

# What Have Remittances Done to Development? Evidence from the Caribbean Community and Common Market

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**Abstract** This paper analyzes the long-run impact of remittances on socio-economic development in the Caribbean Community and Common Market (CARICOM) between 1970 and 2013. We find that remittances have improved the health indicators, reducing infant and child mortality, and food deficit and improving life expectancy, and sanitation and water sources, especially in the rural areas. However, remittance inflows have no significant impact on education and communication infrastructure. Neither do they contribute to any demographic changes.

**Keywords** CARICOM · Remittances · Social development · Health · Education · Communication infrastructure · Demographic changes

## Introduction

Global remittances have reached \$557 billion in 2013 and are projected to grow at a rate of about 4% to \$636 billion by 2017 (World Bank 2015). Approximately 75% of the money goes to developing countries. The flows to Latin America and the Caribbean (LAC) was substantial, reaching \$61 billion in 2013 although the growth has slowed down, growing at a little more than 1% in the last two years. The Caribbean Community and Common Market (CARICOM), an integrated region consisting of Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti,

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Jamaica, Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent and Grenadines, Suriname, and Trinidad and Tobago, received roughly \$4.5 billion in 2012 (World Bank 2013).<sup>1</sup> Due to small population the per-capita receipts are substantial in most countries. St. Kitts and Nevis, Jamaica and Guyana ranked among the top 10 per-capita recipients, receiving \$842, \$791 and \$590, respectively (Lim and Simmons 2015).

The impact of remittances on overall development depends on how remittances are utilized. Samuel (1996) indicates if remittances are used mainly for conspicuous consumption, they might induce growth in the short run, but at the expense of long-run economic development. Given the high percentage of importation content in the consumption pattern of CARICOM countries, there can be negative impact on balance of payments and limited spill over for the contribution to economic development. However, if remittances are used for investment and essential consumption to improve health, education, and other productive activities of the society, development of the society can be greatly enhanced. Given the economic challenges of many countries in CARICOM, it is generally assumed that in the absence of remittances the economies would have significantly more severe socio-economic challenges.

There are priori indications that the increased flows of remittances have facilitated substantial socio-economic development in the region but no definitive empirical studies have been done to substantiate or provide evidence on such outcome. Often times, the Caribbean region is studied in conjunction with Latin America and the region's identity is often minimized within the aggregate analysis. World Bank (2006) shows that remittances are growth-enhancing though the magnitude is relatively small while Mundaca (2009) finds a more pronounced impact of remittances on economic growth, especially when financial development is accounted for. Nsiah and Fayissa (2013) and Ramirez and Sharma (2008) use cointegration test and provide evidence for the long-run relationship between per-capita growth and remittance flows. Unlike these studies, Lim and Simmons (2015) examine specifically the homogeneous part of the region, CARICOM, and find no long-run relationship between remittances and income but a relationship with consumption.

The main purpose of the paper is to analyze the impact of remittances on the socio-economic development of CARICOM countries. If remittances has not boosted long-run economic growth in this region; then, what have they done? More specifically, we examine data from 1970 to 2013 on the long-run impact of remittances on four areas of social development including health, education, communication infrastructure, and demographic changes. To our knowledge, the paper is the first that empirically examines the relationship between remittances and social development in this region. The paper adds to the current knowledge about the role remittances play in the social development of the region. Further, the findings of this study provide insights which are useful for assessing the performance of each country and are a useful tool for policy makers who formulate policies that deal with immigration, migrant workers, and remittance transfers.

<sup>1</sup> CARICOM was established in 1973 for regional integration in trade and in monetary and fiscal affairs. There are fifteen member countries in the Caribbean region which are relatively small island economies. The U.S. is the major source of remittances which accounts for 76% of total remittances flows into the region.

## CARICOM and its socio-economic development

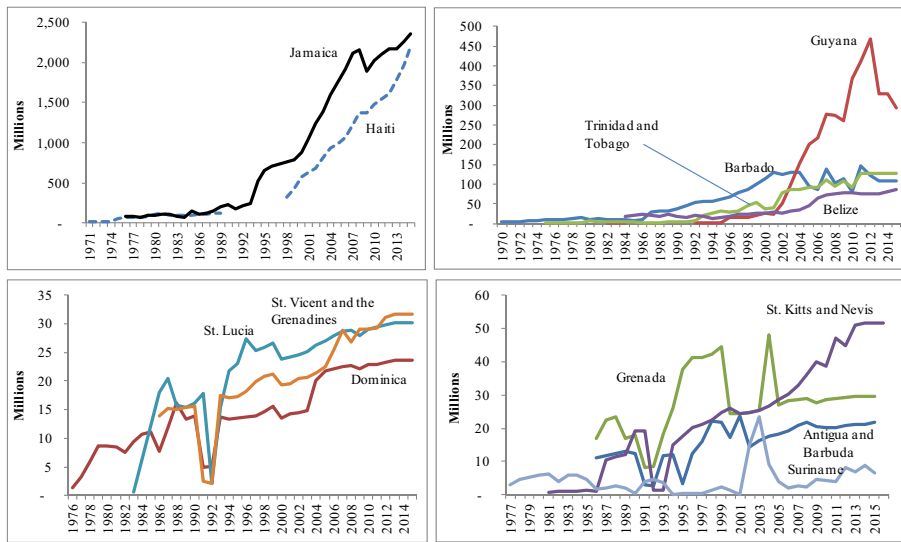
Remittances and migration are an integral part of CARICOM socio-economic history and development. The economies within CARICOM are micro island states, former British colonies (with the exception of Haiti and Suriname) where manufacturing, agriculture, and tourism have traditionally and still are the main source of income. This traditional link between the international economy and the region was maintained through the export of natural resource products such as sugar, bananas, bauxite, coffee, and its human capital. Over the years, the governments within CARICOM have sought to diversify the region through regional integration in trade, monetary fiscal policy, and human capital enhancement. With the indicators showing evidence that remittances can contribute to economic and social development and thus improve the living standards of its citizens, governments within the region are making concerted efforts (in terms of policy initiatives, programs, and legislation) to promote, and support the remittance process as part of their overall development strategy.<sup>2</sup>

