

Effect of Development Aid on Productive Capacities

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The international policy discourse, for example by the World Trade Organization and the United Nations, has emphasized the critical role of productive capacities for promoting sustainable development and building economic resilience in developing countries. This paper examines whether ODA contributes to enhancing productive capacities in recipient countries. It considers two main components of the total official development assistance (ODA), namely, Aid for Trade (AfT) and Non-AfT, where the latter is part of total ODA allocated to other than trade-related sectors. The analysis relies on the index of the overall productive capacities developed recently by the United Nations Conference on Trade and Development (UNCTAD), and covers 111 countries over the period 2002-2018. Findings indicate that development aid, including its two main components, contributes to fostering productive capacities in recipient countries, with AfT flows exerting a larger positive effect on productive capacities than Non-AfT flows. Moreover, in least developed countries (LDCs), the positive effect of ODA on productive capacities reflects the key role of both AfT and Non-AfT flows in contributing to the development of productive capacities. In contrast, in Non-LDCs (other countries than LDCs in the full sample), only AfT flows matter positively for the strengthening of productive capacities, as Non-AfT flows do not appear to exert a significant effect on productive capacities. These outcomes highlight the criticality of development aid for enhancing productive capacities in developing countries, in particular in LDCs.

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INTRODUCTION

The international policy discourse by institutions such as the World Trade Organization (WTO) and the United Nations (including the United Nations Conference on Trade and Development - UNCTAD) has stressed the critical role of productive capacities for building resilience to shocks, and ensuring a sustainable development in developing countries (e.g., Alonso, 2016; Cornia and Scognamiglio, 2016; Gnangnon, 2019a; OECD¹, 2021; OECD/WTO, 2019; Shiferaw, 2017; UN, 2017; UNCTAD, 2006, 2020; WTO, 2021). The concept of 'productive capacities' has been defined in different ways in the literature (see UNCTAD, 2020). For example, some works have considered productive capacities in a narrow sense, and measured it by educational coverage (e.g., Olarte et al., 2021). Other studies have measured it as the capacity output derived from a production function approach (e.g., Barrell and Kirby, 2011; Barrell et al., 2011; Kalirajan and Salim, 1997). One insightful definition by the UNCTAD (2006: 61, 2020) considers 'productive capacities' as "the productive resources, entrepreneurial

¹ See online at: <https://oecd-development-matters.org/2021/02/24/building-productive-capacities-can-avert-a-lost-decade-in-the-poorest-countries/>

capabilities and production linkages which together determine the capacity of a country to produce goods and services and enable it to grow and develop”. Hence, according to UNCTAD (2020), ‘productive capacities’ are considered as the outcomes of multiple factors, including human capital development; physical capital development (energy infrastructure; transport infrastructure; information and communication technology, i.e., ICT); private sector development; strengthening of institutions; structural change in production and natural resources endowment.

In the meantime, the international community has been urged to scale-up its support for developing countries, notably the least developed countries among them, referred by the United Nations to as Least developed countries² (LDCs). Development aid, i.e. the so-called official development assistance (ODA), is one important means for helping these countries strengthen their productive capacities (e.g., Alonso, 2016; Guillaumont, 2011; Hynes and Lammersen, 2017; UN, 2010).

The present analysis examines for the first time the effect of ODA on productive capacities in recipient countries, relying in particular on the UNCTAD’s definition of ‘productive capacities’ (including the index of productive capacities developed by the UNCTAD³). This issue has not been addressed in the literature probably because data on countries’ performance in terms of productive capacities did not really exist. The recent dataset released by the UNCTAD⁴ allows now researchers to perform analyses on productive capacities so as to inform policy decisions by governments in developed and developing countries.

To strengthen developing countries’ trade capacity and helping them to better integrate into the multilateral trading system, members of the WTO launched the Aid for Trade (AfT) Initiative in 2005. The purpose of this initiative is to secure higher financial resources in favour of the trade sector in developing countries (although not at the expense of other ODA flows, which we henceforth refer to as Non-AfT flows), so as to address the structural impediments to these countries’ participation in international trade. AfT flows, therefore, intend to “help developing countries, particularly least developed countries⁵ (LDCs) build the supply-side capacity and trade-related infrastructure that they need to assist them to implement and benefit from WTO Agreements and more broadly to expand their trade” (WTO, 2005, paragraph 57). As AfT flows appear to be directed to strengthening trade-related productive capacities in recipient countries, we find useful to decompose total ODA into AfT flows and Non-AfT flows when investigating the effect of total ODA on productive capacities.

The empirical analysis is conducted using a sample of 111 countries over the period 2002-2018, and uses the two-step system generalized method of moments (GMM) approach. The findings show that total ODA flows, including both AfT flows and Non-AfT flows, positively and significantly affect productive capacities in recipient countries. Furthermore, the magnitude of the positive effect of AfT flows on productive capacities is larger than that of Non-AfT flows. Interestingly, both AfT flows and Non-AfT flows matter positively for fostering productive capacities in LDCs, whereas for Non-LDCs, only AfT flows contribute to enhancing productive capacities.

The rest of the paper contains four other sections. The next section (Section 2) explores theoretically how ODA could affect productive capacities. Section 3 presents the empirical strategy, and Section 4 interprets empirical outcomes. Section 5 concludes.

² The United Nations General Assembly established in 1971 the group of LDCs. Information on the criteria used to select a country as an LDC is provided by the United Nations online at: <https://www.un.org/ohrrls/content/least-developed-countries>

³ This index of productive capacities has been developed by the UNCTAD on the basis of the latter relies on the definition of productive capacities provided above (see UNCTAD, 2006, 2020).

⁴ See information online at: <https://unctad.org/press-material/unctad-launches-new-tool-help-transform-economies-amid-global-crisis> and <https://unctadstat.unctad.org/EN/Pci.html>

⁵ LDCs represent the category of the poorest and most vulnerable countries (to external and environmental shocks) in the world, according to the United Nations. For further information on the countries included in this group, see online at: <http://unohrrls.org/about-lDCs/criteria-for-lDCs/>

DISCUSSION ON THE EFFECT OF DEVELOPMENT AID ON PRODUCTIVE CAPACITIES

This section explores ways through which ODA might affect productive capacities. In light of the UNCTAD's definition of productive capacities (see the introduction section), our discussion on the effect of ODA on productive capacities would take up each of these components of the overall productive capacities. Additionally, the discussion considers the two main components of ODA, namely, AfT flows and Non-AfT flows. The reliance on these two components of the total ODA is particularly useful in the present analysis given that AfT interventions aim to address supply-side weaknesses of recipient countries by building the economic infrastructure and strengthening their capacity to produce goods and services so as to become more competitive in the international market. AfT interventions also contribute to building the capacity of policymakers in the recipient countries to devise trade policies suitable to their trade development strategies, while also complying with the WTO rules. Thus, by nature, AfT flows serve directly to enhance recipient countries' overall productive capacities, as defined by the UNCTAD.

At the same time, Non-AfT flows target sectors such as education, health, other social infrastructure (e.g., social protection, employment creation etc), population policies and reproductive health programmes, government and civil society, conflict peace and security, construction, commodity, humanitarian, as well as cross-cutting issues (e.g., environment protection, rural development, urban development and management, disaster risk reduction, food security policy etc). Thus, Non-AfT flows target many sectors, and can therefore directly or indirectly affect productive capacities. In addition, Non-AfT flows can be fungible, i.e., aid allocated for a given sector may be re-directed by policymakers in the recipient-countries towards other sectors. This is unlikely to be the case for AfT flows which are usually not fungible (e.g., Bearce et al., 2013). For example, while Non-AfT flows (if not fungible⁶) can directly contribute to strengthening human capital through their effect on education and health, humanitarian aid, aid targeting the sector 'conflicts peace and security' or even commodity aid may influence positively or negatively productive capacities. As a result, it can be useful to consider how AfT flows and Non-AfT flows (within the total aid envelope) separately affect productive capacities. Furthermore, given the close links between AfT flows and productive capacities, it might be interesting to look at how the main components of AfT flows (as defined by the OECD) influence productive capacities. These components are AfT flows for economic infrastructure, AfT flows for building productive capacity and AfT interventions for trade policy and regulation. In the following, we provide the discussion for both non-AfT and AfT channels.

The Human Capital Channel

A number of studies have reported a positive effect of education aid on educational outcomes (e.g., Birchler and Michaelowa, 2016; Dreher et al., 2008) and health outcomes (e.g., Abby and Nio-Zarazua, 2016; Gyimah-Brempong, 2015; Kotsadam et al., 2018; Pickbourn and Ndikumana, 2016; Yogo and Mallaye, 2015). However, other studies have noted that aid for education might not necessarily yield positive outcomes. For example, Miningou (2019) has concluded that the efficiency in the use of education aid varies across developing countries, and ultimately depends on the quality of governance, political stability, and the strength of national commitment to finance education. According to Lewin (2020), some low-income countries in Sub-Saharan Africa (SSA) performed well in terms of education thanks to aid, and now relied more on domestic revenue to finance their education spending. In contrast, many other did not perform well. These findings have led him to call for a change in the architecture and goals of external assistance so as to enhance the efficiency and effectiveness of aid utilization, and allow recipient countries to rely later on their domestic revenue to fund their education expenditure. The study by Odokonyero et al. (2019)

⁶ Within the Non-AfT envelop, part of resources targets directly the education and health sectors, although such financial flows could be fungible, i.e., diverted to other purposes than the intended ones by policymakers in the recipient-countries.

have found for Uganda that health aid helped significantly to reduce the productivity burden of disease, measured by the number of days of productivity lost due to illness. However, health aid was not effective in diminishing disease prevalence. The authors have concluded that health aid tended to be primarily useful in accelerating recovery times rather than to prevent disease. Additionally, health aid tended not to accrue to Ugandan localities with the worse socioeconomic conditions, which suggested that the effectiveness of health aid could be enhanced by improving its allocation, including by targeting subnational areas with greater needs. All in all, it is not clear whether aid for education and aid for health would achieve their intended purpose, i.e., the accumulation of human capital (a component of the overall productive capacities) because these types of aid flows may have differing effects on human capital depending on the country's specific features. As a result, it is not clear whether aid for human capital development would genuinely lead to greater accumulation of human capital, and ultimately contribute to the improvement of productive capacities.

The Humanitarian Channel

Humanitarian aid can affect productive capacities through its effect on violence and civil wars. Some studies have reported that by weakening the popular base of insurgents, aid contributes to reducing violence (e.g., Sexton, 2016; Zürcher, 2017). However, other studies⁷ have demonstrated that aid increased violence. For example, some findings have suggested that humanitarian aid flows may threaten rebel authority, and incentivize insurgent violence, in particular if rebels believe that aid intended to provide relief to citizens would help the government or counterinsurgents to consolidate control in the recipient country's areas (e.g., Wood and Molfino, 2016; Wood and Sullivan, 2015). Specifically, Wood and Sullivan (2015) have provided strong empirical evidence that humanitarian aid leads to increased rebel violence, but less empirical support that aid affects state violence. According to Narang (2015), humanitarian aid increases the chances of civil wars to be prolonged because it alters the relative valuations of the strength of the government versus rebels, and hence affects the set of bargains entertained by the government and rebels. Zürcher (2017) has provided a literature review on 19 studies concerning the effect of aid on violence in countries affected by civil war, although the studies reviewed, focused, *inter alia*, on humanitarian aid and aid provided by military commanders in Iraq and Afghanistan. It appeared that aid in conflict zones tended to exacerbate than to dampen violence. Aid could dampen violence when the implementation of aid projects is conditional on a relatively secure environment. In contrast, if aid is misappropriated by violent actors, or if violent actors sabotage aid projects with a view to disrupting the cooperation between the local population and the government, then aid increases violence. Against this backdrop, we can infer that humanitarian aid flows (as part of Non-AfT flows) might not necessarily contribute to enhancing productive capacities in recipient countries.

The Physical Infrastructure Channel

The effect of AfT flows on productive capacities can be straightforward, not only because in contrast with Non-AfT flows, these types of aid flows are unlikely to be fungible (as they directly target projects) (e.g., Bearce et al., 2013) but also because there is a strong matching between the majority of the components of AfT flows and some components of productive capacities.

