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Do remittances worsen export diversification?

Erik Vardanyan

Abstract
The paper explores the impact of workers' remittances on the level of export diversification. The hypothesis is that significant inflow of remittances causes overvaluation of real exchange rate, which in turn deteriorates diversity of export. The theoretical base is in line with the Dutch disease phenomenon. The paper uses annual cross-national panel data over 2000–2016 period and System GMM methodology. The evidence suggests that indeed large inflow of remittances is associated with less diversified export. The economic intuition behind is that remittance-caused real exchange rate appreciation unevenly suppresses export of goods: some goods "suffer" more than others do. In terms of the number of product-names, a percentage point increase in remittances to GDP sent home "reduces" variety of export by approximately five active lines. There are other interesting findings as well. An improvement of government effectiveness facilitates overall export diversification; terms of trade improvement and rise of real exchange rate volatility mostly increase export concentration rather than alter number of exported product-names.

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Keywords Remittances; export diversification; export concentration; export variety; real exchange rate; System GMM

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Introduction

Remittances have risen spectacularly in recent decades, fueling research interest about their pros and cons for recipient economies. For some developing economies, these kinds of financial inflows constitute the main source of foreign exchange, even exceeding received official development assistance and FDI[1]. However, economic implications of remittances are diverse. They can improve the well-being of families left behind, especially in terms of reduction of poverty, improvement of health, education and income distribution (Koczan and Loyola 2018). However, sizable amount of remittances may pose a challenge for the long run economic growth by creating culture of dependence, lowering labor force participation, harming country competitiveness, promoting conspicuous consumption etc. (Amuedo-Dorantes 2014). Academic and policy-oriented research has not come to a consensus, whether remittances contribute to longer-term growth by building human and financial capital or degrade growth by creating public moral hazard problem (Ebeke 2012) and harming economy's competitiveness. Although, several studies state that there is no example of a country with remittances driven economic growth (A. Barajas, et al. 2009), (Clemens and McKenzie), the complete answer to the question "why this is the case?" is yet to be found. This necessitates conducting research like the actual one. Which aims to contribute to filling this gap. Namely, I investigate possible negative consequences of remittances on the quality of external sector, which is an important determinant of long-run growth (Hesse 2008).

The paper claims that significant inflow of remittances eventually leads to the real exchange rate appreciation, which in turn worsen economy's export diversification. The underlying notion is in spirit of Dutch disease phenomenon. On top of that, here I impose a realistic assumption that elasticities of export of goods with respect to real exchange rate fluctuations are uneven. Meaning, that some types of products are relatively immune to an appreciation shock while others are not. After occurrence of such a shock, some goods may even drop out from the export basket of a country or they may not occur in the first place. Eventually, economies associated with sizable inflow of remittances may end up having poorer external sector. Large data available for many countries allow me to use dynamic panel technique to test this hypothesis. The dynamic panel information helps to isolate unobserved time-invariant country-specific characteristics. Moreover, usage of the System GMM methodology (Arellano and Bond 1991) helps to deal with endogeneity of explanatory variables. The estimation results show robust evidence across specifications that sizable inflow of remittances deteriorate diversification of export. This is true for both variety and concentration of the export. Additionally, the government effectiveness is

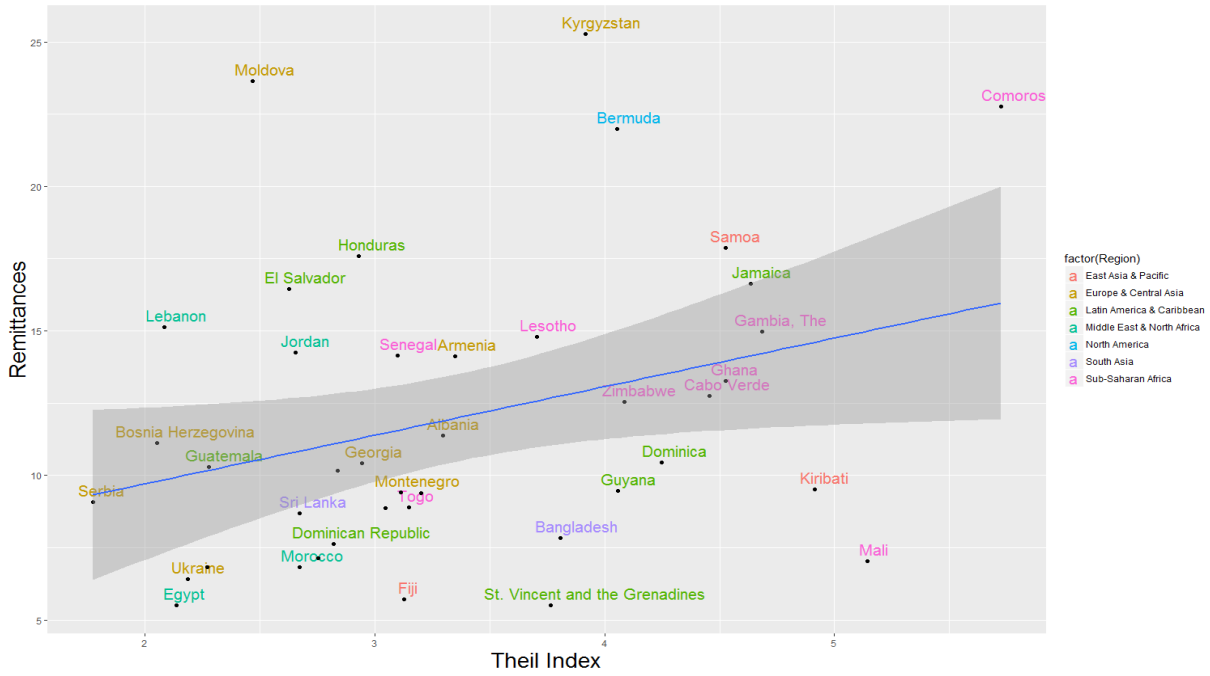
[1] During the last decades remittances sent to developing countries by migrants has increased exponentially, peaking to 441 billion US Dollars in 2015. As a share of GDP, Tajikistan (42 percent), the Kyrgyz Republic (30 percent), Nepal (29 percent), Tonga (28 percent), and Moldova (26 percent) were among the largest recipients of remittances (World Bank, 2016)

one of the strong determinants of export diversification. Terms of trade improvement negatively affects export concentration, while variety dimension of export is insensitive to this movement.

