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ARE REAL MERCHANDISE IMPORTS PER CAPITA A GOOD PREDICTOR FOR THE STANDARD OF LIVING FOR THE SMALL ISLAND WORLD : TESTING FOR THE IMPORTS-LED GROWTH AND THE GROWTH-LED IMPORTS HYPOTHESES IN PANELS OVER THE PERIOD 1970-2019

JEAN-FRANÇOIS HOARAU, NICOLAS LUCIC

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Are real merchandise imports per capita a good predictor for the standard of living for the small island world: Testing for the imports-led growth and the growth-led imports hypotheses in panels over the period 1970-2019.

Jean-François HOARAU
CEMOI, University of La Réunion
jfhoarau@univ-reunion.fr
https://orcid.org/0000-0003-2325-4970

Nicolas LUCIC
CEMOI, University of La Réunion
nicolas.lucic@univ-reunion.fr
https://orcid.org/0000-0002-9933-9404

Abstract:

This article aims at analysing the empirical relationship between real merchandise imports per capita and real GDP per capita for a set of 52 affiliated and sovereign small islands over the period 1970-2019. The objective is to verify whether real imports per capita could be considered as a good predictor for standard of livings for the small islands world in accordance with the theoretical claims. To this regard, we test for the imports-led growth and the growth-led imports hypotheses by running in a panel data framework both the Tado-Yamamoto Granger causality test based on VAR modelling, and the Pooled Mean Group estimator based on ARDL modelling. Finally, bidirectional causality holds in the short and the long-run for the group of sovereign small islands, validating the two hypotheses. However, even if in the short-run bidirectional causality seems to exist, only the growth-led imports hypothesis is validated in the long-run. Anyway, our results states that a high level of imports per capita could be considered as a good predictor for a high level of standards of living for small islands.

Keywords: Causality tests, Imports, Panel data, Political status, Small Island Economies.
Codes JEL: C33, F43, 011

1. Introduction

At date a deep consensus exits in the literature (Goujon and Hoarau, 2020) about the strong economic and environmental structural vulnerability of small island economies (SIE). In parallel, in spite of this high vulnerability, the latter are globally associated with lower poverty, higher standards of living and a sustainable economic development dynamic in the long-run (Blancard and Hoarau, 2013). This surprising situation could be explained by the presence of a solid resilience capacity (Briguglio et al., 2009). However, for the small island world, when we talk about resilience, heterogeneity is the norm. Indeed, the few existing articles in the field (Bertram, 2004; Peron and Rey, 2012) state that characterizing the property of real income convergence for SIE must be done in the framework of convergence clubs. The dynamics of these clubs are mainly conditioned by the country to which the small island is anchored to, either *de jure* (institutional links) or *de facto* (trade and economic links).

Amongst the potential underlying factors for the emergence of convergence clubs, academics recently paid attention to the political status (McElroy and Parry, 2012), that is the so-called affiliated small islands versus sovereign small islands debate. Today, it is well established that politically dependent islands perform better than their independent counterparts in terms of standards of living and more generally of economic development levels. However, correlation does not mean causation. It would then be spurious and premature to conclude that affiliation rather than sovereignty is more likely to result in prosperity for SIEs. For instance, Sampson (2005) found no relationship between the political status and the growth rate of income per capita over the period 1995-2003 for a set of small territories. Bertram (2015) pointed out that the gap between the average real GDPs per capita of the affiliated and sovereign small islands groups, albeit positive, was constant over the period 1970-2008. Therefore, no divergence dynamic seems to work based on the political nature of the decolonization process for small islands.

Accordingly, when studying the nexus between political status and insular development, two main questions need to be asked. Is there a certain convergence process for real incomes per capita relative to the institutional criterion? If so, can we identify the historical starting date of the divergence between the two groups? Considering these questions, the scientific approach to implement is necessarily a historical and dynamic one. In particular, we need a statistical tool allowing us to cover the time periods of both independence and colonization[1]. Unfortunately, the most popular statistical measure used in the convergence/divergence applied literature is the real GDP per capita (in US$ purchasing power parity, PPP) which is not available before 1970 for most SIEs. Thus, building an indicator giving robust information about standards of living for SIE in a larger historical perspective is a fundamental prior stage.

Bertam and Poirine (2018) argue that relative to their structural specificities SIEs are import-led economies to the extent that their ability to import is the key determinant of the sustainability of the material well-being of their populations. They put forward a strong correlation between imports per capita and income per capita for a cross-section of 52 SIEs for the year 2015. Without formally testing for a causal relationship, Bertram (2017) explained that the causality is likely to go in two ways, suggesting the presence of both "import-led growth hypothesis" (ILGH) and "growth-led imports hypothesis" (GLIH). Thus, the central development strategy for the insular world is not really to choose between international openness and self-reliant development, but consists in securing external resources to sustainably fund a high level of imports. In other words, a high propensity to import is not a sign of economic vulnerability but rather a good "proxy" to standard of living in the context of insularity. On the other hand, Lucic (2021) built very long time series for real imports per capita for a set of 40 SIEs (including both affiliated and sovereign small islands) over the period 1900-2019. Then, if we could demonstrate the existence of a strong dynamic causal link between real imports per capita and real incomes per capita for SIEs, it will be possible to derive long time series for real GDPs per capita from the available data for real imports per capita[2].

Unfortunately, even if the applied literature is paying more and more attention to the relationship between imports and real national incomes (Aluko and Adeyeye, 2020), only one article focused on small islands through a panel methodology (Mishra et al., 2010). This work found a bi-directional causality between real imports and economic growth by running a pooled mean group estimator-based Granger causality test over a restricted panel of 6 small

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[1] If the divergence date had to be located in the colonial past, several fundamental perspectives would be interested to investigate for a better understanding of the current insular development. Nunn (2014) gives several promising ways in the general case of developing countries, but also adapted to SIE, namely the identity of the former colonial power, the strategy of colonization, the nature of colonial institutions, the date of colonization, the profitability of the former colonies, and so on.

[2] Another alternative for measuring the levels of income when data about GDPs are lacking is currently preferred by the recent literature that is the use of satellite-recorded night lights (Henderson et al., 2012). Nevertheless, the data span available is too short to be informative for our present study.

sovereign Pacific islands (Fiji, Papua New Guinea, Solomon Islands, Tonga, and Vanuatu). Of course, the interesting conclusions are expected to be specific to both the geographical and political contexts. Consequently, our article contributes to the limited literature in testing for dynamic causality in the sense of Granger (Granger, 1969) between these two variables of interest for a sample of 52 SIEs over the period 1970-2019. Considering potential size and power biases characterizing the standard statistical procedures in finite sample, especially unit root tests and cointegrating estimations, we opt for the panel Granger causality approach developed by Toda and Yamamoto (1995). This statistical method can be implemented regardless of whether there are unit roots or cointegrating relationships between time series, and allows us to split the whole sample into two reduced parts that is a group of 17 affiliated small islands and a group of 35 sovereign small islands. Additionally and for robustness checking, we use the Pooled Mean Group estimator of Pesaran et al. (1999), which relies on ARDL modelling in panels, to give support to the earlier estimations and to disentangle the short-run from the long-run dynamics.

The rest of the article is structured as follows. Section 2 provides a review of the literature about the theoretical links between the propensity to import and standards of living for the small island world. Section 3 describes the data and gives preliminary correlation results. Section 4 presents the panel Granger causality procedure of Toda-Yamamoto (1995) and associated results. Section 5 describes the robustness analysis based on a panel ARDL modelling in the spirit of Pesaran et al. (1999). Section 6 concludes putting forward some operational and political implications.

2. The narrow relationship between propensity to import and standards of living for SIEs : A review of the theoretical and empirical literature

SIEs share numbers of common original features which clearly distinguish them from larger and continental economies (UNDP Barbados conference, 1994; UNDP Samoa Conference 2012). But the more striking one is their tremendous exposure to external shocks resulting from globalization and climate change, due to their small size, lack of human capital, raw materials, energy sources and economies of scale, isolation, remoteness from the main trading partners, and so on (Briguglio, 1995; Bertram and Poirine, 2007; Guillaumont, 2010; Goujon and Hoarau, 2020). Together, these factors lead to a situation of strong structural economic vulnerability which generally disqualifies all economic strategies based on industrialization and merchandise exports, and potentially cause an unavoidable dependence to imports.

However, considering that there is no overdetermination of individual trajectories due to structural factors[3], several academics tried to categorize the outside-oriented strategies islands followed, besides export-promotion. These typologies have been referred to as MIRAB (**Mi**gration, **R**emittances, foreign **A**id, **B**ureaucracy) by Bertram and Watters (1985), TOURAB (**Tou**rism, **R**emittances, **A**id, **B**ureaucracy) by Guthunz and Von Krosig (1996), SITE (**S**mall **I**sland **T**ourism **E**conomies) by McElroy (2006) and PROFIT (**P**eople, **R**esources, **O**penness, **F**inance, **T**ransport) by Baldacchino (2006)[4]. Bertram (2017) stated that SIEs are most likely import-led economies with bidirectional causality between imports and economic growth with the idea of limited income creating a lower capacity to import and a drop in imports leading to lower overall economic activity through consumption contractions. These models have in common that the external financing constraint for imports is an almost insurmountable reality. The price-elasticity of demand for imports in SIEs is indeed structurally very low (Bertram and Poirine, 2018).

Theoretically, there are two main ways of thinking about this specific relationship between external trade and income in the context of SIEs. First, as mentioned above, within a balance of payment framework, the island demand for import is always limited by the availability of external funding and also met by the supply of imports, which operates both at the macro and micro levels. Bertram and Poirine (2018) argue that in this case, import-substitution production capacities are pushed to the maximum. The second relationship between external trade and income is through the concept of Keynesian multiplier. External funds then become an input in the economy of SIEs and each marginal dollar of funding goes to the global demand function of a single economy with a multiplier effect. As local

[3] SIEs are witnessing very heterogeneous economic results as Briguglio (1995) and Easterly and Kraay (2000) show that it is possible to combine both high levels of vulnerability and economic performance (commonly known as the *Singapore Paradox*). Armstrong and Armstead (2002) even show that the Vulnerability Index is positively correlated with per capita incomes. Blaise *et al.* (2018) argue that having mineral resources "*did not appear to determine the economic dynamics during and after the independence period*." and that political status (Affiliated or Independent) seems much more significant than original endowments.