The countries within CARICOM are classified as low, middle, and high income countries. St. Kitts and Nevis and Jamaica are high income countries with PPP real GDP per person of more than \$9000 (World Penn Table 7.1). The lower and upper middle income countries are Guyana, Dominica, Barbados, Grenada, St. Lucia, St. Vincent and the Grenadines, Belize and Antigua and Barbuda with PPP income per person ranging from \$4000 to more than \$7000. Haiti is the only low income country in the community with income of about \$1400.

This region has received considerable amount of remittances over the years and the trend is rising. Figure 1 displays the remittance flows into each of the 13 CARICOM countries over the period between 1970 and 2015. Jamaica and Haiti currently received the largest amount, roughly \$1 billion to \$2.5 billion between 2000 and 2015. Guyana also experienced pronounced growth indicating that the country has become increasingly more reliant on remittances over the last two decades. Amidst substantial growth in the smaller Caribbean islands (specifically within the members of the Eastern Caribbean Monetary Union – Grenada, Dominica, St. Vincent and the Grenadines, St. Lucia, Antigua and Barbuda), there were periods of erosion in the early 1990s and some variation in remittances over the period.

Figure 2 displays the development in health, education, and communication infrastructure in the CARICOM region. The indicators are averaged over a five-year span. Health, infant and child mortalities have reduced more than three times over the period (panel a). Mortality rates were very high in the early 1970s; at approximately 60 infants or 80 children per 1000 births in 1970–74. The rates fell gradually over time to about 20 infants or 25 children in 2010–2013. Access to sanitation facilities such as piped sewer system, ventilated improved pit (VIP) latrine and composting toilet and access to drinking water source have also improved over the years (panel b). For the last two decades, the population having access to improved sanitation facilities has increased to approximately 78% from 73% in 1990–94 and those having access to drinking water

<sup>2</sup> There are a host of measures that can be taken to increase the flow of remittances. Money transfer mechanism can be made more efficient. The introduction of Western Union enhances this process. A more liberal exchange control regime would reduce the incentive to hoard foreign exchange. Financial institutions within the region can offer more attractive interest rates. Government can offer more attractive tax treatments for migrants' investments and develop more efficient domestic and capital markets.



Source: World Bank's World Development Indicators

**Fig. 1** Trends of remittance receipts by country from 1970 to 2015

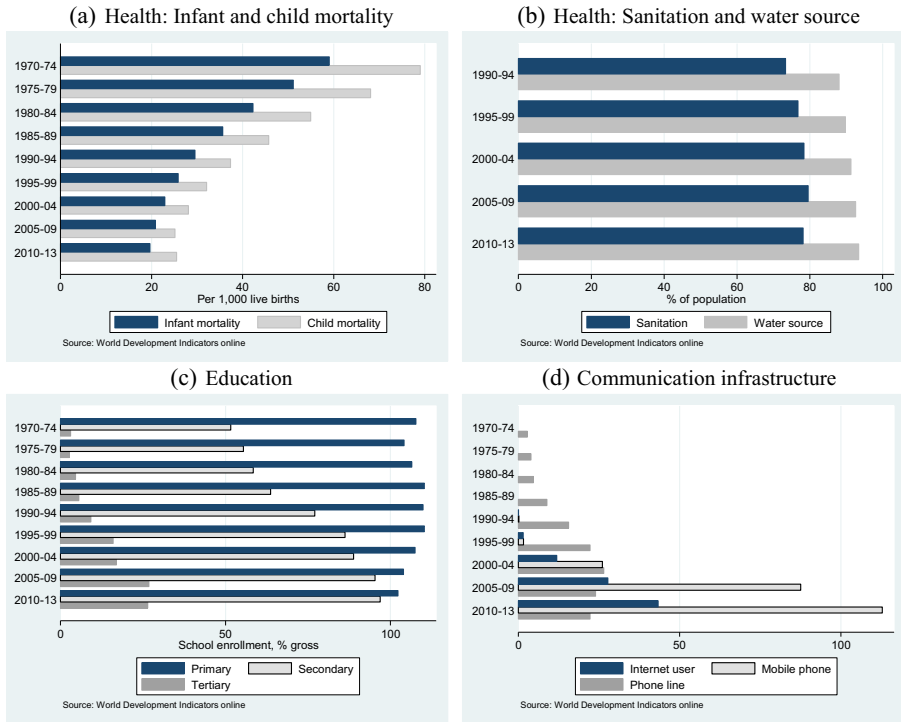
source have reached 93% from 88%. In the rural areas, the sanitation and water access has reached 75 and 91%, respectively.