Background

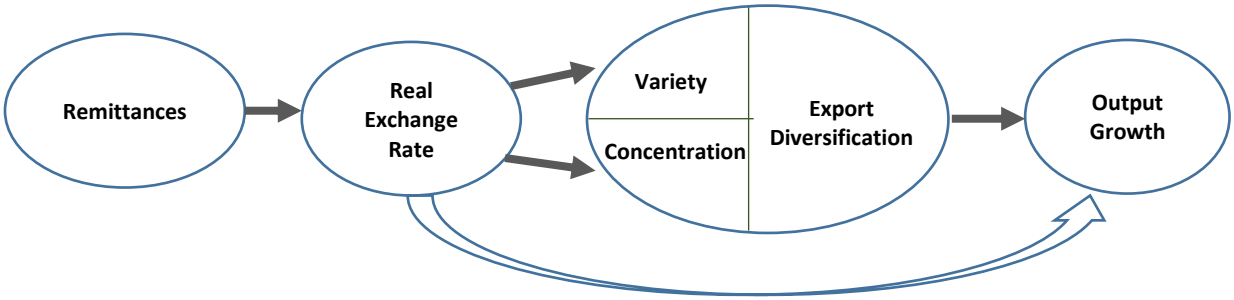
The literature on remittance caused real exchange rate appreciation is extensive, e.g. (Amuedo-Dorantes and Pozo 2004), (Acosta, Mandelman and Lartey 2012), (Acosta, Lartey and K.K.Lartey 2009), (A. Barajas, et al. 2010), (López, Molina and Bussolo 2008), etc. On top of that, economic literature has documented the adverse impact of the real exchange rate appreciation on the export diversification, e.g. (Goya 2014), (Bahar and Santos 2018). The actual study lies at the juncture of these two strands of economic literature, as it explores remittances impact on export diversification. The economic logic behind this connection is in the spirit of the Dutch disease phenomenon: significant inflow of foreign exchange increases aggregate consumption and prices of non-tradables. As a result, appreciated real exchange rate harms the country's competitiveness and induces recourse movement from tradable to non-tradable sector. Consequently, as it was described above, the remittance caused real exchange rate appreciation may adversely affect the structure of the export. The Figure 1 illustrates positive relationship between remittances and export diversification for period of 2015. Importantly, there is no regional pattern of this relationship.

Figure 1. Received Remittances as percent of GDP (>5%) vs. Theil index. 2015[2]



[2] The Theil Index is one of indices used in this research to capture dynamics of export diversification. Higher is the index less diversified is country's export.

Different branches of economic literature prove the beneficial impact of export diversification on the economic activity (Cadot, Carre`re and Strauss-Kahn 2011), (Klinger and Lederman 2004), (Hausmann, Hwang and Rodrik 2005), (Koren and Tenreyro 2007). Academics come to the consensus that export diversification is of the factors promoting high economic growth. First, it helps to moderate negative impact of external instability by diversifying corresponding risks. Moreover, diversification of production, and in turn the export, helps developing economies to undergo structural transformation. It is the process of movement from production of "poor-country goods" to "rich-country goods" (Hesse 2008). Therefore, it is vital to explore factors, which could delay this transformation.



To analyze external sector in depth, I distinguish two dimensions of the export diversification: its *variety* and *concentration*. By variety, I refer to the number of different product-names exported. The concentration, on the other hand, is about the distribution of shares of different products in the export. Moreover, to see the picture broadly and to ensure robustness of findings, I use several indices of export diversification (Gini index, Herfindahl-Hirschman Index (HHI), Theil Index, Number of Active Lines).

Data

To calculate export diversification indices, I use export data (in current USD) from UN COMTRADE database. I use cross-national annual panel data for 135 economies over the 2000-2016 period. The database includes 17 low income, 34 lower middle income, 42 upper middle income and 42 high income countries[3]. For the research, I consider only export of goods and neglect services due to inherent complication of calculating diversification indices for them. 4-digit disaggregated data of export is used (Standard Industry Trade Classification (revision 2), with 786 possible product names); higher level of disaggregation may be noisier and with such data, there may be the risk of taking minor variations as a sign of diversification change. The Gini index, the Herfindahl–Hirschman Index (HHI), and the within component of the Theil Index (Theil Within) are considered as concentration indices. On the other hand, the between component of the Theil Index (Theil Between) and the number of product-names in export of a country (Active Lines) are considered as variety indices. The usage of broad range of indicators allows understanding

[3] The full list of countries used in the research are displayed in the Table 3 of the Appendix

underlying mechanisms of diversification[4]. Increase of the Gini Index, HHI and both Theil indices ***indicate decline*** in diversification. At the same time, literally increase of the Active Lines ***reflects improvement*** of variety component of the export diversification. Other variables used in the research are natural logarithm of GDP per capita (PPP constant 2011 international), Real Effective Exchange Rate (REER) (as a proxy of real exchange rate), volatility of real exchange rate (Standard deviation of the last 5 observations of the REER), Terms of Trade index, the Government Effectiveness Index and the growth rate of population. The absence of some observations is common practice in empirical research. The actual one is not an exception. To fill these gaps, I use Kalman filtering technique, which based on likelihood function replaces empty cells with probabilistic values of the corresponding variable. The sources and summary description of data used in the research are placed in the Table 1 and Table 2 of the Appendix of the paper.

The Methodological Procedure and the Estimation

There are several channels through which remittances affect real exchange rate (Fajnzylber and López 2008). The first possibility is associated with the external equilibrium (remittances affecting net financial position of a country against the rest of the world). The second one is linked to the internal equilibrium (remittances stimulating domestic demand and pushing prices of non-tradables up, plus it increases reservation wage, therefore it is appreciating the real exchange rate). Finally, remittances may affect real exchange rate through the GDP growth. The GDP growth increases domestic demand with consequent implications for real exchange rate described in the preceding point.

