is minimized.

- Since the formula does not contain a lagged value, instruments remain valid. If $y^{*}_{i,t-1}$ represents the orthogonal transformation, $y_{i,t-2}$ is a valid candidate to use as instrument and $\Delta y_{i,t-2}$ is instrument for the one transformed by first-difference (although $y_{i,t-2}$ and $\Delta y_{i,t-2}$ are correlated to $\Delta y_{i,t-1}= y_{i,t-1} - y_{i,t-2}$, but not with $\Delta v_{it}= v_{it} - v_{i,t-1}$, it is assumed that v_{it} are not serially correlated). Instrumenting levels estimator with $y_{i,t-2}$ other than $\Delta y_{i,t-2}$ ensure maximum sample size.

- The FoD transformation transforms differences (rather than regressors): the instruments to make exogenous to FE. In summary, AB instruments differences with levels, but Blundell–Bond instruments levels with the differences.

1.4 Empirical Methodology and Data (contd…)

1.4.2 Model Specification:

- Based on the discussion in section 1.4.1, an autoregressive distributed lag panel data model (initial model) is formed below in equation 1.8 following Kiviet (2020):

$$\boldsymbol{y_{it} = \sum_{j=1}^{q_y=1} \lambda_j y_{i,t-j} + \sum_{j=0}^{q_x=0} X'_{i,t-j} \beta_j + (\alpha_i + u_{i,t})} \qquad \textbf{(1.8)}$$

Where $i = 1, \ldots..N$ and $t = 1, \ldots..T$ (few time periods), $(\alpha_i + u_{i,t})$ is the error term $(e_{i,t})$, and the $y_{i,t}$ is the dependent variable. $\mathbf{X}_{it}$ represents explanatory covariates, which can either be exogenous (strictly), with the assumption of $E[u_{it}|\,\mathbf{X}_{i0}, \mathbf{X}_{i1} \ldots\ldots, \mathbf{X}_{iT}] = 0$, or predetermined (weakly exogenous) with the assumption of $E[u_{it}|\,\mathbf{X}_{i0},\ \mathbf{X}_{i1} \ldots \mathbf{X}_{it}] = 0$ or endogenous with the assumption of $E[u_{it}|\,\mathbf{X}_{i0}, \mathbf{X}_{i1} \ldots\ldots, \mathbf{X}_{i,t-1}] = 0$. The unobserved individual-specific effect (α_I) is assumed to be correlated with $\mathbf{X}_{i,t-j}$, and by construction, it is also correlated with the lagged dependent variable $(y_{i,t-j})$. The idiosyncratic disturbance (u_{it}) is assumed to be serially uncorrelated.

- Through first-differencing, the model is transformed as below.

$$\boldsymbol{\triangle y_{i,t} = \sum_{j=1}^{q_y} \lambda_j \triangle y_{i,t-j} + \sum_{j=0}^{q_x} \triangle X'_{i,t-j} \beta_j + \triangle u_{i,t}} \qquad \textbf{(1.9)}$$

- The FoD transformed model is as below:

$$\boldsymbol{\widetilde{\triangle}_t y_{it} = \sum_{j=1}^{q_y} \lambda_j \widetilde{\triangle}_t y_{i,t-j} + \sum_{j=0}^{q_x} \widetilde{\triangle}_t X'_{i,t-j} \beta_j + \widetilde{\triangle}_t u_{i,t} (= \widetilde{\triangle}_t e_{i,t})} \qquad \textbf{(1.10)}$$

Here, $\widetilde{\triangle}_t u_{i,t} = \sqrt{\frac{T-t+1}{T-t}} \left(u_{i,t} - \frac{1}{T-t+1} \sum_{s=0}^{T-t} u_{i,t+s}\right)$ and $corr\left(\widetilde{\triangle}_t u_{i,t}, \widetilde{\triangle}_t u_{i,t-1}\right) = 0.$

1.4 Empirical Methodology and Data (contd…)

1.4.2 Model Specification:

- Moreover, it is suggested to add time dummies (δ_t) in the regression to capture the global shocks. Time dummies are assumed to be uncorrelated with α_i(individual-specific effect) & considered strictly exogenous (instrumented by themselves).

$$\widetilde{\Delta}_t\, y_{it} = \sum_{j=1}^{q_y} \lambda_j\, \widetilde{\Delta}_t\, y_{i,t-j} + \sum_{j=0}^{q_x} \widetilde{\Delta}_t\, \mathbf{X}'_{i,t-j}\, \beta_j + \delta_t + \widetilde{\Delta}_t\, u_{i,t}\ (=\widetilde{\Delta}_t\, e_{i,t}) \qquad (1.11)$$

1.4.3 Formulation and Selection of Maintained Statistical Model (MSM):

- In system GMM, explanatory variables must be classified as endogenous, predetermined, or exogenous, and whether time dummies should be included or not. The initial model should be specified (with restricted instruments set) in a way so that no regressor is dropped immediately only because of its insignificant coefficient. Avoiding the inclusion of any redundant/invalid instrument or wrongly excluding additional lags of the regressors, their functional forms, and interaction terms is also required.

- The search for an acceptable initial general model forms the necessary part of the analysis (Kiviet, 2020). The selection of explanatory variables (including interaction terms) is retained based on the formulation of a maintained statistical model (MSM), as suggested by Kiviet (2020); Kripfganz (2019).

1.4 Empirical Methodology and Data (contd…)

1. The initial MSM is formulated keeping in mind that no relevant variable is omitted, sufficient lags of the variables and time dummies are included, and the issue of over parametrization is considered. Initially, all the regressors ($\mathbf{X}_{i,t}$) are treated as endogenous, and the use of all the available instruments (if sample permits) for the FD or FoD model is recommended. If the sample size is small, the instruments can be collapsed and/or curtailed. As a rule of thumb, Kiviet (2020) suggests the following inequalities: $K + 4 \leq L < \min\left(h_k K, \frac{1}{h_L}(NT - K)\right)$.

Here $4 < h_k < h_L < 10$, the total number of instruments is represented by L, K is the total number of coefficients, T is the number of time periods, and N is the total number of groups/countries.

2. The initial MSM is then computed using two-step GMM with 'Windmeijer-corrected standard errors' and validity checked with the specification tests One-step GMM is recommended if there are concerns about the estimation of the optimal weighting matrix. If the initial MSM fails to pass any of the specification tests, MSM must be revised as stated in step 1.

3. In this step, further lags or interaction terms can be added and checked to determine if they improve the model. However, it should be kept in mind that higher-order lags reduce the sample size and are costly when few time periods (T) are available.

- The model is sequentially reduced by removing any higher-order lags of the regressors or interaction terms that retain high p-values (in the individual/joint significance test).
- For each of the new MSMs, validity is checked with the specification tests. Kiviet (2020) suggests including the interaction terms first before dropping the higher-order lagged regressors. The robustness of the model is checked using iterated GMM estimation.

1.4 Empirical Methodology and Data (contd…)

- The Model and Moment Selection Criteria (MMSC) proposed by Andrews and Lu (2001) are applied to compare the initial MSMs that pass all the specification tests and select the best one. The MMSC computes Akaike (AIC), Bayesian (BIC), and Hannan-Quinn (HQIC) estimation, and the model that retains lower values of AIC, BIC, and HQIC is selected.