For education (panel c), secondary and tertiary school enrollments have increased drastically, while the enrollment in the primary school education was well above 100%.<sup>3</sup> Over the decades, secondary school enrollment rose to 97% from 51% in the early 1970s. The trends are similar for both male and female students. For tertiary education, there was about 27% enrollment in 2010–13, an increase from 3% in the early 1970s. Interestingly, female enrollment has risen more significantly compared to male enrollment over the period. The enrollment for female has increased from about 2.5% in the early 1970s to 37% in the early 2010s whereas that for male has increased from 3.7% to only 17% over the same period. This happened in most of the countries in the regions, except Haiti where male enrollment accounted for 1.5% compared to 0.5% for the female in the late 1980s.

We use internet and phone usage as a measure of communication infrastructure. The numbers of internet users, mobile cellular subscriptions, and telephone lines have substantially increased over these past decades (panel d). The numbers of internet users and mobile cellular subscriptions were merely zero in the early 1990s. Then, the numbers grew to an average of 43 and 113 per 100 people, respectively, in 2010–13.<sup>4</sup> Fixed telephone lines have been long available in the region. In the early 1970s, roughly 3 out of 100 people had access to fixed phone lines. The number rose to a peak of 27 in the early 2000s, then slightly fell to about 22 per 100 people in 2010–13.

<sup>3</sup> The percentage of primary school enrollment is above 100% due to the fact that the total number also includes early-aged, under-aged students and those repeating grades.

<sup>4</sup> Mobile cellular subscriptions include both post-paid and prepaid subscriptions. Apparently, the number above 100 may indicate that there might be multiple subscriptions to different service providers per person.



**Fig. 2** Social development in CARICOM

Bridging the gap between the actual and potential impact of remittances on overall economic and social development has been a persistent empirical test and policy complexity for many decades. The empirical outcomes are definitive in some cases but the manifestations in terms of the potential role and impact have not been realized. A review study by Orozco (2005) on the impact of remittances in Latin American and the Caribbean identifies five major roles remittances play in development. He summarizes the roles as follows: First, they represent an obligation and commitment to family needs. Second, remittances result in the distribution of finances to households and sectors of the country that tend to be economically disadvantaged. Third, remittances have a macroeconomic impact and tend not to decrease with economic downturns. Consequently, they may offset or stabilize the ups and downs of financial cycles. Fourth, these large financial transfers have the potential and capacity to generate wealth in the home and the community where they are sent. Fifth, remittances have multiplying effects, enhancing in part through furtherance of global economic integration.”<sup>5</sup> A study by Ratha (2003) finds that remittances can provide a counter-cyclical trend to the economy over an extensive period of time. Despite the global economic recession and its impact on the host countries, remittances have continued, even and in spite of growing downturns. The trend whereby remittances continue at the same rate or even increase in times of economic downturns is particularly important for the receiving

<sup>5</sup> In addition to Orozco’s (2005) study, a variety of remittance policy objectives and instruments can be found in the literature (see Wilson and Terry, 2005; Foran 2006).

countries. In fact, there are few studies that have investigated the impact of remittances on socio-economic development within the region. Thus, the long-run macroeconomic impact of the flows is still a debate.

## Literature review

The motives behind sending remittances and the economic impact of remittances are extensively documented in the literature. Those studies that investigate the motives for remittances generally distinguish three motives: pure altruism, pure self-interest, and informal arrangements with family members in the home country (Lucas and Stark 1985; Adams, 2009; Rapoport and Docquier, 2006). Studies based on the altruistic motive indicate that the amount of remittances tends to increase as the migrant income increases, and decreases as the relationship and attachments to family in the home country weakens over time. Altruistic migrants send money to help smooth consumption of family members in their home country (Frankel 2011; IMF, 2005; Singh et al. 2009). On the contrary, migrants with pure self-interest remit money to invest during good times; thus, remittances behave like foreign investment which raises the domestic capital stock and long-run economic growth (Lueth and Ruiz-Arranz 2008). Lim and Morshed (2014) show that remittances result from people migrating to earn more income as a result of shocks, suggesting that there is an implicit agreement between migrants and family members regarding migration and remittances (see also Lucas and Stark 1985). Once the contract is enforced, migrants appear to send a constant fraction of their income earned abroad. Alleyne et al. (2008) investigate the macroeconomic determinants of remittances to 8 English-speaking CARICOM countries and finds that remittances to this region are motivated by both altruism and self-interest.

Another strand of literature reports the impact of remittances on poverty, human capital, inequality and economic growth. Using both macro and household data sets, Acosta et al. (2008) find that remittances in Latin America and the Caribbean (LAC) have a significant and negative impact on poverty and income inequality; however, the effects are relatively small while their previous paper (Acosta et al. 2006) shows that remittances reduce poverty headcounts but not inequality. Similarly, Imai et al. (2014) use the panel data of 24 Asian and Pacific countries and show that remittances reduce poverty. They also show that although remittances enhance growth, the volatility of the flows is harmful to economic growth in the region. On the other hand, Kroeger and Anderson (2014) examine the impact of remittance receipts on education and health of children in Kyrgyzstan between 2005 and 2009 and they find that children are negatively affected by the absence of a migrant parent. Boys aged 14–18 in remittance-receiving households are less likely to go to school and younger girls appear to be thinner. However, when controlling for the absence of parents, Salas (2014) shows that remittance-receiving households in Peru are more likely to send their kids to private schools than public ones.