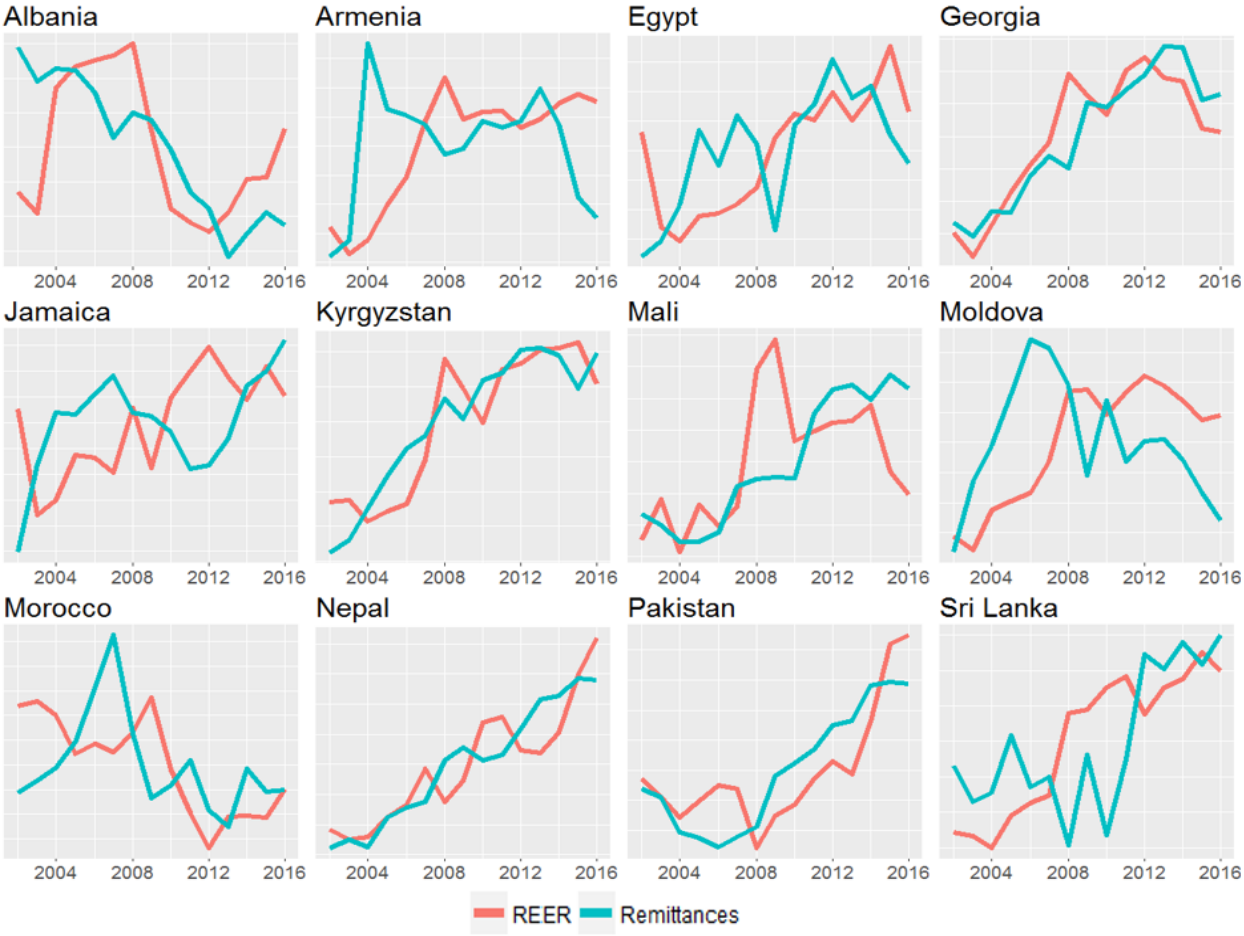
Naturally, overall macroeconomic implication of remittances mostly depends on the households' spending preferences. If hand-to-mouth wage earners receive these financial means, then the impact would be contractionary. A positive remittances (demand) shock would create upward pressure on the relative prices of non-tradables to tradables, and therefore appreciate real exchange rate. The opposite would be true when credit-constrained entrepreneurs are main receivers of remittances. Here the overall effect can be expansionary, since received financial means may be utilized as productive investment (Bahadir, Chatterjee and Lebesmuehlbacher 2018). This case is particularly relevant for financially less developed economies (Giuliano and Ruiz-Arranz 2009).

Conventional wisdom says that addressees of remittances are comparably poorer households. Naturally, one can expect their propensity to consume to be relatively high: so, as it follows remittances would rather have appreciation effect on real exchange rate. Anyway, in practice, evidence is mixed. For instance, (Brahim, Nefzi and Sambo 2017), (Mongardini and Rayner 2009) conclude that remittances have negative or no impact on real exchange rate. They claim that

[4] Technical notes on the calculation of diversification indices are in the Appendix

grants and remittances are easing supply constraints and boosting productivity in non-tradable sector in the recipient economy leading to domestic price downward adjustment and so to depreciation of real exchange rate. However, as a matter of speculation, one may link this to the characteristics of the regions those papers are referencing. Here the economies may have significant space of resource utilization and therefore, remittances could have facilitating role in managing it. On the other hand, other research tackling the remittances inflow/real exchange rate connection ((Lopez, Molina and Bussolo 2007), (Acosta, Lartey and K.K.Lartey 2009), (Amuedo-Dorantes and Pozo 2004)) are in favor of the appreciation hypothesis. For some economies, even visual examination reveals vivid positive correlation between remittances inflow and real exchange rate. The Figure 2 displays some of those cases. At the end of the day, the interplay of various macroeconomic and country specific factors may change the direction of the remittances inflow vs. real exchange rate relationship. Therefore, the hypothesis about the nature of this relationship is an empirical question rather than a given fact (A. Barajas, et al. 2010). Hence, for soundness of further analysis I need to test this hypothesis using our data.