[4] The MIRAB model is a particular strategy of island development in which the financing of imports, and thus the main financial resources of the economy, are based on migration, income transfers from the emigrant diaspora, state control and foreign aid, mainly from the former colonial powers. The SITE model characterizes SIEs that have adopted a development model in which tourism is the almost exclusive activity. The TOURAB model is an evolution of the MIRAB with the emergence of a dynamic tourism sector at the expense of remittances. The PROFIT model focuses on SIEs with a real capacity for political and economic autonomy and an economic structure that is often diversified, where tourism is only one factor (albeit a significant one) among others (exportable light industry, rents from natural resources or a favorable geostrategic position, offshore finance, real estate, information and communication technologies, flags of convenience for maritime activity, public transfers).

production rises, a new part of that generated income becomes a new demand for imports. That cycle can continue depending on the amount of external funding needed for the local multiplier to have an effect. This analysis is different from the more traditional Keynesian view considering imports as a weakness for an economy because they can be seen as a leakage and redirection from the country's demand towards international competitors and thus a problem when it comes to sustain the circular flow of the economy (Liu, Song, Romilly, 1997). Nonetheless, as the goal of SIEs is mostly to continually find ways to fund new imports, this concern may not be central. This dependence to imports is not seen as a threat by Bertram, Poirine, Baldacchino and others, as long as it secures higher levels of material well-being for the population. Indeed, SIEs are the most open territories in the world when using M/Y ratio (and not X/Y) due to their structural economic vulnerability limiting export-promotion of manufactured products mentioned above. This produces selected-specialization as opposed to more traditional ideas of passive price-taking included in the comparative advantage literature, no matter their political affiliation (i.e., sovereign or affiliated)[5]. Bertram and Poirine (2018) extend their argument to show that what really matters is not the development model as much as "*the long-term sustainability of the external source of funds*" (p.4), thus making it possible for the domestic economy to pay for imports. When taking a closer look at islands profiles, most of them do not finance imports through merchandise exports.

Actually, the earlier theoretical developments are constitutive of what is well known today is the international trade literature as the so-called growth-led imports hypothesis. Expectedly, in an open-economy, growing economic activity should stimulate consumption (through increased micro income) and thus imports. Moreover, when imported goods with high technological values arrive in a developing economy (Mazumdar, 2001; Thangevelu and Rajaguru, 2004), productivity of local firms should rise over time and thus push for import-substitution rather than new imports. That said, if productivity gains are spilling over to all sectors of the economy, increased productivity and economic growth will create demand through higher consumption and should, at the end of the chain, create news imports needs, which domestic firms will not be able to match in the short-term.

At the same time, another strand of the literature has investigated the reverse causal link that is the imports-led growth hypothesis. Since the 1960's and 1970's, neoclassical theory

[5] There is a major difference between sovereign and non-sovereign SIEs as the latter can seek and secure long term funding rents from their patrons, an option the former do not have, and thus create a form of absolute advantage.

states that trade openness and especially exports growth should replace former import substitution strategies. Indeed, export promotion should create economies of scale, production and employment efficiency, resource allocation and capital formation (Shiraz, Abdul-Manap, 2005), foreign exchange (Riezman, Whiteman, 1996), specialization thus productivity, spill over of knowledge and technology (Nguyen, 2011). Moreover, import promotion away from import-substitution strategies should incentivize domestic firms to innovate thus improve productivity (Nguyen, 2011), create new varieties of input which in turn cause new products as well as share technological advancements, as 85% of productive imports (machinery and transport equipment) into LDCs came from developed countries (Mazumdar, 2001 ; Islam, Hye, Shahbaz, 2012). As such, cutting down imports would scale back the production possibilities and thus reduce domestic growth (Rahman, Shahbaz 2013)[6]. Also important to note, Cetinas and Barisik (2009) argue that import substitution strategies increase short term dependence to capital and funding to achieve said policies, which creates vulnerabilities that were exposed in the 1980's and incentivized affected countries to move to export-promotion policies.

On the other hand, the literature on endogenous growth models (Rivera-Batiz, Romer, 1991; Coe and Helpman, 1995) highlighted the importance of openness and the Import-Led Growth Hypothesis as imports can be a long-run positive factor for economic growth through technology and intermediate factors the domestic economy could not produce as well as productivity boost through import-competition (Awokuse, 2008). Here too, dependence to the external sector, especially to imports, is not a definite problem for a SIE as there is still conflicting literature regarding the theoretical effects of imports on economic growth. In particular, Bahmani-Oskooee and Alse (1993), and Sprout and Weaver (1993) state that the effects of trade openness on economic growth are different based on individual structural characteristics. Edwards (1992) shows that, for smaller countries, absorption of technologies is relatively faster than for larger ones, thus the former can grow more rapidly and potentially follow a path of convergence. On the contrary, Perkins and Syrquin (1989) and Feinberg *et al.* (1989) argue that the bigger the country, the harder it is to follow a trade openness strategy, especially for the ELGH. Theoretical controversy regarding openness and economic growth has yet to be resolved (Rodriguez, Rodrick, 1999).

[6] Also, it is accepted that the theoretical relationship between imports and economic growth is more diffuse and less clear than that of exports and economic growth (Ugur, 2008) as international relative price changes affect import volumes (on the topic of exchange gap versus savings gap, see Chenery and Strout, 1966).

Besides, proponents of import-substitution strategies, who traditionally have a Keynesian point of view, suggest implementing import-substitution policies to relieve the negative balance of trade, prevent leakage of national currencies and generate jobs and income locally. Panta, Devkota and Banjade (2022) when analyzing the Import-led Growth Hypothesis for Nepal especially argue that import-substitution coupled with export-promotion would be a sustainable path forward. Nepal is an interesting case as it has a very similar external structure to SIEs whose external sector follows the "*Jaws effect*", where exports stagnated but imports drastically increased. Similar to colonial islands, Nepal historically had a very limited number of trade partners[7] and thus followed an external trade structure comparable to SIEs. There is no single one recommendation regarding potential import-substitution policies for SIEs but it seems rather unlikely that they might be successful because of their relative competitive disadvantages discussed earlier.

On the empirical side, the literature was also fruitful (Raghutla and Chittedi,2020; Aluko and Adeyeye, 2020). However, there are more studies focusing on the ELGH, GLEH and FDI rather than ILGH and GLIH, especially for developing nations as the general economic advices in the 1980s and 1990s was to focus on export promotion. Moreover, there are only a few panel data analyses alongside hundreds of time-series works. The whole finding is that no definitive and single direction of causality holds for each country, it really depends on which countries and time period are observed. Note that mostly imports were only considered in order to avoid spurious causation although (Riezman *et al.*, 1996; Thangavelu and Rajaguru, 2004) imports sometimes appears as more important than exports for economic growth (Awokuse, 2008; Shan and Sun, 1998).

Otherwise, only few studies focused on or included small islands (Katircioglu and Katircioglu, 2011; Katircioglu et al. 2010; Mishra, et al., 2010; Narayan et al., 2007; Aluko and Adeyeye, 2020). Katircioglu et al., (2010) use a bounds test for level relationships and Granger causality tests to investigate the long-run relationship between international trade and income growth in three Pacific countries (Fiji, Papua New Guinea and Solomon Islands). They find that for Fiji, there is a feedback relationship between growth of exports and growth of imports and that exports growth leads to import growth in the case of Solomon Islands. Mishra et al. (2010) use panel data to test co-integration and granger causality for five pacific countries (Fiji, Papua New Guinea, Solomon Islands, Tonga and Vanuatu) over the period 1982-2004. They give no detailed results for each island but overall bidirectional (feedback)

[7] Mainly three: India, China and what is known today as Bangladesh.

causality between imports and economic growth and between exports and imports hold. Narayan et al. (2007) study two pacific countries (Fiji and Papua New Guinea) over 1960-2001 for Fiji and 1961-1999 for Papua New Guinea with KPSS unit root rests and Granger causality tests. They validate in the long run the Import-led Growth hypothesis for Fiji and the Growth-led Imports hypothesis for Papua New Guinea. Finally, Katircioglu and Katircioglu (2011) test the Import-led Growth Hypothesis in Turkish Republic of Northern Cyprus (TRNC) for the period 1977-2008. From a VAR modelling, they confirm causality between imports and economic growth with especially a strong positive long-term elasticity coefficient when imports are the exogenous variable. Other studies incorporated SIEs in global sample.Thangavelu and Rajaguru (2004) addresses the Import's and Export's impact on productivity growth using a VECM on nine Asian countries for the period 1960-1996 including Singapore for which imports unidirectionally cause labour productivity growth. Hye and Shahbaz (2012) study 62 countries for years 1971-2009 using an ARDL approach as well as modified Granger-causality tests. They find long term bidirectional causality between imports and economic growth for Iceland, short run ILGH but long term GLIH for Cuba, long term GLIH for the Dominican Republic and long term ILGH for Papua New Guinea. Finally, Aluko and Adeyeye (2020) employed the Breitung and Candelon's Granger causality test in the frequency domain to examine the causality between imports and economic growth in 41 African economies including 4 sovereign small developing islands (Cape Verde, Comoros, Mauritius, Seychelles). Only the GLIH can be validated for Seychelles.

Anyway, this survey obviously reveals that small islands were neglected by the empirical works. More problematic, no article focused on the case of affiliated small islands although the political status is expected to impact trade behaviours. Our current paper seeks to fill this gap.

3. Data description and preliminary investigation

A first limit when studying the small island world is the short span available, especially concerning the time dimension. The lack of time series data then questions the statistical relevance of econometric procedures potentially affected by both power and size distortions. One way to handle this problem is to use the panel data framework. A second limit results from the differentiated impact of the political status on international trade behaviour for small islands. Indeed, the constraint in terms of import capacity is likely to be different relative to the fact that the small island is politically dependent or independent. Thus, in what follows, we built three panels covering the period 1970-2019: (i) one grouping all the 52 small islands, (ii) one based only on the affiliated SIEs (17 territories), and (iii) one including only the sovereign SIEs (35 territories). Table 1 describes the different groups.