The evidence on the growth impact of remittances is also mixed. Some studies find a positive relationship between remittances and economic growth (see Catrinescu et al. 2006; Faini 2007; World Bank 2006; Ramirez and Sharma 2008; Ziesemer 2006 & Ziesemer 2012) while some find a negative or no relationship (Barajas et al. 2009; Chami et al. 2005; Donou-Adonsou and Lim 2016; Gupta 2005; IMF, 2005). Other

studies find a conditional impact of remittances. For instance, Giuliano and Ruiz-Arranz (2009) shows that remittances have positive and significant impact on growth in countries with weak financial sectors and negative impact in countries with developed financial sector. These different results could be due to the estimation techniques and the heterogeneity of the regions or a particular country under study.

Of more interest are studies that look at the Latin America and the Caribbean. Most of these studies find a positive impact of remittances on economic growth. World Bank (2006) shows that the growth impact in this region is positive though the magnitude is relatively small. An average increase in remittances as a percentage of GDP by about 1.4 percentage points from the early 1990s to early 2000s is estimated to lead to an annual increase of 0.27% in per capita income growth. Using a sample of 25 LAC countries, Mundaca (2009) finds a strong and significant impact of remittances on economic growth. The impact is more pronounced when the financial intermediaries as a proxy for financial development are included. Nsiah and Fayissa (2013) show that there is a long-run relationship between per capita remittances and per capita income and Ramirez and Sharma (2008); Ramirez (2013) provide evidence of a long-run relationship between per-capita growth and remittance to GDP ratio. However, Lim and Simmons (2015) use a sample of only small countries in the Caribbean and show that remittances do not improve income because the money is used for consumption other than productivity-improving investment. Consumption rises by \$2.8 when the household receives \$3.3 in remittances.

## Data and results

We examine the impact of remittance inflows on social development indicators by performing fixed-effects regressions of the measures of social development on remittances which is measured as remittance inflows as a percentage of GDP (REMITGDP). Income per capita (LGDPPC) is controlled for in the regressions. Social development indicators and remittances are obtained from World Bank's World Development Indicators online while income per capita is taken from Penn World Table 7.1. Table 1 provides the summary statistics of the variables. All variables are averaged over a five-year span to look at the long rather than short run by eliminating business cycle periods and measurement errors. In addition, the social development variables do not change much from year to year. One may suggest that income is endogenous due to its reverse causality with the social indicators. However, income is not a variable of interest and controlling for income is to resolve the endogeneity of the remittance variable due to omitted variable bias. Remittances can become endogenous if income simultaneously determines development outcomes and remittances.

Table 2 shows the results for the impact of remittances on health outcomes. In general, the results show that remittance inflows into CARICOM have helped improve the health sector. The results from the infant and child mortality regressions indicate that if a country received remittances equal to 10% of its GDP, infant mortality would fall by 7 per 1000 live births over 5 years or child mortality would falls by 8 per 1000 live births. The magnitude seems very small. It is also worth mentioning the impact of income on infant/child mortality. The results show that a 10% rise in income per capita is associated with the reduction of child mortality by 2 per 1000 live births. With an average income of roughly \$9000 (2005 PPP chain) in this region, that translates to an increase of about \$900.

**Table 1** Summary statistics

Variable	Note	Obs	Mean	Std. Dev.	Min	Max
Health outcome variables						
Infant mortality	Per 1000 live births	108	32.64	25.90	7.23	156.50
Child mortality	Per 1000 live births	108	41.93	38.92	9.53	234.68
Maternal mortality	Per 100,000 live births	28	98.69	150.93	0.00	630.00
Food deficit	Calories	65	123.15	120.38	17.50	557.67
Sanitation	% of population	59	77.39	19.43	19.28	98.00
Sanitation, rural	% of population	59	75.05	21.72	12.72	98.30
Water source	% of population	63	91.11	9.96	61.20	99.80
Water source, rural	% of population	63	87.65	14.00	47.63	99.80
Life Expectancy	Years	109	68.01	5.34	47.91	76.60
Education outcome variables						
Enrollment, primary	% gross	109	107.10	14.09	52.69	137.79
Male enroll, primary	% gross	105	108.71	13.60	66.70	143.37
Female enroll, primary	% gross	105	106.02	13.19	57.17	136.52
Enrollment, secondary	% gross	96	74.37	24.40	11.17	119.97
Male enroll, secondary	% gross	90	73.57	23.10	22.12	121.42
Female enroll, secondary	% gross	90	80.79	22.21	27.05	118.57
Enrollment, tertiary	% gross	70	11.46	13.23	0.70	63.49
Male enroll, tertiary	% gross	64	8.75	8.93	0.42	44.85
Female enroll, tertiary	% gross	64	15.15	19.41	0.32	91.10
Communication infrastructure variables						
Internet user	Per 100 people	69	15.93	19.89	0.00	78.24
Mobile phone	Per 100 people	117	25.37	44.37	0.00	165.58
Phone line	Per 100 people	111	15.17	13.31	0.41	50.45
Demographic outcome variables						
Fertility rate	Births per woman	111	3.21	1.23	1.73	6.29
Dependency ratio	% of population	99	72.89	18.58	40.57	117.37
Dependency ratio, young	% of population	99	62.42	19.49	27.13	106.39
Variable of interest and control						
Remittances	% of GDP	90	5.31	5.10	0.04	21.74
Real GDP per capita	2005 PPP chain	117	8946	6916	1268	30,749
Health expenditure	% of GDP	52	3.20	0.84	1.42	4.90
Education expenditure	% of GDP	57	5.17	1.53	1.07	9.01
Human Development Index	Index	66	0.67	0.103	0.35	0.79

However, the results show that the maternal mortality rate is not reduced due to the rise in remittances. The coefficient for maternal mortality is negative but insignificantly different from zero. This could be due to missing observations; the sample size falls to 28 from 88. That is, roughly each country has two data points.

