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Misinvoicing Trade & Informal Capital Movements: The USA - India Case

SUGATA MARJIT

Indian Institute of Foreign Trade, India
and
CTRPFP, India, CES-Ifo Munich, Germany

Amit Biswas, Viswabharati Univ. India

Sandip Sarkar, Xavier University, India

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Motivation

- ❑ The purpose of this work is to throw some light on informal transactions in external account of a developing country (India in our study).
- ❑ If trade or foreign investment data are not properly accounted for, the measure of GDP will be affected.
- ❑ In that context misreporting of trade and/ or investment flows will be a good signal to form a quantitative idea about unrecorded transactions.

Background & Literature

- [Morgenstern \(1963\)](#) was first to use partner country statistics for the European countries to assess corrupt activities.
- [Bhagwati \(1974\)](#) took up the import data of Turkey and the export data of her partner countries and rationalized import misreporting by attributing it to the import duties and the black market premium (BMP) on foreign exchange.
- [Marjit et.al \(2000\)](#) was first to relate devaluation and actual exports through mirror data with India as an example.
- [Fisman & Wei \(2004\)](#) linked up the Chinese import misreporting with incidence of import tax rates.

- [Kellenberg & Levinson \(2019\)](#) showed that the reporting differences also varied systematically with country characteristics besides tariffs like incomes, auditing standards, corruption, and trade agreements.
- [Betz \(2019\)](#) identified institutional constraints on trade policy and on illicit cross-border economic activity and examined trade policy and government revenue.
- [Prasad and Wei \(2007\)](#), [Hung \(2008\)](#) described China's policy measures aimed at curbing illicit capital flows. Although these capital control measures were deemed effective, they did not eliminate all illicit flows.

- [Cheung and Qian \(2010\)](#) showed that the magnitude of China's capital flight could be quite large. For some years, inward or outward capital flight could be larger than the official foreign direct investment data or the change in external debts.
- [Kar and Freitas \(2012\)](#) estimated that trade mis-invoicing accounted for 77.8% of total capital flight.
- [Kar and Spanjers \(2014\)](#) asserted that China was the leading source of illicit capital flows among developing countries and dominated the flows originating from Asia.

- [Cheung et al. \(2016\)](#) studied China's illicit capital flow and documented a change in its pattern. Specifically, they observed that China's capital flight, especially the one measured by trade mis-invoicing, exhibited a weakened response in the post-2007 period to the covered interest disparity, which is a theoretical determinant of capital flight.
- [Biswas, von Hagen & Sarkar \(2019b\)](#) find that invisible capital outflows take place through the trade channel but invisible capital inflows occur through the FDI channel and in long-run outflow positively affects the inflow. They observe that if forward premium on foreign exchange, relative real interest rate or inflation goes up in China, illegal inflow also goes up.

India & Informal External Transactions

- The Indian case of studying misreporting behavior is relatively new in nature and was taken up first by [Marjit et al. \(2000\)](#). [Biswas and Marjit \(2005\)](#) study and rationalize the misreporting phenomena in a theoretical framework, calculate the optimum rates of export and import misreporting and attribute the misreporting to stringent trade and exchange rate policies.
- [Biswas and Marjit \(2007\)](#) build a three-country preferential and non-preferential trade channels to check the nature of mis-invoicing patterns of corrupt traders and its link with the illegal capital inflows or outflows.

- [Marjit et al. \(2008\)](#) extend Lucas argument (Lucas, Jr. 1976) and propose that highly controlled and regulated environment leads to misinterpretation of official statistics and distort policy predictions based on such information.
- [Biswas and Sengupta \(2011, 2015\)](#) focus on import under-invoicing as an outcome of high tariff and non-tariff barriers in an oligopolistic market where domestic producers competed with importers in a welfare optimizing framework both under the fixed and flexible exchange rate regimes.

- [Biswas \(2012\)](#) show that even in the absence of BMP in foreign exchange market, the exporter may rationally under-invoice to satisfy the illegal foreign exchange need of the under-invoiced importers facing high tariff protection.
- [Biswas, von Hagen & Sarkar \(2019a\)](#), in an empirical exercise, observe that capital may fly out of the country through the trade channel.