First, it is natural to expect that AfT for economic infrastructure (i.e., for transport and storage, communications, and energy generation and supply) would lead to greater energy infrastructure, transport infrastructure and ICT development in recipient countries. For example, Gnanngnon (2019b) has obtained that higher AfT inflows dedicated to ICT development in recipient countries have resulted in a greater internet penetration rate in these

⁷ Findley (2018) has provided a survey of key theoretical arguments underpinning the connection of aid to the onset, dynamics, and recurrence of civil wars.

countries. Likewise, AfT for building productive capacity (here in a narrow sense) aims to build the supply-side capacities of recipient-countries, including their capacity to supply goods and services that would be competitive in the international markets. Thus, by targeting banking and financial services, business and other services, agriculture, forestry, fishing, industry, mineral resources and mining, and tourism, this type of AfT flows can contribute to strengthening productive capacities in recipient countries. Furthermore, both AfT for economic infrastructure and AfT for productive capacities, along with AfT related to trade policy and regulation, are all associated with greater trade policy liberalization (Gnanngnon, 2018). As trade openness (or trade policy liberalization) may promote innovation (e.g., Aghion et al., 1997, 2005) and facilitate the diffusion of knowledge (e.g., Grossman and Helpman, 2015), it can indirectly contribute to bolstering productive capacities. Overall, we expect that higher AfT flows would be associated with greater productive capacities.

The Institutional Quality Channel

Aid can also affect institutional quality, which is an important component of productive capacities. The literature on the effect of ODA on the institutional quality is mixed. For example, ODA contributes to the improvement of institutional quality by helping to make reforms acceptable and implementable (e.g., Freytag and Heckelman, 2012), to promoting democratization (e.g., Askarov and Doucouliagos, 2015). ODA also helps to improve economic institutions, through its positive effect on economic freedom (e.g., Dzhumashev and Hailemariam, 2021). Askarov and Doucouliagos (2015) have reported that aid exerted a positive effect on democracy, including constraints on the executive and political participation, but did not affect the overall quality of governance. On the other hand, other works have obtained a negative effect of development on institutional quality, including for example, by enhancing rent-seeking behaviour and creating moral hazard problems (e.g., Bräutigam, 2000), encouraging corruption, notably in ethnically heterogenous countries (e.g., Svensson, 2000), reducing domestic pressures for accountability (e.g., Collier and Dollar, 2004; Remmer, 2004) and worsening governance (e.g., Busse and Gröning, 2009).

However, Jones and Tarp (2016) have obtained empirical evidence that aid might not always affect adversely political institutions. Dijkstra (2018) has performed a systematic search in Web of Science, and found that there was an exaggeration of the negative effects of aid on governance. According to him, there was a more positive aggregate effect of aid on democracy, and most studies showed a positive effect of aid on political stability. Looking at the effect of AfT flows and Non-AfT flows on the regulatory quality policies, Gnanngnon (2020a) has demonstrated empirically that the cumulated amount of total ODA positively affects the quality of regulatory policies in recipient countries, but this positive effect is larger in LDCs than in non-LDCs. The cumulated amount of total AfT flows tended to be positively associated with regulatory policies quality in non-LDCs. However, for LDCs, it is rather the cumulated amount of Non-AfT flows that resulted in an improvement of regulatory policies quality. The effect of AfT flows on regulatory policies quality can particularly take place through the effect of AfT flows on recipient-countries' trade performance and foreign direct investment inflows.

In light of this discussion, we can postulate that while AfT flows can influence positively the institutional and governance quality, Non-AfT flows might not necessarily affect positively it.

The Private Sector Channel

The effect of ODA on the private sector has received scant attention in the literature. Among the few existing studies on the matter is that of Page (2012). The author has suggested that a new aid strategy should be developed to catalyse private investment in high value-added sectors. We can expect that by improving the access to the internet, AfT for information and communication technology (ICT) can help improve firm's innovation performance and facilitate the development of the private sector (Gnanngnon, 2019b). Aid to the financial sector can facilitate the development of the private sector. For example, Maruta (2019) has shown that aid to the financial sector (which is

part of total AfT flows) promoted financial development in recipient countries. However, Agapova and Vishwasrao (2020) have reported evidence that aid to the financial sector raised claims on the government sector, and exerted a negative or neutral effect on claims to the private sector. Furthermore, they have found no significant effect of this aid on liquid liabilities of the banking sector and interest rate spread between borrowing and lending rates. These show a mixed effect of aid to the financial sector on the private sector. Jia (2018) has investigated whether aggregate aid boosted or hindered entrepreneurship. The author has found that aggregate aid appeared to boost only necessity-driven early-stage entrepreneurship and benefited low-income entrepreneurs. In addition, aid to infrastructure encouraged entrepreneurship, and incentivized competition with homogeneous products. At the same time, both aggregate aid and infrastructural aid discouraged the adoption of state-of-the-art technologies, raised business failure rate and promoted necessity-driven early-stage entrepreneurial activities for females. Overall, the effects of AfT flows and Non-AfT flows, and hence, of the aggregate ODA on the private sector are a priori unknown, and are to be determined empirically.

The Structural Change Channel

Lin and Wang (2017) have contended that traditional ODA has been ineffective in addressing the bottlenecks for structural transformation. They have, then, examined South-South ODA and cooperation from the perspective of structural transformation, building on the theoretical foundation of New Structural Economics (NSE). In the same vein, Kim (2017) has called on the international community to address the failure of developing countries over the last decades by going beyond ODA, and improving development cooperation for structural transformation from the NSE perspectives, particularly in sub-Saharan African countries. Gnanngnon (2020b) has found empirically that higher AfT flows induce a greater extent of structural change in production in countries that implemented the Comparative Advantage Following (CAF) development strategy. Thus, we may not necessarily expect that total ODA, including Non-AfT flows, would induce a greater extent of structural change in production in developing countries. Concurrently, one can expect that AfT flows would promote structural change in production in countries that adopted the CAF strategy.

The Inflation Channel

Both AfT flows and Non-AfT flows are associated with lower inflation rates in recipient-countries, with this negative effect being higher for AfT flows than for Non-AfT flows in influencing the inflation rate (e.g., Gnanngnon, 2021). Thus, if both AfT flows and Non-AfT flows are associated with lower inflation rates (and therefore contribute to achieving macroeconomic stability), they can help bolster productive capacities.

The Natural Resource Channel

Finally, we need to address the question as to whether ODA may also influence productive capacities through its effect on natural resources dependence. There is a voluminous literature on whether abundance of or dependence on natural resources is associated with the resource curse⁸ or inversely, with the resource blessing (e.g., Morrison, 2012; Robinson et al., 2014; Sachs and Warner, 2001; Smith, 2015; van der Ploeg, 2011). Meanwhile, the effect of ODA on natural resources has received a little attention in the literature, even though some parallels had been made between the literatures on foreign aid and the resource curse, including the possible resource curse that aid could generate through its negative effect on the institutional quality (see Kolstad et al., 2009 for a literature review on this matter). Nevertheless, we may expect that a high dependence on natural resources would result in greater

⁸The resource curse refers to the situation whereby countries with high levels of natural resources tend to have worse economic and political outcomes.

productive capacities if the revenue extracted from the sale of natural resources were invested in factors that helped improve productive capacities. Otherwise, natural resources would lead to lower productive capacities. Ravetti et al. (2018) have shown theoretically and empirically that aid provided to dictators based on their resource wealth had increased political disincentives for long term investment, and encouraged the looting of the country. Such aid is detrimental to productive capacities.

Petroleum-related aid is a component of ODA that can matter for productive capacities. Petroleum-related aid refers to activities (essentially related to the enhancement of the capacity of the government and civil service staff in recipient-countries) that purport to improve the development impact of petroleum resources (oil and gas) on the recipient economies (Kolstad et al., 2009). A strand of the literature has looked at the effect of petroleum-related aid on development in resource-rich developing countries, and pointed to the lack of governance in these countries (e.g., Ekern, 2005; Kolstad et al., 2009). Specifically, Kolstad et al. (2009) have argued that petroleum-related aid programmes would have a significant impact on development in oil-rich countries if their activities aimed to develop or improve the right kind of institutions in these countries. This is because the priorities of petroleum-related aid programmes tended to prevent the institutional changes needed to lift the curse from taking place. It follows that at best, petroleum-related aid would exert a little change in the institutional quality, and might, therefore, not be helpful in improving productive capacities in recipient-countries, unless steps were taken to significantly improve its positive effect on the institutional quality in recipient-countries. Against this backdrop, we can be tempted to argue that while AfT flows are likely to enhance productive capacities, this may not be necessarily the case for Non-AfT flows. Therefore, the net effects of both AfT flows and Non-AfT flows, and hence of aggregate ODA flows are to be determined empirically.

EMPIRICAL STRATEGY

This section first presents the model specification (sub-section 1); it then discusses the theoretical effects of control variables (sub-section 2). Third, it examines, through graphical analyses, the behaviour of key variables of interest in the analysis, namely aid variables and the indicator of the overall productive capacities (sub-section 3). Finally, it presents the econometric approach used to perform the analysis, and briefly presents the way the empirical analysis is to be conducted (sub-section 4).

Model Specification

In the absence of a theoretical model on the macroeconomic determinants of productive capacities, we adopt a pragmatic approach by postulating a model specification, which links the index of productive capacities to a set of macroeconomic factors, including real per capita income (which is a raw proxy for countries' level of development), trade openness, financial openness, and total public revenue (excluding grants and social contributions), expressed in percentage of gross domestic product (GDP).

Model (1) takes the following form:

$$PCI_{it} = \beta_1 PCI_{it-1} + \beta_2 AID_{it} + \beta_3 \text{Log}(GDPC)_{it} + \beta_4 OPEN_{it} + \beta_5 FINPOL_{it} + \beta_6 TOTREV_{it} + \mu_i + \gamma_t + \omega_{it} \quad (1)$$

The variable “PCI” is the index of the overall productive capacities, and the variable “AID” represents the ODA. It can be the real gross disbursements of total ODA, expressed in constant prices 2018, \$US, and denoted “ODA”, or its two major components considered in the analysis. These two components are the total real gross disbursements of Aid for Trade, denoted “AfTTOT”, and the other ODA flows, i.e., non-trade related ODA (Non-AfT flows),

denoted “Non-AfTTOT”. In light of the theoretical discussion in Section 2, and given the direct link between the majority of the components of total AfT flows and some components of the overall productive capacities, we also investigate how each of the three components of total AfT flows influences the build-up of productive capacities. These three components of total AfT flows are the real gross disbursement of AfT allocated for building economic infrastructure, denoted “AfTINFRA”, the real gross disbursement of AfT for building productive capacities, denoted “AfTPROD”, and the real gross disbursement of Aid allocated for trade policies and regulation, denoted “AfTPOL”. Note that the two major components of ODA, and the three components of total AfT flows are all expressed in constant 2018 US Dollar prices. The vector of control variables include the real per capita income (“GDPC”), trade openness (“OPEN”), financial openness (“FINPOL”), and total public revenue in percentage of GDP (“TOTREV”).

The lagged dependent variable has been introduced as a regressor in model (1) in order to account for the inertia in (i.e., the state dependence of) productive capacities.

i and t are the subscripts respectively for a country, and the time-period. Building on the available data, we construct a panel dataset containing 111 countries over the period 2002–2018. To reduce the effect of business cycles on variables in model (1), we use non-overlapping sub-periods of 3-year intervals, which are 2002–2004; 2005–2007; 2008–2010; 2011–2013; 2014–2016; and 2017–2018 (this last sub-period covers 2 years).

Appendix 1 shows the description and source of all variables contained in model (1). Appendix 2 reports descriptive statistics on these variables, and the list of countries contained in the full sample is provided in Appendix 3.

β_1 to β_6 are regressions’ coefficients that will be estimated. μ_i are countries’ specific effects and γ_t are time dummies representing global shocks that impact simultaneously all countries’ level of productive capacities. ω_{it} stands for random error terms.

Section 2 already discussed the theoretical effect of ODA on productive capacities. We provide here a theoretical discussion on the effect of control variables included in model (1) on productive capacities.

DISCUSSION ON THE THEORETICAL EFFECT OF CONTROL VARIABLES ON PRODUCTIVE CAPACITIES

It is highly likely that advanced developing countries (i.e., those with a high real per capita income) are likely to enjoy a higher level of productive capacities than relatively less advanced countries, including poor countries. This is because countries with a higher real per capita income are likely to have a higher degree of economic sophistication than relatively less advanced countries (e.g., Cristelli et al., 2015; Hausmann and Hidalgo, 2011, 2014; Lall et al., 2006), with such sophistication reflecting a greater degree of productive capacities. We expect the real per capita income to be positively associated with productive capacities.

