RESEARCH ARTICLE

Remittance, Oil Trade Balance, and Income: Empirical Evidence From 55 Developing Countries

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Abstract: This article investigates the effect of net oil trading position on remittance flows through income variation of 55 developing countries over 1986–2018. To disentangle the causal effect of aggregate income on remittances, we take advantage of the persistent response of income to world oil price shocks and instrument income by the lagged interaction term between the dynamics of oil prices and net oil trade volumes. Results reveal that countries with a more substantial net oil trade balance attract larger remittances after an increase in global oil prices. Remittance flows to developing countries are associated with an altruistic or compensatory motive except for net oil-exporting countries where an investment motive prevails. The causal effect reveals via the income channel of the remittance-receiving country. Our results underscore that a surge in the oil trade balance affects remittance flows through its effect on per capita income. Oil trade balance variation exerts a persistent effect on income, and remittances actively respond to permanent income shocks, lasting for more than five years for oil-exporting countries.

Keywords: Remittances, permanent income shocks, oil prices, oil trade balance, economic growth

Over the past decades, the world has witnessed a sharp increase in the volume of worldwide remittances. In 2019, there were 272 million migrants globally (United Nations, 2020), or 3.5% of the world population, who do not live in their country of birth. Such demographic trends significantly influence the composition of remittances. Remittances to low- and middle-income countries touched a record high of $554 billion in 2019, surpassing foreign direct investment (World Bank, 2020b). The World Bank (2020b) foresaw a significant fall of remittance flows in 2020 by 19.7% ($445 billion), owing to the combined effect of the tumbling oil prices and the global COVID-19 pandemic that have caused wage reduction and higher unemployment among international migrants. The actual amount of remittances could be underestimated by official statistics because remitters sometimes choose informal channels of remitting (United Nations, 2020; Brown & Conneil, 1993), such as in-kind or hand transfers among family members or friends, rather than formal bank channels. The inflow of remittances fostered trade deficits in the Middle East and North African countries (Farzanegan & Hassan, 2019) and some Asia-Pacific countries (Tung, 2018). The remittance inflow leads to an increase in the demand for the domestic currency, which may cause an appreciation of the domestic currency and deteriorate the trade balance (Jansen & Vacaflores, 2020).

The effect of remittances on economic growth is statistically significant (Nepal et al., 2020). Remittances have instituted an eminent source of income for households (Wong, 2009). Advocates of remittances often attest to the contribution of remittances to welfare effects and growth effect (Rao & Hassan, 2012) in terms of possessing the conspicuous ability to alleviate poverty (Imai et al., 2014; Haas, 2005), reducing income disparities, boosting standards of living, and contributing to the saving and investment levels of households (Catrinescu et al., 2009). The macroeconomic effects of remittances rest on the spending behavior of the remittance-recipients (Bahadir et al., 2018). Wage earner recipients prefer to spend on non-productive leisure goods. Meanwhile, entrepreneur recipients in favor of finance investment goods contribute promising long-run effects to the economy.

Remittances allow recipient families from the lower-income brackets to access better education, healthcare facilities, and improve their consumption expenditure (Guha, 2013; Balli & Rana, 2015), with greater portions of their budget devoted to health capital investment, instead of other consumption goods (Berloffa & Giunti, 2019). Goldring (2004) termed this type of recurrent costs as family remittances. This implies that remittances are contemplated as households' permanent income hypothesis, as proposed by Friedman (1957), as cited by Lim & Basnet (2017).

Nevertheless, results from the literature are mixed. Retrospectively, remittances may also create an inexpedient impact on the populace by fueling inflation (Ball et al., 2013; Mandelman, 2013) and diminishing home labors' productivity (Catrinescu et al., 2009). High remittances cause a large influx of foreign capital (Wong, 2009), disadvantaging the tradable sector by appreciating the domestic currency and lowering recipients' incentives to supply more labor to the market. Although remittance inflows appreciate domestic currency, it can bring the Dutch disease, an unpremeditated peripheral effect in the economy (Ratha & Moghaddam, 2020). Also, the degree to which remittances impact an economy may depend on the institutional framework and financial structure of the nation (Catrinescu et al., 2009; Poon et al., 2015).

Cross-country heterogeneity may explain the divergence determinants of economic growth (He & Xu, 2019). Due to the potential impact that remittances have on countries' economies, especially the developing ones, it is important to identify factors affecting remittance flows. The literature has identified income to be one of the key determinants of the remittance volume that a country receives. An interesting feature about the impact of home income on remittances is that its direction can go either way. If a negative sign is obtained, remittances are associated mainly with altruistic motivation. The rationale for the counter-cyclical nature of remittances is that when a country experiences low growth, migrants living abroad remit money to ensure their family members at home against unfavorable economic conditions (Chami et al., 2005; Le, 2009; Guha, 2013; Swing, 2018). Likewise, if a positive sign is attained, remittances enhance investment motivation (Lopez-Calix & Seligson, 1990; Le, 2011).