Evidence of Informal Transaction in India – US Bilateral Trade

- Following [Marini et al \(2018\)](#), We have converted US's officially reported export to India, fob into cif, by multiplying with the factor, 1.06 and compare it with the Indian import from the USA, cif. In case of US's import from India, we have converted US's reported import, cif (cost of insurance & freight) into fob (free on board), by dividing with a factor, 1.06 to be eligible for comparison with the India reported export to the USA, fob.

Symbolically,

$M^{Mis} = \text{USA's Export to India as reported by USA}$

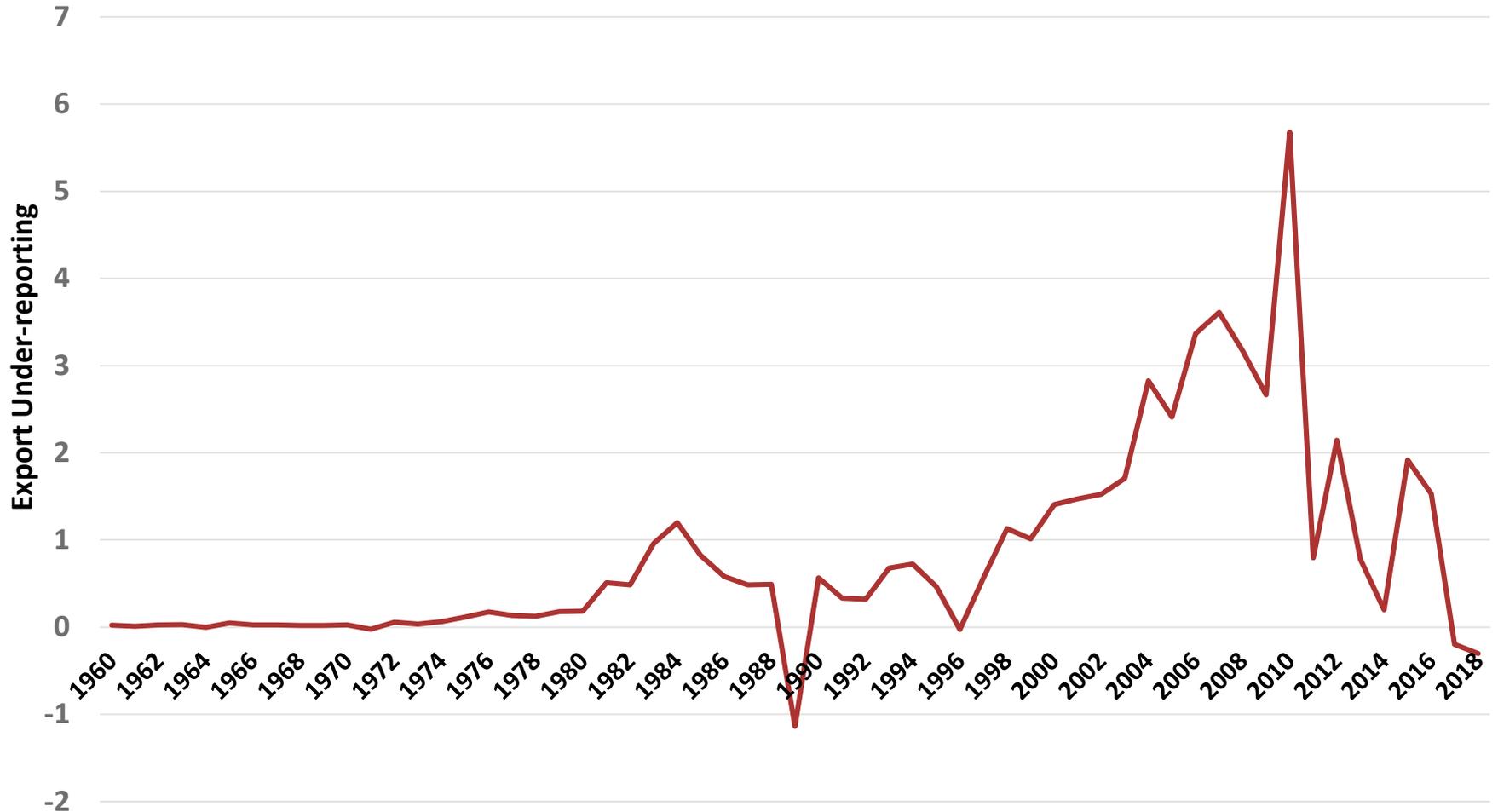
– {India's Import from USA as reported by India / 1.06}