Table 1. The whole, affiliated, and sovereign small islands samples

Groups	Territories
The whole sample	Anguilla, Antigua & Barbuda, Bahamas, Bahrain, Barbados, Belize, Bermuda, British Virgin islands (BVI), Capo Verde, Cayman Islands, Comoros, Cook islands, Cuba, Cyprus, Dominica, Dominican Republic, Fiji, French Guiana, French Polynesia, Guadeloupe, Guyana, Grenada, Haiti, Iceland, Hawaii, Jamaica, Kiribati, Maldives, Malta, Martinique, Mauritius, Montserrat, Nauru, Netherlands Antilles, New Caledonia, Papua New Guinea, Puerto Rico, Samoa, Sao Tomé & Principe, Seychelles, Singapore, Solomon islands, St Kitts & Nevis, Ste Lucia, St Vincent & the Grenadines, Suriname, Tonga, Trinidad & Tobago, Turks & Caicos, Vanuatu, US Virgin islands (USVI)
The affiliated small islands	Anguilla, Bermuda, British Virgin islands (BVI), Cayman islands, Cook Islands, French Guiana, French Polynesia, Guadeloupe, Hawaii, Martinique, Montserrat, Netherlands Antilles, New Caledonia, Puerto Rico, Reunion, Turks & Caicos, US Virgin islands (USVI)
The sovereign small islands	Antigua & Barbuda, Bahamas, Bahrain, Barbados, Belize, Capo Verde, Comoros, Cuba, Cyprus, Dominica, Dominican Republic, Fiji, Guyana, Grenada, Haiti, Iceland, Jamaica, Kiribati, Maldives, Malta, Mauritius, Nauru, Papua New Guinea, Samoa, Sao Tomé & Principe, Seychelles, Singapore, Solomon islands, St Kitts & Nevis, Ste Lucia, St Vincent & the Grenadines, Suriname, Tonga, Trinidad & Tobago, Vanuatu

Source: The authors.

To proxy the standard of living, two variables were retained that is (i) the GDP per capita in PPP current international USD (CRGDPPC, hereafter) and (ii) the GDP per capita in PPP constant 2005 USD (CSGDPPC, hereafter). The raw data relative to current GDP per capita was primarily drawn from the World Development Indicators (WDI) database of the World Bank for 1970-2019 when available. For other islands where data was lacking, United Nations Database goes back until 1970 and reports current GDP values close to that of WDI data. This data was then simply converted to constant 2005 US$ equivalent using the compiled inflation since 1913 reported by the US Bureau of Labor Statistics for the US Consumer Price Index. Regarding the PPP conversion, the WDI PPP conversion factors were taken until the last year available (generally year 1990). In order to go back to 1970, the last available year's conversion factor was applied to the remaining data from 1970 to 1989. On the other hand, the ability of the insular populations to import goods was proxied by the merchandise imports per capita expressed in 2005$ equivalent (IMPORTSPC, hereafter). The series was taken from Lucic (2021) and available for the period 1900-2019[8]. Table 2 gives some descriptive statistics for the variables in levels and in logs.

[8] These data can be obtained online (https://www.umi-source.uvsq.fr/medias/fichier/bdd-importations-lucic-et-al-cahier-du-cemotev-2311_1639150685119-xlsx?ID_FICHE=257205&INLINE=FALSE) or from Nicolas Lucic directly.

Table 2. Summary statistics for the whole, affiliated and sovereign islands samples, 1970-2019

	The whole sample					
	In levels			**In logs**		
	CRGDPPC	**CSGDPPC**	**IMPORTSPC**	**LNCRGDPPC**	**LNCSGDPPC**	**LNIMPORTSPC**
Mean	12509.53	15143.04	5466.432	8.791442	9.204433	7.917781
Median	6823.231	10199.56	3041.244	8.828088	9.230100	8.020022
Maximum	101936.7	78209.01	60534.12	11.53211	11.26714	11.01096
Minimum	190.5186	939.4837	42.66890	5.249750	6.845330	3.753470
Std. Dev.	14687.51	14178.50	6905.020	1.208037	0.957398	1.285186
Observations	2550	2550	2550	2550	2550	2550
	The dependent islands sample					
	In levels			**In logs**		
	CRGDPPC	**CSGDPPC**	**IMPORTSPC**	**LNCRGDPPC**	**LNCSGDPPC**	**LNIMPORTSPC**
Mean	18991.90	22363.20	9507.932	9.349316	9.762307	8.979035
Median	13603.79	18215.57	7972.103	9.518103	9.810032	8.983704
Maximum	85263.76	71841.67	49250.21	11.35350	11.18222	10.80467
Minimum	468.7633	2359.151	1142.479	6.150098	7.766057	7.040956
Std. Dev.	17524.71	15448.48	5989.402	1.127897	0.752516	0.618127
Observations	800	800	800	800	800	800
	The sovereign islands sample					
	In levels			**In logs**		
	CRGDPPC	**CSGDPPC**	**IMPORTSPC**	**LNCRGDPPC**	**LNCSGDPPC**	**LNIMPORTSPC**
Mean	9546.167	11842.40	3618.889	8.536413	8.949404	7.432636
Median	5282.190	7576.102	1657.275	8.572096	8.932754	7.412930
Maximum	101936.7	78209.01	60534.12	11.53211	11.26714	11.01096
Minimum	190.5186	939.4837	42.66890	5.249750	6.845330	3.753470
Std. Dev.	12086.69	12215.19	6497.200	1.156838	0.932602	1.217373
Observations	1750	1750	1750	1750	1750	1750

Note: LnCRGDPPC, LnCSGDPPC and LnIMPORTSPC are the logarithms of the current GDP per capita (in PPP), the constant GDP per capita (in PPP) and merchandise imports per capita, respectively.
Source: the authors.

A simple way to make a preliminary investigation about the link between real GDP per capita and real imports per capita is to test for a potential correlation. To this regard, we applied the usual procedures of Pearson and Spearman to test for the correlation between both CRGDPPC and IMPORTSPC, and CSGDPPC and IMPORTSPC. Note that, for robustness purposes, these tests were run for the panel sample, but also in cross-sections for the year 1970, 1995, and 2019. Regardless of the considered groupings (all countries, affiliated small islands, and sovereign small islands) and the sample retained (panel or cross-sections), the correlation coefficients and the associated p-value (at the 1% significance level) displayed in Table 3 indicates that a strong, positive and significant correlation holds between merchandise imports per capita and the two measures of real GDP per capita.

Table 3. Correlation tests between merchandise imports per capita and GDP per capita in PPP (current and constant) in panels and in cross-sections

	The whole sample		**The affiliated sample**		**The sovereign sample**	
	Pearson	**Spearman**	**Pearson**	**Spearman**	**Pearson**	**Spearman**
For the panel						
LnCRGDPPC	0.749 (0.000)	0.760 (0.000)	0.689 (0.000)	0.663 (0.000)	0.767 (0.000)	0.775 (0.000)
LnCSGDPPC	0.855 (0.000)	0.865 (0.000)	0.802 (0.000)	0.801 (0.000)	0.853 (0.000)	0.852 (0.000)
For the year 1970						
LnCRGDPPC	0.727 (0.000)	0.728 (0.000)	0.903 (0.000)	0.882 (0.000)	0.671 (0.000)	0.649 (0.000)
LnCSGDPPC	0.727 (0.000)	0.728 (0.000)	0.903 (0.000)	0.882 (0.000)	0.671 (0.000)	0.649 (0.000)
For the year 1995						
LnCRGDPPC	0.888 (0.000)	0.890 (0.000)	0.771 (0.000)	0.703 (0.000)	0.874 (0.000)	0.865 (0.000)
LnCSGDPPC	0.888 (0.000)	0.890 (0.000)	0.771 (0.000)	0.703 (0.000)	0.874 (0.000)	0.865 (0.000)
For the year 2019						
LnCRGDPPC	0.907 (0.000)	0.915 (0.000)	0.762 (0.001)	0.800 (0.000)	0.895 (0.000)	0.878 (0.000)
LnCSGDPPC	0.907 (0.000)	0.915 (0.000)	0.762 (0.001)	0.800 (0.000)	0.895 (0.000)	0.878 (0.000)

Note: LnCRGDPPC and LnCSGDPPC are the logarithms of the current GDP per capita (in PPP) and the constant GDP per capita (in PPP), respectively. Figures in () give the associated P-Value. The tests are implemented at the 1% significance level.
Source: The authors.

4. The panel Toda-Yamamoto causality test: some methodological aspects and associated results

Traditionally, Granger causality in a panel setting is computed by running bivariate regressions including stationary variables and performing Wald test coefficient restrictions on the appropriate coefficients (Dumitrescu and Hurlin, 2012). If the variables of interest are not stationary, the standard procedure is based on the estimation of a VAR in first-order differences. In the case of cointegration, a VECM should be specified. However, the usual Wald test statistics used for testing Granger causality (more precisely noncausality) in the framework of VAR/VECM in levels not only had a nonstandard asymptotic distribution but are very sensitive to the values of nuisance parameters in finite samples (Toda and Phillips, 1993). Moreover, such a strategy is conditioned on prior stages including the estimation of a unit root, a cointegration rank and a cointegration vector, which might suffer from severe pre-test biases (Toda, 1995). Finally, the noncausality hypothesis in VECM involves nonlinear restrictions on parameter matrices and therefore Wald tests for Granger noncausality may be exposed to size distortions due to rank deficiency that cannot be excluded under the null hypothesis (Toda and Phillips, 1993).

Considering these problems, Toda and Yamamoto (1995) set up a simple but adapted modified Granger causality procedure, independently whether the VAR is stationary, integrated of an arbitrary order, or cointegrated of an arbitrary order. This convenient method allows us to test for linear or nonlinear restrictions on coefficients by estimating a VAR in levels and running the Wald criterion but without paying attention to the integration and cointegration properties of the time series data. The panel Toda-Yamamoto causality test consists in using within a panel framework a modified Wald (MWald) test from the estimated VAR model in levels with additional lags. In short, two main steps are required: (i) testing the presence of unit root (and cointegration) to determine the number of additional lags et (ii) estimating the augmented VAR and implementing the MWald test to validate or not the presence of causality.

As an initial stage, one must determine the maximal order of integration (d_{max}) that occurs in the process. This is generally done by computing panel unit root tests on all variables and retaining the higher order of integration. To this effect, we implement common unit root tests with cross-section independence and cross-section dependency on two specifications, one with a constant and another one with both a constant and a time trend. We also run several panel cointegration tests, albeit unnecessary, to check the deficiency of estimating a VAR in first differences due to loss of long-run information relative to the variables (see Hurlin and Mignon, 2006, 2008 for a survey).

On the one hand, we apply two first generation tests proposed by Levin et al. (2002) (LLC) and Im et al. (2003) (IPS) which are homogeneous and heterogeneous panel unit root tests, respectively, based on the assumption of independent cross-section units. In Levin et al. (2002), the alternative hypothesis is that no series contains a unit root (all are stationary) while in Im et al. (2003), the alternative allows unit roots for some (but not all) of the series. With very few exceptions, Table 4 pins down that LLC and IPS result in the same insights for the three samples. When the specification in levels with a constant but without a time trend is retained, the two tests generally reject the null of a unit root at the 5% significance level for LnCRGDPPC and LnIMPORTSPC, but not for LnCSGDPPC. However, if the 10% significance level is selected, the same conclusion holds. When the specification with both a constant and time trend is considered, the null is rejected only for LnIMPORTSPC. Considering next the specification in first differences, the null of a unit root is clearly rejected at the 5% significance level for all the variables. Thus, the first-generation tests seem to indicate that our three variables could be stationary.