4. At this stage, extra instruments are added sequentially for each of the initially treated endogenous regressors. The extra instruments are checked for their validity using incremental overidentification tests, whether any of the initially treated endogenous variables is actually predetermined unless theoretical evidence is strong enough to treat that variable as endogenous. The validity of the other specification tests is also monitored.

5. Extra instruments are now added sequentially for each of the predetermined regressors (after step 4). The extra instruments are checked for validity following the procedure stated in step 4 to check whether any of the predetermined variables are strictly exogenous. The final MSM is then revised based on the categorization of the explanatory variables (endogenous, predetermined, and exogenous) in steps 4 and 5.

6. The final MSM is checked again following the procedures discussed in step 3. Instrument counts can be readjusted so that the MSM follows the inequalities mentioned in step 1. If any variable is of particular interest for the analysis, statistical insignificance itself should not be the only criteria to drop that variable.

1.4 Empirical Methodology and Data (contd…)

7. Under the initial conditions assumption, additional instruments (in the level model) are added, and the model is estimated by two-step or iterated system GMM using *'Windmeijer-corrected errors'*. The extra instruments ($\Delta\mathbf{X}_{i,t}$/ $\Delta\mathbf{X}_{i,t-1}$) for the level model are added first (and checked for all specifications and validity tests), then extra instruments for $\Delta y_{i,t-1}$ can be added if the former instruments are valid.

8. If any of the additional instruments added in the level model in step 7 become invalid, non-linear moment conditions by Ahn and Schmidt (1995) can be added, which is valid under the no serial correlation assumption of $u_{i,t}$. The model is finally estimated using a two-step/iterated system GMM and validated by specification tests. The validity of the non-linear moment conditions can be checked by the generalized Hausman test. If the final model fails to pass the specification tests, it is suggested to revoke and revisit some considerations made in earlier steps and re-estimate the rectified model by two-step/iterated system GMM.

1.4 Empirical Methodology and Data (contd…)

1.4.4 Specification Tests:

a) Arellano–Bond Test for Autocorrelation: *This test is known as the Arellano–Bond test for serial correlation of first-differenced errors. If no serial correlation of $u_{i,t}$ is assumed, a negative first-order correlation of $\Delta u_{i,t}$ ($corr(\Delta u_{it}, \Delta u_{it-1}) = -0.5$) is evident, but no second- or higher-order autocorrelation is observed. The absence of higher-order autocorrelation is a necessary condition for the validity of the instruments of the lagged dependent variable ($y_{i,t-2}$, $y_{i,t-3}$, …), endogenous, and predetermined variables. Arellano and Bond (1991) suggest the null hypothesis for the test statistic as H_0: $corr(\Delta u_{it}, \Delta u_{it-j}) = 0,\ j > 0$. The requirement for the model to pass this specification test is that the null hypothesis is rejected for the first-order ($j = 1$) autocorrelation test but not for second- or higher-order ($j > 1$) tests.*

b) Overidentification (Sargan-Hansen) Test: If the number of instruments (L) is equal to the number of regressors (K), the model is just-identified, and the assumption of instrument validity is untested. But if $L > K$, the model is overidentified (even strongly overidentified), and the validity of overidentifying restrictions ($L - K$) can be checked. The optimal weighting matrix ($L \times L$ dimension) is the necessary condition for the overidentified model to estimate an efficient estimator. The requirement for the model to pass this specification test is that the null hypothesis of overidentifying restrictions ($L - K$) are valid is not rejected. However, Kripfganz (2019) argues that the overidentification test is not sufficient for model specification.

c) Incremental Overidentification (Difference Sargan-Hansen) Test: This specification test is used to check the validity of the set of individual instruments used in the regression model. Assuming that the difference GMM estimator is correctly specified, the validity of the moment conditions for the level model is checked using the incremental overidentification difference (Sargan-Hansen) test with a $\chi^2(df_f - df_r)$ distribution. Here df_f is degrees of freedom of the full model and df_r is degrees of freedom of the reduced model overidentification test (Eichenbaum et al., 1988). The validity of the incremental overidentification tests depends on the validity of the overidentification test of the reduced model as well.

Next…

1.1 Introduction
1.2 Literature Review
- 1.2.1 FDI: A Key Driver of Economic Growth
- 1.2.2 FDI Flow in Developing Countries
- 1.2.3 Positive Effects of FDI on Economic Growth
- 1.2.4 Adverse Effects of FDI on Economic Growth

1.3 Other Determinants of Economic Growth
1.4 Empirical Methodology and Data
- 1.4.1 Data Sources and Variables

1.5 Empirical Findings and Discussion

- 1.5.1 Summary Statistics
- 1.5.2 Dynamic Panel Model Estimation Results
  - 1.5.2.1 Two-Step System GMM Results
    - 1.5.2.1.1 First Sample Group (1980–1996)
    - 1.5.2.1.2 Second Sample Group (1997–2017)
  - 1.5.2.2 Iterated GMM Results (Robustness Check)

1.6 Limitations of the Study
1.7 Conclusion

1.5 Empirical Findings and Discussion

1.5.1 Summary Statistics

Table 1.1a Summary statistics of the variables: first sample period 1980–1996

Variables	Mean	Std. dev.	Min	Max
lngdp	22.173	1.648	18.746	26.697
lnfdis	5.398	2.361	-11.513	10.199
lnaid	5.509	1.279	-1.561	8.71
lngcf_n	20.547	1.788	17.244	25.714
lntrd_n	21.533	1.513	17.952	25.501
lnexreal_mx	4.9	0.571	2.943	10.937
lninftel_n	10.76	1.947	6.908	16.496
lnprenr_n	15.725	1.71	12.265	20.642
lnpopl	16.024	1.584	12.669	20.705
lnp64	15.38	1.609	12.011	20.187
lat	15.604	10.343	0.024	48.379
No. of countries	55	55	55	55
No. of observations	652	652	652	652

Table 1.1b Summary statistics of the variables: second sample period, 1997–2017

Variables	Mean	Std. dev.	Min	Max
lngdp	23.123	1.712	19.368	28.462
lnfdis	7.624	2.115	0.28	12.671
lnaid	6.051	1.089	2.992	9.344
lngcf_n	21.593	1.872	15.758	27.305
lntrd_n	22.735	1.693	19.002	27.651
lnexreal_mx	4.651	0.17	3.933	5.468
lninftel_n	12.212	2.115	6.69	17.556
lnmob_n	14.067	2.823	4.585	20.844
lnprenr_n	16.342	1.559	12.27	21.14
lnpopl	16.355	1.545	12.089	21.004
lnp64	15.785	1.557	11.485	20.593
lncba	4.278	0.38	1.938	4.605
lninst	0.351	1.555	-5.585	3.603
c.lnprenr_n#c.lnpopl	269.66	51.104	148.341	444.032
lat	16.969	11.967	0.228	48.379
No. of countries	66	66	66	66
No. of observations	893	893	893	893

1.5 Empirical Findings and Discussion

- The variables have higher mean values in the second period (1997 to 2017) except for the real exchange rate.
- FDI has a higher standard deviation in the first sample group, indicating more volatile stock in the first period.
- The real exchange rate has higher volatility in the first period, and GDP has a higher standard deviation in the second sample period.