The depth of food deficit in the region on average stands at 123.15 kcal per person per day. That is the amount needed to lift undernourished individuals from their status.



**Table 2** Remittances and health outcomes

REMITGDP	LGDPCC	Constant	Country	Obs.	Adj.r2
Mortality rate, infant (per 1000 live births)					
-0.651*** (0.198)	-17.110*** (4.214)	182.903*** (37.604)	13	88	0.342
Mortality rate, under-5 (per 1000 live births)					
-0.797*** (0.245)	-22.450*** (5.452)	237.613*** (48.499)	13	88	0.399
Maternal mortality ratio (national estimate, per 100,000 live births)					
-2.973 (3.867)	-244.492** (95.670)	2323.127** (861.448)	13	28	0.223
Depth of the food deficit (kilocalories per person per day)					
-2.415** (1.099)	-22.725 (27.535)	335.427 (248.580)	13	64	0.042
Improved sanitation facilities (% of population with access)					
0.174** (0.058)	6.571 (4.302)	18.021 (38.619)	13	58	0.210
Improved sanitation facilities, rural (% of rural population with access)					
0.201** (0.071)	6.673 (4.417)	14.677 (39.635)	13	58	0.215
Improved water source (% of population with access)					
0.422** (0.180)	8.785** (3.818)	9.691 (34.695)	13	62	0.399
Improved water source, rural (% of rural population with access)					
0.534* (0.271)	12.329* (6.139)	-26.363 (55.683)	13	62	0.318
Life expectancy at birth, total (years)					
0.080* (0.042)	4.816*** (1.067)	25.598** (9.598)	13	85	0.366

Robust standard errors clustered by country are in parenthesis. Country fixed effects are controlled in the regressions

The results show that if a country received remittances equal to 10% of its GDP, the food deficit would reduce by 24 kcal per person per day. It is also interesting to note that roughly the same amount could be reduced with a 1 % increase in income; however, the income coefficient is insignificantly different from zero.

Access to sanitation facilities and water source has improved as a result of rising remittances.<sup>6</sup> The impact is significantly larger in the rural areas. The results indicate that if a country received remittances equal to 10% of its GDP, about an additional

<sup>6</sup> The improved sanitation facilities include flush/pour flush (to piped sewer system, septic tank, and pit latrine), ventilated improved pit (VIP) latrine, pit latrine with slab, and composting toilet. The improved drinking water source includes piped water on premises (piped household water connection located inside the user's dwelling, plot or yard), and other improved drinking water sources (public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, and rainwater collection).

1.7% of the population would have access to sanitation facilities and about an additional 2% in the rural areas. More than 4% of the population would have access to improved drinking water source and more than 5% in the rural areas.

Finally, we look at life expectancy. The results show that if a country received remittance share of 10%, life expectancy would rise by 0.8 years. That is, people would live almost 10 months longer. This can be easily explained by the improved health outcomes: the infant/child mortality falls; the food deficit also falls; and the access to improved sanitation facilities and water source rises.

Table 3 displays results of the impact of remittances on education outcomes. We examine all three levels of education, primary school, secondary school and tertiary school enrollments, also across male and female. Overall, the results show that

**Table 3** Remittances and education outcomes

REMITGDP	LGDPCC	Constant	Country	Obs	Adj.r <sup>2</sup>
School enrollment, primary (% gross)					
-0.455 (0.319)	-8.192 (5.889)	185.102*** (52.913)	13	83	0.054
School enrollment, primary, male (% gross)					
-0.526 (0.362)	-10.525 (6.478)	207.511*** (58.396)	13	80	0.096
School enrollment, primary, female (% gross)					
-0.379 (0.291)	-7.978 (6.077)	181.351*** (54.594)	13	80	0.048
School enrollment, secondary (% gross)					
0.737 (0.510)	43.704*** (8.495)	-319.659*** (77.467)	12	76	0.465
School enrollment, secondary, male (% gross)					
0.464 (0.655)	46.577*** (9.850)	-347.883*** (89.933)	12	73	0.488
School enrollment, secondary, female (% gross)					
1.046** (0.408)	41.936*** (8.557)	-301.006*** (77.621)	12	73	0.428
School enrollment, tertiary (% gross)					
0.506 (0.468)	14.387** (5.857)	-119.257** (53.168)	12	54	0.123
School enrollment, tertiary, male (% gross)					
-0.146 (0.097)	8.219** (2.997)	-63.442** (27.169)	12	48	0.066
School enrollment, tertiary, female (% gross)					
0.216 (0.251)	24.337** (8.816)	-203.620** (80.479)	12	48	0.09

Robust standard errors clustered by country are in parenthesis. Country fixed effects are controlled in the regressions. Due to unavailability of data, Haiti is dropped from the sample in secondary and tertiary school regressions

remittances have not been used to improve education in this region. The coefficients for remittances are not statistically significant, except for that of female secondary school enrollment. On the other hand, the results indicate that income is the main factor that improves secondary and tertiary education. More importantly, the impact is much larger for female than for male at the tertiary education level. A 1 % rise in income has opened doors for about 24% of girls to higher education while the increase for boys was only 8% with the same increase in income. It is also very interesting to note that there is a larger percentage of female in colleges than that of male.