As countries’ public revenue resources represents an important and stable source for financing the supply of public goods and services (e.g., Anderson and Martin, 2011; Ballard and Fullerton, 1992; Jacobs, 2018; Roberts, 1987), we expect higher public revenue to be associated with a higher level of productive capacities.

As for the trade and financial openness variables, discussing their effect on productive capacities implies taking-up how each of these policies can affect each of the eight components of productive capacities, namely, human capital; physical capital (energy infrastructure; transport infrastructure; information and communication technology, i.e., ICT); institutions; private sector; structural change in production, and natural resources (UNCTAD, 2020).

Effect of Trade Openness on Productive Capacities

We discuss here the effect of trade openness on each component of the overall productive capacities. We control for trade openness in model (1) because many papers have shown that trade openness could matter for each of the eight components of the overall productive capacities, as outlined in the following section.

Effect of Trade Openness on Human Capital

According to Ranjan (2001), trade liberalization can positively or negatively influence human capital depending on several factors, including how it affects the incentives to accumulate human capital, the borrowing constraints facing the accumulation of human capital, and the distribution of income and wealth. Balamoune-Lutz and Boko (2012) have reported a positive effect of trade openness on adult literacy, while Li et al. (2019) have obtained a negative effect of trade liberalization on several aspects of human capital formation in the long term, including completed years of schooling, cognitive abilities, wage, and noncognitive outcomes. They have explained these findings by the fact that trade liberalization leads to an expansion of job opportunities in sectors that are relatively low-skilled and labour-intensive. Hence, the effect of trade openness on human capital (which is one component of productive capacities) is mixed.

Effect of Trade Openness on Institutions

Święcki (2017) and Uy et al. (2013) have demonstrated that international trade can be a key driver of structural transformation, but its effect can depend on the country's level of openness. According to Levchenko (2017), country-specific circumstances matter significantly for the effect of trade openness on institutions. In particular, the effect of trade openness on institutional change depends on how it influences the distribution of economic resources in society as well as the distribution of political power. For example, opening an economy to international trade when rent seekers are in power can result in a strong rent-seeking behaviour and the deterioration of institutional quality. In contrast, institutional quality improves when trade openness occurs in the presence of productive agents in power (e.g., Stefanadis, 2010).

Effect of Trade Openness on Structural Change

Trade openness provides the opportunity for improving firms' innovation performance (e.g., Aghion et al., 2005), including by facilitating knowledge diffusion (e.g., Grossman and Helpman, 2015) and promoting technology transfer (e.g., Baldwin et al., 2005; Coelli et al., 2022). Trade openness can positively or negatively affect structural change in production depending on whether it results in the shift of labour resources from low-productivity activities to high productivity activities that are more likely to generate higher output and employment (e.g., McMillan et al., 2014; van Neuss, 2019). For example, if trade openness generates an increase in production and exports of low value-added goods and services, then it will not lead to a greater extent of structural change. However, greater trade openness can promote structural change if it facilitates the expansion of the manufacturing and services sectors (e.g., Dabla-Norris et al., 2013; Martins, 2018). The theoretical model developed by Święcki (2017) has shown, *inter alia*, that openness to international trade does not have a systematic impact on the relocation of labour, and hence on structural change in production. Teignier (2018) has demonstrated that promoting trade in agricultural goods, in particular the import of food needs, can help overcome the low productivity observed in the agricultural sector in many developing countries, and hence foster structural transformation in these countries. Overall, the effect of trade openness on productive capacities through structural change is *a priori* unknown.

Effect of Trade Openness on Private Sector

Trade openness can also be an important tool for developing the private sector. According to the World Bank (2006), the removal of trade barriers is essential for the promotion of businesses. Grossman (1983) has argued that by enhancing international competition, greater trade openness might discourage the formation of a local entrepreneurial class in less developed countries. He has shown theoretically that free trade shrinks the entrepreneurial class compared to the first-best optimal case where efficient risk-sharing institutions (such as stock markets) are present. He has, nevertheless, noted that while protectionism can increase the number of

entrepreneurs, it will have adverse welfare effects. Norbäck et al. (2014) have shown theoretically and empirically that international market integration reduces barriers to entry for new entrepreneurs, and encourages the implementation of pro-entrepreneurial policies. In contrast, Congregado et al. (2014) have reported that greater trade openness reduces the probability of becoming entrepreneur across the EU-15 countries. Asongu and Nwachukwu (2018) have found that ICT development acts in complementary way with trade openness to ameliorate the conditions for entrepreneurship in SSA countries. Trade openness can, therefore, help to foster productive capacities through its positive effect on the development of the private sector.

Effect of Trade Openness on Natural Resources

The natural resources effect of trade openness has received an attention in the literature. For example, WTO (2010) has discussed extensively the link between trade and natural resources. Some recent studies have pointed out that trade openness is associated with the increase in deforestation in non-OECD countries, but with a slowdown of deforestation in OECD countries (e.g., Tsurumi and Managi, 2014). In this scenario, trade openness may result in lower productive capacities through its adverse effect on natural resources in developing countries.

Effect of Trade Openness on Physical Capital (Energy Infrastructure, Transport Infrastructure and ICT)

Trade openness can facilitate the importation of intermediary inputs needed to develop hard infrastructure. Similarly, market access in ICT goods facilitates digital trade (e.g., López González and Ferencz, 2018). Trade openness is an important channel for the diffusion of new technology (e.g., Auboin et al., 2021; Perkins and Neumayer, 2005; Yartey, 2008; Zhang and Duan, 2020).

Summing-up the discussion under this sub-section, and taking into account the possibility that trade openness can exert a positive or negative effect of each of the eight channels mentioned above on productive capacities, we could not anticipate with precision the direction of the net effect of trade openness on the overall productive capacities. The issue is therefore essentially empirical.

Effect of Financial Openness on Productive Capacities

In this section, we discuss the effect of financial openness on each component of the overall productive capacities.

Effect of Financial Openness on Natural Resources

Financial openness can affect natural resources through its effect on foreign direct investment (FDI) inflows⁹, given the critical role of multinational firms in the extraction and exploitation of natural resources in developing countries. Canh et al. (2020) have obtained that higher FDI inflows are associated with lower natural resource rents. This implies that the rise in FDI inflows as an eventual outcome of financial openness policies can result in lower rents that accrue to the governments of the host countries of the multinational firms, which may limit the ability of governments to rely on natural resource revenues to develop their productive capacities despite their efforts to manage these revenues well. In fact, Ndikumana and Sarr (2019) have shown for African countries that there might exist a phenomenon of FDI-fuelled capital flight phenomenon, whereby FDI inflows can lead to capital flight from host countries of multinationals. In this scenario, financial openness is likely to negatively affect the overall productive capacities through this natural resource channel.

Effect of Financial Openness on Human Development

FDI inflows can help to improve the human capital level (including both education and health levels) of host

⁹Studies on the effect of financial openness on FDI flows include, for example, Asiedu and Lien (2004) and Noy and Vu (2007).

countries (e.g., Kheng et al., 2017; Nagel et al., 2015; Zhuang, 2017). One reason for this is that multinationals usually standardize their operations throughout the world and educate workers in host countries on the basis of their own skill standards. For example, Nagel et al. (2015) have found that the effect of FDI inflows on health is positive for low-income countries, but it decreases as the level of countries' income rises, and turns out to be negative for high-income countries. Zhuang (2017) has provided evidence that an increase in multinationals firms' presence in a country tends to lead to an improvement in secondary schooling, but negatively affects tertiary schooling. However, for East Asian countries, FDI originating in OECD countries promotes both secondary and tertiary schooling. Against this background, the direction of the effect of financial openness on productive capacities through human capital is a priori unknown.

Effect of Financial Openness on the Private Sector

Financial openness can affect the private sector as well. Gregory (2019) has shown that restricting financial openness (i.e., imposing capital controls) reduces entrepreneurial activity in emerging markets, but increases entrepreneurialism in developed markets. Thus, financial openness could be associated with the development of productive capacities through its positive effect on the private sector in developing countries.

Effect of Financial Openness on Physical Infrastructure

Through its effect on FDI inflows, financial openness can influence the provision of hard infrastructure in the host countries. This is exemplified, for example, by the One Belt One Road initiative launched in 2013. While there is still a debate on the effectiveness of this initiative, including, for example, in terms of infrastructure (e.g., Mitchell and Ehizuelen, 2017), some authors such as Du and Zhang (2018) have shown that this initiative has led to an increase in China's outward investment, including in Central and West Asia, Western Europe and Russia. This study also shows that China's state-controlled cross-border acquirers have a leading role in infrastructure sectors, while China's non-state-controlled acquirers are active in non-infrastructure sectors. We, therefore, expect that financial openness can contribute to improving hard infrastructure as well as ICT, and hence productive capacities.

Effect of Financial Openness on Institutions

Goldberg (2004) has argued that when FDI flows are sourced from countries with well-regulated and well supervised financial sector, they tend to improve the institutional quality in emerging markets. Along the same lines, Prasad and Rajan (2008) have noted that greater openness to financial flows can help a country to upgrade its institutions so as to take full advantage from this openness. This positive institutional effect of financial openness works through the higher competition faced by the country's financial sector, which contributes to enhancing domestic corporate governance, and imposing discipline on macroeconomic policies and, more generally, the government (see Prasad and Rajan, 2008: 152). Fon et al. (2021) have explored the effect of FDI flows on institutional quality in African countries by disentangling investments from developed and developing economies. They have observed that bilateral greenfield FDI flows exert no significant effect on the institutional quality in host countries. However, aggregate FDI flows from developed and developing economies positively influence the host country's institutional quality, although the impact varies across time. Specifically, there is no significant effect of FDI flows from China on the institutional quality of the host country. Against this backdrop, the direction of the effect of financial openness on the overall productive capacities through the avenue of institutional quality is a priori indetermined.

Effect of financial openness on structural change

Karimu (2019) has argued that greater openness to financial flows can contribute to structural transformation

through its positive effect on efficiency, competitiveness and diversification, wealth and job creation, income gains, as well as changes in factor income shares. However, there might be a negative effect of capital account openness on structural transformation because greater financial openness can lead to a deterioration of domestic labour conditions, and hence reduce the labour share of income, including the contribution of labour to aggregate production (e.g., Lee and Jayadev, 2005; Rodrik, 1997). Rodrik (1997) has argued that a sector featured by a low marginal productivity of workers and high capital shares may experience a reallocation of labour away from that sector.

Overall, the discussion under this sub-section does not allow anticipating the direction of the effect of financial openness on overall productive capacities, as this effect could be ultimately positive or negative. This, therefore, suggests that the direction of this effect would be determined only empirically.

Data Analysis

This sub-section analyses the developments of aid variables (i.e., total ODA, and its two components, i.e., total AfT flows and total Non-AfT flows) and the index of overall productive capacities, over the full sample, and then sub-samples of LDCs and Non-LDCs. Note that the choice of splitting the full sample into sub-samples LDCs and Non-LDCs is dictated by the fact the international discourse concerning the strengthening of productive capacities on the one hand (UNCTAD, 2006, 2020) and on the other hand, the supply of ODA, notably AfT flows (e.g., WTO, 2005) have usually targeted LDCs among developing countries.

The graphical analysis has been performed using non-overlapping sub-periods of 3-year intervals. Figures 1 to 3 show the evolution of aid variables and the index of the overall productive capacities, respectively over the full sample, and the sub-samples of LDCs and Non-LDCs. The three figures also contain a graph presenting the development of the share of total AfT flows in total ODA over the time.

Figures 4 and 5 display graphs that show how aid variables and the index of productive capacities are correlated respectively over the full sample, and the sub-samples LDCs and Non-LDCs.

Figures 1 to 3 show that total Non-AfT flows are always higher than total AfT flows. This suggests that in the envelope of total ODA, donors tend to allocate higher amounts of Non-AfT flows than AfT flows. This is exemplified by the share of total AfT flows in total ODA, which is lower than 50%, though it moved steadily upward from 14.24% in 2002-2004 to 28.5% in 2017-2018. Additionally, total ODA flows and Non-AfT flows tend to move in tandem in Figures 1 to 3.