When estimating the response of remittances to income fluctuations, we encounter an endogeneity problem caused by the feedback effect from remittances to income (i.e., the reverse causality effect). An effective way to deal with this endogeneity problem, as suggested by the literature, is to use an instrumental variable estimation. We propose to use the lagged interaction between global oil prices and national net oil export as an instrument for income. In doing so, we take advantage of the time series on international oil prices between 1986 and 2018 that affected income across developing countries in different parts of the globe with different volumes of oil export and import. The use of the instrumental variable serves two purposes. Firstly, it helps overcome the issue of endogeneity problem. Although lagged oil trade balance is correlated with income, it is uncorrelated with the error term because there is no reverse causality from contemporaneous remittances to the past oil trade balance. Secondly, it allows us to exploit the persistent response of income per capita to the international oil trade balance to study the effect of fluctuations in the global oil market on remittances through the persistent (driven by net oil trading balance) income channel. Given that shocks in the international oil market are often considered permanent shocks to income, alongside technological shocks (Hamilton, 2009), this study helps explain the variation in remittance flows triggered by a type of shocks that exhibit a persistent impact on national income.

The key findings of this study are as follows: The first set of results involves estimation of the potential effect that net oil trade balance may have on

the variation of remittance flows using a panel fixed effects model. First of all, lagged oil trade balance, on average, has a significant impact on remittances channeled to developing countries. This result is robust to the inclusion of financial credit ratings, and country fixed effects and time fixed effects as control variables. It is also robust to the use of different sub-samples constructed based on net oil trade balances. Secondly, the degree of impact varies across different sub-groups of countries. In particular, it is positive and most profound for net oil-exporting countries, smaller for net oil-importing nations, and smallest for mixed oil trading economies.

The second set of results is obtained using the two-stage least squares estimation technique. Results reveal that, on average, the response of remittance flows to income is mainly due to the investment motive in net oil-exporting countries and the compensatory/altruistic motive in others such as net importing countries and mixed oil trading countries. Although the oil trade balance increases income per capita in the former, it reduces income per capita in the latter. Although the effect of the oil trade balance on per capita income is different between oil-exporting countries and the rest, its effect on remittances is the same for all countries as it increases their volume of remittances received. Ordinary least squares (OLS) regressions provide qualitatively similar results.

The effect of remittances also hinges on the capital formation (Farzanegan & Hassan, 2020). While analyzing the sources of change in income, we found that shocks to oil trade balances exert a significant influence on the gross fixed capital formation of net oil-importing and mixed oil trading countries (the effect is found insignificant for net oil-exporting countries). An increase in the net oil trade balance is found to be associated with a fall in investment (Chuah et al., 2018), which in turn dampens aggregate GDP in these countries. Both effects concur at reducing GDP per capita whenever there is a surge in the oil trade balance. This surge is highly persistent, lasting for more than five years in our sample.

Literature Review

There are three strands of literature in this area. The first strand of literature owes much to the early works, among others, Johnson and Whitelaw (1974), Cox (1987), Lucas and Stark (1985), Cox and Jimenez (1992), and Cox et al. (1998). These studies test the determinants of remittances. Typically, six different motives for remittances are found, of which four are individualistic motives (altruism, exchange, inheritance, and strategic), and two are familial agreements (insurance and investment). Rapoport and Docquier (2005) provided an excellent review of this literature. As a result, anything that affects recipients' income permanently will also affect remittances permanently.

The second strand of literature examines the effect of oil price changes on total GDP. As much as this literature is growing, given that the oil price shocks exert a permanent effect on income, Bruckner et al. (2012) examined the impact of oil price shocks on democracy through income for a large number of developed and developing countries. Acemoglu et al. (2013) found that oil price changes affect the income of different states in the U.S., which then affects their health spending. Naufal and Termos (2009) estimated the elasticity of remittances sent (not remittances received) with respect to oil price and GDP per capita. They found that oil price changes affect the outflow of remittance in the Gulf area. Mohaddes and Raissi (2013) claimed that oil price surges have an indirect positive effect on GDP following remittances inflows in Jordan. This indirect positive effect dictates the direct negative effect on the rising import bill, owing to higher oil prices. More recently, Akçay and Karasoy (2019) demonstrated that GDP per capita has no impact on remittance inflows in the long run but have a negative association with remittances in India in the short run.

The third strand of literature focuses on the association between remittances and oil price shocks. The results are mixed. Most studies argue that remittances respond positively to oil price shocks to recipient oil-importing countries (De et al., 2019; Makhlouf & Kasmaoui, 2017; Asatryan et al., 2017; Mohaddes & Raissi, 2013). For instance, De et al. (2019) revealed a positive association between remittance inflows and a rise in oil prices, vice versa. An increase in crude oil price weakens purchasing power; hence, migrants send more remittances back to their families in Morocco (Makhlouf & Kasmaoui, 2017).

Other studies either showed a negative relationship between remittances inflow and oil price (e.g., Khodeir, 2015) or showed various responses between

remittances and oil prices (e.g., Zahran, 2019; Akçay & Karasoy (2019). For example, Zahran (2019) found various responses of remittances inflows to asymmetric oil price shocks. Akçay and Karasoy (2019) showed remittances respond differently to changes in oil prices in India, where positive oil price shocks increase remittances, and negative movement in oil price shocks have a more intense outcome on remittances in the long run. These mixed results show that the impact of oil price shocks on remittances has not been sufficiently investigated.