Figure 2. The positive association of remittances and real effective exchange rate (increase indicates appreciation) is straightforward in several economies (the data are scaled)



For the test, I employ the methodology applied in the (Acosta, Mandelman and Lartey 2012). Usage of System GMM estimation technique allows addressing reverse causality problem. On one hand, if remittance senders are altruistically driven, the inflow of foreign exchange will increase during downturns (remittances are countercyclical with respect to income in migrant's home economy). On the other hand, irrespective of wellbeing status of those left behind, migrants may define size of remittances to be sent just by looking at the exchange rate level or conditioning it with their own earnings (in other words, here remittances are procyclical with respect to income in migrant's host economy) (Frankel 2009). Therefore, to deal with possible endogeneity problem, I employ System GMM regression technique, which is superior to OLS. Since the latter would provide biased and inconsistent estimates. The equation (1) is the considered econometric model to be estimated. Here, aside from lag of real exchange rate and remittances, I include a vector $\boldsymbol{X_{it}}$ of explanatory variables as determinants of real exchange rate. The vector includes GDP per capita, broad money (M2 as a percentage of GDP), terms of trade index, trade openness (sum of export and import as a percentage of GDP), annual growth rate of real GDP (%), a dummy variable Fixed Exchange Rate (FER) indicating a type of conducted exchange rate policy (1 if the fixed exchange rate regime is in place, 0 otherwise) and Foreign Direct Investments FDI (% of GDP). As in the reference paper, the first lagged differences and the second lag level of all explanatory variables used as standard "IV-style" instruments. The estimation outcome of different specifications of the econometric model (1) is represented in the Table 1.

$$\boldsymbol{REER_{it} = \beta_1 REER_{it-1} + \beta_2 Remittances_{it} + \sum_{n=3}^{p} \beta_n X_{it} + \mu_i + v_{it}} \qquad \textbf{(1)}$$

For *i = 1…N, t= 1…,* – country and time indicators.

β*- Coefficients to be estimated*

$REER_t$ *- Real Effective Exchange Rate*

$Remittances$ *- Net Received Remittances (% GDP)*

X_{it} *- Vector of explanatory variables*

μ_i*- Time-period dummy variable*

v_{it}*- An error term.*

Table 1: System GMM estimation. The dependent variable is the REER, 2000-2016

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Real GDP Growth Rate	**1.336****	**1.243****	**1.247****	**0.592**	**0.583**	**0.631**	**0.593**
	(0.624)	(0.615)	(0.620)	(0.415)	(0.410)	(0.427)	(0.414)
Remittances	**0.306**	**0.485****	**0.437****	**0.578****	**0.535****	**0.804****	**0.578****
	(0.236)	(0.236)	(0.213)	(0.263)	(0.248)	(0.378)	(0.258)
Terms of Trade		**0.032**	**0.031**	**0.042****	**0.042****	**0.030**	**0.042****
		(0.021)	(0.022)	(0.021)	(0.020)	(0.022)	(0.021)
Trade Openness			**0.006**	**-0.013**	**-0.003**	**-0.009**	**-0.013**
			(0.019)	(0.020)	(0.022)	(0.024)	(0.020)
GDP per capita				**1.788***	**1.673***	**3.278***	**1.759***
				(1.036)	(0.996)	(1.900)	(1.025)
FDI					**-0.055**		
					(0.057)		
M2						**-0.067**	
						(0.046)	
FER							**0.373**
							(1.669)
Number of observations	1740	1740	1740	1740	1740	1740	1740
Number of groups	116	116	116	116	116	116	116
Number of instruments	105	107	109	111	113	113	112
AR (2) p-value	0.903	0.912	0.912	0.976	0.966	0.959	0.975
Hansen test of overidentification restrictions	0.097	0.097	0.122	0.091	0.098	0.090	0.092
Difference-in-Hansen tests of exogeneity of instrument subsets							
IV instruments for first differences							
Hansen test excluding group (p-value)	0.088	0.093	0.099	0.077	0.078	0.072	0.079
Difference (null H = exogenous) (p-value)	0.583	0.396	0.684	0.548	0.611	0.596	0.519

Note: Significance levels: .01 - ***; .05 - **; .1 - *, Standard Errors (SE) are in parentheses below the corresponding coefficients, SE are Windmeijer corrected and clustered by countries. For these estimations, advanced economies are excluded from the sample (Acosta, Mandelman and Lartey 2012). In the estimation, first two lags of the dependent variable and Remittances are used as "GMM-style" instruments. First lagged differences and second lag levels are specified as "IV-style" instruments. For conventional purposes, the outcomes for the Difference-in-Hansen tests are reported only for the lagged differences. Corresponding estimates for second lag levels and GMM instruments indicate results similar to those reported, and are available upon request. The Fixed Exchange Rate (FER) is a dummy variable with value 1 if the fixed exchange rate regime policy is conducted and 0 otherwise (De-facto IMF classification); The M2 is broad money (% of GDP); FDI stands for net inflow of Foreign Direct Investments (% of GDP); Remittances represent inflow of remittances (% of GDP); GDP per capita is PPP adjusted (constant 2011 international $) natural logarithm of per capita output; Real GDP Growth Rate is in local currency units and at constant prices. Other variables are self-explanatory. Columns labeled from (1) to (7) represent different specifications of the econometric model.

The outcome of the econometric model (1) estimation supports the hypothesis of remittance based real exchange rate appreciation. The result is immune to specification changes. A percentage point increase in inflow of remittances, appreciates the real exchange rate by approximately 0.5 units. This finding is in line with the one described in (Acosta, Mandelman and Lartey 2012). On top of that, GDP per capita is another significant determinant of real exchange rate. The significance of coefficients of this two factors will play an interesting role in the further analysis illustrated in the second part of the paper.