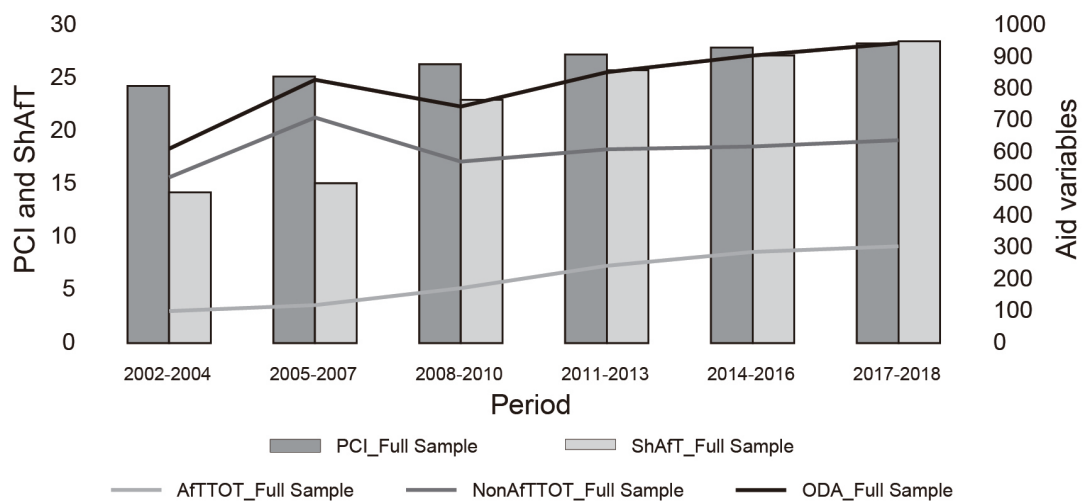


Fig. 1. Development aid variables and productive capacities_Over the full sample

Note: The Aid variables are gross disbursements of aid expressed in million US\$, Constant 2018 Prices. The variable "ShAFT" is the share (%) of gross disbursements of total AfT flows in gross disbursements of total ODA, both aid variables being expressed in US\$, Constant 2018 Prices.

Figure 1 indicates that on average over the full sample, total ODA flows rose from US\$ million 612.3 in 2002-2004 to US\$ million 829.77 in 2005-2007, and subsequently declined to reach US\$ million 744.7 in 2008-2010. It then steadily increased to reach US\$ million 944.05 in 2017-2018. The development of Non-AfT flows over time in the full sample is similar to that of total ODA flows, rising from US\$ million 522.5 in 2002-2004 to US\$ million 638.4 in 2017-2018. Over the full sample, AfT flows exhibited an upward trend from US\$ million 101.09 in 2002-2004 to US\$ million 305.44 in 2017-2018.

Similar developments concerning the aid variables have been observed over the sub-samples of LDCs and Non-LDCs, although on average, countries in both sub-samples received different amounts of aid. Specially, in LDCs, total ODA reached US\$ million 1145.66 in 2017-2018 against US\$ million 764.7 in 2002-2004 (see Figure 2), whereas for Non-LDCs, total ODA amounted to US\$ million 840.45 in 2017-2018 against US\$ million 536.13 in 2002-2004 (see Figure 3). This suggests that on average, over the period 2000-2018, LDCs tended to receive higher total ODA flows than Non-LDCs. At the same time, in LDCs, Non-AfT flows amounted to US\$ million 654.17 in 2002-2004 against US\$ million 833.785 in 2017-2018 (see Figure 2), whereas in Non-LDCs, Non-AfT flows amounted to US\$ million 453.85 in 2002-2004 against US\$ million 538.32 in 2017-2018 (see Figure 3). Thus, on average, LDCs also enjoyed higher amounts of Non-AfT flows than Non-LDCs over the period 2002-2018.

The average amount of total AfT flows that accrued to LDCs steadily increased from US\$ million 110.54 in 2002-2004 to US\$ million 311.86 in 2017-2018 (see Figure 2). For Non-LDCs, AfT flows amounted to US\$ million 302.135 in 2017-2018 against US\$ million 96.175 in 2002-2004 (see Figure 3). Thus, LDCs received, on average, higher amounts of AfT flows than Non-LDCs over the period from 2002 to 2018.

These developments in AfT flows and Non-AfT flows over time in the sub-samples of LDCs and Non-LDCs are reflected in the evolution of the share of AfT flows in total ODA in each of these sub-samples. We note that in LDCs, this share consistently increased from 12.2% in 2005-2007 to 25.5% in 2017-2018 (the value here is more than the double of that of 2005-2007), after a decline from 14.5% in 2002-2004 to 12.2% in 2005-2007 (see Figure 2). For Non-LDCs, the share of AfT flows in total ODA consistently rose from 14.11% in 2002-2004 to 30.1% in 2017-2018 (see Figure 3). Thus, while AfT flows and Non-AfT flows were higher in LDCs than in Non-LDCs, the share of AfT flows in total ODA was consistently lower in LDCs than in Non-LDCs over the period under analysis.

Meanwhile, on average, countries in the full sample experienced a steady increase in the level of productive

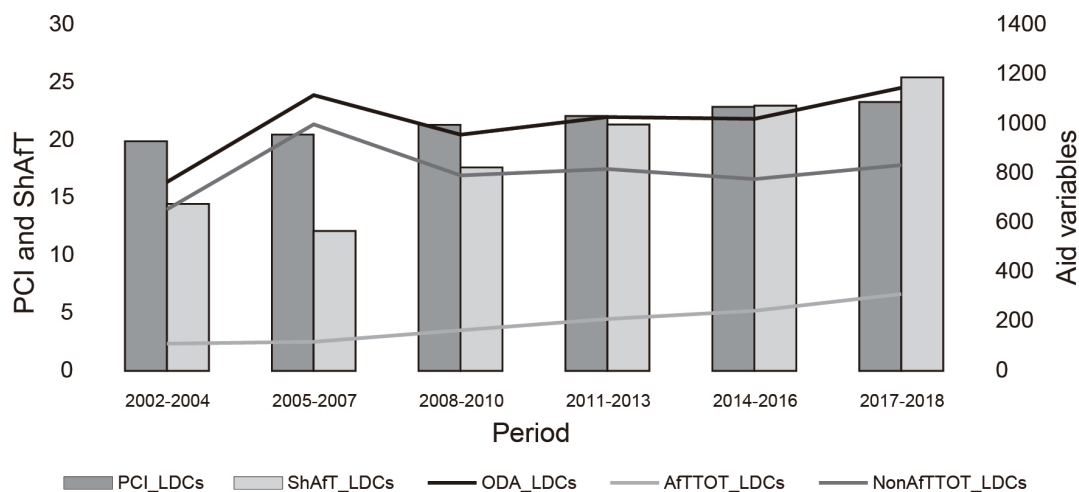


Fig. 2. Development aid variables and productive capacities_Over the sub-sample of LDCs

Note: The Aid variables are gross disbursements of aid expressed in million US\$, Constant 2018 Prices. The variable "ShAFT" is the share (%) of gross disbursements of total AfT flows in gross disbursements of total ODA, both aid variables being expressed in US\$, Constant 2018 Prices.

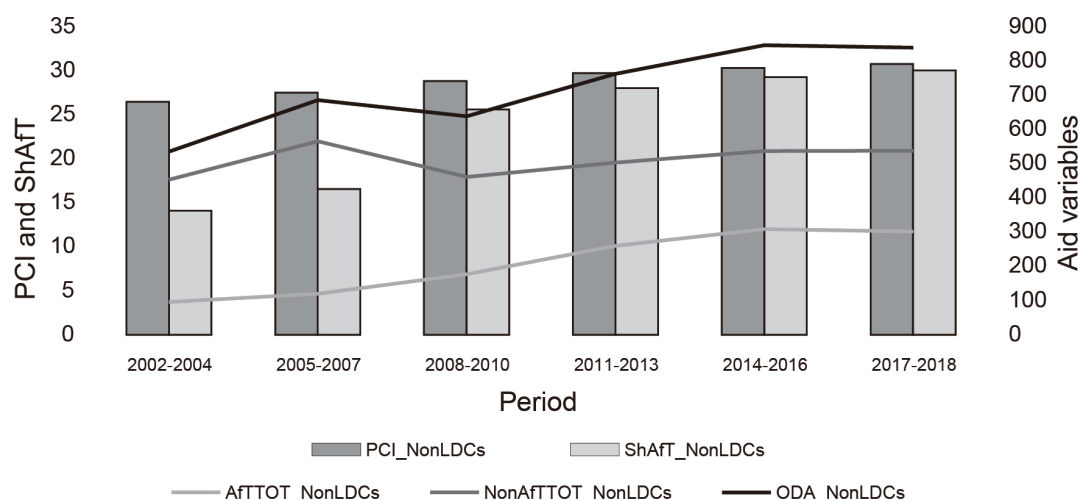


Fig. 3. Development aid variables and productive capacities_Over the sub-sample of Non-LDCs

Note: The Aid variables are gross disbursements of aid expressed in million US\$, Constant 2018 Prices. The variable "ShAFT" is the share (%) of gross disbursements of total AfT flows in gross disbursements of total ODA, both aid variables being expressed in US\$, Constant 2018 Prices.

capacities¹⁰ from 24.3 in 2002-2004 to in 28.3 2017-2018, which signifies that countries improved their productive capacities over time. Figures 2 shows similar developments of productive capacities over time, although without surprise, the level of productive capacities in LDCs was consistently lower than the levels of productive capacities in Non-LDCs (see Figure 3). In LDCs, the level of productive capacities increased from the value of 19.9 in 2002-2004 to the value of 23.3 in 2017-2018, while in Non-LDCs, it rose from 26.5 in 2002-2004 to the value of 30.8 in 2017-2018.

Figure 4 shows a negative correlation pattern between each aid variable (namely total ODA, AfT flows, and Non-AfT flows) and the index of productive capacities. This does not necessarily mean that ODA variables influence negatively (in terms of causality) productive capacities, as the estimation of model (1) that contains the ODA variable along with control variables would provide guidance on the genuine direction of the effect of ODA on productive capacities.

We note from Figure 5 that for LDCs, total ODA is negatively correlated with the overall productive capacities, but this correlation pattern reflects a positive correlation between total AfT flows and productive capacities, and a negative correlation between Non-AfT flows and productive capacities. For Non-LDCs, we find a negative correlation pattern between total ODA and productive capacities. While for this sub-sample, Non-AfT flows are negatively correlated with productive capacities, the correlation pattern between AfT flows and productive capacities is unclear.

Econometric Approach

The preferred estimator in the empirical analysis is the two-step system generalized method of moments (GMM) estimator proposed by Blundell and Bond (1998). Employing this estimator involves estimating a system of equations that contains an equation in first-differences and an equation in the levels, where lagged first differences are used as instruments for the level equation, and lagged levels are used as instruments for the first-difference equation. The two-step system GMM technique has the advantage of addressing several endogeneity problems. One of these problems arises from the presence of the lagged dependent variable as a regressor in model (1), and concerns the correlation between this variable and countries' specific effects in the error term. This correlation

¹⁰To recall, the value of the index of productive capacities range from 0 to 100.

