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Invoice Currency Choice in Malawi's Imports from Asia

Is There Any Evidence of Renminbi Internationalization?

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Motivation

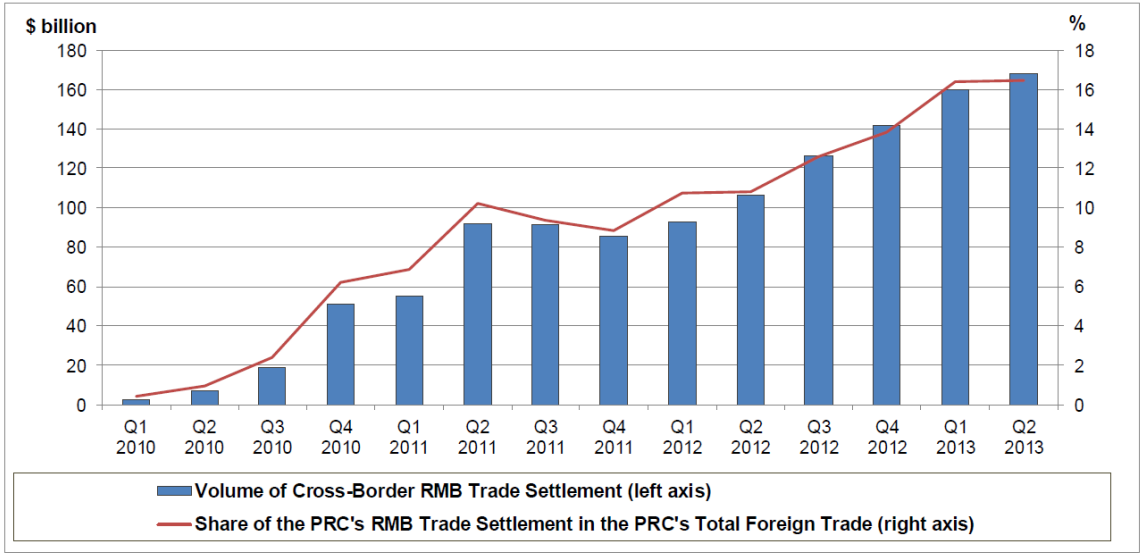
- **RMB internationalization**:
  - Lots of studies on RMB internationalization
    - See, for example, Eichengreen and Kawai (2014), Zhang and Tao (2014), Xu and He (2015), Ito (2011, 2017).
    - But, only **aggregated** data on **RMB invoiced trade** were presented.

      => See Figure 1.

Previous studies show:

- No information on destination (source) country breakdown.
- No rigorous empirical analysis.
- But, there are a few exceptions.

Figure 1: Renminbi Trade Settlement



Source: Eichengreen and Kawai (2014).

Motivation (cont.)

- **A few empirical studies**:
  - Ito *et al*. (2018) and Sato and Shimizu (2018):
    - The data on RMB transactions by Japanese overseas subsidiaries are presented.
    - But, need more information on RMB invoiced transactions in China's trade with other countries.

- **Malawi's customs data**:
  - **Africa** = One of the China's strategic economic partners.
  - **Malawi** = Least developed country in Africa.
    - Unpublished **customs level** data.
    - Highly detailed **import data** by commodity (HS8-digit), by source (exporting) country, and by **invoicing currency**.

Contribution of this Paper (1)

- **New data on a least developed country**:
  - Transaction data (2.2 million) at customs level in Malawi.
    - *Source*: National Statistical Office (NSO), Malawi.

  - Monthly series from **Jan. 2004** to **Dec. 2016**
  - By commodity (=> **H.S. 8-digit**)
  - By **source** (exporting) **country**
  - Unit-value (UV) can be calculated correctly.
  - **Invoice currency** can be identified for each transaction.
  - Tariff (import duty) data for each transaction
    - We do not use the tariff (duty) data in this paper.

Previous Studies on ERPT

- **Customs and transaction (unpublished) data:**
  - Amiti *et al*. (2014, 2019)
    - ERPT and invoice currency choice using Belgium customs data.
  - Auer *et al*. (2018)
    - The AC Nielsen "homescan" data covers a demographically and regionally representative sample of 3,187 households in Switzerland.
  - Gopinath and Rigobon (2008) and Gopinath *et al*. (2010):
    - Estimate ERPT using the invoice currency data on US export and import price by commodity (HS 10-digit) and by source country.
  - Goldberg and Tille (2016) and Devereux *et al*. (2017):
    - Invoice currency data on Canadian import price by commodity (HS 10-digit) and by source country.
  - Chung (2016) and Chen *et al*. (2019):
    - UK export and import transaction data on invoice currency choice.

Previous Studies on ERPT (cont.)

- **Customs and transaction (unpublished) data:**
  - Cravino (2017):
    - Chilean customs data (HS 8-digit) on invoice currency at firm-product-destination level.
  - Casas *et al*. (2017) :
    - Colombia customs data on invoice currency and argued "dominant U.S. dollar paradigm".
  - Türkcan, Yoshida, Yoshimi and Zhai (2019):
    - Invoice currency and payment method data on Turkish exports and imports.

Contribution of this Paper (2)

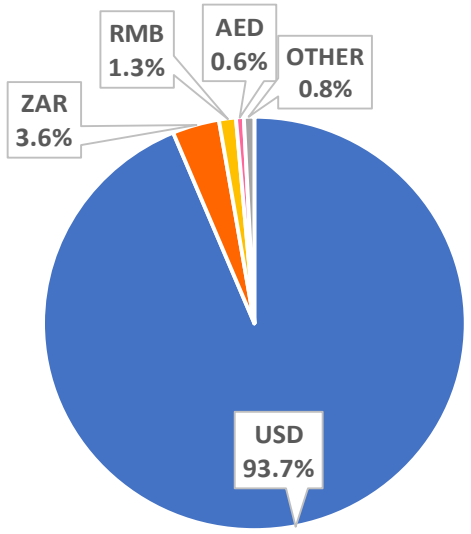
- **New evidence on RMB internationalization**
  - No detailed information on RMB trade has been presented.
  - RMB internationalization is compared with Yen internationalization.
    - Whether RMB invoiced trade has increased in China's exports to Malawi (developing country in Africa).