In light of this research gap, the current manuscript distinguishes itself from the previous study. We test the effect of net oil balance on received remittances by examining the interaction effect between net oil exports and oil price level in 55 developing countries from 1986–2018, which cover a longer sample period and more countries. Our fundamental hypothesis is that net oil balance affects remittance flow by altering the income. To test this hypothesis, we include in our econometric specifications for remittances either an income variable or a net oil trade balance variable. Our results provide substantial evidence of the hypothesis.

This paper contributes to the literature in three folds. Firstly, it is among the first studies that examine how permanent income shocks influence remittance flows. Explicitly, it considers the effect of lagged net oil balances on remittances through lagged interaction between net oil exports in 55 developing countries and the international oil price level. This interaction term allows us to capture both the price effect and the market size effect of the world oil trading activities on remittance flows. To investigate channels through which changes in the international oil market affect income, we extend our analysis to the potential impact of oil on investment incentives as per Blanchard and Katz (1992).

Secondly, this paper includes a large number of remittance-recipient developing countries across different regions and over a long period. Most studies focus on either a single country (e.g., Akçay & Karasoy (2019) for India, Makhlouf & Kasmaoui (2017) for Morocco; Mohaddes & Raissi (2013) for Jordan) or a few countries (e.g., De et al. (2019) for Egypt, Pakistan, and Sri Lanka; Naufal & Termos (2009) for the Middle East). So, at this stage, it would be fair to notice that the role of the oil trading balance in affecting received remittances is still unclear. Therefore, our proposed empirical investigation is aimed at closing this research gap. In exploring our findings further, we split our sample into different sub-groups based on oil trade balance characteristics. Across a wide range of specifications, it is found that remittances are mainly driven by an investment motive in net oil-exporting sub-sample and an altruistic motive of migrants in other sub-samples (i.e., net oil importing and mixed oil trading economies).

Third, our approach based on country and year fixed effects regressions reduce the risk of omitted variables bias caused by country and time-specific characteristics. Furthermore, by using 55 developing countries and longer year periods in the panel data analysis setting, it gives sample variability and thus provides breadth inference of model parameters. Besides, we also account for endogeneity issues by using an internal instrumental variable.

Methods

Estimation Strategy

To examine the impact of oil price fluctuations on remittance flow, we construct our main indicator of the oil trade balance, OTB_{it}, as follows:

$$OTB_{it} = \frac{(OX_{it} - OM_{it})}{1,000,000}.\log(P_t) \quad (1)$$

In this formulation, OX_{it} is the o il exports, OM_{it} is oil imports (both measured in thousands of barrels), P_t is the global spot oil price (U.S. dollars per barrel), and i and t denote the country and time index, respectively. Given this specification, each change in OTB_{it} captures the change of country i's net trading position per every billion barrels of oil at time t. This variable is expected to reflect the impact of fluctuations in the oil market through the market size and price effects.

The main equation of our reduced-form model, which captures the effects of world oil trading developments on remittance flows as a percentage of GDP, could be written as follows:

$$Rpercent_{it} = \alpha_{i0} + \gamma_t + \alpha_1.OTB_{it-1} + X_{it}^{T}\Phi + \varepsilon_{it} \quad (2)$$

where $Rpercent_{it}$ represents remittances as a percentage of GDP, X_{it}^{T} denotes the transposed vector of other covariates that are included in the regression, and ε_{it}

is an error term, α_{i0} and γ_t denote country and year fixed effects, respectively. Unless otherwise stated, throughout, we use a single-lagged oil trade balance (i.e., in $t - 1$ period) to allow for some time in the transmission of net oil trading position to remittances. We estimate this equation by standard OLS, and the main coefficient of interest is α_1.

To investigate whether oil trade balance induces a change in remittance flows through per capita GDP, we also estimate:

$$Rpercent_{it} = \beta_{i0} + \delta_t + \beta_1.\log\left(GDPPC_{it}\right) + X_{it}^{T}\Theta + \vartheta_{it} \quad (3)$$

In this formulation, $GDPPC_{it}$ denotes GDP per capita of country i at time t, and ϑ_{it} it is an error term. β_{i0} and δ_t are defined similarly to α_{i0} and γ_t in our previous equation. The simplest strategy would be to estimate β_1 using OLS. However, the OLS results are likely to be biased due to the endogeneity of $GDPPC_{it}$. Although income affects the amount of received remittances, remittances may influence income in return as well. Moreover, the sign of bias is not defined. If income is associated with the compensatory motive of remittances, then the OLS estimates would be biased downward. However, if income is associated with the investment motive, then the OLS estimates would be biased upwards instead. To eliminate this potential bias, we instrument for changes in income in year t by the differential impact of global changes in oil prices on the oil trade balance in year $t - 1$, i.e. OTB_{it-1}. This again allows for a lag in the translation of oil prices into income changes. In addition, this helps us avoid any potential reverse causality from remittances to oil balance, the main source of endogeneity problem in our sample.