$X^{Mis} = \text{USA's Import from India as reported by USA}$

– {India's Export to USA as reported by India X 1.06}

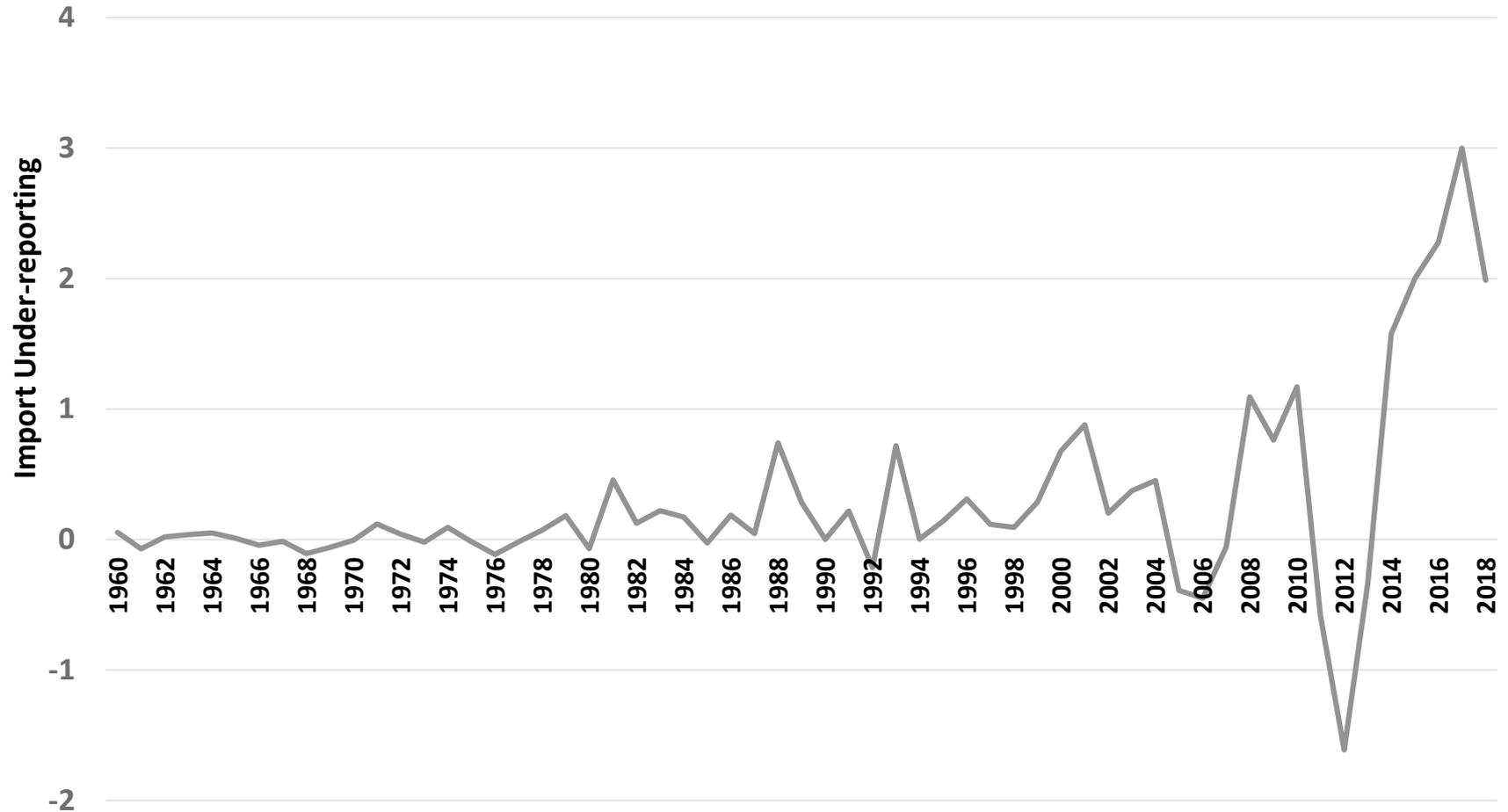
Export Under-reporting

**Export Under-reporting of India with the USA as trade partner
(In US \$ Billion)**



Import Under-reporting