- What determines the **invoicing currency** choice in **imports of Malawi** (developing country)?
  - Conventional determinants of **invoice currency** are tested by panel logit estimation.
    - Producer's currency pricing (PCP), Local currency pricing (LCP), and vehicle currency pricing (VCP) are considered.
  - Recent discussions of intra-firm trade or global value chains (e.g., Ito *et al.*, 2018) need not to be considered.

Findings (1)

- Whether **RMB** is used in Malawi's **imports from China?**
  - **Descriptive analysis** of invoicing currency choice in Malawi's imports from China, Japan, other Asia.
    - Invoicing currency choice by industry.
  - **Findings**:
    - In imports from China and other Asia:
      - RMB is rarely used.
      - USD is dominantly used.
    - In imports from Japan:
      - JPY is often used.
      - But, USD is the most used currency.
    - But, different results between the "value" data and the "count" data.

Figure: Invoice currency share in Malawi's imports from China



Findings (2 & 3)

- Whether **RMB internationalization** is comparable to **Yen internationalization?** => **No.**
  - RMB is rarely used even in Malawi's imports from China.
  - Yen is more often used in Malawi's imports from Japan.

- **Vehicle currency** accounts for the largest share.
  - The share of **ZAR** is surprisingly large.
  - If the share is counted on a **transaction** basis, the share of **ZAR** (South African Rand) becomes very large in imports from Asia.
    - Amount of transaction = **small** ➔ **ZAR** is often used.
    - Amount of transaction = **large** ➔ **USD** tends to be used.

I. Descriptive Analysis

— Share of RMB Invoicing and Yen Invoicing —

Data Handling (Devereaux *et al.*, 2017)

Import price of good s in month t in Malawi Kwacha:

(1) $$P_{lst} = \frac{IM_{lst}}{Unit_{lst}}$$

$$s = \{pro, exc, cur\}$$

where pro = HS 8-digit product
exc = exporting country
cur = invoicing currency
l = individual import transaction
IM = import amount of good s at t
$Unit$ = number of units (Q or KG)
n = total number of transactions of good s

(2) $$\alpha_{lst} = \frac{IM_{lst}}{\sum_{l=1}^{n} IM_{lst}}$$

Weight of each import transaction l in total transactions at t :

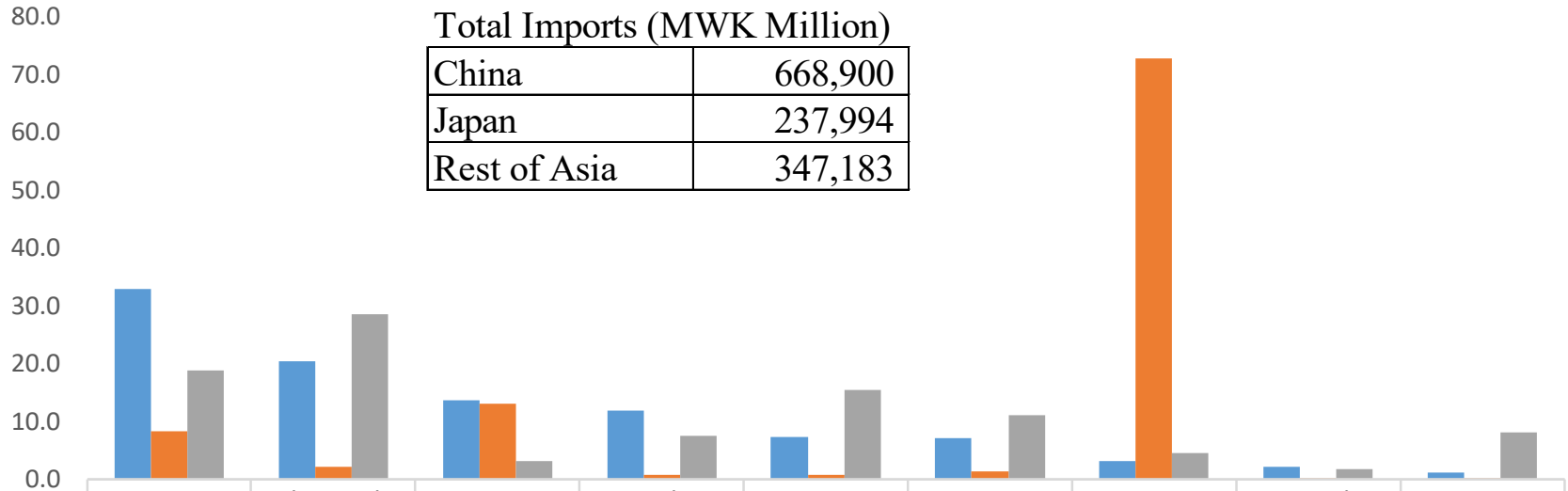
(3) $$P_{st} = \sum_{l=1}^{n} \left(\alpha_{lst} \cdot P_{lst} \right)$$