1.5 Empirical Findings and Discussion (contd..)

1.5.2 Two-Step System GMM Results:

- Initially, three different MSMs (appendix A, table A2) were retained, passing the required specification tests (Arellano–Bond test for autocorrelation, overidentification, and incremental overidentification).
- The MMSC proposed by Andrews and Lu (2001) is applied to compare the three MSMs and select the best model. MSM1, which retains lower values of Akaike (AIC), Bayesian (BIC), and Hannan-Quinn (HQIC) estimation, is selected.
- Each of the variables of the selected MSM1 (appendix A, table A3) is checked to identify whether the initially treated endogenous regressors are predetermined or exogenous.
- Since the p-value of the extra instruments for each variable, such as aid, domestic investment, trade openness, human capital, and population, are greater than 0.50, these variables are considered predetermined in the first sample period of 1980 to 1996.
- A revised model is formulated considering the above variables to be predetermined, passing the specification tests.
- Later, these predetermined variables are checked further (by adding extra instruments) to determine whether these are exogenous.
- The final model is formulated by considering the following categorization of the variables:

1.5 Empirical Findings and Discussion (contd..)

- Endogenous variables: FDI stock, real exchange rate, land telephone, labor force, and the interaction term of population and human capital.
- Predetermined variables: foreign aid, trade openness, and population.
- Exogenous variables: domestic investment, human capital, and latitude.

- The final model is estimated by sequentially adding each category of variables, applying a two-step system GMM.

1.5.2.1 First Sample Group (1980–1996)

- The sGMM result (Table 1.1, column 7) reveals that lag of GDP, domestic investment, trade openness, and the labor force significantly contribute to economic growth during the first period,
- Infrastructure (land telephone) and population significantly reduce growth.
- The lag of GDP retains the lag effect of the explanatory covariates. Beck and Katz (2011) argue that including the lag of the dependent variable accounts for the continuous effect of past explanatory covariates. In the presence of the lagged dependent variable, all the coefficient estimates (except the convergence parameter) measure their short-run effects.
- The long-run effects are estimated by dividing each of the short-run coefficients by the difference of the coefficient of lag GDP to one, proposed by Papke and Wooldridge (2005).

1.5 Empirical Findings and Discussion (contd..)

- The coefficient of lag GDP (0.604) is positive and significant at a 1% significance level, with a value ranging from 0.534 to 1.178 across the estimations with different combinations of explanatory covariates & is consistently positive and significant.
- The convergence rate (1–0.604 = 0.396) is 39.6%. GDP increases by 0.604% for every 1% increase in GDP in the last year, ceteris paribus.
- The long-run multiplier (1/0.396) is 2.53, implying that the long-run effect of each of the regressors contributing to growth is 2.53 times more than their short-run effect, ceteris paribus.
- The coefficient of DI (0.195) is positive and significant at a 1% significance level, implying that in the short run (long run), a 1% increase in DI results in a 0.195% (0.50 times) increase in GDP.

Table 1.1 Two-step system GMM estimation results: first sample period, 1980–1996

	Main variable	Macroeconomic variables	Economic openness	Infrastructure	Human capital	Final model (2-step sGMM)	Final model (iGMM)
1	2	3	4	5	6	7	8
l.lngdp	1.178***	0.796***	0.669***	0.646***	0.610***	0.604***	0.534***
	(0.0905)	(0.0669)	(0.0805)	(0.0970)	(0.0843)	(0.0749)	(0.0785)
lnfdis	-0.0150	-0.0216	-0.0254	-0.0112	-0.0170	0.00287	0.0111
	(0.0154)	(0.0191)	(0.0242)	(0.0275)	(0.0261)	(0.00966)	(0.0211)
lnaid		-0.00664	-0.00764	-0.00490	0.00103	0.00156	0.0116
		(0.0128)	(0.0131)	(0.0177)	(0.0211)	(0.0133)	(0.0145)
lngcf_n		0.195***	0.167***	0.168***	0.189***	0.195***	0.244***
		(0.0401)	(0.0420)	(0.0469)	(0.0648)	(0.0535)	(0.0581)
lnexreal_mx		-0.0623*	-0.0362	-0.0178	-0.0142	-0.00362	-0.0241
		(0.0342)	(0.0460)	(0.0491)	(0.0484)	(0.0456)	(0.0273)
lntrd_n			0.183*	0.211**	0.200**	0.115**	0.0502
			(0.103)	(0.103)	(0.0986)	(0.0552)	(0.0669)
lninftel_n				-0.00598	-0.0801	-0.0833**	-0.0667
				(0.0578)	(0.0759)	(0.0381)	(0.0576)
lnprenr_n					0.150	0.0964	0.299
					(0.0968)	(0.308)	(0.289)
lnpopl						-1.353**	-1.961***
						(0.592)	(0.647)
lnp64						1.400*	2.235***
						(0.728)	(0.702)
lat		-0.0153**	-0.0188**	-0.0135*	-0.0106	-0.0111	-0.0149***
		(0.00681)	(0.00855)	(0.00803)	(0.00647)	(0.00697)	(0.00528)
c.lnprenr_n#c.lnpopl						0.000708	-0.0116
						(0.0185)	(0.0182)
Constant	-3.673*	1.360	0.710	0.383	-0.682	1.887	0.608
	(1.970)	(0.988)	(1.005)	(1.091)	(1.788)	(4.205)	(4.742)
No of observations	652	652	652	652	652	652	652
No. of instruments	23	32	36	39	44	51	51
No. of countries	55	55	55	55	55	55	55
AR2 test (p-value)	0.1550	0.0926	0.0793	0.0893	0.0864	0.0771	0.0749
Sargan-Hansen test	1.1654	12.7878	14.0386	23.2070	26.2357	19.9648	20.5537
(p-value)	(0.8838)	(0.1724)	(0.2982)	(0.0570)	(0.0945)	(0.5852)	(0.5484)

Note: (a) Dependent variable is log of GDP (lngdp); (b) Robust Standard errors in parentheses; (c) *, **, and *** represent, respectively, statistical significance at 10, 5, and 1 percent levels; and (d) Time-specific dummies included but not reported in the table.

1.5 Empirical Findings and Discussion (contd..)

- The coefficients of trade openness (0.115) and labor force (1.40) are positive and significant at 5% and 10% levels of significance, respectively. A 1% increase in trade openness and labor force increases economic growth in the short run (long run) by 0.115% (0.29 times) and 1.40% (3.54 times), respectively.
- The coefficients of land telephones (–0.0833) and population (–1.353) are negative and significant at a 5% significance level. A 1% increase in land telephones and population reduces the economic growth in the short run by 0.0833% and 1.35%, respectively. FDI is not a significant contributor to growth in the first period.
- The p-value of the AR(2) and overidentification tests (Sargan-Hansen test) are 0.0771 and 0.5852, respectively, implying the absence of second-order serial correlation. These results also suggest the validity of the overidentifying restrictions in the specified model. The p-values of the incremental Hansen (IH) test confirm the validity of each set of instruments used in the estimation.