Our identifying assumption is that, other things being equal, in the absence of changes in oil trading balance, remittance flows in countries would have behaved similarly. This is plausible because both world oil prices and oil trading activities should not be affected by changes in a country's remittance flow. However, countries with different net oil trade balance may have different characteristics that could affect remittance flow.

Data Description

To estimate Equations (2) and (3), we use annual panel data for a group of 55 developing countries over the period of 1986–2018. It is important to emphasize that our selection of countries and the time period is severely constrained by the availability of data at the time of data collection. Nevertheless, our sample is still highly representative. In particular, out of these 55 developing economies, 24 are located in Sub-Saharan Africa, 14 in Asia, and 17 in Latin America and the Caribbean (for more details on the countries, see Table A1 in the Appendix). We briefly describe the construction of our main data series here. Summary statistics on our key variables are presented in Table 1.

Our main measure of remittances is the personal remittances received as a percentage of GDP. These data are obtained from the World Development Indicator (WDI) database provided by the World Bank (2020a). In our sample, annual remittance flows are around 3% of a country's total GDP on average and range from 4% to over 22% of national GDP.

Table 1

Descriptive Statistics of Main Data Series

Data series	Measuring unit	Mean	Std. Dev.	Min	Max
Remittances received	Percentage of GDP	3.071	4.224	0.000	22.526
Oil exports	Thousand barrels	17405.32	67426.97	0.000	647095
Oil imports	Thousand barrels	3695.087	11810.40	0.000	163193
Financial risk ratings	Rating points	34.160	7.765	6.500	49.000
Real GDP	Billion 2010 US dollars	201.687	725.124	0.512	1087.300
Real GDP per capita	2010 US dollars	4179.936	4933.356	164.192	34749.68
Gross fixed capital formation	Percentage of GDP	21.963	7.499	2.424	54.948

We measure oil prices by taking the average annual spot oil prices (US$ per barrel) among three major brands: Dubai, Brent, and West Texas Intermediate (WTI). These data are extracted from the Platts database (www.platts.com).

The data on oil exports and imports come from the International Energy Statistics database provided by the U.S. Energy Information Administration (www.eia.gov). Based on these data, we can compute net oil exports (or net oil imports if negative) for countries in our sample. We further organize countries in the sample into different sub-groups such as net oil exporters (15 countries), net oil importers (22 countries), mixed oil traders (11 countries), and non-oil traders (7 countries). More details on country classification based on oil trade balance are available in Table A2 in the Appendix.

Along with data on remittance flows, the following data were also obtained from the WDI database: GDP, GDP per capita (both at 2010 constant U.S. dollars), and gross capital formation (as a percentage of GDP). The control variable, financial risk rating (*Finrisk*), is obtained from the International Country Risk Guide (ICRG) database provided by the Political Risk Services (PRS) group. On its website, PRS defines *Finrisk* as an indicator of a country's ability to pay back its official, commercial, and trade debt obligations. Here, risk points are assessed for each of the component factors of foreign debt as a percentage of GDP, foreign debt service and current account as percentages of export of goods and services, net liquidity as months of import cover, and exchange rate stability. The final scale of the risk rating ranges from 50 (least risk) to 0 (highest risk).

We collected data on the annual gross fixed capital formation of the countries in our sample to explore the potential impact of oil-driven income on investment activities. As we will show in the next section, these data provide valuable insight into how permanent income shocks influence remittance flows.

Results

Reduced-Form Estimates

Table 2 presents the reduced-form effects of oil price changes on remittance flows. Column (1) shows estimates where there is only one control variable, financial risk (*Finrisk)*, which is an important factor affecting remittance flows. The coefficients of our main variable of interest, oil trade balance (*OTB*), and the control variables are both highly significant. However, the adjusted R^2 indicates a low explanatory power of the regression (i.e., less than 2% of the within-sample variation in remittances is explained by the model).

In column (2), we additionally control for country fixed effects. The results show that the oil trade balance yields a negative and marginally significant

Table 2

Oil Trade Balance and Remittances

	Dependent variable: $Rpercent_t$		
Explanatory variables	**(1)**	**(2)**	**(3)**
OTB_{t-1}	-2.012*** (0.167)	-0.299* (0.176)	-0.411*** (0.151)
$Finrisk_t$	0.058*** (0.005)	0.113*** (0.006)	0.034*** (0.011)
Country FE	No	Yes	Yes
Time FE	No	No	Yes
Adjusted R^2	0.019	0.775	0.786
Observations	1760	1760	1760

Notes: *Rpercent* is remittances as a share of GDP, *OTB* is oil trade balance and *Finrisk* is financial risk rating. All regressions include an unreported constant. White heteroskedasticity consistent standard errors are in parentheses. Significance at the 1%, 5%, and 10% levels are denoted respectively by ***, **, and *.

effect on remittances. The goodness-of-fit of the regression is found to be improved significantly (77.5% of the within-sample variation in remittances can now be explained by the model). The size of the effect on remittances implies that if the oil price rises by one log point for every billion barrels of net oil export per year, the annual inflow of remittances (as a share of GDP) will decrease by 0.299 percentage points. The coefficient of the control variable is found positive and statistically significant, meaning that improving financial credit rating (or reducing financial risk) is an effective way of attracting more remittances. In particular, if financial risk rating is improved by one point, remittance flows will increase by about 0.1 percentage points of GDP.