After the assurance of validity of the appreciation hypothesis, it is time to turn to the testing of the main hypothesis (i.e., whether remittances deteriorate export diversification). To explain export diversification, I rely on econometric specifications to identify the most plausible way of enriching existing econometric models with a new determinant of export diversification (the remittances inflow). To construct the model, I refer to the relevant empirical literature (Agosin, Alvarez and Bravo-Ortega 2012), (Elhiraika and Mbate 2014) etc. In nutshell, the model I consider here is remittances augmented model of export diversification. Thus, aside from common explanatory variables: GDP per capita, terms of trade, real exchange rate, volatility of real exchange rate, government effectiveness index and population growth, I use remittances inflow as well as an interaction of remittances and real exchange rate as explanatory variables. It is worth noting, that the model is a general one and it includes common factors determining the export diversification regardless of the economic development level of countries. Consideration of remittances as additional exogenous variable should not be worrisome, since this variable is an inflow of remittances as a percentage of GDP and for developed economies; this term is close to zero. Therefore, the model estimation contains the information of remittances being a factor determining the external sector developments for developing nations and neglects their impact for advanced economies. Brief description and sources of data are placed in the Appendix.

The GDP per capita is included as a proxy of country's standard of leaving and level of development. It is expected to diversify export by boosting domestic demand for variety of goods and providing resources for productive investment. In the empiric literature, there is a well-known stylized fact describing the export diversification - aggregate output relationship. This relationship follows hump-shaped trajectory, while economies go from low income status to high income status (J.Imbs and R.Wacziarg 2003), (Cadot, Carre`re and Strauss-Kahn 2011). Initially (at the diversification stage), countries development path coincides with export basket enrichment. Here economies start to export new types of products. Furthermore, they distribute resources among economic sectors relatively evenly, making the external sector less concentrated around limited number of products. This upgraded export structure helps the economy absorbing new technologies and explore new product markets where it can potentially have comparative advantages. This process facilitates improvement of overall economic performance of the economy. However, at certain point economies start to concentrate around several export products (the specialization stage). The new "specialized" export basket of an economy reflects its upgraded comparative advantages. This stage usually corresponds to the production and export of highly sophisticated products, in production of which developed economies specialize. This represents the story of transformation of an economy from being commodity exporter to the one with sophisticated products in its export basket. Therefore, the level of economic development captured by GDP per capita is an important factor to be included in the estimation as a determinant of export diversification. Real effective exchange rate adjusted by CPI of trade partners is used as a proxy of real exchange rate. Generally, especially for developing countries, this variable is one of key factors defining external sector developments. Since real exchange rate undervaluation facilitates export growth (Rodrik 2008), it is natural to expect that it would have

positive impact on export diversification as well. However, the real exchange rate and export diversification relationship is ambiguous, especially for economies heavily depending on remittances inflow. The terms of trade index as well is included as a determinant of export diversification. For developing economies, an improvement of terms of trade (which is a ratio of export prices over import prices) usually indicates increase of commodity prices. Therefore, by fostering export of unprocessed raw materials, it worsens export diversification, especially in terms of export concentration. Thus, I expect that in the estimation the coefficient of terms of trade index will be positive (for the number of Active Lines, the opposite sign is expected). The government effectiveness indicator captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Inclusion of this indicator confirms the notion that sound and efficient government in place would improve economic performance of a country and the economy would be more attractive for investment. This index varies within the range from -2.5 to 2.5, with 2.5 being the best performance of a government. It is natural to expect that an improvement of the government effectiveness will facilitate export diversification. Finally, empirical literature suggests inclusion of population growth as a factor affecting structure of the external sector. Aside of ensuring sufficient supply of labor resources needed for economic upraise, population growth may generate additional demand for different types of goods. Therefore, one may expect that population growth brings production growth and therefore export diversification. The econometric model to be estimated is the following:

$$\boldsymbol{D_{it} = \beta_1 D_{it-1} + \sum_{n=2}^{p} \beta_n X_{it} + \mu_t + \Lambda_i + v_{it}} \qquad \textbf{(2)}$$

For i = 1…N, t= 1…T – country and time indicators.

D_{it} *- Export diversification indices.*

β *- Coefficients to be estimated*

X_{it} *- Vector of explanatory variables*

μ_t *- Time-period dummy variable*

Λ_i *- A dummy variable representing an income group classification of an economy*

v_{it} *- An error term.*

Here as previously, I apply System GMM technique to estimate the econometric model described above. This allow me to overcome inherent endogeneity problem and so-called dynamic panel bias (Blundell and Bond 1998), (Roodman 2009). The estimations are carried out computing robust standard errors and applying the Windeijer small-sample correction. To detect second-order autocorrelation of the error in the first-differences equation (Arellano and Bond 1991) AR (2) test is performed. Corresponding results are supplemented with main estimation outcome in the Table 2. In all the specifications, the p-value of the AR (2) test fail to reject the null hypothesis

of no autocorrelation in the differenced error terms. In turn, for most of the specifications, the Hansen test marginally fails to reject null hypothesis of joint validity of all the instruments used. The outcome of the estimations is represented in the Table 2 below.

Table 2: System GMM estimation: Different export diversification indices are used as dependent variables, 2000-2016 (full sample)