**Import Under-reporting of India with the USA as trade partner
(in US \$ Billion)**



Informal Transactions, Hidden Trade and GDP

$$\text{Official GDP} \equiv C + I + G + (X - M)$$

$$\text{Actual GDP} \equiv C + I + G + [X^{\text{Actual}} - M^{\text{Actual}}]$$

Here,

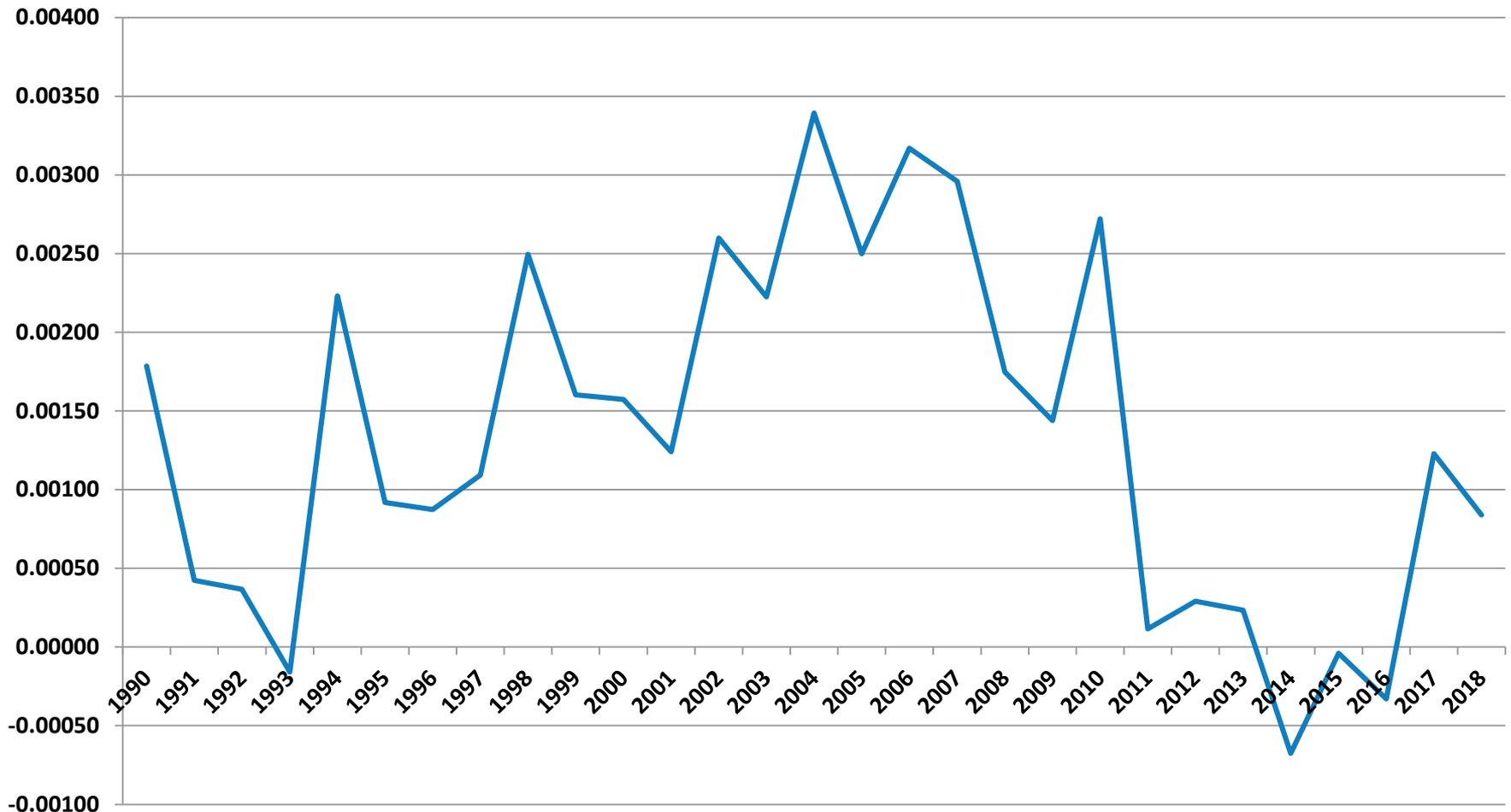
- *Hidden Trade (HT) = $X^{\text{Actual}} - M^{\text{Actual}}$*