Column (3) contains analogous results when time fixed effects are also accounted for. The effect of the oil trade balance on remittances is still negative and statistically significant. In terms of the adjusted R2, the regression described in column (3) is the most preferred model.

To check whether the marginal effect that net oil export exerts on remittances varies by country with different characteristics, we present estimates of sub-samples based on oil trade balance categorization in Table 3. As mentioned before, countries in the sample are classified as net oil exporting, net oil importing, mixed oil trading, and non-oil trading countries (see Table A2 in the Appendix for further details on this classification). Columns (1) and (2) present results for net oil-exporting countries. Estimates for net oil-importing countries are provided in columns (3) and (4). The last two columns include the results for mixed oil trading countries, that is, the countries that change their types during the analyzed time period (from a net oil exporter to a net oil importer and vice versa). (As for non-oil trading countries, because they do not conduct any oil trading transactions over the entire sample period, changes in the oil price are expected not to have any direct effect on their remittance flows). In addition, regressing remittances on their oil trade balances, in this case, is meaningless, for the latter are all zeros.

The estimated coefficient on the oil trade balance is mostly significant across all the sub-samples though having different signs. Quantitatively, the marginal effect of the oil trade balance on remittances is strongest for net oil-exporting countries, followed by net oil-importing countries, and then by mixed oil trading countries. This indicates that there is a significant difference between country groups of different oil trading characteristics. Hence, from now

Table 3

Oil Trade Balance and Remittances (Sub-Samples of Oil Trade Balance)

Explanatory variables	Dependent variables: $Rpercent_t$					
	Net oil exporters		Net oil importers		Mixed oil traders	
	(1)	(2)	(3)	(4)	(5)	(6)
OTB_{t-1}	0.312*	0.522***	-7.539***	-1.363	-2.947**	-1.812
	(0.171)	(0.164)	(1.716)	(1.257)	(0.733)	(1.214)
$Finrisk_t$	0.021	0.049	0.194***	0.072***	0.052***	-0.003
	(0.015)	(0.006)	(0.011)	(0.024)	(0.008)	(0.026)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes	No	Yes
Adjusted R^2	0.630	0.628	0.801	0.814	0.588	0.572
Observations	480	480	704	704	352	352

Notes: *Rpercent* is remittances as a share of GDP, *OTB* is the oil trade balance, and *Finrisk* is financial risk rating. All regressions include an unreported constant. White heteroskedasticity consistent standard errors are in parentheses. Significance at the 1%, 5%, and 10% levels are denoted respectively by ***, **, and *.

and henceforth, regressions will be run separately for these different sub-samples to capture how differences in oil trade balance shape their remittance inflows rather than for the whole sample.

Two-Stage Least Squares Estimates (Baseline Estimates)

In this sub-section, we estimate the impact of the oil trade balance on remittances through the income channel. We start with least squares estimation and provide results for all sub-samples in Table 4. In every regression, the financial risk rating is included as the primary covariate. Each regression is also controlled for either country fixed effects alone or together with time fixed effects. In terms of the adjusted R2, regressions containing both types of fixed effects are preferred models. Although the coefficient on income per capita is positive and significant for oil-exporting countries, it is mostly negative and significant across regressions for other country groups. This means that for oil-exporting countries, an increase in income per capita increases the inflow of remittances (measured as a percentage of GDP). Specifically, if income per capita rises by 1%, remittances increase by as much as 1.1 percentage points of GDP. This result supports the notion of investment motive of remittances received in oil-exporting countries. By contrast, remittances seem to behave largely altruistic in other subsamples, especially in non-oil trading countries. In particular, an increase in income per capita by 1% would reduce remittance inflow by as much as 1.7, 0.4, and 8.9 percentage points, respectively, for net oil importing, mixed oil trading, and non-oil trading countries. The coefficient of the control variable (i.e., financial risk ratings) is positive and significant throughout. This means that an improvement in the financial environment entails an increase in the amount of remittances received. It should be noted that although the OLS results are interesting and informative, they are mainly exploratory and should be treated with caution.

As previously discussed, possible reverse causality between income and remittances may bias the OLS estimates. To avoid this potential endogeneity problem, we use an instrument for GDP per capita. This takes us to the two-stage least squares estimates presented in Table 5.