	GINI	HHI	Theil	Theil Within	Theil Between	Active Lines
Lag	**0.311****	**0.541*****	**0.627*****	**0.571*****	**0.627*****	**0.497*****
	(0.154)	(0.059)	(0.062)	(0.063)	(0.059)	(0.119)
GDP per capita	**-0.042***	**0.028**	**0.035**	**-0.272**	**0.368**	**-31.228**
	(0.024)	(0.053)	(0.237)	(0.211)	(0.284)	(67.275)
REER volatility	**-0.000002**	**0.002***	**0.003**	**0.003**	**-0.00003**	**0.132**
	(0.0003)	(0.001)	(0.004)	(0.003)	(0.003)	(0.964)
Remittances	**0.003***	**0.008****	**0.067*****	**0.039****	**0.019**	**-5.656****
	(0.002)	(0.003)	(0.019)	(0.017)	(0.012)	(2.664)
REER	**0.0002**	**-0.00002**	**0.001**	**0.001**	**-0.0002**	**-0.140**
	(0.0001)	(0.0001)	(0.001)	(0.001)	(0.001)	(0.172)
Remittances*REER	**-0.00003****	**-0.0001****	**-0.001*****	**-0.0004*****	**-0.0001**	**0.019**
	(0.00002)	(0.00003)	(0.0002)	(0.0002)	(0.0001)	(0.030)
Terms of Trade	**0.0002****	**0.0002**	**0.001***	**0.003*****	**-0.001**	**0.054**
	(0.0001)	(0.0002)	(0.001)	(0.001)	(0.001)	(0.199)
Government Effectiveness	**-0.003**	**-0.075****	**-0.363****	**-0.121**	**-0.266****	**63.285*****
	(0.011)	(0.030)	(0.152)	(0.135)	(0.115)	(21.896)
Population Growth	**0.009****	**0.018***	**0.124****	**0.075****	**0.055**	**-19.194****
	(0.004)	(0.010)	(0.054)	(0.030)	(0.037)	(8.328)
Number of observations	2160	2160	2160	2160	2160	2160
Number of groups	135	135	135	135	135	135
Number of instruments	132	132	132	132	132	132
AR (2) p-value	0.524	0.351	0.310	0.971	0.430	0.861
Hansen test p-value	0.188	0.126	0.114	0.093	0.055	0.136
Difference-in-Hansen tests of exogeneity of instrument subsets						
IV instruments						
Hansen test excluding group (p-value)	0.099	0.080	0.140	0.056	0.021	0.083
Difference (null H = exogenous) (p-value)	0.892	0.715	0.240	0.711	0.908	0.757

Note: Significance levels: .01 - ***; .05 - **; .1 - *, Standard Errors (SE) are in parentheses below the corresponding coefficients, SE are Windmeijer corrected and clustered by countries; the Gini, the HHI and the Theil indices (with its components) are inversely related to the degree of diversification. The Gini and the HHI take value 0 in the case of perfectly diversified export, and 1 for the opposite scenario. Instead, in the case of perfect diversification the Theil index is taking value 0, while in our case the maximum possible value of the Theil index would be ln(n)= ln (786) = 6.66. The Lag represents the first lags of the corresponding dependent variable; REER is real effective exchange rate; REER Volatility is standard deviation of the last five observations of REER; Government Effectiveness is an index within the -2.5 and 2.5 range, with 2.5 representing the best performance; Population growth is annual growth rate of the population (%); other variables are self-explanatory. All equations contain time and income group dummy variable. In the estimations, the first three lags of corresponding export diversification index and GDP per capita are used as "GMM-style" instruments. Other variables are assumed to be strictly exogenous, therefore their first lags are included in "IV-style" specification. Aside from lags of explanatory variables, first lags of inflation, unemployment, nominal exchange rate of local currency per USD and human capital are included within "IV-style" instruments as well.

Generally, the estimation confirms the main hypothesis of remittances adversely affecting export diversification. Five out of six equations of export diversification indicators have statistically significant coefficients with expected signs in front of the remittance term. Roughly speaking, in terms of export variety a percentage point increase in remittances to GDP sent home "costs" approximately five active lines for an economy. For any period, higher remittances to GDP is associated with less diversified export. Importantly, the significant negative coefficient of the interaction term indicate that remittances – export diversification relationship is not linear and the remittances impact is marginally diminishing.

The research has another interesting finding. It follows from the combination of results of the real exchange rate equation estimation and the one corresponding to the export diversification indices. From the outcome of the first estimation (Table 1), we already know that both remittances and GDP per capita are among factors determining real exchange rate movements. Nevertheless, the estimation of the export diversification equations (Table 2) indicates that from the two factors affecting real exchange rate (remittances and GDP per capita) only remittances appear to alter diversification of the export. The outcome is similar to one in the (Goya 2014). This leads to the conclusion that there are "good" and "bad" sources of real exchange rate appreciation. If appreciation comes from technological improvement and productivity growth, the external sector, at least will not be deteriorated. The opposite is true if the appreciation is caused by large inflow of remittances. Which as we already know, is not necessarily channeled to productive investment.

Across all specifications, the coefficients of lagged terms are positive and significant; pointing out that export diversification movement contains inertia. Furthermore, there is weak evidence in favor of hypothesis that high real exchange rate volatility is associated with higher export concentration. It could be the reflection of substantial differences between sectors (e.g. production and inventory capacity, competitiveness of markets, level of technological intensity, sophistication of production etc.). Consequently, some producers may be able to adjust their production to the real exchange rate surprises, while others lack this ability. The government effectiveness index is another significant determinant of export diversification. Importunately, higher level of government efficiency associated with both less concentrated and more diverse export. As it was speculated above, terms of trade improvement would affect rather export concentration than its variety. For our data, it turns out to be the case. Population growth is the only variable with coefficients signs opposite to the one I expected. A possible explanation may be that, although high population growth generates additional demand for goods and services, which in turn may expend production and therefore improve export diversification, however, higher population growth is usually observed in the developing economies, which face institutional and structural challenges to boost long-run growth. Though those features are partially captured by GDP per capita and the government effectiveness index, the population growth could carry similar information as well.

To be sure that the outcome is robust, I conduct the same exercise but for a restricted sample of countries. Specifically, I drop out small countries with population less than million people. Microstates and small island countries have naturally concentrated exports (e.g. exporting fruits and fish); they may have misleading implication for the estimation outcome. Therefore, I exclude them from the dataset to be sure that the results are not driven by the presence of these economies. The outcomes illustrated in the Table 3, show that, most of the results have not changed significantly.