1.5 Empirical Findings and Discussion (contd..)

UNIVERSITY of TASMANIA

1.5.2.2 Second Sample Group (1997–2017)

- In the second sample group, the final model is selected as discussed in section 1.5.2 (appendix A, table A4 and table A5), with the following categorization of the variables,
  - Endogenous variables: aid, domestic investment, real exchange rate, trade openness, land telephone, human capital, institutional index, and the interaction term of population and human capital
  - Predetermined variables: population, labor force, and financial development
  - Exogenous variables: FDI and mobile telephone.
- The final model is estimated by sequentially adding each category of variables, applying a two-step sGMM.
- The findings reveal that the lag of GDP, FDI, domestic investment, real exchange rate, trade openness, mobile telephone, labor force, and financial development variables are positive and statistically significant.
  - The coefficient of lag of GDP (0.729) is positive and significant at a 1% level of significance, and the implied convergence rate (1–0.729 = 0.271) is 27.1%.
  - The long-run multiplier (1/0.271) is 3.69, implying that in the long run, the effect of each of the regressors on growth is 3.69 times more than their short-run effect, ceteris paribus.
  - The coefficient of lag GDP ranges from 0.729%–0.951%, and that of FDI stock is 0.0123%–0.0224% across the estimations with different combinations of explanatory covariates.

1.5 Empirical Findings and Discussion (contd..)

UNIVERSITY of TASMANIA

Table 1.2 Two-step system GMM estimation results: first sample period, 1997–2017

	Main variable	Macroeconomic variables	Economic openness	Infrastructure	Human capital	Demographic variables	Financial development	Final model (2-step sGMM)	Final model (igmm)
1	2	3	4	5	6	7	8	9	10
l.lngdp	0.951***	0.869***	0.790***	0.834***	0.824***	0.737***	0.740***	0.729***	0.721***
	(0.0306)	(0.0295)	(0.0560)	(0.0612)	(0.0469)	(0.0478)	(0.0525)	(0.0540)	(0.0483)
lnfdis	0.0228	0.0178	0.0133	0.0123	0.0149	0.0219***	0.0224***	0.0209**	0.0169**
	(0.0166)	(0.0118)	(0.0106)	(0.0114)	(0.0126)	(0.00732)	(0.00812)	(0.00868)	(0.00656)
lnaid		-0.00633	0.00224	0.00773	-0.00779	-0.0155	-0.0151	-0.0138	-0.0100
		(0.0189)	(0.0193)	(0.0178)	(0.0173)	(0.0185)	(0.0204)	(0.0215)	(0.0146)
lngcf_n		0.0763***	0.0424	0.0373	0.0424*	0.0502**	0.0532**	0.0529**	0.0525***
		(0.0231)	(0.0283)	(0.0294)	(0.0240)	(0.0240)	(0.0233)	(0.0234)	(0.0188)
lnexreal_mx		0.105	0.178*	0.210*	0.179**	0.222***	0.212***	0.216***	0.231***
		(0.0812)	(0.0958)	(0.114)	(0.0883)	(0.0549)	(0.0596)	(0.0594)	(0.0542)
lntrd_n			0.130**	0.110	0.109*	0.113**	0.0927*	0.107**	0.125***
			(0.0605)	(0.0724)	(0.0570)	(0.0498)	(0.0491)	(0.0454)	(0.0412)
lninftel_n				-0.0379*	-0.0316**	-0.0289*	-0.0224*	-0.0236*	-0.0231**
				(0.0191)	(0.0155)	(0.0173)	(0.0125)	(0.0125)	(0.0104)
lnmob_n				0.0160	0.0124	0.0193**	0.0155*	0.0163**	0.0160*
				(0.00989)	(0.0142)	(0.00826)	(0.00864)	(0.00805)	(0.00805)
lnprenr_n					0.0111	-0.171	-0.171	-0.182	-0.153
					(0.0441)	(0.240)	(0.202)	(0.183)	(0.162)
lnpopl						-0.188	-0.211	-0.196	-0.163
						(0.159)	(0.170)	(0.170)	(0.175)
lnp64						0.421**	0.425**	0.415**	0.385*
						(0.196)	(0.178)	(0.204)	(0.208)
lnceba							0.0414**	0.0443**	0.0432**
							(0.0184)	(0.0198)	(0.0193)
lninst								-0.00218	-0.00147
								(0.0131)	(0.0133)
c.lnprenr_n#c.lnpopl						0.00123	0.00209	0.00226	0.00107
						(0.0114)	(0.01000)	(0.00992)	(0.00815)
Constant	0.984	0.826	0.0784	-0.252	-0.100	0.348	0.595	0.584	0.106
	(0.614)	(0.548)	(0.613)	(0.690)	(0.714)	(3.275)	(2.863)	(2.774)	(2.288)
No of observations	893	893	893	893	893	893	893	893	893
No. of instruments	28	35	37	43	46	56	59	61	61
No. of countries	66	66	66	66	66	66	66	66	66
AR2 test (p-value)	0.0493	0.0548	0.0412	0.671	0.633	0.1424	0.1349	0.1341	0.1238
Sargan-Hansen test	15.759	12.5625	8.8294	15.4561	16.8293	15.0387	17.1300	17.7481	16.3914
(p-value)	(0.0197)	(0.2492)	(0.6376)	(0.4191)	(0.4660)	(0.9196)	(0.9051)	(0.9110)	(0.9451)

Note: (a) Dependent variable is log of GDP (lngdp); (b) Robust standard errors in parentheses; (c) *, **, and *** represent, respectively, statistical significance at 10, 5, and 1 percent levels; and (d) Time-specific dummies are included but not reported in the table.

1.5 Empirical Findings and Discussion (contd..)

- The coefficient of FDI stock (0.0209) is positive and significant at a 5% level of significance, implying that a 1% increase in FDI stimulates economic growth in the short run (long run) by 0.0209% (0.077 times), ceteris paribus.
- The coefficient of the real exchange rate (0.216) is positive and significant at a 1% level of significance. This suggests that the host economy may benefit from appreciating its currency against the basket of currencies with its trading partners. A 1% appreciation of RER would increase economic growth in the short run by 0.216%.
- The coefficients of DI (0.0529), trade openness (0.107), the labor force (0.415), and financial development (0.0443) are positive and significant at a 5% level of significance.
- The coefficient of the land telephone variable (-0.0236) is negative and significant at a 10% level of significance, but that of mobile telephone (0.0163) is positive and significant at a 5% level of significance.
- Therefore, FDI, DI, RER, trade openness, infrastructure (mobile telephone), and financial development are significant determinants of economic growth in the selected developing economies from 1997 to 2017.
- The p-value of the AR(2) and overidentification tests (Sargan-Hansen test) are 0.1341 and 0.9110, respectively, implying the absence of second-order serial correlation and validity of the overidentifying restrictions in the specified model. The model also passes the IH test for each set of instruments used in the estimation.

1.5 Empirical Findings and Discussion (contd..)

UNIVERSITY of TASMANIA

1.5.2.2 Iterated GMM Results (Robustness Check)

- The results of the iterated GMM estimation (Table 1.1, column 8) for the first sample group (1980 to 1996) suggest that the lag of GDP, domestic investment, and labor force are positive and significant at a 1% level of significance, which are the key determinants of economic growth. However, population and latitude significantly reduce growth in developing countries.

- The results of the iterated GMM (Table 1.2, column 10) estimation for the second sample group (1997 to 2017) reveal that lag of GDP, FDI, DI, RER, trade openness, infrastructure (mobile telephone), labor force, and financial development variables are positive and significant determinants of growth. In contrast, land telephone and latitude are negative and significant for growth.

- The coefficients retain a smaller value (except for RER and trade openness) and greater significance (except mobile telephone and labor force) than the sGMM findings.