In Table 5, Panel A shows the second stage results of two-stage least square (2SLS) estimates using a single lag of oil trade balance as an instrument for the log level of real income per capita. As previously discussed, this variable satisfies the requirements for being an instrument. Firstly, it is highly correlated with our potentially endogenous variable, that is, income per

Table 4

Income and Remittances (OLS Estimates)

	Dependent variables: *Rpercent*$_t$							
	Net oil exporters		**Net oil importers**		**Mixed oil traders**		**Non-oil traders**	
Explanatory variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
log(*GDPPCt*)	1.009***	1. 053***	0.830*	-1.715***	0.302*	-0.440***	-4.363***	-8.873***
	(0.271)	(0.216)	(0.485)	(0.241)	(0.158)	(0.165)	(0.690)	(0.531)
Finriskt	0.044***	0.028**	0.181***	0.089***	0.048***	0.002	0.176***	0.041**
	(0.008)	(0.014)	(0.018)	(0.025)	(0.012)	(0.026)	(0.014)	(0.018)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes	No	Yes	No	Yes
Adjusted R^2	0.628	0.630	0.793	0.807	0.580	0.567	0.543	0.719
Observations	495	495	726	726	363	363	231	231

Notes: *Rpercent* is remittances as a share of GDP, log(*GDPPC*) is the natural log of GDP per capita, *OTB* is the oil trade balance, and *Finrisk* is financial risk rating. All regressions include an unreported constant. White heteroskedasticity consistent standard errors are in parentheses. Significance at the 1%, 5%, and 10% levels are denoted respectively by ***, **, and *.

Table 5

Effects of Oil Trade Balance on Remittances Through GDP Per Capita (2SLS Estimates)

Explanatory variables	Net oil exporters		Net oil importers		Mixed oil traders	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: second stage regressions (Dependent variable: $Rpercent_t$)						
$Log(GDPPC_t)$	-28.328 (44.366)	26.572 (5.746)	2.536*** (0.464)	0.904 (0.784)	2.067*** (0.628)	1.838 (1.366)
$Finrisk_t$	0.459 (0.611)	-0.003 (0.082)	0.142*** (0.016)	0.065*** (0.021)	-0.003 (0.019)	-0.009 (0.025)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes	No	Yes
Panel B: first stage regressions (Dependent variable: $Log(GDPPC_t)$						
OTB_{t-1}	-0.018 (0.027)	0.012 (0.021)	-2.973*** (0.311)	-1.508*** (0.220)	-1.425*** (0.320)	-0.986*** (0.229)
$Finrisk_t$	0.014*** (0.001)	0.001 (0.002)	0.021*** (0.001)	0.007*** (0.002)	0.027*** (0.002)	0.003 (0.003)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes	No	Yes
Adjusted R^2	0.976	0.982	0.973	0.981	0.888	0.918
F-statistics	1215.276	570.268	1097.803	690.670	232.923	91.953
Observations	480	480	704	704	352	352

Notes: *Rpercent* is remittances as a share of GDP, log(*GDPPC*) is the natural log of GDP per capita, *OTB* is the oil trade balance, and *Finrisk* is financial risk rating. All regressions include an unreported constant. White heteroskedasticity consistent standard errors are in parentheses. Significance at the 1%, 5%, and 10% levels are denoted respectively by ***, **, and *.

capita. Secondly, it is uncorrelated with the error term as there is no reverse impact from contemporaneous remittances to any past oil trade balance. With this instrument, we find a significant impact of income per capita on remittance flows. However, the magnitude of the impact varies significantly across different categories of oil trade balance countries. There exists evidence that an increase in income encourages the inflow of remittances in net oil-exporting countries. This supports the notion that remittances are mainly due to an investment motive.

Panel B offers several interesting first stage regression findings. In particular, lagged net oil trade balance has an insignificant impact on GDP per capita for net oil exporters but a negative impact on net oil importers. Mixed oil traders are also negatively affected by fluctuations in the oil market. Obtained results imply that, on average, an increase in oil price by one log point per every billion barrels in the preceding year does not affect the current GDP per capita of oil-exporting countries. Meanwhile, it reduces the current GDP per capita of oil-importing and mixed oil trading countries by as much as 1.5%–3 percent and 1%–1.4%, respectively. The control variable, Finrisk, has a positive and mostly significant effect on per capita income across regressions. The F-statistics is substantially greater than 10, the critical value suggested by Staiger and Stock (1997), across all first-stage regressions, indicating that the issue of a weak instrument is not a problem here. In other words, our instrument of lagged net oil export for income is a good predictor of changes in this variable.

In short, our results can be interpreted as follows. An oil price surge in a prior year increases the current

GDP per capita of oil-exporting countries. On the one hand, it attracts more remittance inflow due to the investment motive. On the other hand, migrants originating from these countries send less money back to their home countries due to compensatory motives. These two effects cancel out each other. In the meantime, the oil price surge reduces the GDP per capita of other countries. This income reduction, in turn, causes a higher volume of remittance inflow due to the compensatory motive. This is because migrants living overseas care about their family members at home, so they remit money to home to help alleviate the economic hardship of their relatives.

More on First Stage Results

Table 6 shows other first-stage results, specifically on the sources of income changes using the sub-sample of net oil-exporting countries. Columns (1) and (2) re-estimate the first stage regression equation using the log of total GDP as a dependent variable instead of the log of GDP per capita. Obtained results indicate that the oil trade balance has no impact on the aggregate GDP of countries. To capture the potential effect of the oil trade balance on capital accumulation, columns (3) and (4) regress gross fixed capital formation as a share of GDP on the net oil trade balance and the control variable. Results show that there is a significant negative effect of the oil trade balance on investment activities.