Import unit price of product s at month t

Industry Share in Malawi's Imports from Asia

Industry share in Malawi's Import Amounts: Jan. 2004–Dec. 2016

Total Imports (MWK Million)	
China	668,900
Japan	237,994
Rest of Asia	347,183



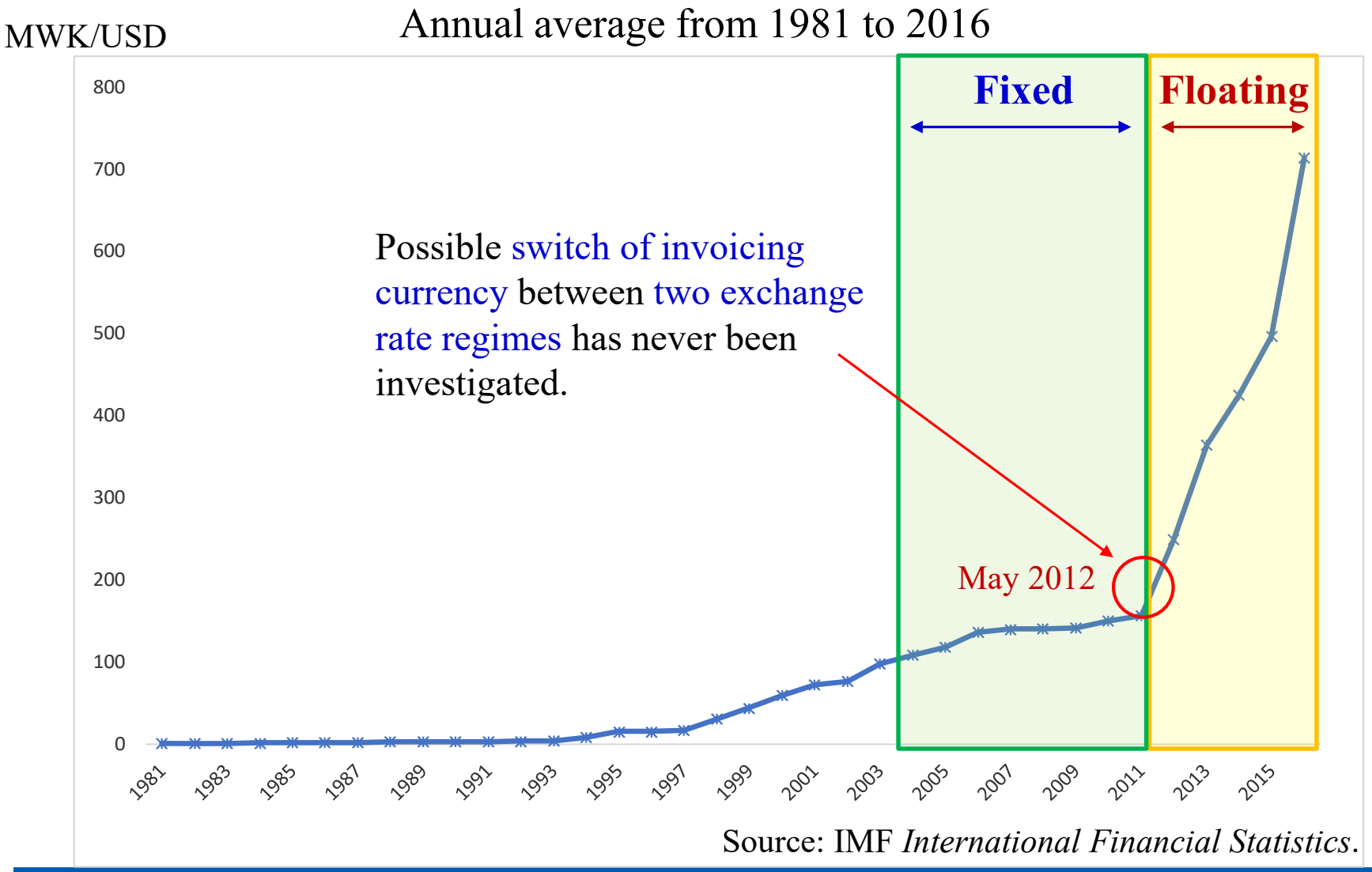
	Machinery & Electrical	Chemicals & Allied Industries	Stone, Glass, Metals	Textiles, Footwear, Headgear	Plastics, Rubbers	Miscelleneous	Transportation	Wood, Rawhides etc	Animals & vegetables
China	33.0	20.4	13.7	11.8	7.3	7.0	3.1	2.1	1.2
Japan	8.4	2.2	13.1	0.7	0.8	1.4	72.7	0.1	0.1
Rest of Asia	18.8	28.5	3.2	7.5	15.4	11.1	4.4	1.6	8.1

Source: Authors' calculation from Malawi NSO.

17 Asian Countries & Number of Transactions (2004–2016)

Country Name	Country Code	PCP	LCP	VCP			**Total**
					USD	ZAR	
Bangladesh	BD	0	0	209	130	57	209
Brunei	BN	0	0	84	6	0	84
Cambodia	KH	0	0	75	67	7	75
China	CN	1,617	1,081	125,914	85,925	30,106	128,612
Hong Kong	HK	878	178	10,571	8,225	1,948	11,627
Indonesia	ID	0	57	2,385	1,822	521	2,442
Japan	JP	8,657	273	16,241	7,757	6,366	25,171
Korea	KR	13	3	6,245	4,661	1,359	6,261
Lao PDR	LA	0	0	1	1	0	1
Macau	MO	0	0	10	8	0	10
Malaysia	MY	9	12	3,399	2,417	789	3,420
Myanmar	MM	0	2	27	27	0	29
Philippines	PH	0	2	492	251	201	494
Singapore	SG	81	4	1,965	1,534	389	2,050
Taiwan	TW	47	8	6,274	3,848	2,252	6,329
Thailand	TH	426	151	5,186	3,777	1,135	5,763
Vietnam	VN	0	0	648	363	232	648