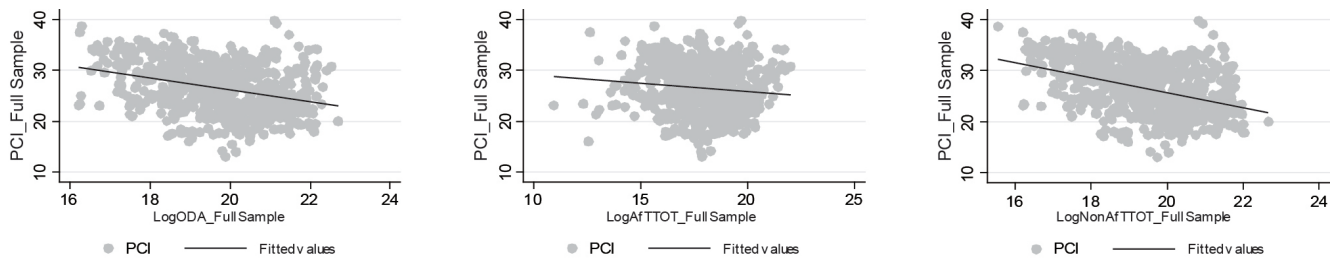


Fig. 4. Correlation patterns between development aid and productive capacity_over the full sample
Source: Author

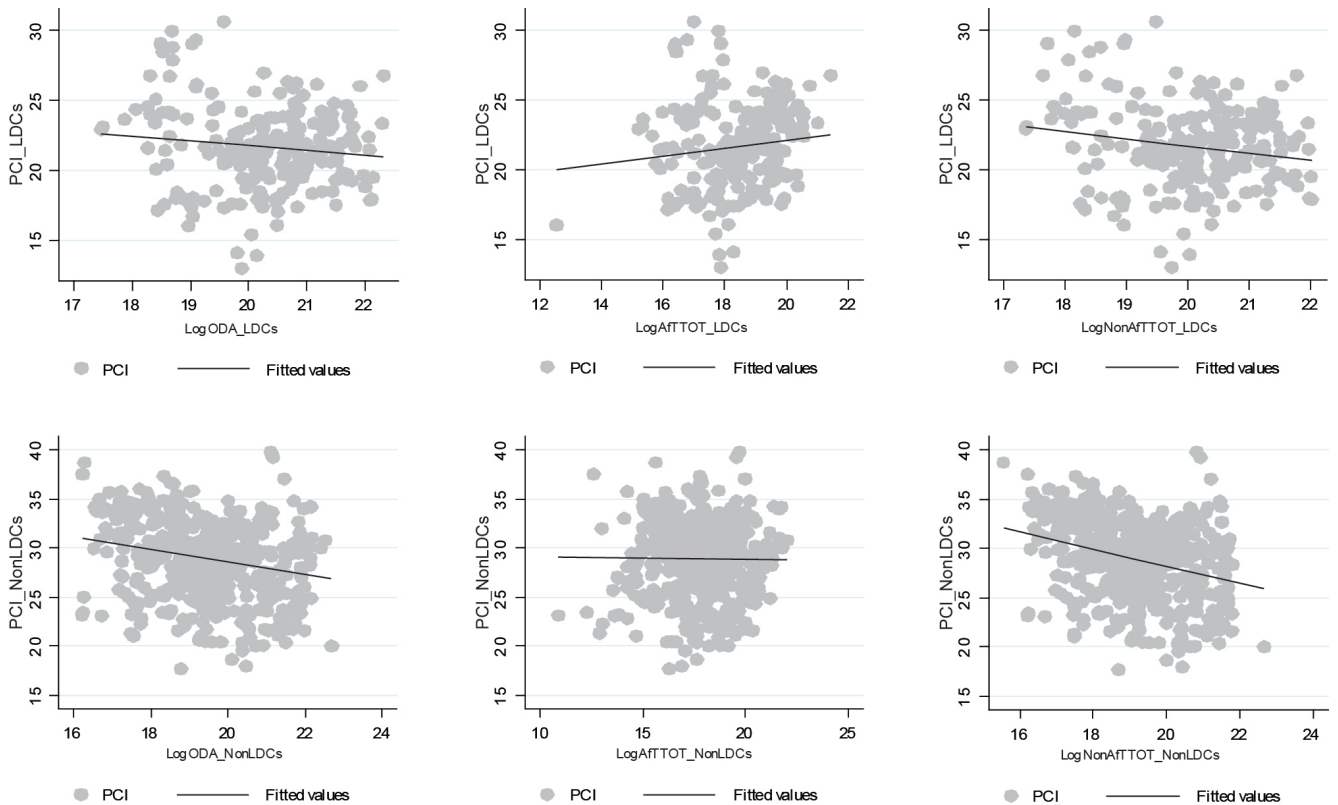


Fig. 5. Correlation patterns between development aid and productive capacities_over the sub-samples of LDCs and Non-LDCs
Source: Author

generates inconsistent estimates when model (1) is estimated using standard economic approaches such as the ordinary least squares or the within fixed effects estimators. This bias, referred to as the Nickell bias, is particularly severe in dynamic panel datasets with a large cross-sectional dimension and small-time dimension (Nickell, 1981). Another problem can stem from measurement errors, omitted variables biases, and reverse causality from the dependent variable to regressor(s).

In the present study, the two-step system GMM estimator helps address at least two main endogeneity problems. The first one is the Nickell bias, given that the time dimension of our panel dataset is short (i.e., 6 years) with a cross-section dimension of 111 countries. The second endogeneity concern stems from the reverse causality from the dependent variable to each regressor in model (1). It is arguable that countries with a low level of the overall productive capacities will likely receive higher amounts of ODA from donor-countries that would be willing to help them improve their productive capacities. It also seems straightforward that countries with a low level of overall productive capacities would make efforts to raise public revenue and increase the level of trade and financial

openness if they realized that both types of openness were beneficial to their economies. Similarly, one could anticipate that greater productive capacities would be associated with a rise in the real per capita income, insofar as the level of the development of productive capacities reflects the sophistication level of the economy concerned. For these reasons, we treat all regressors in model (1) as endogenous.

The validity of the two-step system GMM estimator is evaluated using three tests, including the AR(1) test, which is the Arellano-Bond test of the presence of first-order serial correlation in the residuals of the equations in level; the AR(2) test, which is the Arellano-Bond test of no second-order autocorrelation in the residual of the differenced equation; and the Sargan-Hansen test of over-identifying restrictions (OID). The null hypothesis of the latter test is the joint validity of the instruments used in the system of equations. The two-step system GMM estimator is valid for conducting the empirical analysis if we do not reject the null hypothesis of each of these tests.

To avoid over-instrumentation in the regressions (i.e., the number of instruments is lower than the number of countries in the sample), the regressions have used 3 lags of the dependent variable as instruments, and 2 lags of endogenous variables as instruments.

Even though the two-step system GMM estimator is our preferred estimator in the analysis, we aim to get a first insight into the effect of ODA on productive capacities by estimating the dynamic model (1) using standard estimators, namely the within/fixed effects estimator¹¹ (denoted “FE”) and the feasible generalized least squares (FGLS) estimator. The results obtained from the estimation of this static version of model (1) using the FE and FGLS estimators are displayed in Table 1. In this model specification, the variable “AID” is measured by total ODA as well as its two major components, each introduced once in the regressions. Note that to mitigate the endogeneity issue that could stem from the bi-directional causality between the index of productive capacities and the regressors in model (1), we have considered all regressors with a one-period lag. This means that we will be empirically assessing the effect of each regressor (including the total ODA, and its two major components considered in the present study) in period $t-1$ on productive capacities in period t . Notwithstanding the fact that the use of the one-period lag of the regressors in model (1) to mitigate endogeneity concerns related to the reverse causality problem may help to reduce the biases in the estimates obtained by means of the FE and FGLS estimators, these estimates may still be biased due to the presence of the lagged dependent variable as a regressor in model (1). This is why the two-step system GMM estimator could be suitable to address the endogeneity problems raised above.

Results in Tables 2 and 3 are obtained from the estimation of the dynamic model (1) (as presented) or its variants using the two-step system GMM estimator. Note that when performing the regressions, it appeared that the use of only the one-period lag of the dependent variable as a regressor was not sufficient to meet the requirements of the two-step system GMM estimator, whereas with the two lags of the dependent variable, these conditions were met. Therefore, we introduce a one-period lag and a two-period lag of the dependent variable as regressors in the dynamic model (1).

The outcomes reported in Table 2 are obtained from the estimation of model (1) specification where the variable “AID” is alternatively measured by total ODA, total AfT flows, and Non-AfT flows, as well as each of the three components of total AfT flows.

The results in Table 3 allow assessing the effect of ODA (both total ODA, and each of its two major components) on productive capacities in LDCs versus Non-LDCs. These outcomes are obtained by estimating several variants of model (1) that include the dummy variable “LDC” (which takes 1 for LDCs, and 0, otherwise) as well as its interaction with each aid variable considered here.

¹¹ Note that the standard errors arising from the estimation based on the within fixed effects estimator are corrected using the Driscoll and Kraay (1998) technique.

INTERPRETATION OF EMPIRICAL OUTCOMES

We note from all columns of Table 1 that the coefficients of the lagged dependent variable are significant at least at the 5% level, and these findings suggest the existence of inertia in countries' level of overall productive capacities. In particular, a rise in productive capacities in period $t-1$ leads to an increase in productive capacities in period t , while greater productive capacities in period $t-2$ leads to lower levels of productive capacities in period t . For regressions based on the FE estimator, we find no significant effect of ODA and its two components on productive capacities in recipient countries at the 5% level: both total ODA and AfT flows do not significantly affect the overall productive capacities at the conventional significance levels, while Non-AfT flows appear to be negatively associated with productive capacities, but only at the 10% level. The high level of the Within R-squared in columns [1] to [3] of Table 1 show that the regressors included in model (1) explain to a large extent (at least at 82%) the dynamics of the indicator of the overall productive capacities.

For results based on the FGLS approach, we obtain a positive and significant effect (at the 1% level) of each of the

Table 1. Effect of development aid on productive capacity
Estimators: FEDK and FGLS

Variables	FEDK			FGLS		
	PCI	PCI	PCI	PCI	PCI	PCI
	(1)	(2)	(3)	(4)	(5)	(6)
PCI_{t-1}	0.749*** (0.109)	0.752*** (0.109)	0.751*** (0.109)	1.258*** (0.0245)	1.276*** (0.0214)	1.261*** (0.0249)
PCI_{t-2}	-0.176** (0.0821)	-0.173** (0.0815)	-0.174** (0.0800)	-0.283*** (0.0262)	-0.306*** (0.0228)	-0.284*** (0.0267)
$\text{Log}(\text{ODA})_{t-1}$	0.0653 (0.0454)			0.0825*** (0.0114)		
$\text{Log}(\text{AfTTOT})_{t-1}$		-0.0198 (0.0258)			0.0559*** (0.00741)	
$\text{Log}(\text{Non-AfTTOT})_{t-1}$			0.0973* (0.0549)			0.0856*** (0.0120)
$\text{Log}(\text{GDPC})_{t-1}$	1.621*** (0.352)	1.637*** (0.354)	1.629*** (0.350)	0.188*** (0.0193)	0.174*** (0.0186)	0.186*** (0.0193)
OPEN_{t-1}	-0.0622 (0.0739)	-0.0431 (0.0792)	-0.0622 (0.0699)	0.207*** (0.0431)	0.190*** (0.0397)	0.205*** (0.0433)
FINPOL_{t-1}	0.0612 (0.107)	0.0457 (0.111)	0.0593 (0.103)	0.122** (0.0516)	0.136*** (0.0506)	0.121** (0.0516)
TOTREV_{t-1}	1.203* (0.629)	1.426*** (0.472)	1.164* (0.647)	-1.041*** (0.181)	-0.985*** (0.147)	-1.021*** (0.186)
Constant	-2.117 (1.507)	-0.787 (1.464)	-2.883 (1.791)	-1.517*** (0.310)	-0.678*** (0.195)	-1.598*** (0.323)
Observations - Countries	413 - 111	413 - 111	413 - 111	411 - 109	411 - 109	411 - 109
Within R-squared	0.8205	0.8201	0.8212			
Pseudo R-squared				0.97	0.97	0.98

Note: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Robust Standard Errors are in parenthesis. The Pseudo R2 has been calculated for FGLS-based regressions, as the correlation coefficient between the dependent variable and its predicted values.

Table 2. Effect of development aid on productive capacity
 Estimators: Two-Step System GMM

Variables	PCI	PCI	PCI	PCI	PCI	PCI
	(1)	(2)	(3)	(4)	(5)	(6)
PCIt-1	1.171*** (0.0408)	1.149*** (0.0418)	1.177*** (0.0410)	1.155*** (0.0421)	1.102*** (0.0414)	1.140*** (0.0418)
PCIt-2	-0.211*** (0.0341)	-0.227*** (0.0346)	-0.207*** (0.0347)	-0.247*** (0.0352)	-0.174*** (0.0367)	-0.196*** (0.0396)
Log (ODA)	0.169*** (0.0632)					
Log (AfTTOT)		0.173*** (0.0364)				
Log (Non-AfTTOT)			0.159** (0.0672)			
Log (AfTINFRA)				0.129*** (0.0297)		
Log (AfTPROD)					0.171*** (0.0463)	
Log (AfTPOL)						0.0701*** (0.0223)
Log (GDPC)	0.173* (0.0966)	0.286*** (0.109)	0.121 (0.0927)	0.339*** (0.106)	0.279*** (0.0927)	0.166* (0.0953)
OPEN	-0.264 (0.271)	-0.188 (0.256)	-0.350 (0.272)	-0.252 (0.257)	-0.0355 (0.261)	-0.0431 (0.231)
FINPOL	1.364*** (0.226)	0.988*** (0.222)	1.378*** (0.225)	0.719*** (0.203)	1.258*** (0.206)	1.001*** (0.186)
TOTREV	2.404*** (0.599)	1.839** (0.718)	2.996*** (0.605)	1.630** (0.651)	2.254*** (0.653)	2.009*** (0.746)
Constant	-3.855** (1.640)	-3.565*** (1.020)	-3.728** (1.726)	-2.532*** (0.845)	-3.761*** (1.112)	-1.125** (0.542)
Observations - Countries	397 - 111	397 - 111	397 - 111	397 - 111	397 - 111	393 - 111
Number of Instruments	51	51	51	51	51	51
AR1 (P-Value)	0.0002	0.0002	0.0002	0.0002	0.0003	0.0007
AR2 (P-Value)	0.6840	0.6270	0.7229	0.4922	0.7109	0.6672
OID (P-Value)	0.4478	0.3344	0.4944	0.2710	0.4184	0.5502

Note: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Robust standard errors are in parenthesis. The aid variables and the variables "TOTREV", "OPEN", "FINPOL" and "GDPC" have been treated as endogenous. Time dummies have been included in the regressions. The latter have used a maximum of 3 lags of the dependent variable as instruments, and 2 lags of endogenous variables as instruments. The one-period lag and the two-period lag of the dependent variable are used here because with only the one period lag of the dependent variable, the conditions for the validity of the two-step system GMM approach are not met.