- The findings of the iterated GMM are discussed below;

1.5 Empirical Findings and Discussion (contd..)

UNIVERSITY of TASMANIA

Lag of GDP

- The lag of GDP is a significant determinant of growth across both periods. In the first period, the coefficient of lag GDP (0.534) implies that a 1% increase in GDP in the last year would increase current GDP by 0.534%, with a convergence rate (1–0.534) of 46.6%. The long-run multiplier (1/0.466) is 2.15, which implies that the long-run effect of each of the regressors is 2.15 times greater than their short-run effect.
- However, the effect of the lag GDP (0.721) is stronger in the second period, with a convergence rate (1–0.721) of 27.9% and a stronger long-run multiplier effect (1/0.279) of 3.58. The GDP in the current year would increase by 0.721% for every 1% increase in GDP in the last year, ceteris paribus.

Foreign Direct Investment

- FDI is a significant determinant of growth, but only in the second period. The coefficient of FDI (0.0169) is positive and significant at a 5% level of significance. A 1% increase in FDI stock stimulates growth in the short run (long run) by 0.0169% (0.0606 times), respectively, ceteris paribus.
- However, according to our findings, FDI made no significant contribution to growth during the first period.
- The findings also indicate that although the effect of FDI on growth is low in magnitude, the selected developing economies possess the macroeconomic absorptive capacities (trade openness and labor force) necessary to attract FDI and stimulate economic growth.

1.5 Empirical Findings and Discussion (contd..)

- The positive and significant coefficients of trade openness suggest that FDI may be export platform and vertical: that is, motivated to export back to the home economy or other economies, offsetting barriers (tariffs) to trade (Ekholm et al., 2007).
- Moreover, since export-platform FDI is less competitive with the local firms, it tends to contribute to economic growth through technology spillovers.
- The findings also suggest that the direct effect of FDI on growth is through the accumulation of higher capital stocks (via DI) and increased demand for the labor force. The significance of this result is evident in the empirical literature (Almfraji and Almsafir, 2014; Azman-Saini et al., 2010; Makiela and Ouattara, 2018; Mallick and Moore, 2008; Thompson, 2008). Therefore, despite the complex and counterfactual FDI-growth relationship, our results provide sufficient evidence on the direct link between FDI and growth (through capital accumulation).

Domestic Investment

- The coefficient of DI is positive and significant at a 1% significance level in both the sample periods, with a stronger effect in the first period.
- In the first period (second period), a 1% increase in domestic investment causes economic growth by 0.244% (0.0525%), respectively, ceteris paribus. Since domestic investment is positive and significant across the periods, this reflects a better business environment in the host economy to attract FDI.
- However, FDI is positively contributing to growth only in the second period. Therefore, a complementary relationship between FDI and DI to stimulate growth in developing economies is evident in the recent period.

1.5 Empirical Findings and Discussion (contd..)

- Our results also suggest that developing countries may benefit more by opening up their economy, allowing capital and other inputs to move in, and the final products to move out (export). This will let the economies grow through spillover effects of FDI, which will stimulate the incorporation of domestic factors of production in the host economy.
- In effect, in the presence of information asymmetry in the developing economies, the prospect of DI gives some positive information about the business environment in the host country to attract much-needed FDI. Therefore, our findings indicate a crowding-in effect of FDI on DI is also evident.

Real Effective Exchange Rate

- The real exchange rate is an important determinant of economic growth in the second period, with a positive and significant coefficient at a 1% level of significance.
- The positive value of the real exchange rate index implies that a 1% increase (appreciation) of the exchange rate would increase GDP in the short run by 0.231% with a 3.58 times greater long-run effect than the short-run effect, ceteris paribus.
- Prasad et al. (2007) opine that increased capital flow in fast-growing economies results in an appreciation of the currency that affects growth by reducing incentives for investment in the manufacturing sectors. However, the capital flow tends to increase the demand for tradable and non-tradable goods, leading to higher relative prices of non-tradables and currency appreciation.

1.5 Empirical Findings and Discussion (contd..)

- As a result, fast-growing, low-income economies experience overvaluation of their currencies over time.
- Our result suggest that moderate appreciation (0.231%) combined with favorable macroeconomic conditions and positive capital flow supports economic growth in developing economies.

Trade Openness

- In the first sample, the coefficient of trade openness is positive (significant) in sGMM and positive and insignificant in iterated GMM estimation.
- Trade openness is a significant determinant of growth in the second period.
- In the second period, it is positive (significant) at a 1% level of significance in iGMM estimation, implying that a 1% increase in trade openness increases GDP by 0.125%, ceteris paribus.
- The positive effect of FDI stock and trade openness in the second period indicates that developing countries may benefit from global integration and international trade in the more recent period.
- Liberalization and globalization have led to developing economies becoming more interconnected through external factors, such as trade openness. Therefore, our findings of strong positive growth gain through trade openness in the recent period are convincing.
- The growth-promoting effect of trade openness is higher in low-growing economies than that of high-growing ones.

1.5 Empirical Findings and Discussion (contd..)

- Developing economies lack capital but are abundant in labor forces. Hence, openness may facilitate scarce capital influx and benefit the economy by creating better jobs with a better working environment, increased wages, and a higher marginal product of labor.
- The positive coefficient of the labor force in our findings suggests the potential of developing economies to benefit from capital accumulation by opening their economies.
- In addition, the significant coefficient of trade openness is larger in value in the second period than a smaller and insignificant coefficient in the first period. The implication is that this may be because of a lack of sufficient absorptive capacity in the first period.
- These economies have maintained selective trade protection (less open) to insulate from negative growth during the early stages.
- Moreover, the positive and significant coefficient of DI, infrastructure, financial development, and labor force reveals the complementary effects of these non-trade variables to spur growth through trade openness in developing economies.
- This result also suggests that a certain level of economic development is required to benefit trade openness and may be the reason for the insignificant coefficient of FDI, infrastructure and trade openness variables in the first sample period that becomes positive and significant in the later period (1997 to 2017).

1.5 Empirical Findings and Discussion (contd..)

- Therefore, it seems that during the initial stage of development, economies should first support domestic sectors to grow sustainably. Later, these economies should develop necessary absorptive capacities, establish favorable business environments, build sufficient labor stock to explore foreign capital, and expand economic activities through trade openness and other forms of economic integration.

Infrastructure

- The coefficient of the land telephone is negative (insignificant) in the first period (1980 to 1996) and negative (significant) in the second period (1997 to 2017) at a 5% level of significance. A 1% increase in land telephone subscription would significantly reduce growth in the short run by 0.0231% in the second period, ceteris paribus.
- The mobile telephone variable is positive (significant) at a 10% significance level in the second period. A 1% increase in mobile telephones would significantly increase GDP in the short run by 0.016%, ceteris paribus.
  - The negative effect of land telephones on growth may suggest that either land telephones are not an appropriate infrastructure proxy to capture its effect on growth, or it may be a weak predictor of growth.
  - A further possible cause may be the issue of reverse causality. In developing countries, the number of fixed telephone subscriptions is stable or decreasing, whereas mobile telephone subscriptions are increasing due to new connections and migration from fixed to mobile technologies.
  - Although an increase in land telephone subscriptions had been considered to impact growth positively, since the 1990s, the land telephone has been replaced by the mobile telephone as the most preferred access mode of communication.