Nominal Exchange Rate of MWK vis-à-vis USD

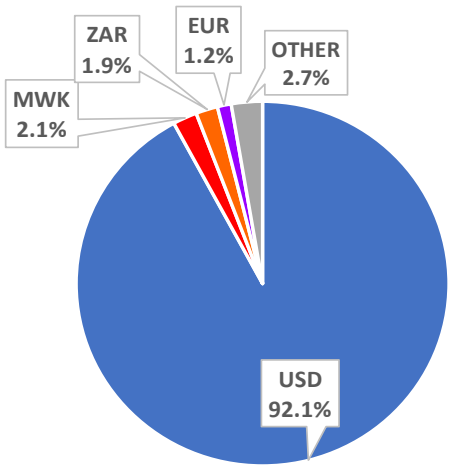


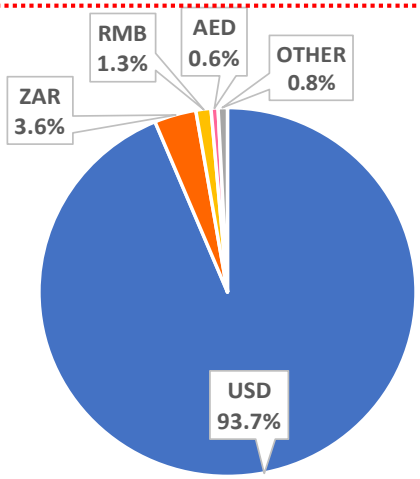
Invoicing Currency Share in Malawi's Imports from **China**: Jan.2004 – April 2012 and May 2012 – Dec.2016

Fixed EXR Period

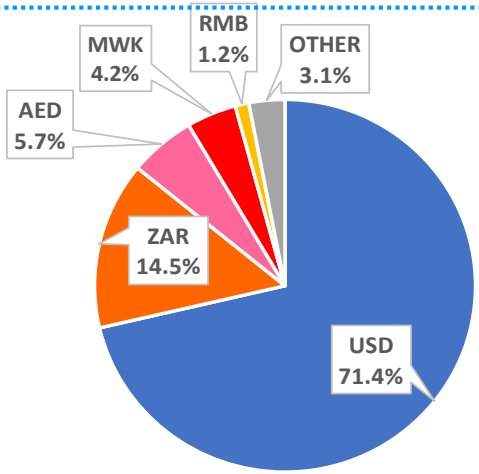
Floating EXR Period

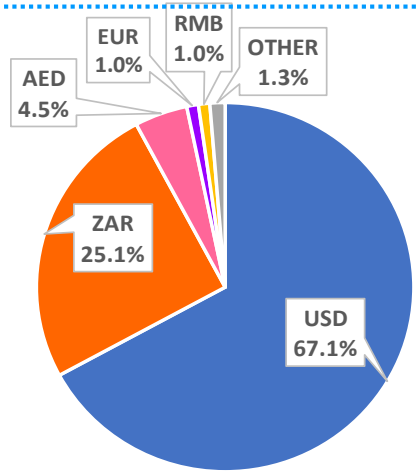
Value
(Import amounts: MWK)



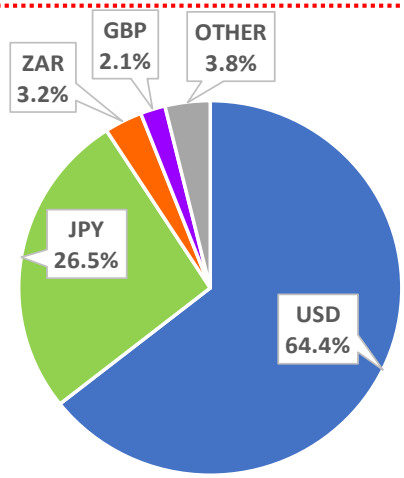
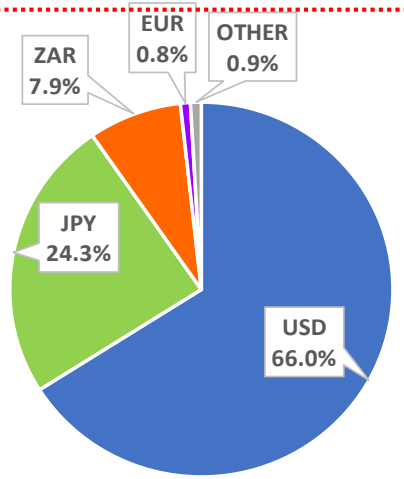
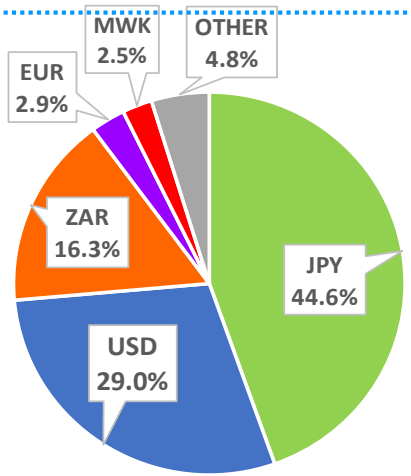
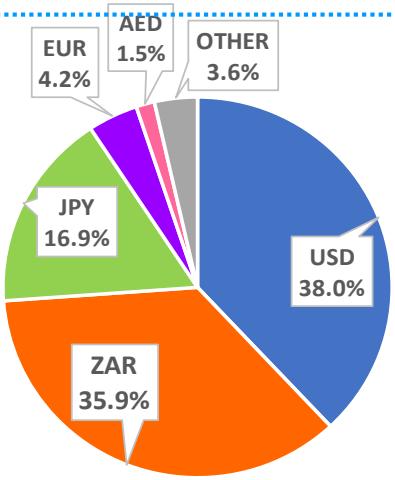