Table 3. Effect of development aid on productive capacity across sub-samples, as well as countries in the full sample
Estimators: Two-Step System GMM

Variables	PCI	PCI	PCI
	(1)	(2)	(3)
PCI _{t-1}	1.096*** (0.0435)	1.133*** (0.0426)	1.068*** (0.0434)
PCI _{t-2}	-0.166*** (0.0352)	-0.191*** (0.0348)	-0.144*** (0.0349)
Log (ODA)	0.0521 (0.0634)		
[Log (ODA)]*LDC	0.446*** (0.120)		
Log (AfTTOT)		0.111*** (0.0306)	
[Log (AfTTOT)]*LDC		0.217*** (0.0750)	
Log (Non-AfTTOT)			0.0670 (0.0683)
[Log (Non-AfTTOT)]*LDC			0.499*** (0.128)
LDC	-9.274*** (2.473)	-3.786*** (1.451)	-10.36*** (2.622)
Log(GDPC)	0.155 (0.134)	0.292*** (0.0988)	0.166 (0.127)
OPEN	-0.222 (0.266)	-0.315 (0.238)	-0.145 (0.275)
FINPOL	0.905*** (0.227)	0.915*** (0.182)	1.063*** (0.241)
TOTREV	2.705*** (0.676)	1.733*** (0.657)	2.805*** (0.622)
Constant	-0.361 (1.925)	-2.683*** (0.956)	-0.862 (2.052)
Observations - Countries	397 - 111	397 - 111	397 - 111
Number of Instruments	58	58	58
AR1 (P-Value)	0.0000	0.0001	0.0000
AR2 (P-Value)	0.5818	0.5362	0.6028
OID (P-Value)	0.2612	0.4707	0.3131

Note: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Robust standard errors are in parenthesis. The aid variables and the variables "TOTREV", "OPEN", "FINPOL", "GDPC" and the interaction variables have been treated as endogenous. Time dummies have been included in the regressions. The latter have used a maximum of 3 lags of the dependent variable as instruments, and 2 lags of endogenous variables as instruments. The one-period lag and the two-period lag of the dependent variable are used here because with only the one period lag of the dependent variable, the conditions for the validity of the two-step system GMM approach are not met.

three aid variables on the overall productive capacities, although the effect of total Non-AfT flows on productive capacities is higher than that of AfT flows.

Regarding control variables, we uncover (for the regressions based on the FE estimator) that at conventional significance levels, only total public revenue and real per capita income show significant coefficients. In particular, an increase in real per capita income and higher public revenue are positively and significantly associated with overall productive capacities. However, both trade and financial openness do not significantly influence overall productive capacities. For the FGLS based regression, we find, surprisingly, that total public revenue is negatively and significantly (at the 1% level) associated with productive capacities. These outcomes may be attributed to the Nickell bias mentioned above. The coefficients of the other control variables are significant at least at the 1% level, which suggests that greater trade and financial openness and an improvement in real per capita income contribute significantly to strengthening productive capacities in developing countries.

We now turn to results in Tables 2 and 3. Estimates displayed in these two Tables confirm the state-dependent nature of the indicator of overall productive capacities. The coefficient of the one-period lag and two-period lag of the dependent variable are all significant at the 1% level. These, therefore, show the importance of considering the baseline model (1) in a dynamic form. In addition, we cannot reject the null hypothesis of each of the tests presented above for assessing the validity of the two-step system GMM estimator (see the outcomes reported at the bottom of Tables 2 and 3). Indeed, the AR(1) and AR(2) tests suggest that p-values are, respectively, lower than 0.10 at the 1% level of statistical significance, and higher than 0.10 at the 10% level of statistical significance. The over-identifying restrictions test shows a p-value higher than 0.10 at the 10% level of statistical significance. Overall, we consider that the two-step system GMM estimator is appropriate for performing the empirical analysis whose results are reported in Tables 2 and 3.

We note from all columns of Table 2 that all aid variables show positive and significant coefficients at the 1% level. This signifies that both total ODA, its two main components (i.e., total AfT flows and total Non-AfT flows), as well as each of the three components of total AfT flows contribute to fostering the overall productive capacities in the recipient-countries. In terms of the magnitude of these effects, we obtain that a 100% increase in total ODA flows (i.e., doubling the amount of total ODA flows) leads to a rise in the overall productive capacities by 0.17 point. At the same time, doubling total AfT flows and total Non-AfT flows results in a rise in the value of the index of overall productive capacities respectively by 0.173 point and 0.16 point. It, therefore, appears that total AfT flows exert a slightly higher positive effect on the overall productive capacities than total Non-AfT flows do. Among the components of total AfT flows, AfT for enhancing productive capacities appear to exert the highest positive effect on productive capacities, followed by AfT for economic infrastructure, and finally by AfT for trade policy and regulation. The magnitude of the effect¹² for each of these components of total AfT flows is 0.17, 0.13, 0.07 respectively for AfT flows for productive capacities, AfT for economic infrastructure, and AfT related to trade policy and regulation. The positive effect of AfT flows on productive capacities aligns largely with our theoretical prediction in section 2. While the expected effect of Non-AfT flows on productive capacities was not clear-cut, the empirical analysis has shown that this type of aid flows influence positively productive capacities, thereby indicating that the positive effect of Non-AfT flows on the components of productive capacities (as discussed in section 2) dominate the negative ones.

With regard to results of control variables across all columns of Table 2, we obtain that real per capita income is positively associated with productive capacities at conventional significance levels. Greater capital account liberalization and a rise in total public revenue exert a positive effect on productive capacities at the 1% level, while

¹² According to statistics reported in Appendix 2, the average of the indicator of the index of productive capacities over the full sample amounts to 27.5, while the standard deviation of this index amounts to 4.98.

trade openness is not associated significantly with productive capacities at conventional significance levels. These findings concerning the control variables are similar to the ones observed in Table 3.

Turning to the outcomes concerning the variables of interest in Table 3, we obtain from column [1] that the coefficient of the variable “ODA” is not significant at the 10% level, whereas the coefficient of the interaction between “ODA” and the “LDC” dummy is positive and significant at the 1% level. We conclude that the net effect of total ODA flows on productive capacities for LDCs amounts to 0.446, whereas there is no significant effect of total ODA on productive capacities in Non-LDCs. Estimates in column [2] of Table 3 show that the net effects of total AfT flows on productive capacities in LDCs and Non-LDCs amount respectively to 0.328 ($= 0.111 + 0.217$) and 0.111. These outcomes, therefore, indicate that total AfT flows exert a higher positive effect on productive capacities in LDCs than in Non-LDCs. At the same time, the estimates in column [3] of Table 3 indicate a positive and significant interaction term of the interaction variable, while the coefficient of the variable capturing Non-AfT flows is not significant at the 10% level. These outcomes indicate that total Non-AfT flows exert a positive and significant effect on productive capacities in LDCs (and the magnitude of this effect is given by the coefficient 0.5), while they do not significantly affect productive capacities in Non-LDCs.

To sum up the findings in columns [1] to [3], total ODA, including both AfT flows and Non-AfT flows appear to matter significantly for the strengthening of productive capacities in LDCs, whereas for Non-LDCs, only AfT flows appear to be important for the enhancement of productive capacities. Additionally, among the two main components of total ODA, AfT exerts a slightly higher positive effect on productive capacities than Non-AfT does.

CONCLUDING REMARKS

This paper has investigated the effect of development aid flows, including AfT flows and Non-AfT flows on the overall productive capacities in recipient countries. In light of the close link between components of AfT flows and some factors of the overall productive capacities, the paper has additionally examined how the components of total AfT flows influence productive capacities. The three components of total AfT flows include AfT for economic infrastructure, AfT flows for productive capacities, and AfT flows for trade policy and regulation.

The empirical analysis shows that over the full sample, total development aid as well as both total AfT flows and total Non-AfT flows exert a positive effect on productive capacities, that is, they contribute to fostering productive capacities in recipient countries. The positive effect of total development aid on productive capacities reflects the fact that total AfT flows exert a slightly higher positive effect on productive capacities than Non-AfT flows. Additionally, among these three components, AfT for enhancing productive capacities appears to exert the largest positive effect on productive capacities, followed by AfT for economic infrastructure, and AfT for trade policy and regulation. Finally, the analysis has revealed that both total development aid, including AfT flows and Non-AfT flows, matter for the development of productive capacities in LDCs, while for Non-LDCs, it is essentially AfT flows that influence significantly (yet positively) productive capacities.

These outcomes convey a key take-home message. International institutions (e.g., the UNCTAD and the WTO) and many researchers have been urging the international community, notably donor countries, to scale up their financial support to enhance productive capacities in developing countries, particularly LDCs. The rationale for this international policy discourse is that the development of productive capacities would help developing countries, notably the poorest and most vulnerable (to shocks) among them (i.e., LDCs) promote a sustainable economic growth and development, while also fostering their capacity to cope easily with shocks.

The findings of the present analysis support this policy discourse as they highlight the strong relevance of development aid and particularly AfT flows for bolstering productive capacities in developing countries, and LDCs among them. A substantial increase in these AfT flows, ideally not at the expense of Non-AfT flows, and a good

management of these financial inflows along with an improvement of recipient-countries' absorptive capacities would surely help these countries further develop their productive capacities. Similarly, increasing the amounts of Non-AfT flows that benefit particularly LDCs (for example aid for education and aid for health) could also contribute significantly to the enhancement of their productive capacities, given the weak human capital of these countries. The present analysis has not investigated how development aid affects each component of the UNCTAD's indicator of the overall productive capacities. Therefore, an avenue for future research could aim to address this topic, including using for example, a system of structural equations that involve all components of this indicator.

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REFERENCES

- Abby, R. A., & Niño-Zarazúa, M. (2016). The effectiveness of foreign aid to education. What can be learned? *International Journal of Educational Development*, 48, 23-36.
- Agapova, A., & Vishwasrao, S. (2020). Financial sector foreign aid and financial intermediation. *International Review of Financial Analysis*, 72, 101589.
- Aghion, P., Bloom, N., Blundell, R., Griffith, R., & Howitt, P. (2005). Competition and innovation: An inverted-U relationship. *The Quarterly Journal of Economics*, 120(2), 701-728.
- Aghion, P., Harris, C., & Vickers, J. (1997). Competition and growth with step-by-step innovation: An example. *European Economic Review*, 41(3-5), 771-782.
- Alonso, J. A. (2016). *Aid for trade: Building productive and trade capacities in LDCs*. New York: CDP Policy Review, United Nations Committee for Development Policy.
- Anderson, J. E., & Martin, W. (2011). Costs of taxation and benefits of public goods with multiple taxes and goods. *Journal of Public Economic Theory*, 13(2), 289-309.
- Asiedu, E., & Lien, D. (2004). Capital controls and foreign direct investment. *World Development*, 32(3), 479-490.
- Askarov, Z., & Doucouliagos, H. (2015). Aid and institutions in transition economies. *European Journal of Political Economy*, 38, 55-70.
- Asongu, S. A., & Nwachukwu, J. C. (2018). Openness, ICT and entrepreneurship in sub-Saharan Africa. *Information Technology & People*, 31(1), 278-303.
- Auboin, M., Koopman, R., & Xu, A. (2021). Trade and Innovation Policies: Coexistence and Spillovers. *Journal of Policy Modeling*, 43(4), 844-872.
- Baldwin, R. E., Braconier, H., Forslid, R. (2005). Multinationals, endogenous growth, and technological spillovers: Theory and evidence. *Review of International Economics*, 13(5), 945-963.
- Balioune-Lutz, M., & Boko, S. H. (2012). Trade, institutions, income and human development in African Countries. *Journal of African Economies*, 22(2), 323-345.
- Ballard, L., & Fullerton, D. (1992). Distortionary taxes and the provision of public goods. *Journal of Economic Perspectives*, 6(3), 117-131.
- Barrell, R., & Kirby, S. (2011). Trend output and the output gap in the UK. *National Institute Economic Review*, 215, F63-F74.
- Barrell, R., Delannoy, A., & Holland, D. (2011). Monetary policy, output growth and oil prices. *National Institute Economic Review*, 215, F37-F43.
- Bearce, D. H., Finkel, S. E., Pérez-Liñán, A. S., Rodríguez-Zepeda, J., & Surzhko-Harned, L., (2013). Has the new aid for trade agenda been export effective? Evidence on the impact of US AfT allocations 1999-2008. *International Studies Quarterly*, 57(1), 163-170.
- Birchler, K., & Michaelowa, K. (2016). Making aid work for education in developing countries: An analysis of aid effectiveness for primary education coverage and quality. *International Journal of Educational Development*, 48, 37-52.
- Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115-

143.