1.5 Empirical Findings and Discussion (contd..)

- According to Vu (2011), the internet has the highest impact on the growth of different telecommunication infrastructures, followed by mobile telephone and land telephone.
- Gruber and Koutroumpis (2011) argue that mobile telephone usage has increased dramatically since the 1990s, especially in developing countries, and is a fascinating example of technology diffusion. The process of land telephone penetration took more than 120 years to achieve, but penetration of the mobile telephone took one-fifth of the time.
- Moreover, Waverman et al. (2005) argue that a mobile telephone is a substitute for a land telephone with a stronger (twice as large compared to developed economies) growth impact in poor countries.
- Initially, mobile telephones seemed to strengthen the fixed networks (calls to and from mobile telephones were originally made to fixed telephones), meaning the two variables were complementary. But the maturity (growth) of mobile networks has transformed them into a substitute for fixed telephones.
- Therefore, due to the recent expansion of mobile technology, it is reasonable to assume that mobile telephone penetration is taking over in importance in impacting economic growth in developing countries.

Poulation

- A growing population is assumed to hurt economic growth in developing countries. The coefficient of the population variable is consistently negative across the sample periods, being negative and significant at a 1% level of significance in the first sample period (1980 to 1996) and negative (insignificant) in the second sample period (1997 to 2017).

1.5 Empirical Findings and Discussion (contd..)

- Therefore, an increase in population reduces GDP growth in the short run by 1.961% in the first period, ceteris paribus.
- The general assumption is that a larger population with a relatively fixed amount of capital stock diminishes returns of outputs. The neoclassical growth model by Solow (1956) outlines a negative relationship between per capita growth and population growth by exogenously considering savings and population as the main growth drivers.
- According to Peterson (2017) GDP has two components (population and an economic component), and percentage change in growth is equal to the sum of population growth and GDP per capita growth. If population growth and economic growth are independent of each other, a higher population would lead to higher growth.
- However, the growing population does not contribute to economic productivity immediately. An increasing population has a short-run negative impact on growth in developing economies.
- Therefore, empirical findings are convincing enough to conclude that larger populations have a diminishing effect on per capita income in developing economies.

1.5 Empirical Findings and Discussion (contd..)

UNIVERSITY of TASMANIA

Labor Force

- The coefficient of the labor force is positive and significant in both the sample periods. The magnitude of the coefficient (2.235%) is highest in the first period, but the effect wanes out in the second period to a value of 0.385%. A 1% increase in the labor force would be expected to increase GDP in the short run by 2.235% and 0.385%, respectively, ceteris paribus.
- The impact of the labor force on growth in the first period is about six times larger in absolute value than that in the second period and suggests that in the early stage of development, developing countries can achieve positive productivity growth by maintaining a larger labor supply. However, in the second period, maintaining productivity may require a more skilled labor force, which is assumed to be in short supply in developing countries, leading to a declining but still positive impact.
- Although population growth reduces economic growth, it may increase economic growth by increasing the size of the labor force. A larger population also means a larger domestic market, encouraging competition for innovation and technological improvement and resulting in economic growth.
- A larger labor force pushes down the wage. Tsen and Furuoka (2005) opine that according to the standard labor demand model, lower wages increase the demand for labor and will attract more labor-intensive foreign investments, which may contribute to economic growth. Moreover, the demand for labor force increases when foreign capital seems to be concentrated in labor-intensive sectors (Jenkins, 2006).

1.5 Empirical Findings and Discussion (contd..)

- Our empirical findings reveal that the higher impact of the labor force in the first period compared to that in the second period suggests the prevalence of a labor-intensive production process during the early period of development. However, the significant positive effect of FDI with declining effect of labor force in growth in the second period suggests that more recently, FDI may be embedded with technology and is less labor-intensive.
- Therefore, high productivity gains would create fewer employment opportunities and require a smaller quantity of more skilled workers.

Financial Development

- The coefficient of financial development is positive and significant at a 5% level of significance in the second period, increasing GDP in the short run (long run) by 0.0432% (0.155 times), ceteris paribus. Efficiency in the banking sector means the efficient allocation of savings and investment into productive sectors to stimulate economic growth.
- Although the causal link between financial development and economic growth is driven by either demand or supply, it seems to be mostly demand-driven in developing economies because this is a relatively costly process for the capital-constrained economy.
- The requirement of financing (credits) from domestic sources is inevitable to imitate and absorb the spillover effects of FDI and to expand domestic businesses. However, the smaller positive coefficient of financial development suggests a relatively small effect of financial institutions in promoting economic growth in developing economies.

1.5 Empirical Findings and Discussion (contd..)

UNIVERSITY of TASMANIA

Latitude

- Although the latitude variable is included in the first sample period, the model selection process has not systematically supported the inclusion of latitude as an explanatory variable of growth in the second sample period.
- Our findings suggest that countries that are 1% away from the equator would experience a significant drop in growth by 0.0149% at a 1% level of significance, ceteris paribus. Therefore, the growth prospect in tropical regions of the world is valid in the first sample period.
- Acemoglu et al. (2001) argued that geographical locations had played an important role in the formation and performance of economic institutions. Therefore, Europeans colonized and created better institutions in temperate latitudes because of their poor immunity against tropical diseases. Moreover, since the history of the formation of better institutions is related to the colonization behavior of the European settlers, if the effect of economic institutions on per capita income is controlled for, geographical location does not affect economic performance.
- However, our findings suggest the opposite of the popular view of lower economic growth in tropical countries.
- Therefore, other than latitude and geographical location, the growth prospects in our sample economies are mostly dependent on macroeconomic and financial variables.

1.5 Empirical Findings and Discussion (contd..)

Table 1.3 Summary of the results in two periods in iGMM

	Significant Factors of Growth (iGMM)	
Year	1980 - 1996	1997 - 2017
	Lag of GDP (+)	Lag of GDP (+)
	Domestic Investment (+)	FDI (+)
	Population (-)	Domestic Investment (+)
	Latitude (-)	Real Exchange Rate (+)
	Labor Force (+)	Trade openness (+)
		Land Telephone (-)
		Mobile Telephone (+)
		Financial Development (+)
		Labor Force (+)

Next…

1.6 Limitations of the Study

- Although most of the empirical literature suggests the importance of human capital for FDI-induced growth, the effect human capital (primary enrolment) variable is insignificant. The available proxy of human capital seems to not be a good predictor of growth, and the knowledge gained through primary education in each country is not comparable across the sample economies to demonstrate its actual effect on growth through FDI.
- The lack of sufficient and reliable data is a big hurdle in any research.
- Moreover, the availability of data may guide future studies to identify and compare region-specific growth determinants and their magnitude of effect. This could also be extended to identify the determinants of growth based on the income status of the economies.

Next…

1.7 Conclusion

- This study assesses the effect of FDI along with other factors on economic growth in developing economies over two time periods.
- Estimation was conducted using system GMM and iterated GMM techniques using a DPD model. Although most of the sample economies overlap across the periods, their growth determinants are not identical.
- The different set of factors to influence economic growth across the periods reflect the heterogeneity in economic characteristics.
- Lag of GDP, DI, population, labor force, and latitude are the main drivers of growth in the first sample period, while high population and economies located away from the equator experienced reduced growth.
- However, economic growth in recent times is characterized by the lag of GDP, FDI, DI, RER, trade openness, infrastructure (mobile telephones), labor force, and financial development variables. These variables are found to significantly increase growth in the second period, whereas land telephones had a significant negative impact on growth.
    - Lag of GDP, DI, and the labor force are the common driving forces of growth in developing economies, irrespective of the sample periods (1980 to 1996 or 1997 to 2017).
    - The long-run multiplier effect of the explanatory variables is larger in the second period, suggesting the stronger influence of these variables to promote growth in recent times.