Table 3: System GMM estimation: Different export diversification indices are used as dependent variables, 2000-2016 (restricted sample)

	GINI	HHI	Theil	Theil Within	Theil Between	Active Lines
Lag	**0.436*** **	**0.505*** **	**0.608*** **	**0.579*** **	**0.620*** **	**0.342** **
	(0.091)	(0.083)	(0.066)	(0.056)	(0.082)	(0.170)
GDP per capita	**-0.018**	**0.056**	**0.136**	**-0.022**	**0.109**	**-23.364**
	(0.015)	(0.044)	(0.207)	(0.233)	(0.143)	(53.411)
REER volatility	**-0.00004**	**0.002***	**0.005**	**0.003**	**0.002**	**-0.456**
	(0.0003)	(0.001)	(0.005)	(0.004)	(0.002)	(1.087)
Remittances	**0.003*** **	**0.005**	**0.056*** **	**0.045*** **	**0.010**	**-6.216***
	(0.001)	(0.004)	(0.020)	(0.017)	(0.008)	(3.342)
REER	**0.0001**	**-0.0001**	**0.001**	**0.001**	**-0.0004**	**-0.014**
	(0.0001)	(0.0002)	(0.001)	(0.001)	(0.0004)	(0.181)
Remittances*REER	**-0.00003** **	**-0.00005**	**-0.001*** **	**-0.0004** **	**-0.0001**	**0.030**
	(0.00001)	(0.00004)	(0.0002)	(0.0002)	(0.0001)	(0.039)
Terms of Trade	**0.0002** **	**0.0004***	**0.002** **	**0.002** **	**-0.001**	**0.001**
	(0.0001)	(0.0002)	(0.001)	(0.001)	(0.001)	(0.245)
Government Effectiveness	**-0.003**	**-0.067***	**-0.351** **	**-0.119**	**-0.250** **	**85.161** **
	(0.009)	(0.035)	(0.177)	(0.144)	(0.126)	(36.687)
Population Growth	**0.006*** **	**0.011**	**0.110***	**0.060***	**0.072** **	**-23.515** **
	(0.002)	(0.008)	(0.056)	(0.034)	(0.036)	(9.413)
Number of observations	1968	1968	1968	1968	1968	1968
Number of groups	123	123	123	123	123	123
Number of instruments	104	104	104	104	104	104
AR (2) p-value	0.997	0.717	0.320	0.841	0.394	0.814
Hansen test p-value	0.014	0.132	0.015	0.028	0.013	0.027
Difference-in-Hansen tests of exogeneity of instrument subsets						
IV instruments for first differences						
Hansen test excluding group (p-value)	0.004	0.092	0.016	0.018	0.009	0.013
Difference (null H = exogenous) (p-value)	0.877	0.592	0.285	0.502	0.434	0.638

Note: Significance levels: .01 - ***; .05 - **; .1 - *, Standard Errors (SE) are in parentheses below the corresponding coefficients, SE are Windmeijer corrected and clustered by countries; the Gini, the HHI and the Theil indices (with its components) are inversely related to the degree of diversification. The Gini and the HHI take value 0 in the case of perfectly diversified export, and 1 for the opposite scenario. Instead, in the case of perfect diversification the Theil index is taking value 0, while in our case the maximum possible value of the Theil index would be ln(n)= ln (786) = 6.66. The Lag represents the first lags of the corresponding dependent variable; REER is real effective exchange rate; REER Volatility is standard deviation of the last five observations of REER; Government Effectiveness is an index within the -2.5 and 2.5 range, with 2.5 representing the best performance; Population growth is annual growth rate of the population (%); other variables are self-explanatory. All equations contain time and income group dummy variable. In the estimations, the first two lags of corresponding export diversification index and GDP per capita are used as "GMM-style" instruments. Other variables are assumed to be strictly exogenous, therefore their first lags are included in "IV-style" specification. Aside from lags of explanatory variables, first lags of inflation, unemployment, nominal exchange rate of local currency per USD and human capital are included within "IV-style" instruments as well.

From the policymaking perspective, development of proper policy response is rather difficult; this is due to the nature of these financial inflows. The first option coming to mind could be the taxation. However, taxing remittances directly is not a viable policy. Since the income generating the remittances has already been taxed at the origin. On top of that, generally, the beneficiaries of remittances are comparable poor population of an economy; therefore, the taxation could increase the vulnerability of households to income shocks and worsen the income inequality within the society. Moreover, an introduction of remittances taxation would drive workers to transfer money through the black market. To cope with negative consequences of remittances, some research advocate a switch from direct to indirect taxation: decreasing payroll taxes and increasing sales taxes (López, Molina and Bussolo 2008). Encouragement of saving may be considered as another possible policy option. Nevertheless, (Maimbo and Ratha 2005) show that forcing remittance recipients to save more and consume less, as Lesotho, Turkey, Mexico and others have done in the past, reduces consumer welfare. Nevertheless, there may be ways to indirectly increase the development impact of remittances Encouraging account-to-account remittance flows instead of cash transfers would result in increased saving by recipients (and senders) and better matching (by banks) of available saving and investment demand. In this context, the incentive to invest and its subsequent productivity will depend on the policy environment. Good policy environment will increase the return on investment and hence will raise the opportunity cost of consumption (Burnside and Dollar 2004).

Conclusion

Using large dataset of countries for the period of seventeen years, I examine the possible impact of workers' remittances on export diversification of a receiver economy. The main hypothesis is that sizable amount of remittances inflow causes real exchange rate appreciation, which worsen diversity of export. Corresponding estimations support this hypothesis. It appears that indeed remittance-driven overvaluation of real exchange rate unequally affects export of products. Shares of some productions shrinks, and/or the products drop out of the export basket, being unable to overcome the negative shock, and/or production of some potentially feasible products are not profitable to export in an environment of overvaulted real exchange rate. As a result, remittances dependent economies end up having relatively poorer external sector. The analysis reveal that the outcome is valid for both variety of products and concentration of the export. Further research needed to address questions originated from above mentioned outcome. For instance, is there a hysteresis problem: do dropped active lines recover after an adverse shock? What are the most vulnerable sectors?