Table 4 presents the results of the impact of remittances on communication infrastructure. We use three measures of communication infrastructure, Internet users, mobile phone subscriptions, telephone lines. The results indicate that the coefficients for remittances in all three regressions are insignificantly different zero. That is, the money received as remittances is not spent on improving communication infrastructure.

The final indicator we look at is whether there are any demographical changes in the region due to remittances (see Table 5). We look at fertility rate and dependency ratio of all dependents (younger than 15 and older than 64). The results show that the coefficients for the impact of remittances are negative but insignificantly different from zero. The results also show that the improvement in income has reduced the fertility rate and the dependent ratio. That means economic progress has reduced the family size and thus the number of dependents.

One of the concerns is that social development in the society may also be affected by government policy. For instance, health and education development can improve due to the effort that the government put into addressing those issues. We address this concern by controlling for government expenditure on health services in the health outcome regressions and government expenditure on education in the education outcome regressions. The government spending is measured as a percentage of GDP.

Table 6 reports the results for the health outcomes. The coefficients for the impact of remittances on infant and child mortality rates, improved sanitation facilities and water source remain fairly similar and statistically significant while those for the depth of food deficit and life expectancy turn insignificant. However, government spending on

**Table 4** Remittances and communication infrastructure

REMITGDP	LGDPCC	Constant	Country	Obs	Adj.r2
Internet users (per 100 people)					
-0.146 (0.542)	67.020*** (12.399)	-587.998*** (110.854)	13	65	0.452
Mobile cellular subscriptions (per 100 people)					
1.115 (1.475)	132.509*** (9.676)	-1168.6*** (89.882)	13	90	0.452
Telephone lines (per 100 people)					
0.239 (0.144)	24.624*** (4.781)	-205.328*** (43.314)	13	90	0.402

Robust standard errors clustered by country are in parenthesis. Country fixed effects are controlled in the regressions

**Table 5** Remittances and demographic changes

REMITGDP	LGDPCC	Constant	Country	Obs	Adj.r2
Fertility rate, total (births per woman)					
-0.002	-1.599***	17.229***	13	85	0.353
(0.030)	(0.446)	(4.035)			
Age dependency ratio (% of working-age population)					
-0.177	-32.304***	361.202***	11	75	0.365
(0.624)	(6.716)	(61.673)			
Age dependency ratio, young (% of working-age population)					
-0.154	-32.201***	349.266***	11	75	0.362
(0.649)	(6.572)	(60.660)			

Robust standard errors clustered by country are in parenthesis. Country fixed effects are controlled in the regressions. Due to unavailability of data, Dominica and St. Kitts and Nevis is dropped from the sample in age dependency regressions

health is hardly statistically significant across the regressions, except for improved sanitation facilities.

Table 7 reports the results for the education outcomes. The inclusion of government spending does not change most of the results. The coefficients for the impact of remittances on education at all levels remain statistically insignificant. At the same time, one interesting thing is that government spending has improved primary school enrollment. An additional 4 percentage points of kids get enrolled in primary school with a one-percentage point rise in government spending on education.

As a final step in the analysis, we conduct some robustness tests. One of the concerns could be the averaging strategy. To check the robustness of the results, we average the data by 3 years instead of 5. The results for the impact of remittances on health outcomes are presented in Table 8. They show that the coefficient for remittances is statistically significant at the conventional level for infant and child mortality, access to sanitation facilities and access to water sources; however, it is not significant for maternal mortality, food deficit and life expectancy. The results for education, communication infrastructure, and demographic outcomes, though not reported, are consistent with those from the 5-year average. Because these socio-economic indicators do not change much over time, the 3-year average increases the number of observations, but the variation in the sample remains pretty much unchanged. Thus, the overall results do not change.

Another possible concern is the reverse causality between remittances and socio-economic outcomes. It is possible that improved health raise the productivity of migrants, so they can earn more money and remit more as well. To address the concern, we employ an instrumental variable (IV) approach to obtain a consistent estimate of the causal impact of remittances on socio-economic development. The approach can also resolve any omitted variable bias problems. That is, the change in the outcome variable is due to a change in remittance receipt as a result of a change in instruments, not any other factors. We choose a change in nominal exchange rate and the level of real effective exchange rate as excluded instruments. For instruments to be valid, they must be highly correlated with the endogenous regressor, but not correlated with the error

**Table 6** Remittances and health outcomes: controlling public expenditure on health

REMITGDP	LGDPCC	HEALTHGDP	Constant	Country	Obs	Adj.r2
Mortality rate, infant (per 1000 live births)						
-0.645**	-11.771***	1.22	129.085***	13	52	0.447
(0.268)	(3.293)	(1.368)	(28.963)			
Mortality rate, under-5 (per 1000 live births)						
-0.788**	-14.067***	2.179	153.088***	13	52	0.374
(0.266)	(3.473)	(2.154)	(30.839)			
Maternal mortality ratio (national estimate, per 100,000 live births)						
-2.86	-246.259**	-15.71	2387.916**	13	28	0.206
(3.403)	(91.331)	(15.822)	(808.000)			
Depth of the food deficit (kilocalories per person per day)						
-1.749	-51.679*	-9.849	633.078**	13	52	0.075
(1.579)	(27.313)	(17.489)	(242.212)			
Improved sanitation facilities (% of population with access)						
0.174**	4.261	1.996**	32.377	13	48	0.302
(0.064)	(3.692)	(0.885)	(34.385)			
Improved sanitation facilities, rural (% of rural population with access)						
0.178**	4.124	2.159**	30.81	13	48	0.304
(0.074)	(3.799)	(0.790)	(35.164)			
Improved water source (% of population with access)						
0.381**	7.959*	1.812	11.54	13	51	0.442
(0.162)	(4.318)	(1.634)	(41.080)			
Improved water source, rural (% of rural population with access)						
0.469*	11.754	2.501	-28.831	13	51	0.336
(0.253)	(7.390)	(2.667)	(69.293)			
Life expectancy at birth, total (years)						
0.102	4.052*	0.511	31.157	13	48	0.336
(0.090)	(1.961)	(0.451)	(17.705)			