1.7 Conclusion (contd..)

- However, foreign capital (FDI) inflow is not enough to spur economic growth alone. Policy implications that arise from our study are not straightforward but suggestive.
  - Since FDI is growth enhancing and promotes domestic capital accumulation in developing economies, policies that promote trade openness, improve the quality of human capital, and financial development should be prioritized to enhance the competitiveness of the economy to foreign investors.
  - Policies relating to the expansion of mobile telephone as a quick means of technology diffusion should also be emphasized.
  - The positive effect of the labor force in generating growth can have its synergistic effect through its qualitative improvement, which requires more investment in human capital.
  - Moreover, improvement of the quality of labor force will not only attract more FDI but also improve the quality of FDI in developing countries, promote growth, and in turn may improve the human capital further.
  - Supporting foreign capital induced growth through the improvement of absorptive capacities may shift the demand-driven financial systems to a supply-driven approach and secure sustained growth.
- Notably, developing favorable policies are also required, to maintain macroeconomic stability to secure growth prospects and continue attracting foreign investments.

Appendix

Table A1. Description of the variables

Variables	Description
lngdp	Log of gross domestic product (GDP) (current USD).
lnfdis	Log of FDI stock (million USD).
lnaid	Log of net official development assistance received (current million USD).
lngcf_n	Log of gross capital formation (USD).
lntrd_n	Log of trade openness, number.
lnexreal_mx	Log of real effective exchange rate index.
lninftel_n	Log of land telephone (total number).
lnmob_n	Log of mobile telephone (total number).
lnprenr_n	Log of enrolment total (primary).
lnpopl	Log of population (total number).
lnp64	Log of population (age between 15 to 64 years).
lncba	Log of commercial bank's assets to commercial and central bank's assets by banks (%).
lninst	Log of institutional quality matrix.
lat	Latitude, angular distance of a place north or south of the earth's equator.

Appendix

Model	ngroups	J	nmom	npar	MMSC-AIC	MMSC-BIC	MMSC-HQIC
MSM 1	55	15.2507	44	29	-14.7493	-44.8593	-26.8095
MSM 2	55	14.8828	43	29	-13.1172	-41.2198	-24.3734
MSM 3	55	11.2104	41	28	-14.7896	-40.8849	-25.2417

Note: a) ngroups- number of groups; b) nmom- number of instruments/moment conditions; c) npar- number parameter in the model; and d) MMSC is model and moment selection criteria, AIC- Akaike information criteria, BIC- Bayesian information criterion and HQIC- Hannan and Quinn information criterion.

Table A3 Andrews-Lu model and moment selection criteria: first sample period, 1980–1996

	MSM (1)*	MSM (2)	MSM (3)	1st revised MSM
Dependent variable	lngdp	lngdp	lngdp	lngdp
l.lngdp	0.789***	0.792***	0.699***	0.610***
	(0.135)	(0.130)	(0.182)	(0.0766)
lnfdis	0.00177	0.00240	-0.00631	0.00254
	(0.00638)	(0.00663)	(0.00970)	(0.0122)
lnaid	0.00208	0.00221	-0.0224	0.000799
	(0.0150)	(0.0149)	(0.0458)	(0.0142)
lngcf_n	0.0937	0.0929	0.211	0.228***
	(0.156)	(0.152)	(0.297)	(0.0650)
lnexreal_mx	-0.0274	-0.0295	-0.0540	-0.0154
	(0.0523)	(0.0514)	(0.0809)	(0.0502)
lntrd_n	0.0961	0.0924	0.0536	0.104*
	(0.0805)	(0.0819)	(0.120)	(0.0596)
lninftel_n	-0.0916	-0.0911	-0.00509	-0.0865**
	(0.0708)	(0.0721)	(0.120)	(0.0422)
lnprenr_n	-0.0524	-0.0539	-0.265	0.102
	(0.328)	(0.325)	(0.558)	(0.287)
lnpopl	-1.177*	-1.173*	0.629	-1.424**
	(0.669)	(0.658)	(2.448)	(0.596)
lnp64	1.125	1.122	-0.182	1.508**
	(0.781)	(0.763)	(1.958)	(0.744)
lat	-0.00766	-0.00763	-0.00603	-0.0121*
	(0.00816)	(0.00818)	(0.0119)	(0.00650)
c.lnprenr_n#c.lnpopl	0.00689	0.00687	--	-0.00130
	(0.0169)	(0.0168)		(0.0174)
Constant	2.652	2.686	-1.243	1.335
	(3.538)	(3.501)	(3.617)	(3.959)
No of observations	652	652	652	652
No. of instruments	44	43	41	49
No. of groups	55	55	55	55
AR(2) test (p-value)	0.1120	0.1131	0.0825	0.0711
Sargan-Hansen test	15.2507	14.8828	11.2104	17.6672
(p-value)	(0.4335)	(0.3862)	(0.5932)	(0.6093)
IH test	all passed	all passed	all passed	all passed

Note: (a) Robust standard errors in parentheses; (b) *, **, and *** represent, respectively, statistical significance at 10, 5, and 1 percent levels; (c) Time-specific dummies included but not reported in the table; and (d) *MSM 1 selected by mmsc criteria.

Table A2 Different maintained statistical model (MSM): first sample period, 1980–1996

Appendix

Model	ngroups	J	nmom	npar	MMSC-AIC	MMSC-BIC	MMSC-HQIC
MSM 1	66	17.0652	54	34	-22.9348	-66.7279	-40.8126
MSM 2	66	17.1937	54	34	-22.8063	-66.5994	-40.6841
MSM 3	66	17.1937	54	34	-22.8063	-66.5994	-40.6841
MSM 4	66	16.8601	53	34	-21.1399	-62.7433	-38.1238

Note: a) ngroups-number of groups; b) nmom-number of instruments/moment conditions; c) npar-number parameter in the model; and d) MMSC is model and moment selection criteria, AIC- Akaike information criteria, BIC- Bayesian information criterion and HQIC- Hannan and Quinn information criterion.

Table A5 Andrews-Lu model and moment selection criteria: second sample period, 1997–2017