Appendix

Table 1. Description and Sources of data

Variable	Description	Source
Export data	4-digit disaggregated data (Standard Industry Trade Classification (revision 2), with 786 possible product names), in USD	UN COMTRADE database
Remittances	Personal remittances, received (% of GDP)[5]	World Bank
REER	Real Effective Exchange Rate, CPI based. **Increase indicates appreciation.**	For more complete data (Darvas 2012a), (Darvas 2012b), (Darvas 2012c)
REER Volatility	Standard deviation of the last 5 observations of the REER	
GDP per capita	PPP (constant 2011 international $)	World Bank
GDP Real Growth Rate	Annual GDP, local currency unit at constant prices.	World Bank
Terms of Trade	Net barter terms of trade index (2000=100)	World Bank
M2	Broad Money	World Bank
FDI	Foreign direct investment, net inflow (% of GDP)	World Bank
FER	Fixed Exchange Rate. A dummy variable; 1 if the fixed exchange rate regime is conducted. De-facto classification	Annual Report on Exchange Arrangements and Exchange Restrictions, IMF
Trade Openness	The sum of exports and imports of goods and services (% GDP)	World Bank
Population Growth	Annual growth of population (%)	World Bank
Government Effectiveness	Is a country score ranging within -2.5 the worst governance) to 2.5 (the best)	Worldwide Governance Indicators. World Bank
Inflation	Inflation, consumer price (annual %)	World Bank
Unemployment	Unemployment, total (% of total labor force, modeled ILO estimate)	World Bank
Nominal exchange rate	Official exchange rate (LCU per US$, period average)	World Bank
Human capital	School enrollment, primary (% gross)	World Bank

[5] From the perspective of economic relevancy, usage of net received remittances would be more appropriate. Anyway, I substitute it with just received remittances because of scarcity of data. In fact, for remittances dependent economies those two variables pretty much resemble each other.

Table 2. Summary statistics

	Number of observations	Mean	Standard Deviation	Min	Max
HHI	2380	0.16	0.20	0.01	0.99
Gini Index	2380	0.91	0.06	0.49	0.998
Theil Index	2380	3.79	1.32	1.69	7.11
Theil Within Index	2380	2.83	1.01	0.47	5.81
Theil Between Index	2380	0.96	0.66	0.48	6.03
Active lines	2380	547.9	200.4	3	771
Remittances	2380	4.21	6.35	0.00003	53.83
REER	2380	102.99	30.55	14.50	1282.61
REER Volatility	2380	6.36	7.57	0.27	172.94
GDP per capita	2380	16687.69	17318.05	561.61	129349.90
GDP Real Growth Rate	2380	3.83	4.32	-37.26	54.19
Terms of Trade	2380	111.49	46.20	21.39	810.65
M2	2380	61.04	37.35	-8.92	267.39
FDI	2380	5.51	16.45	-43.46	451.72
Trade Openness	2380	84.82	38.88	19.79	325.86
Government Effectiveness	2380	0.12	0.89	-2.27	2.35
Population Growth	2380	1.33	1.44	-2.85	16.33

Calculation of Export Diversification Indices

Gini Index

$$G = \frac{2}{n}\frac{\left(\sum_{k=1}^{n} kR_k\right)}{\sum_{k=1}^{n} R_k} - \frac{n-1}{n}$$

k – index of a product
R_k - export revenue of product k. Such that $R_k < R_{k+1}$
n – number of exported products
The Gini coefficient lies between zero (perfect equality) and one (complete inequality).

Herfindahl-Hirschman Index (HHI)

$$\text{HHI}=\frac{\sum_{i=1}^{n} S_i^2-(\frac{1}{n})}{1-(\frac{1}{n})}$$

n – number of exported products (active lines)
S_i - share of every product in the export basket
The HHI is normalized as to lie within zero and one.

Theil Index

$$\boldsymbol{T}=\frac{1}{N}\sum_{k=1}^{N}\frac{x_k}{\mu}ln(\frac{x_k}{\mu})$$

Where

$$\mu=\frac{1}{N}\sum_{k=1}^{N}x_k$$

x_k– amount of export of product *k*
μ - mean of x_k
N - number of all possible products in the world (for 4-digit disaggregated data it is 786)
Theil's Index: this index can be separated into two components

- Between or Extensive margin (T_b)
- Within or Intensive margin (T_w)

Such that T= T_b+T_w

$$T_w=\frac{1}{n}\sum_{k=1}^{n}\frac{x_k}{\mu_e}\ln(\frac{x_k}{\mu_e}) \qquad T_b=\ln(\frac{N}{n})$$

x_k– amount of export of product k
μ_e- mean of x_k (only active lines)
n - number of exported products
In in the case of perfect diversification the Theil index is taking value 0, while the maximum value of the Theil index (perfect concentration) is ln(n).

Active Lines

The number of active lines at 4-digit disaggregation SITC rev. 2 (out of 786).

Table 3. The list of countries used in the research

Albania	Cabo Verde	Finland	Japan	Mozambique	Russian Federation	Togo
Algeria	Cambodia	France	Jordan	Namibia	Rwanda	Tonga
Argentina	Cameroon	Gambia	Kazakhstan	Netherlands	Saint Lucia	Trinidad and Tobago
Armenia	Canada	Georgia	Kenya	New Zealand	Saint Vincent and the Grenadines	Tunisia
Australia	Chile	Germany	Kuwait	Nicaragua	Samoa	Turkey
Austria	China	Ghana	Kyrgyzstan	Niger	Sao Tome and Principe	Uganda
Azerbaijan	Colombia	Greece	Latvia	Nigeria	Saudi Arabia	Ukraine
Bangladesh	Comoros	Guatemala	Lebanon	Norway	Senegal	United Kingdom
Barbados	Costa Rica	Guinea	Lesotho	Oman	Serbia	United Rep. of Tanzania
Belarus	Croatia	Guyana	Lithuania	Pakistan	Slovakia	Uruguay
Belgium	Cyprus	Honduras	Madagascar	Panama	Slovenia	USA
Belize	Czech Republic	Hungary	Malawi	Paraguay	Solomon Is.	Venezuela
Benin	Denmark	Iceland	Malaysia	Peru	South Africa	Viet Nam
Bolivia	Dominican Rep.	India	Maldives	Philippines	Spain	Yemen
Botswana	Ecuador	Indonesia	Mali	Poland	Sri Lanka	Zambia
Brazil	Egypt	Iraq	Malta	Portugal	Suriname	
Bulgaria	El Salvador	Ireland	Mauritius	Qatar	Sweden	
Burkina Faso	Estonia	Israel	Mexico	Rep. of Korea	Switzerland	
Burundi	Ethiopia	Italy	Mongolia	Rep. of Moldova	TFYR of Macedonia	
Côte d'Ivoire	Fiji	Jamaica	Morocco	Romania	Thailand	

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