- Bräutigam, D. (2000). *Aid dependence and governance*. Stockholm, Sweden: Report prepared for the division for international development cooperation, ministry for foreign affairs, Sweden, Almqvist & Wiksell International.
- Busse, M., & Gröning, S. (2009). Does foreign aid improve governance? *Economics Letters*, 104(2), 76-78.
- Canh, N. P., Schinckus, C., & Thanh, S. D. (2020). The natural resources rents: Is economic complexity a solution for resource curse? *Resources Policy*, 69, 101800.
- Chinn, M. D., & Ito, H. (2006). What matters for financial development? Capital controls, institutions, and interactions. *Journal of Development Economics*, 81(1), 163-192.
- Coelli, F., Moxnes, A., & Ulltveit-Moe, K. H. (2022). Better, faster, stronger: Global innovation and trade liberalization. *The Review of Economics and Statistics*, 104(2), 205-216. https://doi.org/10.1162/rest_a_00951
- Collier, P., & Dollar, D. (2004). Development effectiveness: What have we learnt? *The Economic Journal*, 114(496), F244-F271.
- Congregado, E., Millán, J. M., & Román, C. (2014). The emergence of new entrepreneurs in Europe. *International Economics*, 138, 28-48.
- Cornia, G. A., & Scognamiglio, A. (2016). Clusters of least-developed countries, their evolution between 1993 and 2013, and policies to expand their productive capacity. *CDP Background Paper*, 33.
- Cristelli, M., Tacchella, A., Pietronero, L. (2015). The heterogeneous dynamics of economic complexity. *PloS one*, 10(2), e0117174.
- Dabla-Norris, E., Thomas, A. H., Garcia-Verdu, R., & Chen, Y. (2013). *Benchmarking structural transformation across the world*. Washington, DC: International Monetary Fund.
- Dijkstra, G. (2018). Aid and good governance: Examining aggregate unintended effects of aid. *Evaluation and Program Planning*, 68, 225-232.
- Dreher, A., Nunnenkamp, P., & Thiele, R. (2008). Does aid for education educate children? Evidence from panel data. *World Bank Economic Review*, 22(2), 291-314.
- Driscoll, J. C., & Kraay, A. C. (1998). Consistent covariance matrix estimation with spatially dependent panel data. *Review of Economics and Statistics*, 80(4), 549-560.
- Du, J., & Zhang, Y. (2018). Does one belt one road initiative promote Chinese overseas direct investment? *China Economic Review*, 47, 189-205.
- Dzhumashev, R., & Hailemariam, A. (2021). Foreign aid and the quality of economic institutions. *European Journal of Political Economy*, 68, 102001.
- Ekern, O. F. (2005). *The Norwegian assistance to the petroleum sector: a state-of-the-art study*. Oslo, Norway: Evaluation Report for NORAD.
- Findley, M. G. (2018). Does foreign aid build peace? *Annual Review of Political Science*, 21(1), 359-384.
- Fon, R. M., Filippaios, F., Stoian, C., & Lee, S. H. (2021). Does foreign direct investment promote institutional development in Africa? *International Business Review*, 30(4), 101835.
- Freytag, A., & Heckelman, J. (2012). Has assistance from USAID been successful for democratization? Evidence from the transition economies of Eastern Europe and Eurasia. *Journal of Institutional and Theoretical Economics*, 168(4), 636-657.
- Gnanangnon, S. K. (2018). Aid for trade and trade policy in recipient countries. *The International Trade Journal*, 32(5), 439-464.
- Gnanangnon, S. K. (2019a). Has the WTO's aid for trade initiative delivered on its promise of greater mobilization of development aid in favor of the trade sector in developing countries? *International Trade Journal*, 33(6), 519-541.
- Gnanangnon, S. K. (2019b). Does aid for information and communications technology help reduce the global digital divide? *Policy & Internet*, 11(3), 344-369.
- Gnanangnon, S. K. (2020a). Development aid and regulatory policies in recipient-countries: Is there a specific effect of aid for trade? *Economics Bulletin*, 40(1), 316-337.
- Gnanangnon, S. K. (2020b). Comparative advantage following (CAF) development strategy, aid for trade flows and structural change in production. *Journal of Economic Structures*, 9(1), 1-29.
- Gnanangnon, S. K. (2021). Aid for trade and inflation: Exploring the trade openness, export product diversification and foreign direct investment channels. *Australian Economic Papers*, 60(4), 563-593.
- Goldberg, L. (2004). Financial-sector foreign direct investment and host countries: New and old lessons. *Federal Reserve Bank of New York Staff Report*, 240.

- Gregory, R. P. (2019). Financial openness and entrepreneurship. *Research in International Business and Finance*, 48, 48-58.
- Grossman, G. M. (1983). International trade, foreign investment, and the formation of the entrepreneurial class. *American Economic Review*, 74(4), 605-614.
- Grossman, G. M., & Helpman, E. (2015). Globalization and growth. *American Economic Review*, 105(5), 100-104.
- Guillaumont, P. (2011). *Making development financing in LDCs more conducive to development*. Clermont-Ferrand, France: FERDI Working Papers 18, Fondation pour les Études et Recherches sur le Développement International (FERDI).
- Gyimah-Brempong, K. (2015). Do African countries get health from health aid? *Journal of African Development*, 17, 83-114.
- Hausmann, R., & Hidalgo, C. A. (2014). *The atlas of economic complexity: mapping paths to prosperity*. Cambridge, MA: MIT Press.
- Hausmann, R., Hidalgo, C. A. (2011). The network structure of economic output. *Journal of Economic Growth*, 16(4), 309-342.
- Hynes, W., & Lammersen, F. (2017). *Facilitate trade for development: Aid for trade*. Tokyo, Japan: ADBI Working Paper 670, Asian Development Bank Institute (ADBI).
- Jacobs, B. (2018). The marginal cost of public funds is one at the optimal tax system. *International Tax and Public Finance*, 25(4), 883-912.
- Jia, S. (2018). Foreign aid: Boosting or hindering entrepreneurship? *Journal of Entrepreneurship and Public Policy*, 7(3), 248-268.
- Jones, S., & Tarp, F. (2016). Does foreign aid harm political institutions? *Journal of Development Economics*, 118, 266-281.
- Kalirajan, K. P., & Salim, R. A. (1997). Economic reforms and productive capacity realisation in Bangladesh: An empirical analysis. *The Journal of Industrial Economics*, 45(4), 387-403.
- Karimu, S. (2019). *Structural transformation, openness, and productivity growth in sub-Saharan Africa*. Helsinki, Finland: United Nations University World Institute for Development Economics Research.
- Kheng, V., Sun, S., & Anwar, S. (2017). Foreign direct investment and human capital in developing countries: A panel data approach. *Economic Change and Restructuring*, 50(4), 341-365.
- Kim, Y. (2017). Going beyond aid: Development cooperation for structural transformation, *International Relations of the Asia-Pacific*, 19(1), 180-183.
- Kolstad, I., Wiig, A., & Williams, A. (2009). Mission improbable: Does petroleum-related aid address the resource curse? *Energy Policy*, 37(3), 954-965.
- Kotsadam, A., Østby, G., Rustad, S. A., Tollefsen, A. F., & Urdal, H. (2018). Development aid and infant mortality: Micro-level evidence from Nigeria. *World Development*, 105, 59-69.
- Lall, S., Weiss, J., & Zhang, J. (2006). The sophistication of exports: A new trade measure. *World Development*, 34(2), 222-237.
- Lee, K., & Jayadev, A. (2005). Capital account liberalization, growth and the labor share of income: Reviewing and extending the cross-country evidence. In G. A. Epstein (Ed.), *Capital flight and capital controls in developing countries* (pp. 15-57). Cheltenham, England: Edward Elgar Publishing.
- Levchenko, A. A. (2017). *The impact of trade openness on institutions*. Washington, DC: World Development Report Background Papers. Retrieved from <https://elibrary.worldbank.org/doi/abs/10.1596/26214>.
- Lewin, K. M. (2020). Beyond business as usual: Aid and financing education in Sub Saharan Africa. *International Journal of Educational Development*, 78, 102247.
- Li, J., Lu, Y., Song, H., & Xie, H. (2019). Long-term impact of trade liberalization on human capital formation. *Journal of Comparative Economics*, 47(4), 946-961.
- Lin, J. Y., & Wang, Y. (2017). Traditional Aid Is Ineffective for Structural Transformation. In J. Y. Liu & Y. Wang (Eds.), *Going beyond aid: Development cooperation for structural transformation* (pp. 53-85). Cambridge, England: Cambridge University Press.
- López González, J., & Ferencz, J. (2018). *Digital Trade and Market Openness*. Paris, France: OECD Trade Policy Papers 217, OECD Publishing.
- Martins, P. M. G. (2018). Structural change: Pace, patterns and determinants. *Review of Development Economics*, 23(1), 1-32.
- Maruta, A. A. (2019). Can aid for financial sector buy financial development? *Journal of Macroeconomics*, 62, 103075.
- McMillan M., Rodrik, D., & Verduzco-Gallo, I. (2014). Globalization, structural change, and productivity growth, with an update on Africa. *World Development*, 63, 11-32.
- Miningou, E. W. (2019). Effectiveness of education aid revisited: Country-level inefficiencies matter. *International Journal of Educational*

Development, 71, 102123.