Robust standard errors clustered by country are in parenthesis. Country fixed effects are controlled in the regressions

term. There is evidence that the exchange rates have an impact on remittances (see Yang 2008). We use the Fuller 1 estimator (Fuller 1977), which is a bias-corrected limited information maximum likelihood estimator. To the extent that the instruments may be potentially weak, the regressions provide the Kleibergen and Paap (2006)  $F$ -statistic for the excluded instruments which is used to test the null hypothesis of weak instruments. We also report Hansen's test of overidentification to check if the instruments are correlated with the error term.

The results for the IV estimation of health outcome are presented in Table 9. The estimate for the impact of remittances on infant and child mortality, food deficit, and access to water sources is consistent and statistically significant at the conventional confidence interval. That is, remittances into CARICOM reduce infant and child mortality and the depth of food deficit as well as improve access to water sources.

**Table 7** Remittances and education outcomes: controlling public expenditure on education

REMITGDP	LGDPCC	EDUGDP	Constant	Country	Obs	Adj.r2
School enrollment, primary (% gross)						
-0.087 (0.394)	-19.437*** (5.978)	4.215** (1.758)	262.791*** (50.629)	11	51	0.447
School enrollment, primary, male (% gross)						
-0.194 (0.389)	-21.866*** (5.835)	4.162** (1.778)	285.383*** (51.446)	11	49	0.481
School enrollment, primary, female (% gross)						
-0.065 (0.428)	-17.997** (8.068)	3.755* (1.749)	250.094*** (67.066)	11	49	0.376
School enrollment, secondary (% gross)						
0.551 (0.846)	62.309*** (13.917)	-1.158 (1.750)	-482.913*** (130.473)	11	48	0.675
School enrollment, secondary, male (% gross)						
0.386 (0.987)	62.247*** (15.019)	-1.305 (2.259)	-483.786*** (138.680)	11	48	0.624
School enrollment, secondary, female (% gross)						
0.787 (0.648)	63.311*** (12.364)	-0.505 (1.712)	-493.219*** (117.152)	11	48	0.684
School enrollment, tertiary (% gross)						
0.436 (0.563)	15.275** (6.351)	-0.184 (1.019)	-125.612* (56.590)	10	41	0.076
School enrollment, tertiary, male (% gross)						
-0.200 (0.119)	7.231** (3.178)	-0.357 (0.460)	-52.294* (28.222)	10	37	-0.004
School enrollment, tertiary, female (% gross)						
-0.072 (0.294)	26.292** (8.619)	-1.301 (1.432)	-211.578** (73.311)	10	37	0.07

Robust standard errors clustered by country are in parenthesis. Country fixed effects are controlled in the regressions. Due to unavailability of data, Haiti and Suriname are dropped in primary and secondary school regressions and Grenada, Haiti and Suriname are dropped in tertiary school regressions

The Kleibergen and Paap (2006) *F*-statistic for the excluded instruments is greater than Stock and Yogo (2005) critical values at the 5% significance level, rejecting the null of weak instruments and Hansen *J*-statistic cannot reject the null that the excluded instruments are not correlated with the error term. Both tests indicate that our two instruments are valid and the results are consistent with those in Table 2, except for access for sanitation facilities and life expectancy whose estimates turn out to be statistically insignificant. In addition, we add another result explaining the impact of remittances on human development index (HDI), which combines health, education and income.<sup>7</sup> The result

<sup>7</sup> Human Development Index is taken from UN Development Programme (2016) 's Human Development Reports (accessed on 10/24/2016).

**Table 8** Remittances and health outcomes (3-year average)

REMITGDP	LGDPCC	Constant	Country	Obs.	Adj.r2
Mortality rate, infant (per 1000 live births)					
-0.571**	-14.813***	160.831***	13	128	0.428
(0.191)	(3.811)	(34.162)			
Mortality rate, under-5 (per 1000 live births)					
-0.681**	-19.677***	210.609***	13	128	0.411
(0.227)	(4.663)	(41.691)			
Maternal mortality ratio (national estimate, per 100,000 live births)					
-2.603	-254.24**	2407.02**	13	35	0.252
(1.697)	(113.99)	(1029.5)			
Depth of the food deficit (kilocalories per person per day)					
-1.437	60.249	666.29*	13	54	0.356
(0.84)	(33.568)	(296.9)			
Improved sanitation facilities (% of population with access)					
0.131**	8.513*	2.748	13	91	0.251
(0.058)	(4.432)	(39.937)			
Improved sanitation facilities, rural (% of rural population with access)					
0.163***	8.649*	-0.242	13	91	0.265
(0.049)	(4.462)	(40.201)			
Improved water source (% of population with access)					
0.231*	7.654**	21.161	13	95	0.311
(0.106)	(3.454)	(31.355)			
Improved water source, rural (% of rural population with access)					
0.313**	10.593*	-8.933	13	95	0.257
(0.13)	(5.368)	(48.681)			
Life expectancy at birth, total (years)					
0.081	3.609***	36.604**	13	118	0.32
(0.047)	(1.088)	(9.76)			

Robust standard errors clustered by country are in parenthesis. Country fixed effects are controlled in the regressions

is presented in the last row of Table 9. It is evident that remittances improve human development index of the recipient country. However, the effect is small. A one percentage point rise in remittance share raises HDI by only 0.002.