However, the cross-unit independence assumption of the first generation tests is quite restrictive in many empirical applications and can lead to severe size distortions (Banerjee et al. 2005; Breitung and Pesaran 2008). This problem is expected to be present in our sample. In the context of globalisation even small islands could have significant interrelated trade and economic links. Thus, we test for cross-sectional dependency by means of four usual procedures, namely the Breusch-Pagan LM (1980), Pesaran scaled LM (2004), Baltagi and al. bias-corrected scaled LM (2012) and Pesaran CD (2004) tests. As can be seen in Table A.2 (see the Appendix), the null hypothesis of no cross-sectional dependency across the territories is strongly rejected at the 5% level of significance for all variables whatever the sample considered. Consequently, the small islands included in the panel seem to share some common dynamics. This finding casts doubts about the reliability of the earlier first-generation tests.

Table 4. Panel unit root tests, 1970-2019: the first generation tests

	Variables	LLC		IPS		Order of integration (5%)
		constant	constant and trend	constant	constant and trend	
The whole sample	**LnCRGDPPC**	-16.255***	-3.476***	-7.053***	0.515	≈I(0)
	P-Value	0.000	0.000	0.000	0.697	
	ΔLnCRGDPPC	-14.040***	-24.154***	-14.107***	-20.718***	
	P-Value	0.000	0.000	0.000	0.000	
	LnCSGDPPC	-6.085***	2.333	-1.467*	1.804	≈I(1)
	P-Value	0.000	0.990	0.071	0.964	
	ΔLnCSGDPPC	-16.823***	-22.844***	-16.915***	-20.867***	
	P-Value	0.000	0.000	0.000	0.000	
	LnIMPORTSPC	-3.420***	-0.628	-2.815***	-2.091**	≈I(0)
	P-Value	0.000	0.265	0.002	0.018	
	ΔLnIMPORTSPC	-34.173***	-35.092***	-30.975***	-31.047***	
	P-Value	0.000	0.000	0.000	0.000	
The affiliated small islands sample	**LnCRGDPPC**	10.411***	-0.544	-4.867***	3.628	≈I(0) without trend
	P-Value	0.000	0.293	0.000	0.999	
	ΔLnCRGDPPC	7.083***	14.211***	-6.699***	-12.667***	
	P-Value	0.000	0.000	0.000	0.000	
	LnCSGDPPC	-3.279***	1.756	-0.159	1.742	I(1)
	P-Value	0.000	0.960	0.437	0.959	
	ΔLnCSGDPPC	-12.229***	-11.717***	-11.453***	-10.635***	
	P-Value	0.000	0.000	0.000	0.000	
	LnIMPORTSPC	21.551***	-22.311***	-19.497***	-20.069***	I(0)
	P-Value	0.000	0.000	0.000	0.000	
	ΔLnIMPORTSPC	-42.702***	-41.623***	-41.321***	-41.311***	
	P-Value	0.000	0.000	0.000	0.000	
The sovereign small islands sample	**LnCRGDPPC**	-12.628***	-4.198***	-5.230***	-1.840**	I(0)
	P-Value	0.000	0.000	0.000	0.033	
	ΔLnCRGDPPC	-12.152***	-19.676***	-12.501***	-16.460***	
	P-Value	0.000	0.000	0.000	0.000	
	LnCSGDPPC	-5.316***	1.611	-1.667**	1.002	≈I(0) without trend
	P-Value	0.000	0.946	0.048	0.841	
	ΔLnCSGDPPC	-11.815***	-19.584***	-12.714***	-17.938***	
	P-Value	0.000	0.000	0.000	0.000	
	LnIMPORTSPC	3.320***	-0.757	-2.254**	-1.988**	≈I(0)
	P-Value	0.001	0.224	0.012	0.023	
	ΔLnIMPORTSPC	26.455***	-27.102***	-24.221***	-23.932***	
	P-Value	0.000	0.000	0.000	0.000	

Note: *, **, and *** indicate the rejection of the null of a unit root at 10%, 5%, and 1%, respectively. LnCRGDPPC, LnCSGDPPC and LnIMPORTSPC are the logarithms of the current GDP per capita (in PPP), the constant GDP per capita (in PPP) and merchandise imports per capita, respectively. Δ represents the first difference operator. The different tests implement selection of lags based on Modified Akaike Information Criterion and Newey-West bandwidth selection using Bartlett kernel.
Source: The authors.

Therefore, on the other hand we also consider two second-generation unit root tests that allow cross-unit dependencies with the tests developed by Bai and Ng (2004, BN hereafter) and Pesaran (2007, PES hereafter). The simplest way consists of using a factor structure model. Bai and Ng (2004) shift data into two unobserved components: one with the characteristic that is cross-sectionally correlated and one with the characteristic that is largely unit specific. Thus, the testing procedure consists in two steps: in a first one, data are de-factored, and in a second step, panel unit root test statistics based on de-factored data and/or common factors are then proposed[9]. What we want to know here is whether this factor structure allows us to obtain a clear-cut conclusion about stationarity of macroeconomic variables. Contrary to the previous work, Pesaran (2007) retains a unique test applied to the raw data in the framework of a Cross Sectionally Augmented Dickey Fuller (CADF) model obtained from augmenting the DF/ADF model by the individual averages and the first differences of the variable of interest. The findings are displayed in Table 5.

The PES test cannot reject the null of a unit root no matter the nature of the deterministic component (with a constant or with both a constant and a time trend) for the three variables in levels at the 5% significant level, but strongly reject the presence of non-stationarity for the three variables taken in first differences. These results hold, regardless of the sample considered with one notable exception. LnCRGDPPC appears stationary with a time trend in the context of the global sample. Overall, the BN test goes in the same way both for the affiliated and sovereign small islands groups, validating the non-stationarity of the variables. This non stationarity stems from the common factors and/or the idiosyncratic components depending on the case[10]. Surprisingly for the whole sample, when considering the model with a time trend, the presence of a unit root seems to be rejected both in the common and the specific components for all the variables, suggesting that the latter might be trend-stationary.

In conclusion, based on the more robust second-generation panel unit root tests, our three variables of interest are likely to be integrated of order 1, except for LnCRGDPPC which should be characterized by a trend stationary process when the global panel is used. Note that these findings strongly contrast with the ones resulting from the first-generation tests.

[9] Note that here the number of common factors is estimated according to the ICP2 and PCP2 criteria (see Bai and Ng 2002) with a maximum number of factors fixed according to Ahn and Horenstein (2013).
[10] Note that for all specifications we found only one common factor both with the ICP2 and PCP2 criteria.

Table 5. Panel unit root tests, 1970-2019: the second generation tests

	Variables	BN				PES		Order of Integration (5%)
		constant		constant and trend		constant	constant and trend	
		CF	IC	CF	IC			
The whole sample	**LnCRGDPPC**	-2.774*	0.269	-2.650**	-2.802***	-1.768	-2.825***	≈I(0) with trend
	P-Value	0.063	0.788	0.012	0.005	≥0.10	≤0.01	
	ΔLnCRGDPPC	-7458***	+/-inf***	-7.394***	+/-inf***	-3.409***	-3.818***	
	P-Value	0.000	0.000	0.000	0.000	≤0.01	≤0.01	
	LnCSGDPPC	0.197	-2.047**	-2.346**	-2.907***	-1.322	-1.308	≈I(0) with trend/I(1)
	P-Value	0.969	0.041	0.021	0.004	≥0.10	≥0.10	
	ΔLnCSGDPPC	-0.748	+/-inf***	-7.976***	+/-inf***	-2.795***	-3.987***	
	P-Value	0.835	0.000	0.000	0.000	≤0.01	≤0.01	
	LnIMPORTSPC	-0.097	-1.668*	-2.491**	1.816*	-1.551	-2.048	I(1)
	P-Value	0.949	0.095	0.016	0.069	≥0.10	≥0.10	
	ΔLnIMPORTSPC	-6.733***	+/-inf***	-6.680***	+/-inf***	-5.192***	-5.672***	
	P-Value	0.000	0.000	0.000	0.000	≤0.01	≤0.01	
The affiliated small islands sample	**LnCRGDPPC**	-3.123**	-0.765	-0.898	2.300**	-1.825	-2.113	I(1)
	P-Value	0.025	0.442	0.132	0.021	≥0.10	≥0.10	
	ΔLnCRGDPPC	-9.557***	+/-inf***	-9.557***	+/-inf***	-3.781***	-3.857***	
	P-Value	0.000	0.000	0.000	0.000	≤0.01	≤0.01	
	LnCSGDPPC	0.959	-2.209**	-1.952**	-1.086	-1.642	-1.795	I(1)
	P-Value	0.774	0.027	0.047	0.278	≥0.10	≥0.10	
	ΔLnCSGDPPC	-3.116**	+/-inf***	-5.101***	+/-inf***	-3.375***	-3.802***	
	P-Value	0.027	0.000	0.000	0.000	≤0.01	≤0.01	
	LnIMPORTSPC	-1.509	-1.437	-1.705*	1.051	-2.270**	-2.221	≈I(1)
	P-Value	0.531	0.151	0.060	0.293	≤0.05	≥0.10	
	ΔLnIMPORTSPC	-9.641***	+/-inf***	-9.557***	+/-inf***	-4.437***	-4.986***	
	P-Value	0.000	0.000	0.000	0.000	≤0.01	≤0.01	
The sovereign small islands sample	**LnCRGDPPC**	-2.549	0.583	-5.735***	-0.030	-1.575	-1.692	I(1)
	P-Value	0.100	0.560	0.000	0.976	≥0.10	≥0.10	
	ΔLnCRGDPPC	-6.096***	+/-inf***	-6.177***	+/-inf***	-2.264***	-3.263***	
	P-Value	0.000	0.000	0.000	0.000	≤0.01	≤0.01	
	LnCSGDPPC	0.228	-0.370	-1.477*	-2.101**	-1.225	-1.730	I(1)
	P-Value	0.974	0.711	0.080	0.036	≥0.10	≥0.10	
	ΔLnCSGDPPC	-0.744	+/-inf***	-6.282***	+/-inf***	-2.559***	-3.731***	
	P-Value	0.829	0.000	0.000	0.000	≤0.01	≤0.01	
	LnIMPORTSPC	-0.864	-1.600	-1.711*	+/-inf***	-1.340	-2.246	I(1)
	P-Value	0.806	0.110	0.059	0.000	≥0.10	≥0.10	
	ΔLnIMPORTSPC	7.141***	+/-inf***	-7.072***	+/-inf***	-5.076***	-5.943***	
	P-Value	0.000	0.000	0.000	0.000	≤0.01	≤0.01	

Note: *, **, and *** indicate the rejection of the null of a unit root at 10%, 5%, and 1%, respectively. LnCRGDPPC, LnCSGDPPC and LnIMPORTSPC are the logarithms of the current GDP per capita (in PPP), the constant GDP per capita (in PPP) and merchandise imports per capita, respectively. Δ represents the first difference operator. The different tests implement selection of lags based on Modified Akaike Information Criterion and Newey-West bandwidth selection using Bartlett kernel. For the BN test, we use the PANIC MQC option (with a 0.05 significance level), the PCP2 criterion for factor selection with the maximum factors to be considered fixed following Ahn and Horenstein (2013). Moreover, we improve the factor selection procedures by demeaning and standardizing the time and the cross-section dimensions.
Source: The authors.