The result that oil trade balance significantly reduces gross fixed capital formation despite attracting more remittances for investment motive is interesting. This can be explained by the fact that most of the investments in oil-exporting countries are in the energy sector rather than in areas that help build up the capital stock (Dhumale, 2002).

Similarly, Table 7 establishes the first stage results for net oil-importing countries. As expected, the net oil balance significantly reduces the aggregate GDP of these countries. It also reduces its investment activities. The latter adds clarity to the picture: oil trade balance reduces the total GDP of a country, of which a potential channel is its crowding-out effect on the capital stock.

Table 8 provides a largely similar picture. However, the results are this time for the mixed oil trading countries instead. It is shown that net oil balance exerts a harmful impact on both aggregate GDP and gross fixed capital formation of these countries. In comparison, the negative effects on GDP and gross fixed capital formation are smaller than what was found previously for net oil-importing countries.

To check for how long net oil trade balance can

Table 6

Other First Stage Results (Least Squares Estimates, Net Oil Exporters)

Explanatory variables	Dependent variable			
	Total GDP		Gross fixed capital formation	
	(1)	(2)	(5)	(6)
OTB_{t-1}	-0.039	-0.013	-3.288***	-2.898**
	(0.059)	(0.022)	(0.938)	(1.260)
$Finrisk_t$	0.040***	0.004***	0.095**	-0.012
	(0.003)	(0.001)	(0.039)	(0.063)
Country FE	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes
Adjusted R^2	0.972	0.994	0.335	0.327
Observations	480	480	480	480

Notes: *OTB* is oil trade balance and *Finrisk* is financial risk rating. All dependent variables are in logarithmic form except for gross fixed capital formation, which is expressed as a share of GDP. All regressions include an unreported constant. White heteroskedasticity consistent standard errors are in parentheses. Significance at the 1%, 5%, and 10% levels are denoted respectively by ***, **, and *.

Table 7

Other First Stage Results (Least Squares Estimates, Net Oil Importers)

Explanatory variables	Dependent variable			
	Total GDP		Gross fixed capital formation	
	(1)	(2)	(5)	(6)
OTB_{t-1}	-4.066***	-1.153***	-30.002***	-36.722***
	(0.418)	(0.145)	(4.498)	(5.620)
$Finrisk_t$	0.044***	0.012***	0.242***	0.406***
	(0.003)	(0.001)	(0.030)	(0.041)
Country FE	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes
Adjusted R^2	0.975	0.993	0.553	0.574
Observations	704	704	704	704

Notes: *OTB* is oil trade balance and *Finrisk* is financial risk rating. All dependent variables are in logarithmic form except for gross fixed capital formation, which is expressed as a share of GDP. All regressions include an unreported constant. White heteroskedasticity consistent standard errors are in parentheses. Significance at the 1%, 5%, and 10% levels are denoted respectively by ***, **, and *.

Table 8

Other First Stage Results (Least Squares Estimates, Mixed Oil Traders)

Explanatory variables	Dependent variable			
	Total GDP		Gross fixed capital formation	
	(1)	(2)	(5)	(6)
OTB_{t-1}	-0.1672***	-0.989***	-6.373**	-9.953***
	(0.365)	(0.190)	(2.556)	(3.101)
$Finrisk_t$	0.044***	0.004	0.151***	0.192***
	(0.003)	(0.003)	(0.028)	(0.060)
Country FE	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes
Adjusted R^2	0.974	0.988	0.790	0.779
Observations	352	352	352	352

Notes: *OTB* is oil trade balance and *Finrisk* is financial risk rating. All dependent variables are in logarithmic form except for gross fixed capital formation, which is expressed as a share of GDP. All regressions include an unreported constant. White heteroskedasticity consistent standard errors are in parentheses. Significance at the 1%, 5%, and 10% levels are denoted respectively by ***, **, and *.

Table 9

Long-Lasting Effect of Oil Trade Balance on Income

Explanatory variables	Dependent variable: Log(*GDPPC*)					
	Net oil exports		Net oil imports		Mixed oil traders	
	(1)	(2)	(3)	(4)	(5)	(6)
OTB_{t-2}	0.020		-1.305***		-0.873***	
	(0.021)		(0.194)		(0.310)	
OTB_{t-5}		0.244**		-0.842***		-0.753**
		(0.100)		(0.180)		(0.301)
$Finrisk_t$	-0.001	0.055	0.006***	0.003**	0.005**	0.008***
	(0.002)	(0.007)	(0.001)	(0.001)	(0.002)	(0.002)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.984	0.990	0.983	0.986	0.926	0.946
Observations	465	420	682	616	341	308

Notes: *OTB* is oil trade balance and *Finrisk* is financial risk rating. All dependent variables are in logarithmic form except for gross fixed capital formation, which is expressed as a share of GDP. All regressions include an unreported constant. White heteroskedasticity consistent standard errors are in parentheses. Significance at the 1%, 5%, and 10% levels are denoted respectively by ***, **, and *.

affect income, Table 9 presents results obtained by regressing income per capita on further lags of the oil trade balance. All these lagged terms, when regressed separately, yield a positive and significant coefficient for net oil-exporting countries but a negative and significant coefficient for all other countries. This means that although an increase in the net oil trade balance is translated into a rising income for net oil-exporting countries, it results in a fall in income for other countries during later years. Results indicate that the effect of changes in the oil trade balance on income is highly persistent: it remains statistically significant after two years, five years, and even longer. In terms of magnitude, the effect of a change after two years is lower (higher) than the effect after one year and gets substantially weaker (stronger) after five years for oil-exporting (other) countries.