Dependent variable	MSM (1) lngdp	MSM (2) lngdp	MSM (3) lngdp	MSM (4) lngdp	1st revised model lngdp
l.lngdp	0.718***	0.719***	0.720***	0.720***	0.727***
	(0.0635)	(0.0572)	(0.0633)	(0.0740)	(0.0520)
lnfdis	0.0249**	0.0231*	0.0253**	0.0250**	0.0245**
	(0.0111)	(0.0118)	(0.0111)	(0.0124)	(0.0116)
lnaid	-0.0175	-0.0115	-0.0171	-0.0176	-0.0111
	(0.0214)	(0.0229)	(0.0218)	(0.0208)	(0.0203)
lngcf_n	0.0601**	0.0442	0.0603**	0.0631**	0.0550**
	(0.0292)	(0.0355)	(0.0293)	(0.0308)	(0.0243)
lnexreal_nx	0.224***	0.237***	0.216***	0.207**	0.223***
	(0.0831)	(0.0843)	(0.0807)	(0.0947)	(0.0653)
lntrd_n	0.108**	0.132***	0.106**	0.105*	0.105**
	(0.0501)	(0.0462)	(0.0517)	(0.0598)	(0.0436)
lninftel_n	-0.0258	-0.0226	-0.0249	-0.0253	-0.0227
	(0.0167)	(0.0177)	(0.0166)	(0.0179)	(0.0137)
lnmob_n	0.0164	0.0167	0.0174	0.0150	0.0141
	(0.0134)	(0.0148)	(0.0134)	(0.0139)	(0.00902)
lnprenr_n	-0.206	-0.203*	-0.222	-0.204	-0.187
	(0.201)	(0.104)	(0.182)	(0.191)	(0.193)
lnpopl	-0.175	-0.0684	-0.132	-0.172	-0.179
	(0.247)	(0.274)	(0.296)	(0.256)	(0.194)
lnp64	0.448	0.367	0.387	0.440	0.415*
	(0.311)	(0.261)	(0.411)	(0.321)	(0.215)
lncba	0.0359	0.0447	0.0348	0.0388	0.0449**
	(0.0299)	(0.0331)	(0.0299)	(0.0355)	(0.0196)
lninst	-0.000377	0.000203	-0.000351	-0.000792	0.000669
	(0.0137)	(0.0130)	(0.0140)	(0.0153)	(0.0136)
c.lnprenr_n#c.lnpopl	0.00147	--	--	0.00154	0.00180
	(0.0103)			(0.0101)	(0.00948)
c.lnprenr_n#c.lnp64	--	--	0.00239	--	--
			(0.00973)		
Constant	0.396	-0.0832	0.686	0.454	0.475
	(2.934)	(0.670)	(2.668)	(2.853)	(2.687)
No of observations	893	893	893	893	893
No. of instruments	54	51	54	53	59
No. of groups	66	66	66	66	66
AR2 test (p-value)	0.1428	0.1459	0.1410	0.1415	0.1419
Sargan-Hansen test (p-value)	17.0652 (0.6487)	14.7972 (0.6758)	17.1937 (0.6404)	16.8601 (0.5993)	17.1900 (0.8748)
IH Test	all passed	all passed	all passed	all passed	all passed

Note: (a) Robust standard errors in parentheses; (b) *, ** and *** represent, respectively, statistical significance at 10, 5, and 1 percent levels; (c) Time-specific dummies included but not reported in the table; and (d) MSM 1 selected.

Table A4 Different maintained statistical model (MSMs): second sample period, 1997–2017

Appendix

UNIVERSITY of TASMANIA

Table A5 List of countries

Countries for sample period (1980-1996),	Income group	Region
Bangladesh	LMIC	SA
Benin	LIC	SSA
Bhutan	LMIC	SA
Bolivia	LMIC	LAC
Burkina Faso	LIC	SSA
Burundi	LIC	SSA
Cambodia	LMIC	EAP
Cameroon	LMIC	SSA
Central African Rep.	LIC	SSA
Chad	LIC	SSA
Comoros	LIC	SSA
Congo, Dem. Rep.	LIC	SSA
Congo, Rep.	LMIC	SSA
Cote d'Ivoire	LMIC	SSA
Egypt, Arab Rep.	LMIC	MENA
El Salvador	LMIC	LAC
Eritrea	LIC	SSA
Eswatini	LMIC	SSA
Gambia, The	LIC	SSA
Ghana	LMIC	SSA
Guinea	LIC	SSA
Guinea-Bissau	LIC	SSA
Haiti	LIC	LAC
Honduras	LMIC	LAC
India	LMIC	SA
Indonesia	LMIC	EAP
Kenya	LMIC	SSA
Lesotho	LMIC	SSA
Madagascar	LIC	SSA
Malawi	LIC	SSA
Mali	LIC	SSA
Mauritania	LMIC	SSA
Moldova	LMIC	ECA
Mongolia	LMIC	EAP
Morocco	LMIC	MENA
Mozambique	LIC	SSA
Nepal	LIC	SA
Nicaragua	LMIC	LAC
Niger	LIC	SSA
Nigeria	LMIC	SSA
Pakistan	LMIC	SA
Papua New Guinea	LMIC	EAP
Philippines	LMIC	EAP
Rwanda	LIC	SSA
Senegal	LIC	SSA
Sierra Leone	LIC	SSA
Syrian Arab Rep.	LMIC	MENA
Tajikistan	LMIC	ECA
Tanzania	LIC	SSA
Togo	LIC	SSA
Tunisia	LMIC	MENA
Uganda	LIC	SSA
Ukraine	LMIC	ECA
Uzbekistan	LMIC	ECA
Vietnam	LMIC	EAP

Countries of sample period (1997-2017)	Income level	Region
Afghanistan	LIC	SA
Angola	LMIC	SSA
Bangladesh	LMIC	SA
Benin	LIC	SSA
Bhutan	LMIC	SA
Bolivia	LMIC	LAC
Burkina Faso	LIC	SSA
Burundi	LIC	SSA
Cabo Verde	LMIC	SSA
Cambodia	LMIC	EAP
Cameroon	LMIC	SSA
Central African Rep.	LIC	SSA
Chad	LIC	SSA
Comoros	LIC	SSA
Congo, Dem. Rep.	LIC	SSA
Congo, Rep.	LMIC	SSA
Cote d'Ivoire	LMIC	SSA
Djibouti	LMIC	MENA
Egypt, Arab Rep.	LMIC	MENA
El Salvador	LMIC	LAC
Eritrea	LIC	SSA
Eswatini	LMIC	SSA
Ethiopia	LIC	SSA
Gambia, The	LIC	SSA
Ghana	LMIC	SSA
Guinea	LIC	SSA
Guinea-Bissau	LIC	SSA
Haiti	LIC	LAC
Honduras	LMIC	LAC
India	LMIC	SA
Indonesia	LMIC	EAP
Kyrgyz Rep.	LMIC	ECA
Lao PDR	LMIC	EAP
Lesotho	LMIC	SSA
Liberia	LIC	SSA
Madagascar	LIC	SSA
Malawi	LIC	SSA
Mali	LIC	SSA
Moldova	LMIC	ECA
Mongolia	LMIC	EAP
Morocco	LMIC	MENA
Mozambique	LIC	SSA
Myanmar	LMIC	EAP
Nepal	LIC	SA
Nicaragua	LMIC	LAC
Niger	LIC	SSA
Nigeria	LMIC	SSA
Pakistan	LMIC	SA
Papua New Guinea	LMIC	EAP
Philippines	LMIC	EAP
Rwanda	LIC	SSA
Senegal	LIC	SSA
Sierra Leone	LIC	SSA
Sudan	LMIC	SSA
Syrian Arab Rep.	LMIC	MENA

Contd.	Income group	Region
Tajikistan	LMIC	ECA
Tanzania	LIC	SSA
Timor-Leste	LMIC	EAP
Togo	LIC	SSA
Tunisia	LMIC	MENA
Uganda	LIC	SSA
Ukraine	LMIC	ECA
Vanuatu	LMIC	EAP
Vietnam	LMIC	EAP
Zambia	LMIC	SSA
Zimbabwe	LIC	SSA

Note: LICs- Low-income countries, LMICs- Lower-Middle income countries, EAP- East Asia and Pacific, ECA- Europe and Central Asia, LAC- Latin America and Caribbean, MENA- Middle East and North Africa, SA- South Asia and SSA- Sub-Saharan Africa

UNIVERSITY of TASMANIA

Thank You

Q & A