Additionally, we investigate whether there is a cointegration relationship between real imports per capita and the two proxies of real incomes per capita. The rejection of a cointegration relationship amongst a panel of variables potentially integrated of order 1 would question the opportunity to simulate the Toda-Yamamoto causality test in favour of a VAR in first differences. Here two procedures were followed, namely the Pedroni (1999, 2004) and the Kao (1999) residual cointegration tests. These two tests extended the standard Engle-Granger (1987) cointegration test, but adapted to the panel settings. Pedroni (1999, 2004) proposed two classes of residual-based tests for the null of no cointegration on heterogeneous panels obtained from a hypothesized cointegration relationship estimated separately for each panel member. On the one hand, four tests (Panel v-stat, Panel rho-stat, Panel PP-stat, Panel ADF-stat) rely on pooling the residuals of the regression along the within-dimension of the panel, i.e. the heterogeneous panel. On the other hand, three tests (Group rho-stat, Group PP-stat, Group ADF-stat) are based on pooling the residuals of the regression along the between-dimension of the panel, i.e. the homogeneous group. Kao (1999) followed the same approach as Pedroni (1999, 2004), but its procedure requires the framework of a bivariate system and specifies cross-section specific intercepts and homogeneous coefficients on the first-stage regressors. Amongst the five statistics suggested by the authors, we take the one based on the augmented version of the pooled specification (noted Kao ADF-stat).

The results from the panel cointegration tests are reported in Table 6. As a whole, a large majority of test statistics can reject the null hypothesis of no panel cointegration at the 10% significance level. One exception is for the whole sample when the model is based on the income variable proxied by LnCSGDPPC and includes a time trend, for which the null of no cointegration is rejected only by two tests. Thus, we conclude that a panel cointegration relationship exists among the two variables of interest, regardless of the political status.

Table 6. Panel cointegration tests, 1970-2019

	The whole sample				The affiliated small islands samples				The sovereign small islands samples			
	LnCRGDPPC		LnCSGDPPC		LnCRGDPPC		LnCSGDPPC		LnCRGDPPC		LnCSGDPPC	
	Constant	Constant & Trend	Constant	Constant & Trend	Constant	Constant & Trend	Constant	Constant & Trend	Constant	Constant & Trend	Constant	Constant & Trend
Panel v-stat	5.327***	0.258	-0.428	1.074	4.423***	2.063**	3.677***	0.222	3.718***	-0.646	1.713**	0.358
P-Value	0.000	0.398	0.666	0.141	0.000	0.020	0.000	0.412	0.000	0.741	0.043	0.360
Panel rho-stat	-5.878***	-2.302**	-1.524*	-0.291	-4.195***	-3.371***	-3.872***	-1.685**	-4.434***	-0.976	-3.929***	-3.329***
P-Value	0.000	0.011	0.064	0.386	0.000	0.000	0.000	0.046	0.000	0.165	0.000	0.000
Panel PP-stat	-5.499***	-4.135***	-2.615***	-1.537*	-3.539***	-3.975***	-3.388***	-2.417***	-4.330***	-2.621***	-4.624***	-4.729***
P-Value	0.000	0.000	0.005	0.062	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000
Panel ADF-stat	-4.441***	-3.005***	-1.421*	1.791	-1.916**	-1.985**	-2.048**	-0.928	-3.992***	-2.395***	-4.248***	-4.752***
P-Value	0.000	0.001	0.078	0.963	0.023	0.024	0.020	0.177	0.000	0.008	0.000	0.000
Group rho-stat	-5.175***	-1.388*	-0.836	1.151	-2.456***	-0.630	-2.292**	-0.263	-4.587***	-1.250	-3.330***	-2.588***
P-Value	0.000	0.083	0.202	0.875	0.007	0.264	0.011	0.396	0.000	0.106	0.000	0.005
Group PP-stat	-6.568***	-4.705***	-3.280***	-1.508*	-3.194***	-2.303**	-3.129***	-1.805**	-5.769***	-4.123***	-5.675***	-6.189***
P-Value	0.000	0.000	0.001	0.066	0.001	0.011	0.001	0.036	0.000	0.000	0.000	0.000
Group ADF-stat	-4.713***	-3.653***	-0.521	1.757	-2.451***	-1.476*	-2.248**	-1.313*	-4.032***	-3.412***	-4.036***	-5.215***
P-Value	0.000	0.000	0.301	0.961	0.007	0.070	0.012	0.095	0.000	0.000	0.000	0.000
Kao ADF-stat	-5.258***		-4.244***		-2.886***		-2.654***		-4.154***		-1.448*	
P-Value	0.000		0.000		0.002		0.004		0.000		0.074	

Note: *, **, and *** indicate the rejection of the null of no cointegration at 10%, 5%, and 1%, respectively. LnCRGDPPC, LnCSGDPPC and LnIMPORTSPC are the logarithms of the current GDP per capita (in PPP), the constant GDP per capita (in PPP) and merchandise imports per capita, respectively. The different tests implement selection of lags based on Modified Akaike Information Criterion and Newey-West bandwidth selection using Bartlett kernel.

Source: The authors.

In a second stage, one has to estimate the following $(k + d_{max})$th-order bivariate VAR as follows:

$$Y_{it} = \alpha_{1it} + \sum_{j=1}^{m} \beta_{ij} Y_{it-j} \sum_{j=m+1}^{k+d_{max}} \beta_{ij} Y_{it-j} + \sum_{j=1}^{m} \gamma_{ij} X_{it-j} + \sum_{j=m+1}^{k+d_{max}} \gamma_{ij} X_{it-j} + \varepsilon_{1it}$$

$$X_{it} = \alpha_{2it} + \sum_{j=1}^{m} \delta_{ij} X_{it-j} \sum_{j=m+1}^{k+d_{max}} \delta_{ij} X_{it-j} + \sum_{j=1}^{m} \theta_{ij} Y_{it-j} + \sum_{j=m+1}^{k+d_{max}} \theta_{ij} Y_{it-j} + \varepsilon_{2it}$$

Where Y=LnIMPORTSPC and X= LnCRGDPPC or LnCSGDPPC, $\alpha_1, \alpha_2, \beta's, \gamma's, \delta's, \theta's$ are the parameters of the model, and $\varepsilon_{1it}, \varepsilon_{2it}$ the residuals independently and identically distributed. Note that the optimal lag order (k) of the VAR model in levels is selected from the standard information criteria[11] (see Table 6). Afterwards, the null hypothesis of no causality is tested by applying the MWald test statistics to the first k VAR coefficient matrix in order to conduct inference on Granger causality[12].

Table 7 lays out the results. First, the specifications without or with the time trend results in the same conclusion independently of the sample considered and the proxy for GDP per capita. Second, the null hypothesis of Granger no causality from GDP per capita to imports per capita can be rejected at the 5% significance for the whole sample and also for both the affiliated and sovereign samples. This finding gives strong support to the growth-led imports hypothesis in the context of the small island world in accordance with the structuralist and Keynesian approaches. This is true for whichever way we measure the variable of standard of living. Regarding the reverse case, the evidence is much more mixed. The null of Granger no causality from imports per capita to GDP per capita cannot be rejected to the 5% significance level for the whole and sovereign samples. However, the null hypothesis is strongly rejected for the affiliated sample. Thus, the import-led growth hypothesis holds for the global sample and the sovereign small island group but not for the affiliated small island group. Regarding the sovereign economies, this is in line both with the theoretical literature based on the

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[11] Toda and Yamamoto (1995) state that a lag selection procedure commonly used for stationary VAR is valid even for VAR with integrated or cointegrated processes as far as $k \geq d$. Then the standard information criteria, namely Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), Hannan-Quin Information Criterion (HQ), the Final Prediction Error (FPE), and the sequential modified LR test (LR) can be run. This is what we have done in this work.

[12] The additional lags d_{max} are used only to ensure that the asymptotical critical values can be applied when causality tests between integrated variables are conducted.

endogenous growth models and with the empirical work of Mishra et al. (2010). The latter found a bi-directional Granger causality between real imports and economic growth working on a sample of 6 independent small Pacific islands (Fiji, Papua New Guinea, Solomon Islands, Tonga, and Vanuatu). For the affiliated ones, a possible explanation might be found from an investigation of the different models of economic specialization in the small islands world. We discuss this perspective below in the conclusion.