Discussion

This paper examines the impact of income variation driven by fluctuations in the international oil market on remittance flows in 55 developing countries. To disentangle the causal effect of aggregate income on remittances, we instrumented income by a lagged term of interaction between the dynamics of international oil prices and volumes of net oil exports in different developing countries. Across a wide range of specifications based on sub-samples split according to different net oil balance characteristics, we found that remittances are facilitated by the altruistic motive, that is, remittances are mainly sent home by migrants as a compensatory source of funding in most developing countries. The only exception is the sub-sample of net oil-exporting countries where the pivoting motive of remittances is the investment one. In these countries, migrants living overseas send more money home as they see more business opportunities there.

Our article has made an important first step in establishing the causal relationship between two seemingly unrelated but crucial factors: remittance flows and oil trade balance. The causal effect reveals itself via the income channel of the remittance-receiving country. The results obtained are quite encouraging: oil trade balance variation exerts a persistent effect on income, and remittances actively respond to permanent income shocks.

Our study sheds light on several important policy implications. Firstly, no matter whether remittances are facilitated by the altruistic motive (in oil-importing countries and mixed oil traders) or motivated by investment motive (in the net oil-exporting countries), remittances should not be treated as a panacea for growth. The reason is that remittances also involve in moral hazard issue of workers' slackening efforts (Imai et al., 2014), that is, the tendency of remittance recipients to substitute remittance income for labor supply and opt for more leisure. This would deter long-term growth. Policymakers in developing countries should enact policies that channel a larger volume of remittances to investment for the sake of enhancing economic growth. Equally important, the government should offer more incentives to develop small and medium industries to boost domestic investment; for this, the government needs to build public infrastructure to facilitate small productive investment opportunities. Secondly, a higher level of corruption may lead to a preference for people to remit money through unofficial channels (Abbas et al., 2017).

Moreover, black market premiums likely exist in the home country if remitters choose the informal sector (El-Sakka & McNabb, 1999). Therefore, policymakers should develop a more mature formal financial system to cater to the needs of all people, including those living in remote rural areas (Jouini, 2015). This includes the establishment of a microfinance scheme with lower transfer fees for impoverished households. This initiative may stimulate remitters to reallocate remittances back home through a cost-effective official transfer mechanism.

Future empirical research works could consider institutional factors as well. In this context, it is interesting to understand the role of institutional quality in affecting the impact of oil trading balance on remittances. Given that recipients' income is not the sole factor that determines remittances, it may also be worth testing other channels through which fluctuations in the international oil market indirectly affect remittance flows as well as the remittance-receiving country's assets or wealth transfer. This will undoubtedly enrich our future research agenda.

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None.

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APPENDICES

Table A1

List of 55 Developing Countries in the Sample as Classified by Geographical Regions

Geographical Regions		
Africa (24 countries)	**Asia (14 countries)**	**Latin America and the Caribbean (17 countries)**
Algeria	Bangladesh	Argentina
Botswana	China	Bolivia
Burkina Faso	India	Brazil
Cameroon	Indonesia	Chile
Congo Republic	Israel	Colombia
Cote d'Ivoire	Jordan	Costa Rica
Egypt	Malaysia	Dominican Republic
Gabon	Oman	Ecuador
Ghana	Pakistan	El Salvador
Guinea	Papua New Guinea	Guatemala
Guinea-Bissau	Philippines	Honduras
Kenya	Sri Lanka	Jamaica
Madagascar	Syrian Arab Republic	Panama
Mali	Thailand	Paraguay
Morocco		Suriname
Mozambique		Trinidad and Tobago
Niger		Venezuela
Nigeria		
Senegal		
Sierra Leone		
South Africa		
Sudan		
Togo		
Tunisia		

Table A2

Classification of Countries Based on Oil Trading Balance

Net oil exporters (15 countries)	Net oil importers (22 countries)	Mixed oil traders (11 countries)	Non-oil traders (7 countries)
Algeria	Bangladesh	Brazil	Botswana
Argentina	Chile	China	Burkina Faso
Bolivia	Cote d'Ivoire	Costa Rica	Guinea
Cameroon	Dominican Republic	Egypt	Guinea-Bissau
Colombia	El Salvador	Ghana	Mali
Congo Republic	Honduras	Guatemala	Mozambique
Ecuador	India	Indonesia	Togo
Gabon	Israel	Sudan	
Malaysia	Jamaica	Suriname	
Niger	Jordan	Syrian Arab Republic	
Nigeria	Kenya	Trinidad and Tobago	
Oman	Madagascar		
Papua New Guinea	Morocco		
Tunisia	Pakistan		
Venezuela	Panama		
	Paraguay		
	Philippines		
	Senegal		
	Sierra Leone		
	South Africa		
	Sri Lanka		
	Thailand		