- Mitchell, M., & Ehizuelen, O. (2017). More African countries on the route: The positive and negative impacts of the belt and road initiative. *Transnational Corporations Review*, 9(4), 341-359.
- Morrison, K. M. (2012). What can we learn about the “resource curse” from foreign aid? *The World Bank Research Observer*, 27(1), 52-73.
- Nagel, K., Herzer, D., & Nunnenkamp, P. (2015). How does FDI affect health? *International Economic Journal*, 29(4), 655-679.
- Narang, N. (2015). Assisting uncertainty: How humanitarian aid can inadvertently prolong civil war. *International Studies Quarterly*, 59(1), 184-195.
- Ndikumana, L., & Sarr, M. (2019). Capital flight, foreign direct investment and natural resources in Africa. *Resources Policy*, 63, 101427.
- Nickell, S. (1981). Biases in dynamic models with fixed effects. *Econometrica: Journal of the Econometric Society*, 49(6), 1417-1426.
- Norbäck, P.-J., Persson, L., & Douhan, R. (2014). Entrepreneurship policy and globalization. *Journal of Development Economics*, 110, 22-38.
- Noy, I., & Vu, T. B. (2007). Capital account liberalization and foreign direct investment. *The North American Journal of Economics and Finance*, 18(2), 175-194.
- Odokonyero, T., Marty, R., Muhumuza, T., Ijjo, A. T., & Moses, G. O. (2019). The impact of aid on health outcomes in Uganda. *Health Economics*, 27(4), 733-745.
- OECD (2021). Building productive capacities can avert a lost decade in the poorest countries. Accessible online at: <https://oecd-development-matters.org/2021/02/24/building-productive-capacities-can-avert-a-lost-decade-in-the-poorest-countries/>
- OECD/WTO. (2019). *Aid for trade at a glance 2019: Economic diversification and empowerment*. Paris, France: Author. Retrieved From <https://doi.org/10.1787/18ea27d8-en>.
- Olarte, S. H., Villarreal, F., & Torrent, J. (2021). Is productive capacity a key factor to reduce inequalities in South America? *Development Studies Research*, 8(1), 94-108.
- Page, J. (2012). *Aid, structural change and the private sector in Africa*. Helsinki, Finland: United Nations University World Institute for Development Economics Research.
- Perkins, R., & Neumayer, E. (2005). The international diffusion of new technologies: A multitechnology analysis of latecomer advantage and global economic integration. *Annals of the Association of American Geographers*, 95(4), 789-808.
- Pickbourn, L., & Ndikumana, L. (2016). The impact of the sectoral allocation of foreign aid on gender inequality. *Journal of International Development*, 28(3), 396-411.
- Prasad, E. S., & Rajan, R. G. (2008). A pragmatic approach to capital account liberalization. *Journal of Economic Perspectives*, 22(3), 149-172.
- Ranjan, P. (2001). Dynamic evolution of income distribution and credit-constrained human capital investment in open economies. *Journal of International Economics*, 55(2), 329-358.
- Ravetti, C., & Sarr, M., & Swanson, T. (2018). Foreign aid and political instability in resource-rich countries. *Resources Policy*, 58, 277-294.
- Remmer, K. (2004). Does foreign aid promote the expansion of government? *American Journal of Political Science*, 48(1), 77-92.
- Roberts, R. D. (1987). Financing public goods. *Journal of Political Economy*, 95(2), 420-437.
- Robinson, J. A., Torvik, R., & Verdier, T. (2014). Political foundations of the resource curse: A simplification and a comment. *Journal of Development Economics*, 106, 194-198.
- Rodrik, D. (1997). *Trade, social insurance, and the limits to globalization*. Cambridge, MA: National Bureau of Economic Research.
- Sexton, R. (2016). Aid as a Tool against Insurgency: Evidence from Contested and Controlled Territory in Afghanistan. *American Political Science Review*, 110(4), 731-749.
- Sachs, J. D., & Warner, A. M. (2001). The curse of natural resources. *European Economic Review*, 45(4-6), 827-838.
- Shiferaw, A. (2017). Productive capacity and economic growth in Ethiopia. *CDP Background Paper*, 34.
- Smith, B. (2015). The resource curse exorcised: Evidence from a panel of countries. *Journal of Development Economics*, 116, 57-73.
- Stefanadis, C. (2010). Appropriation, property rights institutions, and international trade. *American Economic Journal: Economic Policy*, 2(4), 148-172.
- Svensson, J. (2000). Foreign aid and rent-seeking. *Journal of International Economics*, 51(2), 437-461.
- Świącki, T. (2017). Determinants of structural change. *Review of Economic Dynamics*, 24, 95-131.

- Teignier, M. (2018). The role of trade in structural transformation. *Journal of Development Economics*, 130, 45-65.
- Tsurumi, T., & Managi, S. (2014). The effect of trade openness on deforestation: Empirical analysis for 142 countries. *Environmental Economics and Policy Studies*, 16(4), 305-324.
- UN. (2010). *Strengthening international support measures for the least developed countries*. New York, NY: Policy Note of the Committee for Development Policy, Author.
- UN. (2017). *Expanding productive capacity - Lessons learned from graduating least developed countries*. New York, NY: Committee for Development Policy, Author.
- UNCTAD. (2006). *The least developed countries report 2006: Developing productive capacities*. New York and Geneva: Author.
- UNCTAD. (2020). *The least developed countries report 2020: Productive capacities for the new decade*. New York and Geneva: Author.
- Uy, T., Yi, K.-M., & Zhang J. (2013). Structural change in an open economy. *Journal of Monetary Economics*, 60(6), 667-682.
- van der Ploeg, F. (2011). Natural Resources: Curse or Blessing? *Journal of Economic Literature*, 49(2), 366-420.
- van Neuss, L. (2019). The drivers of structural change. *Journal of Economic Surveys*, 33(1), 309-349.
- Wood, R. M., & Molino, E. (2016). Aiding victims, abetting violence: the influence of humanitarian aid on violence patterns during civil conflict. *Journal of Global Security Studies*, 1(3), 186-203.
- Wood, R. M., & Sullivan, C. (2015). Doing harm by doing good? The negative externalities of humanitarian aid provision during civil conflict. *Journal of Politics*, 77(3), 736-748.
- World Bank. (2006). *Revitalizing the rural economy: An assessment of the rural investment climate in Indonesia*. Jakarta, Indonesia: World Bank.
- WTO (World Trade Organization). (2005, December). *Ministerial declaration on DOHA work programme*. Paper presented at the Sixth Session of Trade Ministers Conference, Hong Kong, China.
- WTO. (2010). *World trade report 2010 - Trade in natural resources*. Geneva, Switzerland: Author.
- WTO. (2021). *Strengthening Africa's capacity to trade*. Geneva, Switzerland: Author. Retrieved from: https://www.wto.org/english/res_e/publications_e/strengthening_africa2021_e.htm.
- Yartey, C. A. (2008). Financial development, the structure of capital markets, and the global digital divide. *Information Economics and Policy*, 20(2), 208-227.
- Yogo, U. T., & Mallye, D. (2015). Health aid and health improvement in sub-Saharan Africa: Accounting for the heterogeneity between stable states and post-conflict states. *Journal of International Development*, 27(7), 1178-1196.
- Zhang, G., & Duan, H. (2020). How does international trade network affect multinational diffusion of wind power technology? *Journal of Cleaner Production*, 276, 123245.
- Zhuang, H. (2017). The effect of foreign direct investment on human capital development in East Asia. *Journal of the Asia Pacific Economy*, 22(2), 195-211.
- Zürcher, C. (2017). What do we (not) know about development aid and violence? A systematic review. *World Development*, 98(10), 506-522.

Appendix 1. Definition and Source of variables

Variables	Definition	Sources
PCI	This is the overall Productive Capacity Index. It measures the level of productive capacities along three pillars: "the productive resources, entrepreneurial capabilities and production linkages which together determine the capacity of a country to produce goods and services and enable it to grow and develop" (UNCTAD, 2006). It is computed as a geometric average of eight domains or categories, namely, Information communication and technologies (ICTs), structural change, natural capital, human capital, energy, transport, the private sector and institutions. Each category index is obtained from the principal components extracted from the underlying indicators, weighted by their capacity to explain the variance of the original data. The category indices are normalized into 0-100 intervals.	United Nations Conference on Trade and Development (UNCTAD) Statistics portal: https://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx See UNCTAD (2020) for a complete description of the methodology used to compute the indicator "PCI".
ODA, AftTOT, AftINFRA, AftPROD, AftPOL	"ODA" is the real gross disbursements of total Official Development Assistance (ODA) expressed in constant prices 2018, US Dollar. "AftTOT" is the total real gross disbursements of Aid for Trade. "AftINFRA" is the real gross disbursements of Aid for Trade allocated to the buildup of economic infrastructure. "AftPROD" is the real gross disbursements of Aid for Trade for building productive capacities. "AftPOL" is the real gross disbursements of Aid allocated for trade policies and regulation. All four Aft variables are expressed in constant prices 2018, US Dollar.	Author's calculation based on data extracted from the OECD statistical database on development, in particular the OECD/DAC-CRS (Organization for Economic Cooperation and Development/Donor Assistance Committee)-Credit Reporting System (CRS). Aid for Trade data cover the following three main categories (the CRS Codes are in brackets): Aid for Trade for Economic Infrastructure ("AftINFRA"), which includes transport and storage (210), communications (220), and energy generation and supply (230); Aid for Trade for Building Productive Capacity ("AftPROD"), which includes banking and financial services (240), business and other services (250), agriculture (311), forestry (312), fishing (313), industry (321), mineral resources and mining (322), and tourism (332); and Aid for Trade policy and regulations ("AftPOL"), which includes trade policy and regulations and trade-related adjustment (331).
Non-AftTOT	This is the measure of the development aid allocated to other sectors in the economy than the trade sector. It has been computed as the difference between the gross disbursements of total ODA and the gross disbursements of total Aid for Trade (both being expressed in constant prices 2018, US Dollar).	Author's calculation based on data extracting from the OECD/DAC-CRS database.
OPEN	Measure of trade openness calculated as the share of sum of exports and imports of goods and services in GDP. This variable is not expressed in percentage.	Authors' calculation based on data extracted from the WDI.
TOTREV	This is the share of total public revenue (excluding grants and social contributions) in GDP. This variable is not expressed in percentage.	Public Revenue Dataset developed by the United Nations University World Institute for Development Economics Research (UNU-WIDER). See online: https://www.wider.unu.edu/project/government-revenue-dataset
GDPC	Per capita Gross Domestic Product (constant 2010 US\$).	WDI
FINPOL	This is the measure of financial openness (capital account openness), i.e., de jure financial openness.	This index has been computed by Chinn and Ito (2006) and updated in July 2020. Its value ranges between 0 and 1. See: http://web.pdx.edu/~ito/Chinn-Ito_website.htm For the purpose of the present study, we have transformed this index by multiplying its values by 100. So, its values range here between 0 and 100.

Appendix 2. Descriptive statistics on variables used in the analysis

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
PCI	397	27.536	4.9815	13.94043	39.77283
ODA	397	880	1020	11	5400
AfTTOT	397	258	412	0.054762	2850
AfTINFRA	397	157	269	0.01176	2060
AfTPROD	397	96.3	169	0.016798	1890
AfTPOL	393	4.908784	14.3	0.002152	248
Non-AfTTOT	397	622	699	5.679066	3610
TOTREV	397	0.207	0.087	0.062	0.776
OPEN	397	0.797	0.339	0.203	2.135
FINPOL	397	0.380	0.322	0.000	1.000
GDPC	397	4083.157	3778.551	231.192	19229.960

Note: The variables "ODA", "AfTTOT", "AfTINFRA", "AfTPROD", "AfTPOL" and "Non-AfTTOT" are expressed in US\$ million.

Appendix 3. List of countries contained in the full sample and sub-sample of LDCs

Full sample			LDCs
Albania	Gabon	Nepal	Angola
Algeria	Gambia, The	Niger	Bangladesh
Angola	Georgia	Nigeria	Benin
Armenia	Ghana	North Macedonia	Bhutan
Azerbaijan	Grenada	Oman	Burkina Faso
Bangladesh	Guatemala	Pakistan	Burundi
Barbados	Guinea	Panama	Cambodia
Belarus	Guinea-Bissau	Paraguay	Central African Republic
Belize	Haiti	Peru	Chad
Benin	Honduras	Philippines	Comoros
Bhutan	India	Rwanda	Congo, Dem. Rep.
Bosnia and Herzegovina	Indonesia	Samoa	Eritrea
Botswana	Iran, Islamic Rep.	Senegal	Ethiopia
Brazil	Jordan	Seychelles	Gambia, The
Burkina Faso	Kazakhstan	Sierra Leone	Guinea
Burundi	Kenya	Solomon Islands	Guinea-Bissau
Cabo Verde	Kyrgyz Republic	South Africa	Haiti
Cambodia	Lao PDR	Sri Lanka	Lao PDR
Cameroon	Lebanon	St. Vincent and the Grenadines	Lesotho
Central African Republic	Lesotho	Sudan	Liberia
Chad	Liberia	Suriname	Madagascar
Chile	Libya	Tajikistan	Malawi
China	Madagascar	Tanzania	Mali
Comoros	Malawi	Thailand	Mauritania
Congo, Dem. Rep.	Malaysia	Togo	Mozambique
Congo, Rep.	Maldives	Tonga	Myanmar
Costa Rica	Mali	Tunisia	Nepal
Cote d'Ivoire	Marshall Islands	Turkey	Niger
Dominica	Mauritania	Turkmenistan	Rwanda
Dominican Republic	Mauritius	Uganda	Senegal
Egypt, Arab Rep.	Mexico	Ukraine	Sierra Leone
El Salvador	Moldova	Uruguay	Solomon Islands
Equatorial Guinea	Mongolia	Uzbekistan	Sudan
Eritrea	Morocco	Venezuela, RB	Tanzania
Eswatini	Mozambique	Vietnam	Togo
Ethiopia	Myanmar	Zambia	Uganda
Fiji	Namibia	Zimbabwe	Zambia