Table 7. Toda-Yamamoto causality tests, 1970-2019

	With constant			with constant and trend		
	Chi-square	Prob.	Optimal lag (Var order)	Chi-square	Prob.	Optimal lag (Var order)
For the whole sample						
LnCRGDPPC does not cause LnIMPORTSPC	38.161***	0.000	6(7)	38.232***	0.000	6(7)
LnCSGDPPC does not cause LnIMPORTSPC	46.965***	0.000	5(6)	46.616***	0.000	5(6)
LnIMPORTSPC does not cause LnCRGDPPC	39.361***	0.000	6(7)	39.121***	0.000	6(7)
LnIMPORTSPC does not cause LnCSGDPPC	13.859**	0.017	5(6)	14.158***	0.000	5(6)
For the affiliated small islands sample						
LnCRGDPPC does not cause LnIMPORTSPC	30.150***	0.000	3(4)	29.192***	0.000	2(3)
LnCSGDPPC does not cause LnIMPORTSPC	41.079***	0.000	2(3)	40.672***	0.000	2(3)
LnIMPORTSPC does not cause LnCRGDPPC	6.078	0.108	3(4)	5.727	0.126	2(3)
LnIMPORTSPC does not cause LnCSGDPPC	2.364	0.307	2(3)	2.361	0.307	2(3)
For the sovereign small islands sample						
LnCRGDPPC does not cause LnIMPORTSPC	15.965**	0.014	6(7)	15.968**	0.014	6(7)
LnCSGDPPC does not cause LnIMPORTSPC	21.611***	0.001	6(7)	21.422***	0.002	6(7)
LnIMPORTSPC does not cause LnCRGDPPC	34.325***	0.000	6(7)	34.169***	0.000	6(7)
LnIMPORTSPC does not cause LnCSGDPPC	16.567**	0.011	6(7)	16.183**	0.013	6(7)

Note: *, **, and *** indicate the rejection of the null of no causality at 10%, 5%, and 1%, respectively. LnCRGDPPC, LnCSGDPPC and LnIMPORTSPC are the logarithms of the current GDP per capita (in PPP), the constant GDP per capita (in PPP) and merchandise imports per capita, respectively.
Source: The authors

5. A robustness analysis with a Panel ARDL modeling

Following the earlier empirical assessment, one might be interested in (i) checking the validity of the previous results by implementing another statistical methods and (ii) disentangling the short run and the long run causality dynamics. In panels in which both the number of time series observations and the number of groups are relatively large and of the same order of magnitude, as it is the case here, Pesaran et al. (1999) suggest to use the Pooled Mean Group (PMG) estimator within a Panel AutoRegressive Distributed Lag (P-ARDL) modeling. This method displays several advantages. First, it can estimate possible long term relationships even if the variables have different order of integration, i.e. I(0) and I(1) or a mixture of both. Second, by including lags for both endogenous and exogenous variables, it gives consistent estimators robust to the problem of endogeneity. Third, the modeling is based on a good balance between theoretical consistency[13] and statistical flexibility because it involves both pooling and averaging: the estimators allows the intercepts, short-run coefficients, and error variances to differ freely across cross-sections, but constrains the long-run coefficients to be the same[14]. Last, it appears to be quite robust to outliers and to choice of lag order compared to other classical models (the Mean Group and Dynamic Fixed Effect estimators).

Suppose that given data on time periods, $t = 1,2,\dots,T$, and cross-sections, $i = 1,2,\dots,N$, specifically the PMG models can be written under its error correction form as:

$$\Delta Y_{it} = C_{1i} + \sum_{j=0}^{q-1} \beta_{1ij}\Delta X_{it-j} + \sum_{j=1}^{p-1} \gamma_{1ij}\Delta Y_{it-j} + \emptyset_{1i}ECT_{1it} + \varepsilon_{1it}$$

$$\Delta X_{it} = C_{2i} + \sum_{j=0}^{q-1} \beta_{2ij}\Delta Y_{it-j} + \sum_{j=1}^{p-1} \gamma_{2ij}\Delta X_{it-j} + \emptyset_{2i}ECT_{2it} + \varepsilon_{2it}$$

With the error correction terms given as $ECT_{1it} = y_{it-1} - \varphi_1 x_{it}$ and $ECT_{2it} = x_{it-1} - \varphi_2 y_{it}$. Y=LnIMPORTSPC and X= LnCRGDPPC or LnCSGDPPC, Δ is the first difference operator,

[13] According to Pesaran et al. (1999), the hypothesis stating the homogeneity of the long-run equilibrium relationships between variables across individuals is rational due to budget or solvency constraints, arbitrage conditions, or common technologies impacting all entities in the same way.

[14] The PMG method appears as a good alternative to the Mean Group (MG) estimator (Pesaran and Smith, 1995) consisting in estimating distinct regressions, which allows all coefficients and error variances to be different across cross-sections, and standard pooled estimators (Ahn and Schmidt, 1995), such as fixed and random effects estimators, which suppose that all slope coefficients and error variances are the same.

C_{1i}, C_{2i} represent the fixed effects and $\varepsilon_{1it}, \varepsilon_{2it}$ the residuals independently and identically distributed. Note that time trend or other types of fixed regressors can be introduced. The optimal lag orders (p, q) of the P-ARDL models are selected from the Hannan-Quinn information criterion. The short-run parameters (β_{1ij}, β_{2ij}, γ_{1ij}, γ_{2ij}), the error correcting speed of adjustment terms ($\emptyset_{1i}$, $\emptyset_{2i}$), and the long-run parameters (φ_1, φ_2) are estimated from a maximum likelihood approach by maximizing a concentrated log-likelihood function following the lines of Pesaran et al. (1999). Of course, the short-run parameters and the long-run parameters are expected to be positive, and the error correction coefficient must be on the contrary negative.

The results are displayed in Tables 8 and 9 which are designed in the same way: the first block gives the coefficients of interest in the short-run, the second block focuses on the useful parameters to identify the long-run relationship, and the third block specifies the chosen ARDL form. Table 8 presents the estimations for the P-ARDL models taking real imports per capita as the dependent variables and real GDPs (both in current and constant us$) per capita as the regressors. Accordingly, it enables us to check the validity of the GLIH both in the short and the long-run. Clearly, the PMG estimators give strong support to the earlier findings resulting from the Tado-Yamamoto approach. All coefficients of interest, both in the short and the long-run, have the good signs and are statistically significant at conventional levels, whatever the proxy for real GDP per capita. Moreover, the GLIH holds for the three samples considered. The influence of real GDP per capita (in constant us$) on real imports per capita seems to be particularly high in the long-run since a 10% increase in the former leads to an increase in the latter of roughly 7-8 %. In the same vein, the coefficients of the adjustment speed are moderate (0.2-0.3). Then, a shock impacting the real imports per capita tends to vanish quite quickly that reinforces the validity of the long-run relationship: the half-life of a shock is around 2 years[15].

[15] The formula to determine the half-life duration (h) is $h = \frac{\ln(0.5)}{\ln(\emptyset_i - 1)}$. h gives the number of years needed to dissipate half of the effects of a shock hitting the dependent variable.

Table 8. The P-ARDL specifications: Real imports per capita as dependent variables

	Short-run parameters				Long-run parameters			
	Constant	**Trend**	**ΔLnCRGDPPC**	**ΔLnCSGDPPC**	**ECT**	**LnCRGDPPC**	**LnCSGDPPC**	**Model**
For the whole sample								
ΔLnIMPORTSPC	0.870***	…	0.695***	…	-0.196***	0.383***	…	ARDL(1,1)
P-value	0.000	…	0.000	…	0.000	0.000	…	
ΔLnIMPORTSPC	0.325***	…	…	0.535***	-0.202***	…	0.699***	ARDL(1,1)
P-value	0.000	…	…	0.000	0.000	…	0.000	
The affiliated small islands sample								
ΔLnIMPORTSPC	1.152***	…	0.646***	…	-0.187***	0.283***		ARDL(1,1)
P-value	0.000	…	0.000	…	0.000	0.000		
ΔLnIMPORTSPC	0.250***	0.002***	…	0.328***	-0.264***		0.843***	ARDL(1,1)
P-value	0.000	0.001	…	0.000	0.000		0.000	
The sovereign small islands sample								
ΔLnIMPORTSPC	0.800***	…	0.711***	…	-0.205***	0.416***	…	ARDL(1,1)
P-value	0.000	…	0.000	…	0.000	0.000	…	
ΔLnIMPORTSPC	0.377***	0.002***	…	0.540***	-0.279***	…	0.670***	ARDL(1,1)
P-value	0.000	0.006	…	0.000	0.000	…	0.000	

Note: *, **, and *** indicate the rejection of the null of no causality at 10%, 5%, and 1%, respectively. LnCRGDPPC, LnCSGDPPC and LnIMPORTSPC are the logarithms of the current GDP per capita (in PPP), the constant GDP per capita (in PPP) and merchandise imports per capita, respectively. The optimal lag orders are determined from the Hannan-Quinn information criterion.
Source: The authors.

On the other hand, Table 9 pins down the results relative to the P-ARDL models with real GDPs per capita as dependent variables and real imports per capita as explanatory variable. Here again, earlier findings are confirmed. The ILGH holds both in the short and the long term for the whole and sovereign small islands samples whatever the definition of real GDP per capita. Moreover, the rejection of the ILGH for the affiliated small islands samples seems to be confirmed in the long-run. This is obvious for the constant GDP per capita in the extent that the long-run elasticity associated with real imports per capita is not significant. Concerning the current GDP per capita, the long-run elasticity is significantly positive but the error correction coefficient is very low implying a speed of adjustment to the long-run equilibrium relatively slow: the half-life of a shock takes about 8 years to be absorbed.

Overall, permanent bidirectional causality between real imports per capita and real GDPs per capita is found when considering the global sample and the sovereign small islands world. For the affiliated small islands, only permanent unidirectional causality running from real GDPs per capita to real imports per capita is valid. Nevertheless, the short-run analysis shows evidence for temporary bidirectional causality even for dependent islands.

Table 9. The P-ARDL specifications: Imports per capita as dependent variable

	Short-run parameters					Long-run parameters		
	Constant	Trend	ΔLnIMPORTSPC	ΔLnCRGDPPC(t-1)	ΔLnCSGDPPC(t-1)	ECT	LnIMPORTSPC	Model
For the whole sample								
ΔLnCRGDPPC	0.487***	0.003***	0.139***	…	…	-0.122***	0.592***	ARDL(1,1)
P-value	0.000	0.000	0.000	…	…	0.000	0.000	
ΔLnCSGDPPC	1.176***	0.002***	0.124***	…	0.193***	-0.181***	0.315***	ARDL(2,1)
P-value	0.000	0.000	0.000	…	0.000	0.000	0.000	
The affiliated small islands sample								
ΔLnCRGDPPC	0.370***	0.003***	0.136***	0.179***	…	-0.082***	0.495***	ARDL(2,1)
P-value	0.000	0.000	0.000	0.000	…	0.000	0.000	
ΔLnCSGDPPC	1.431***	0.003***	0.136***	…	0.244***	-0.153***	-0.009	ARDL(2,1)
P-value	0.000	0.000	0.000	…	0.000	0.000	0.889	
The sovereign small islands sample								
ΔLnCRGDPPC	0.616***	0.003***	0.133***	…	…	-0.144***	0.552***	ARDL(1,1)
P-value	0.000	0.000	0.000	…	…	0.000	0.000	
ΔLnCSGDPPC	1.220***	0.001***	0.127***	…	0.176***	-0.193***	0.345***	ARDL(2,1)
P-value	0.000	0.000	0.000	…	0.000	0.000	0.000	

Note: *, **, and *** indicate the rejection of the null of no causality at 10%, 5%, and 1%, respectively. LnCRGDPPC, LnCSGDPPC and LnIMPORTSPC are the logarithms of the current GDP per capita (in PPP), the constant GDP per capita (in PPP) and merchandise imports per capita, respectively. The optimal lag orders are determined from the Hannan-Quinn information criterion.
Source: The authors.