Count
(Number of shipments)





Invoicing Currency Share in Malawi's Imports from **Japan**: Jan.2004 – April 2012 and May 2012 – Dec.2016

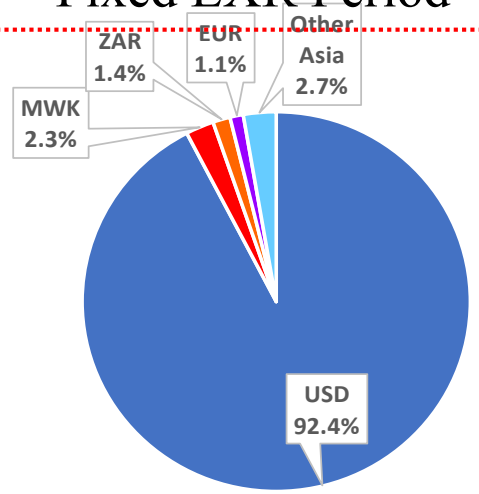
	Fixed EXR Period	Floating EXR Period
Value (Import amounts: MWK)		
Count (Number of shipments)		

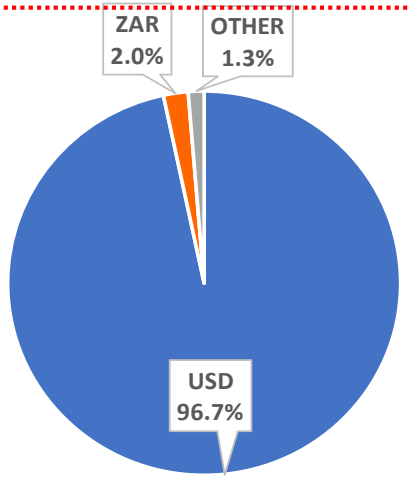
Invoicing Currency Share in Malawi's Imports from **Other Asia**: Jan.2004 – April 2012 and May 2012 – Dec.2016

Fixed EXR Period

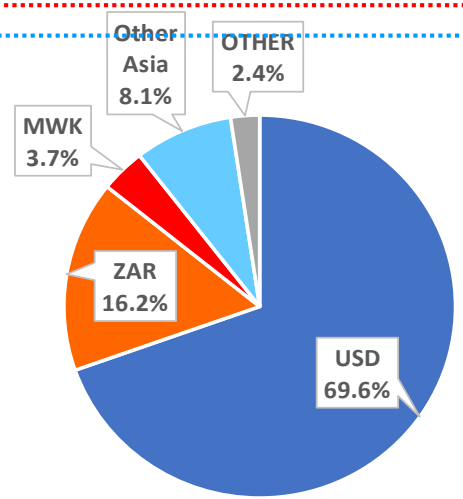
Floating EXR Period

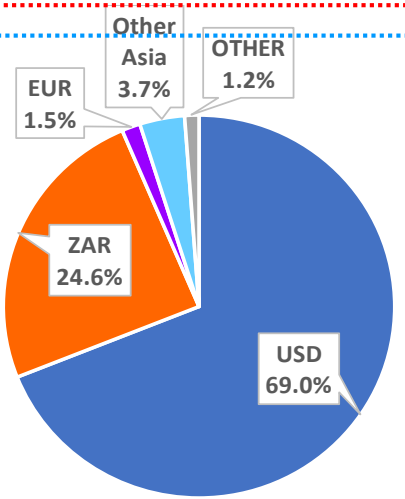
Value
(Import amounts: MWK)





Count
(Number of shipments)





Invoicing Currency Choice by Industry and by Country

(Currency share in terms of import amounts from 2004 to 2016.)

Chemicals	**BD**	**BN**	**CN**	**HK**	**ID**	**JP**	**KH**	**KR**
USD	100%	0%	99%	100%	100%	83%	100%	99%
EUR	0%	0%	0%	0%	0%	12%	0%	0%
ZAR	0%	0%	1%	0%	0%	3%	0%	1%
Other	0%	100%	0%	0%	0%	2%	0%	0%
Mach. & Electrical	**BD**	**BN**	**CN**	**HK**	**ID**	**JP**	**KH**	**KR**
USD	35%	9%	91%	95%	87%	38%	97%	71%
ZAR	0%	0%	6%	1%	7%	29%	3%	28%
JPY	0%	0%	0%	0%	0%	31%	0%	0%
Other	65%	91%	3%	4%	7%	3%	0%	1%
Transportation	**BD**	**BN**	**CN**	**HK**	**ID**	**JP**	**KH**	**KR**
USD	100%	0%	96%	97%	95%	70%	100%	99%
JPY	0%	0%	0%	0%	0%	24%	0%	0%
ZAR	0%	0%	3%	1%	4%	4%	0%	1%
Other	0%	100%	1%	2%	1%	3%	0%	0%

Invoicing Currency Choice by Industry and by Country

(Currency share in terms of import amounts from 2004 to 2016.)