To save space, the estimates for the impact of remittances on education, communication infrastructure, and demographic changes are not reported. They are all statistically insignificant, consistent with the findings in the study.

## Discussion

In this section, we sum up the findings in this study and the literature, and rationalize the link between remittances and income growth. Studies that examine the impact of

**Table 9** Remittances and health outcomes (IV Fuller 1 estimations)

REMITGDP	LGDPCC	Country	Obs.	Kleibergen-Paap <i>F</i> -stat.	Hansen <i>J</i> -stat. ( <i>P</i> -value)
Mortality rate, infant (per 1000 live births)					
-0.534**	-17.720***	9	60	216.57	1.38 (0.24)
(0.236)	(3.976)				
Mortality rate, under-5 (per 1000 live births)					
-0.939***	-23.935***	9	60	216.57	1.37 (0.24)
(0.282)	(5.168)				
Maternal mortality ratio (national estimate, per 100,000 live births)					
1.454	-293.52***	8	19	53.28	0.61 (0.43)
(5.779)	(114.43)				
Depth of the food deficit (kilocalories per person per day)					
-6.392***	-7.744	9	45	87.30	0.09 (0.77)
(2.039)	(31.757)				
Improved sanitation facilities (% of population with access)					
-1.469	11.427	9	40	58.80	2.03 (0.15)
(4.927)	(12.988)				
Improved sanitation facilities, rural (% of rural population with access)					
-1.438	11.926	9	40	58.80	2.04 (0.15)
(6.081)	(15.700)				
Improved water source (% of population with access)					
0.666*	7.488*	9	43	75.47	2.07 (0.15)
(0.343)	(3.915)				
Improved water source, rural (% of rural population with access)					
0.889*	9.683*	9	43	75.47	1.90 (0.17)
(0.511)	(5.870)				
Life expectancy at birth, total (years)					
0.058	4.810***	9	56	376.50	1.62 (0.20)
(0.040)	(1.022)				
Human Development Index					
0.002***	0.091***	9	38	2655.4	1.23 (0.27)
(0.0005)	(0.012)				

Robust standard errors clustered by country are in parenthesis. Country fixed effects are controlled. Due to unavailability of exchange rate data, Barbados, Haiti, Jamaica and Suriname are dropped from the sample. The regressions are estimated using the change in nominal exchange rate and the level of real effective exchange rate as excluded instruments. Kleibergen-Paap *F*-stat. is reported to test the null hypothesis of weak instruments. Stock-Yogo critical values at the 5% significance level for weak instruments tests are 13.46 and 7.49 based on, respectively, 5 and 30% maximal Fuller relative bias. Hansen *J*-stat. And *p*-value are also reported for the test of overidentification. The null hypothesis is that the instruments are not correlated with the error term

remittances in Latin America and Caribbean find that remittances have improved economic growth in the region (Mundaca 2009; Nsiah and Fayissa 2013; Ramirez and Sharma 2008); however, these studies have not adequately explained the channels through which remittances enhances growth. Lim and Simmons (2015) investigate the



economic impact of remittance inflows into the Caribbean region. They show that remittances have been used for consumption, not for investment that would generate more income.

According to the growth theory predictions, income and growth should rise with improvement in human capital which could include both education and health. For instance, Robert Fogel contends that 30% of growth in Great Britain between 1790 and 1980 could be explained by improved caloric intake (Mankiw 2015). If the recipient households spend remittance money on consumption that improves education and health of the family members, that may also lead to higher income or growth in the long run. However, the present paper shows that remittances in CARICOM have done little to improve the health or nothing at all to improve the education of the children. It is possible that remittance is used for unproductive consumption such as home improvement (see World Bank 2006) or for substitute of domestic income by reducing working hours or stopping working (see Itzigsohn, 1995; Kim, 2007). Our present results complement Lim and Simmons (2015) and confirm that remittance inflows in CARICOM have not improved productive factors that generate higher income or economic growth.

## Conclusion

We examine the long-run impact of remittances on social development in 13 Caribbean countries of CARICOM. The data are averaged over a 5-year span for the period between 1970 and 2013. We find that remittances have significantly improved the health indicators; however, the impacts are small. *Ceteris Paribus*, when a country received remittances equal to 10% of GDP, infant mortality would fall by 7 per 1000 live births over 5 years or child mortality would fall by 8 per 1000 live births; the food deficit would reduce by 24 kcal per person per day; about an additional 1.7% of the population would have access to sanitation facilities and about an additional 2% in the rural areas; more than 4% of the population would have access to improved drinking water source and more than 5% in the rural areas; and life expectancy would rise by 0.8 years. However, remittance inflows have no impact on education and communication infrastructure. Neither do they contribute to any demographic changes.

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