6. Conclusion: summary and discussions

In this paper, we determined empirically the relationship between real imports per capita and real GDP per capita in the context of the small island world over the period 1970-2019. We checked in particular the validity of two main hypotheses in the field of economic development for 52 small islands (17 affiliated and 35 sovereign economies), namely the imports-led growth and growth-led imports hypotheses. Implementing the Tado-Yamamoto Panel Granger causality test, based on a VAR modeling in panels, and the PMG estimators within a Panel ARDL framework, several important findings emerged. First, Bidirectional causality holds both in the short and the long-run for the group of sovereign small islands, validating the two hypotheses. However, for the group of affiliated small islands, the ILGH is unexpectedly rejected in the long-run. Indeed, even if in the short-run bidirectional causality seems to exist, estimations found only unidirectional permanent causality from real GDP per capita to real imports per capita.

The surprising rejection of the ILGH for the affiliated small islands may find an explanation in terms of economic specialization. Especially following the endogenous growth literature, imports of energy, machinery, transport equipment and manufactured goods are major sources of economic development because, in the case of small island territories with limited technological endowments, they give access to foreign technology from industrialized countries. Currently, the technological effect of imports works fully for the territories specialized in merchandise manufactured goods, and to a lesser extent for tourism countries. However, for the economies based on remittances / public aids and financial services (offshore finance), this mechanism is not evident. Yet, within our affiliated small islands sample, at least 12 out of 17 entities strongly depend on remittances / public aids and/or financial services (Table A.3 in the appendix). Only New Caledonia and US Virgin Islands have a significant merchandise export sector. But even here the technological effect of imports would be reduced because merchandise exports are largely dominated by oil refining (US Virgin Islands) and nickel extractions (New Caledonia).

This finding results in an important political implication. Import-substitution strategies, such as implemented in French overseas regions, could be an interesting complement to promote local employment and growth even if naturally limited by a small domestic market, relatively high wages and strong transport costs. This does not induce that affiliated small entities must not resort to imports. Indeed, local small-scaled industries always need imports to access to capital and intermediate goods. Moreover, imports allow improving competition to ensure efficient resource allocation and moderation in domestic price levels (Aluko and adeyeye, 2020).

To conclude, regardless of the earlier comments, our present work points out one major conceptual and operational contribution common to all affiliated or sovereign small islands. Confronting to a strong structural economic vulnerability, resorting to imports is not a choice but a requirement so that a high level of imports per capita could be considered as a good predictor for a high level of standards of living.

References

Ahn, S.C. and Horenstein, A.R., 2013. Eigenvalue Ratio Test for the Number of Factors, *Econometrica*, 81, 1203-1227.

Ahn, S.C., Schmidt, P., 1995. Efficient estimation of models for dynamic panel data, *Journal of Econometrics*, 68, 29-52.

Aluko, O.A., Adeyeye, P.O., 2020. Imports and economic growth in Africa: Testing for granger causality in the frequency domain, *The Journal of International Trade & Economic Development*, 29(7), 850-864.

Awokuse, T.O., 2008. Trade openness and economic growth: is growth export-led or import-led?, *Applied Economics*, *40:2*, 161-173, DOI: 10.1080/00036840600749490

Bai, J., Ng, S., 2002. Determining the number of factors in approximate factor models, *Econometrica*, 70, 191–221.

Bai, J., Ng, S., 2004. A PANIC attack on unit roots and cointegration. *Econometrica*, 72, 1127–1178.

Baldacchino, G., 2006. Managing the hinterland beyond: two idea-type strategies of economic development for small island territories, *Asia Pacific Viewpoint, Vol.47(1)*, 45-60.

Baltagi, B.H., Feng, Q., Kao, C., 2012. A Lagrange Multiplier test for cross-sectional dependence in a fixed effects panel data model, *Journal of Econometrics*, 170(1), 164-177.

Bahmani-Oskooee, M., Alse, J.,1993. Export growth and economic growth: an application of cointegration and error-correction modelling, *The Journal of Development Areas, Vol. 27*, 535-42.

Bertram, G., Watters, R.F., 1985. The MIRAB Model in the South Pacific Micro-States, *Pacific Viewpoint, Vol. 26*, 497-519.

Bertram, G., 2004. On the convergence on small island economies with their metropolitan patrons. *World Development*, 32(2), 343-364.

Bertram, G., 2015. Is independence good or bad for small island economies? A long-run analysis. *Région et Développement*, 42(1), 31-54.

Bertram, G., 2017. Comparing models of island economic development, in James Randall (eds), *Annual report on global islands 2017*, Islands Economic Cooperation Forum, Chapter 2, 55-82.

Bertram, G., Poirine, B., 2018. Economic and Development. Dans G. Baldacchino (eds), *The Routledge International Handbook of Island Studies*, Part II: The Human World of Islands, 1-19.

Blaise, S., Geronimi, V., Taranco, A., Cartier-Bresson, J., 2018. Mines, émergences et indépendance : le cas des petites économies insulaires, in : *L'émergence en question : Mesure et dynamique du développement*, CREG- Université Grenoble-Alpes.

Blancard, S., Hoarau, J.F., 2013. A new sustainable human development indicator for small island developing states: A reappraisal from data envelopment analysis, *Economic Modelling*, 30(C), 623-635.

Briguglio, L., 1995. Small island developing states and their economic vulnerabilities, *World Development, Vol. 23(9)*,1615-1632.

Briguglio, L., 1998. Small country size and returns to scale in manufacturing. *World Development, Vol. 26(3)*, 507-515.

Briguglio, L., Cordina, G., Farrugia, N., Vella, S., 2009. Economic Vulnerability and Resilience: Concepts and Measurements, *Oxford Development Studies*, 37(3), 229-247.

Breusch, T.S., Pagan, A.R., 1980. The Lagrange multiplier test and its applications to model specification in econometrics, *The Review of Economic Studies*, 47(1), 239-253.

Çetintaş, H., Barişik, S., 2009. Export, Import and Economic Growth: The Case of Transition Economies. *Transit Stud Rev 15***,** 636–649, https://doi.org/10.1007/s11300-008-0043-0

Coe, D.T., Helpman, E., 1995. International R&D spillovers, *European Economic Review, Vol.39 (5)*, 859-887.

Dumitrescu, E.I., Hurlin, C., 2012. Testing for Granger non-causality in heterogeneous panels, *Economic Modelling*, 29(4), 1450-1460.

Easterly, W., Kraay, A.C., 2000. Small States, Small Problems? Income, growth and income in small states, *World Development, Vol. 28(11)*, 2013-2027.

Engle, R.F., Granger, C.W.J., 1987. Cointegration and Error-Correction: Representation, Estimation and Testing, *Econometrica*, 64, pp. 813-836.

Feinberg, R. E., Echeverri-Gent, J., Muller, F., 1989. U.S. foreign policy and economic reform in the three giants: the U.S.S.R., China and India, U.S., *Thirld World Policy Perspectives, Series (14),* Washington.

Goujon, M., Hoarau, J.F., 2020. Le tourisme insulaire à la merci du changement climatique : une évaluation par un indice synthétique de vulnérabilité physique. *Revue d'Economie du Développement*, 28(1), 69-106.

Guillaumont, P., 2010. Assessing the economic vulnerability of small island developing states and least developed countries. *Journal of Development Studies, 46(5)*, 828-854. https://doi.org/10.1080/00220381003623814

Guthunz, U., von Krosig, F., 1996. Tourism development in small island states: From MIRAB to TOURAB. In L. Briguglio, B. Archer, J. Jafari, G. Wall, D. Harrison & W. Leal Filho (Eds.) *Sustainable tourism in islands and small states*, 18-25.

Henderson, J.V., Storeygard, A., Weil, D.N., 2012. Measuring economic growth from outer space, American Economic Review, 102, 994-1028.

Hurlin, C., Mignon, V., 2005. Une synthèse des tests de racine unitaire sur données de panel, *Économie & prévision*, 3-4-5(169-170-171), 253-294.

Hurlin, C. Mignon, V., 2007. Une synthèse des tests de cointégration sur données de Panel, *Économie & prévision*, 4-5(180-181), 241-265.

Hye, Q.M.A., 2012. Exports, imports and economic growth in China: an ARDL analysis, *Journal of Chinese Economic and Foreign Trade Studies*, *Vol. 5(1)*, 42-55. DOI 10.1108/17544401211197959

Im, K.S., Pesaran, M.H., Shin, Y., 2003. Testing for unit roots in heterogeneous panels, Journal of Econometrics, 115, 53–74.

Islam, F., Hye, Q.M.A., Shahbaz, M., 2012. Import-economic growth nexus: ARDL approach to cointegration, *Journal of Chinese Economic and Foreign Trade Studies*, *Vol. 5(3)*, 194 - 214

Kao C., 1999. Spurious Regression and Residual-Based Tests for Cointegration in Panel Data, *Journal of Econometrics*, 90, pp. 1-44.

Katircioglu, S., Eminer, F., Aga, M., Ozygit, A., 2010. Trade and growth in the Pacific islands – Empirical evidence from the bounds test level relationships and Granger causality tests, *Romanian Journal of Economic Forecasting, Vol. 4*, 88-101.

Katircioglu, S., Katirciolgu, E., 2011. Testing import-led growth hypothesis in North Cyprus: an empirical investigation from cointegration and causality tests, *EUL Journal of Social Sciences, Vol. 2(2)*, 27-38.

Levin, A., Lin, C.F., Chu C.S.J., 2002. Unit root test in panel data: asymptotic and finite sample properties, *Journal of Econometrics*, 108, 1–24.

Liu, X., Song, H., Romilly, P., 1997. An empirical investigation of the causal relationship between openness and economic growth in China, *Applied Economics, 29:12*, 1679-1686, DOI: 10.1080/00036849700000043

Lucic, N. Geronimi, V. Taranco, A., 2021. Note sur la mise à jour et l'extension des données d'importations des petites économies insulaires (1900-2019). *Cahiers du CEMOTEV*, n°1-2021.