Chemicals	**MM**	**MO**	**MY**	**PH**	**SG**	**TH**	**TW**	**VN**	**Av**
USD		100%	99%	79%	97%	100%	94%	100%	99%
EUR		0%	0%	0%	0%	0%	4%	0%	1%
ZAR		0%	0%	21%	3%	0%	1%	0%	0%
Other		0%	0%	0%	0%	0%	0%	0%	0%
Mach. & Electrical	**MM**	**MO**	**MY**	**PH**	**SG**	**TH**	**TW**	**VN**	**Av**
USD	100%	23%	92%	74%	99%	88%	94%	88%	88%
ZAR	0%	0%	5%	18%	1%	8%	3%	2%	7%
JPY	0%	0%	0%	0%	0%	0%	0%	0%	2%
Other	0%	77%	4%	7%	0%	4%	2%	10%	3%
Transportation	**MM**	**MO**	**MY**	**PH**	**SG**	**TH**	**TW**	**VN**	**Av**
USD	100%	100%	100%	100%	94%	63%	77%	1%	74%
JPY	0%	0%	0%	0%	0%	16%	0%	0%	20%
ZAR	0%	0%	0%	0%	2%	19%	23%	0%	4%
Other	0%	0%	0%	0%	3%	1%	1%	99%	2%

Invoicing Currency Choice by Industry and by Country

(Currency share in terms of import amounts from 2004 to 2016.)

Animal & Vegetable	BD	BN	CN	HK	ID	JP	KH	KR
USD	100%		15%	99%	100%	92%	100%	100%
RMB	0%		85%	0%	0%	0%	0%	0%
GBP	0%		1%	0%	0%	0%	0%	0%
Other	0%		0%	1%	0%	8%	0%	0%

Animal & Vegetable	MM	MO	MY	PH	SG	TH	TW	VN	Av
USD			100%	98%	100%	91%	98%	100%	81%
RMB			0%	0%	0%	0%	0%	0%	18%
GBP			0%	0%	0%	0%	0%	0%	0%
Other			0%	2%	0%	9%	2%	0%	0%

Findings:

1. **RMB** is largely used only in Malawi's imports of animal and vegetables from China.
2. RMB transactions are not observed in other industries.

Conclusion 1

- **RMB** is **rarely used** in Malawi's imports from China.
  - Surprisingly small share (1.0-1.3%). Only exception is animal & vegetable imports (85%).
  - Lags far behind the internationalization of the yen.

- **Vehicle currencies** are dominantly used.
  - 92-97% are invoiced in USD in imports from China and Asia.
  - But, on a **transaction** basis, **South African Rand** (**ZAR**) plays a surprisingly large role as the third-currency invoicing.
  - The share of ZAR increased from the fixed exchange rate period to the floating exchange rate period, especially in imports from Japan.

II. Empirical Analysis

— Determinants of Invoicing Currency —

Determinants of Invoicing Currency

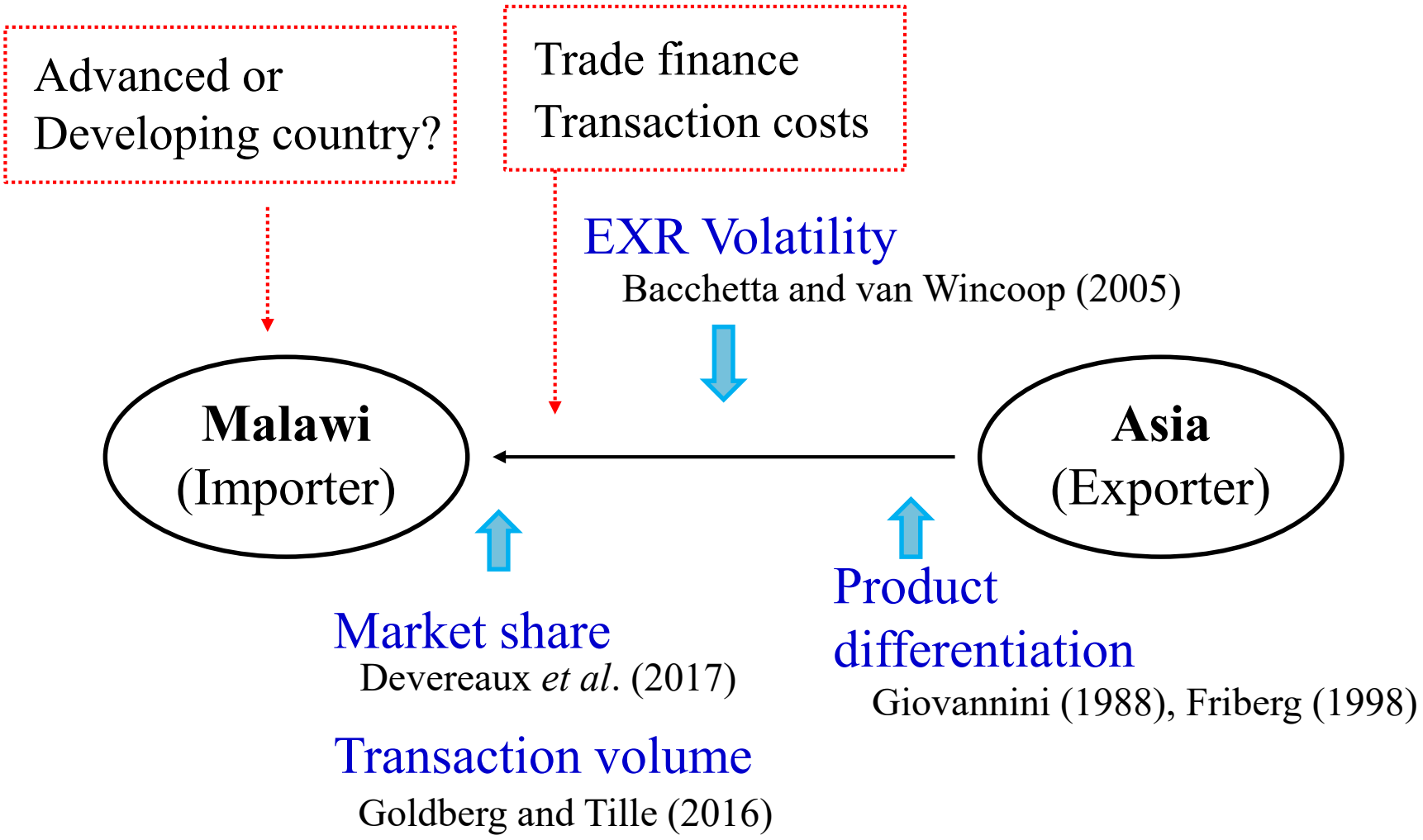
- Panel logit model:

$$\Pr(X_{st}) = \frac{\exp(v_{st})}{1+\exp(v_{st})}$$

$$v_{st} = \alpha + \mathbf{Z}'_{st}\boldsymbol{\beta} + \varepsilon_{st}$$

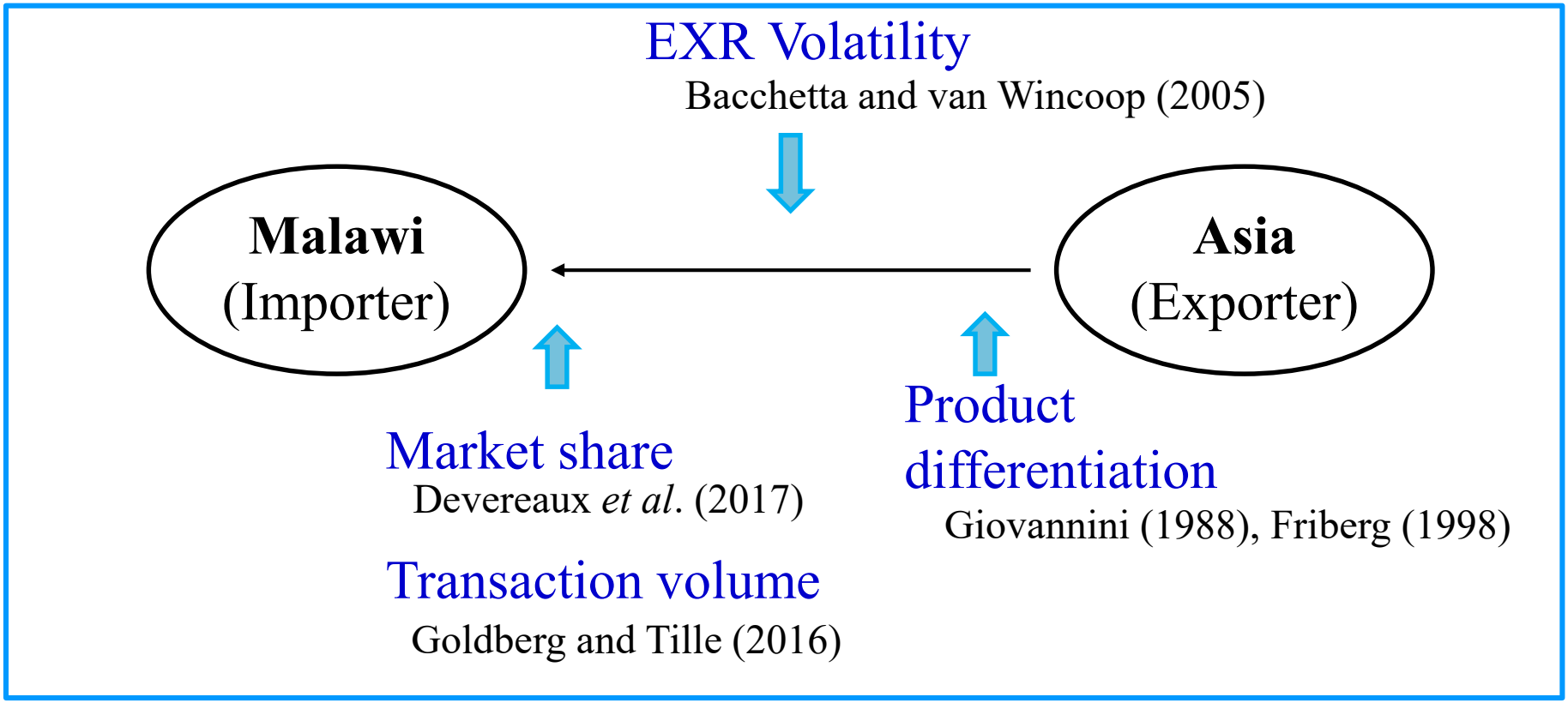
  - X_{st} : represents either PCP_{st}, LCP_{st}, or VCP_{st}.
    => (e.g.) If $X_{st} = PCP_{st}$, then PCP=1, LCP=VCP=0.
  - $\mathbf{Z}_{st}$: control variables for (1) product differentiation, (2) market share, (3) exchange rate volatility, and (4) individual effects.
  - ε_{st} is an error term.

Sketch: Theory suggests possible determinants.



Sketch: Theory suggests possible determinants.

We use the highly **disaggregated transaction level** data.



Explanatory Variables (1)

- Relative Price (*RP*):
  - A proxy for **product differentiation**.

$$RP_{sjt} = \frac{P_{sjt}}{\overline{P}_{sjt}}$$

Each *s*-product at HS8-digit level for exporter *j* in time *t*.

Average price for *s*-product in time *t* across exporters.

  - Assumption:
    - Average price ($\overline{P}_{sjt}$) is the production cost.
    - All exporters for *s*-product face the same production cost.
    - Degree of product differentiation is proportional to the mark-up (=difference between each export price and production cost).

Explanatory Variables (2)

- Exchange Rate Volatility:
  - **Standard deviation** of the **bilateral nominal exchange rate** between the exporter's currency and Malawi Kwacha.
  - The exchange rates for the last 12 months are used for calculation.