Mazumdar, J., 2001. Imported machinery and growth in LDCs, *Journal of Development Economics, Vol.65*, 209-224.

McElroy, J.L., Pearce, K., 2006. The advantage of political affiliation: dependent and independent small island profiles, The Round Table: *Commonwealth Journal of International Affairs, Vol. 95(386)*, 529-539.

McElroy, J.L., Parry, C., 2012. The long-term propensity for political affiliation in island microstates. *Commonwealth and Comparative Politics*, 50(4), 403-412.

Mishra, V., Sharma, S.S., Smyth, R., 2010. Is economic development in the Pacific island countries export led or import led?, *Pacific Economic Bulletin*, 25(1), 46-63.

Narayan, P.K., Narayan, S., Chand Prasad, B. and Prasad, A., 2007. Export-led growth hypothesis: Evidence from Papua New Guinea and Fiji, *Journal of Economic Studies, Vol. 34 No. 4*, 341-351. https://doi.org/10.1108/01443580710826380.

Nguyen, H.T., 2011. Exports, imports, FDI and economic growth, *Working Paper No. 11-03*, Department of Economics, University of Colorado at Boulder.

Panta, H., Devkota, M.L., Banjade. D., 2022. Exports and Imports-Led Growth: Evidence from a Small Developing Economy, *Journal of Risk and Financial Management, Vol. 15:11*. https:// doi.org/10.3390/jrfm15010011.

Pedroni P., 1999. Critical Values for Cointegration Tests in Heterogenous Panels with Multiple Regressors, *Oxford Bulletin of Economics and Statistics*, S1, 61, 653-670.

Pedroni P., 2004. Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis, *Econometric Theory*, 20(3), 597-625.

Perkins, D., Syrquin, M., 1989. Large countries: The influence of size, Chapter 32, in: *Handbook of Development Economics, Vol.2*, 1691-1753.

Peron, O., Rey, S., 2012. Trade and convergence of per capita income in the Indian Ocean Zone, 1950–2008, *Annals of Regional Science*, 49, 657-683.

Pesaran, M.H., 2004. General diagnostic tests for cross section dependence in panels, *Cambridge Working Papers in Economics,* n°0435, Faculty of Economics, Department of Applied Economics, University of Cambridge, UK.

Pesaran, M.H., 2007. A simple panel unit root test in the presence of cross-section dependence, *Journal of Applied Econometrics*, 22(2), 265-312.

Pesaran, M.H., Smith, R.P., 1995. Estimating long-run relationships from dynamic heterogeneous panels, *Journal of Econometrics*, 68, 79-113.

Pesaran, M.H., Shin, Y., Smith, R.P. Pooled mean group estimation of dunamic heterogeneous panels, *Journal of the American Statistical Association*, 94(446), 621-634.

Sampson, T., 2005. Notes on the economic performance of small states 1995-2003. *Working Paper*, n°2, Asian Development Bank-Commonwealth Secretariat Joint Report to the Pacific Islands Forum Secretariat. Suva: Forum Secretariat.

Raghutla, C., Chittedi, K.R., 2020. Is there and export- or import-led growth in emerging countries? A case of BRICS countries, *Journal of Public Affairs*, https://doi.org/10.1002/pa.2074

Rivera-Batiz, L.A., Romer, P.M., 1991. Economic Integration and endogenous growth, *The Quarterly Journal of Economics, Vol. 106(2),* 531-555.

Rodriguez, F., Rodrik, D., 1999. Trade Policy and economic growth: A skeptic's guide to the cross-national evidence, *NBER Working Paper n°7081*, DOI: 10.3386/w7081

Shan, J. , Sun, F., 1998. On the export-led growth hypothesis: the econometric evidence from China, *Applied Economics*, *Vol. 30*, 1055-1065.

Shahbaz, M., Rahman, M.M., 2013. Do imports and foreign capital inflows lead economic growth? Cointegration and causality analysis in Pakistan, *South Asia Economic Journal, Vol. 14(1),* 59-81.

Sprout, R.V.A., Weaver, J.H., 1993. Exports and economic growth in simultaneous equations model, *The Journal of Developing Areas*, *Vol. 27(3)*, 289-306.

Thangavelu, S.M., Rajaguru, G., 2004. Is there an export or import-led productivity growth in rapidly developing Asian countries? A multivariate VAR analysis, *Applied Economics, 36:10*, 1083-1093, DOI: 10.1080/0003684042000246795

Toda, H.Y., 1995. Finite sample performance of likelihood ratio tests for cointegrating ranks in vector autoregressions, Econometric Theory, 11, 1015-1032.

Toda, H.Y., Phillips, P.C.B., 1993. Vector autoregressions and causality, *Econometrica*, 61, 1367-1393.

Toda, H.Y., Yamamoto, T., 1995. Statistical inference in vector autoregressions with possibly integrated processes, *Journal of Econometrics*, 66, 225-250.

Ugur, A., 2008. Import and economic growth in Turkey: Evidence from Multivariate VAR analysis, *East-West Journal of Economics and Business, Vol. 11(1-2)*, 54-75.

Appendix

Table A.1. A review of empirical studies focusing on small islands

Study	Countries	Time Period	Methodology	Outcomes
Aluko and Adeyeye (2020)	41 African Countries	1985-2017	Breitung-Candelon Granger Causality Test in frequency domain with VAR model.	GLIH for Guinea-Bissau and Seychelles ; Neutrality for Cape Verde, Comoros and Mauritius.
Katircioglu and Katircioglu (2011)	Northern Cyprus	1977-2008	Ganger causality tests using block exogeneity under VECM approach	No long term causality between Y, M and Exchange rates for Northern Cyprus (no ILGH).
Narayan et al. (2007)	Fiji & Papua New Guinea (PNG)	Fiji 1960-2001, PNG 1961-1999	ARDL model & VECM Granger causality tests	For PNG, short term bidirectional causality (X⇔Y) + unidirectional causality (M=>X) & long term bidirectional causality (X,Y⇔M) ; Fiji only long run unidirectional causality (M=>Y & X=>Y).

Thangavelu and Rajaguru (2004)	9 Asian countries	1960-1996	Multivariate VAR + VECM & Granger causality tests	For Singapore, Imports cause Labor Productivity thus growth (M=>LpY).
Hye and Shahbaz (2012)	62 countries	1971-2009	ARDL approach + modified Granger causality tests for ILGH	Bidirectional long run causality (M⇔Y) for Iceland. Short run ILGH (M=>Y) and long term GLIH (Y=>M) for Cuba. Long term GLIH (Y=>M) for Dominican Republic. Long term ILGH (M=>Y) for Papua New Guinea.
Katircioglu et al. (2010)	Fiji, Papua New Guinea, Solomon Islands	1960-2006	ARDL &VECM Granger causality tests	Long term bidirectional causality (X⇔Y & X⇔M) for Fiji, no long term or short causality for Papua New Guinea, long term unidirectional causality (Y=>X & X=>M) for Solomon Islands.
Mishra et al. (2010)	Fiji, Papua New Guinea, Solomon Islands, Tonga, Vanuatu	1982-2004	VAR framework augmented with ECT + granger causality tests in panel	Short term unidirectional causality (X=>M & Y=>X) and long run

Source: The authors.

Table A.2. Panel cross-sectional dependence tests, 1970-2019

Variables	Breusch-Pagan LM	Pesaran scaled LM	Baltagi et al. bais corrected scaled LM	Pesaran CD
For the whole sample				
LnCRGDPPC	50684.550 (0.000)***	978.455 (0.000)***	977.935 (0.000)***	217.604 (0.000)***
LnCSGDPPC	30210.930 (0.000)***	573.017 (0.000)***	572.497 (0.000)***	81.749 (0.000)***
LnIMPORTSPC	185111.810 (0.000)***	341.340 (0.000)***	340.820 (0.000)***	86.909 (0.000)***
For the affiliated small islands sample				
LnCRGDPPC	5745.894 (0.000)***	363.150 (0.000)***	362.987 (0.000)***	75.793 (0.000)***
LnCSGDPPC	4515.231 (0.000)***	283.702 (0.000)***	283.548 (0.000)***	66.850 (0.000)***
LnIMPORTSPC	1705.256 (0.000)***	102.328 (0.000)***	102.145 (0.000)***	27.160 (0.000)***
For the sovereign small islands sample				
LnCRGDPPC	21802.040 (0.000)***	614.761 (0.000)***	614.404 (0.000)***	141.165 (0.000)***
LnCSGDPPC	11229.126 (0.000)***	308.268 (0.000)***	307.911 (0.000)***	31.722 (0.000)***
LnIMPORTSPC	8750.245 (0.000)***	236.409 (0.000)***	236.052 (0.000)***	61.111 (0.000)***

Note: *, **, and *** indicate the rejection of the null of no cross-sectional dependence at 10%, 5%, and 1%, respectively. Figures in () give the probability of rejection. LnCRGDPPC, LnCSGDPPC and LnIMPORTSPC are the logarithms of the current GDP per capita (in PPP), the constant GDP per capita (in PPP) and merchandise imports per capita, respectively.

Source: The authors.

Table A.3. External resources in % of imports of goods and services (2010-2015) for the small affiliated islands

Small affiliated islands	Merchandise exports (ME)	Tourism (T)	Remittances and public aids (RPA)	Financial services (FS)	Specialization
Anguilla	4	60,9	3,6	3,2	T
Bermuda	0,7	23,8	66,4	54	RPA/FS
British V. Islands	3,5	58,8	0	59	T/FS
Cayman Islands	1	22,1	0	45,7	FS
Cook Islands	5,9	94,1	35	18,1	T/RPA
French Polynesia	6,8	34,2	55	3,9	T/RPA
Guadeloupe	7,9	16,9	83,1	-7,9	RPA
Martinique	13,9	12,3	72,5	1,3	RPA
Montserrat	5,7	13,4	73,7	-20,4	RPA
Curaçao	26,4	23,3	-0,1	23,8	balanced
New Caledonia	32,5	0	31,1	2,9	ME/RPA
Reunion	6,3	6,9	94,7	7,9	RPA
Turks and Caicos	2,6	104	-2,3	-4,3	T
US V. Islands	83	18,7	1	-2,8	ME

Note: The external source is considered as a main factor of specialization when its percentage of imports of goods and services is greater than 30%. Data for French Guiana, Hawaii and Puerto Rico are lacking but we can reasonably suppose that French Guiana has an economic profile quite similar to other French overseas regions (then RPA). For Puerto Rico, according to its strong level of indebtedness, public aids form the US government should be significant.
Source: Bertram and Poirine (2018).

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