- Market Share (*MS*):
  - *Overall MS*: an exporting country's share in Malawian total imports.
  - *Industry MS*: an exporting country's share in Malawian total imports in a specific sector.
  - ***Product MS***: an **exporting country's share** in Malawian total imports in a specific HS 8-digit product.

Panel Logit Estimation

	China	Japan	ROA
PCP	pa	re	pa
LCP	pa	pa	pa
VCP	re?	re	re?

Note:

1. For LCP estimation, the results of population averaged (*pa*) estimation are presented, because the number of observations for LCP is quite small.
2. Random-effect (*re*) estimation is conducted only for PCP for Japan and VCP for China, Japan, and ROA (rest of Asian countries).

Determinants of Invoicing Currency: PCP

Dependent Variable: PCP=1

(A) Product Market Share	China	Japan		ROA
	(PA)	(PA)	(RE)	(PA)
Relative Price	-0.0014 **	0.0018 ***	0.191 ***	0.0026
	(0.0007)	(0.0003)	(0.008)	(0.0020)
Product MS	-0.00002	0.00003 ***	0.0009 ***	-0.000007
	(0.00001)	(0.00001)	(0.0001)	(0.000019)
EXR Volatility	-0.0082 ***	-0.0195 ***	-1.370 ***	-0.0809 ***
	(0.0026)	(0.0023)	(0.058)	(0.0068)
(B) Industry Market Share	China	Japan		ROA
	(PA)	(PA)	(RE)	(PA)
Relative Price	-0.0012 *	0.0015 ***	0.191 ***	0.0026
	(0.0006)	(0.0003)	(0.008)	(0.0020)
Industry MS	0.00021 ***	-0.00039 ***	-0.0018 ***	0.000014
	(0.00002)	(0.00005)	(0.0001)	(0.000053)
EXR Volatility	-0.0127 ***	-0.0190 ***	-1.366 ***	-0.0806 ***
	(0.0027)	(0.0024)	(0.057)	(0.0069)
Observations	128,612	25,171	25,171	39,442

Determinants of Invoicing Currency: LCP

Dependent Variable: LCP=1

	China			Japan		
Relative Price	-0.000885**	-0.000905**	-0.000778*	-0.0127***	-0.0113***	-0.0139***
	-0.000423	-0.000438	-0.000421	-0.00217	-0.00201	-0.00227
EXR Volatility	-0.0445***	-0.0439***	-0.0470***	0.00149	-0.00439	-0.0141
	-0.00292	-0.00302	-0.00316	-0.0099	-0.00969	-0.0107
Product MS	-0.0000763***			0.000218***		
	-0.0000136			-0.0000366		
Industry MS		-0.000117***			0.000406***	
		-0.0000171			-0.0000722	
Overall MS			0.0000474***			-0.000361***
			-0.0000164			-0.0000705
Observations	128,612	128,612	128,612	25,171	25,171	25,171

Note: All are results of population averaged estimation. The number of observations for LCP is quite small.

Determinants of Invoicing Currency: VCP

Dependent Variable: VCP=1

	China	Japan	ROA
Relative Price	-0.00002	0.0016	0.0029
	(0.00089)	(0.018)	(0.0104)
EXR Volatility	0.0187 **	0.346 ***	0.268 ***
	(0.0095)	(0.102)	(0.047)
Industry MS	-0.000018	0.0018 ***	-0.0002
	(0.000019)	(0.0001)	(0.0002)
Observations	128,612	25,171	39,442

Findings:

1. Exchange rate volatility is an important determinant. The larger the volatility, the more likely to use the third-currency invoicing.
2. Need to use “Product MS” for estimation.

Tentative Conclusion

- RMB is rarely used in Malawi's imports from China.
  - Surprisingly small share. Only exception is agricultural imports.
  - Lags far behind the internationalization of the yen.
  - As the third-currency invoicing (VCP), South African Rand plays a large role.

- Determinants of invoicing currency:
  - Exchange rate volatility is a key determinant for PCP and VCP.
    - EXR stability may have positive impact on PCP in Asian exports.
  - Product market share may be a key determinant for PCP.
  - Relative price may be a determinant, but need more work.
  - Hard to analyze PCP for RMB, because of small RMB invoiced exports.

Policy Discussion

- Why RMB is rarely used in imports from China?
  - ZAR (USD) plays a large vehicle role for small (large) transactions and less (more) differentiated products.
  - Only one **RMB offshore clearing bank** in Africa (Zambia)
    - It may not be easy to access RMB liquidity in Malawi, even though Zambia is a neighboring country.
- Yen's share fell substantially on a transaction basis.
  - Likely due to overconcentration in **transport equipment** imports.
  - Other small-size imports may be invoiced in ZAR. => Why?
    - Only one Japanese subsidiary (Toyota Malawi Ltd.) in Malawi.
    - Malawi's import share: 1. South Africa (18.0%); 2. China (13.1%); 3. UAE (10.9%); 4. India (10.3%); 5. Zambia (5.1%).
    - Lots of **South African trading companies** are doing business in Malawi, which promotes ZAR-invoiced trade in Malawi's imports.

Policy Discussion (cont.)

- How to promote the use of RMB in Africa?
  - RMB share is surprisingly small.
  - USD transactions are very large. Even in Malawi's imports from Japan, about two-thirds are invoiced in USD.
  - In exports to least developed countries (e.g., Africa), the role of **trading companies** in local markets as well as in imports may facilitate the use of invoicing currency, even though each transaction amount is quite small.

Need More Work

- Any difference in invoicing currency choice before and after May 2012?
- Estimation by industry needs to be conducted.
- Surprisingly large role of South African Rand (**ZAR**) as a vehicle currency (i.e., third-currency invoicing).
  - Need to take into account two-types of VCP (USD and SAR)?
- Other key factors (e.g., financial factors) are not considered in this study.

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