- *Hidden Trade as proportion of Official GDP*

$$= (\text{Hidden Trade}) / (\text{Official GDP})$$

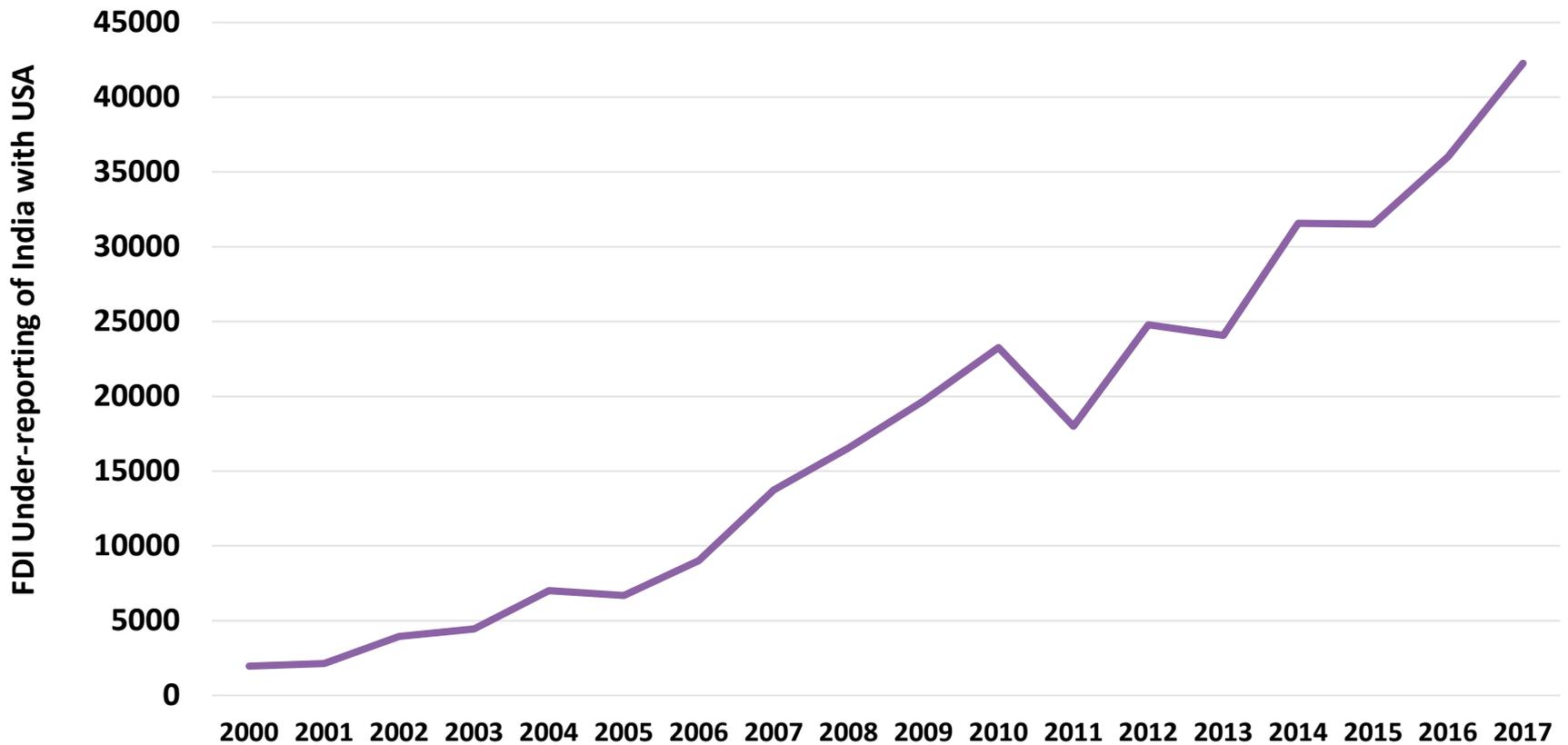
Unofficial Trade as Proportion of India's Official GDP (1990 – 2017)

Hidden Trade as proportion of Official GDP

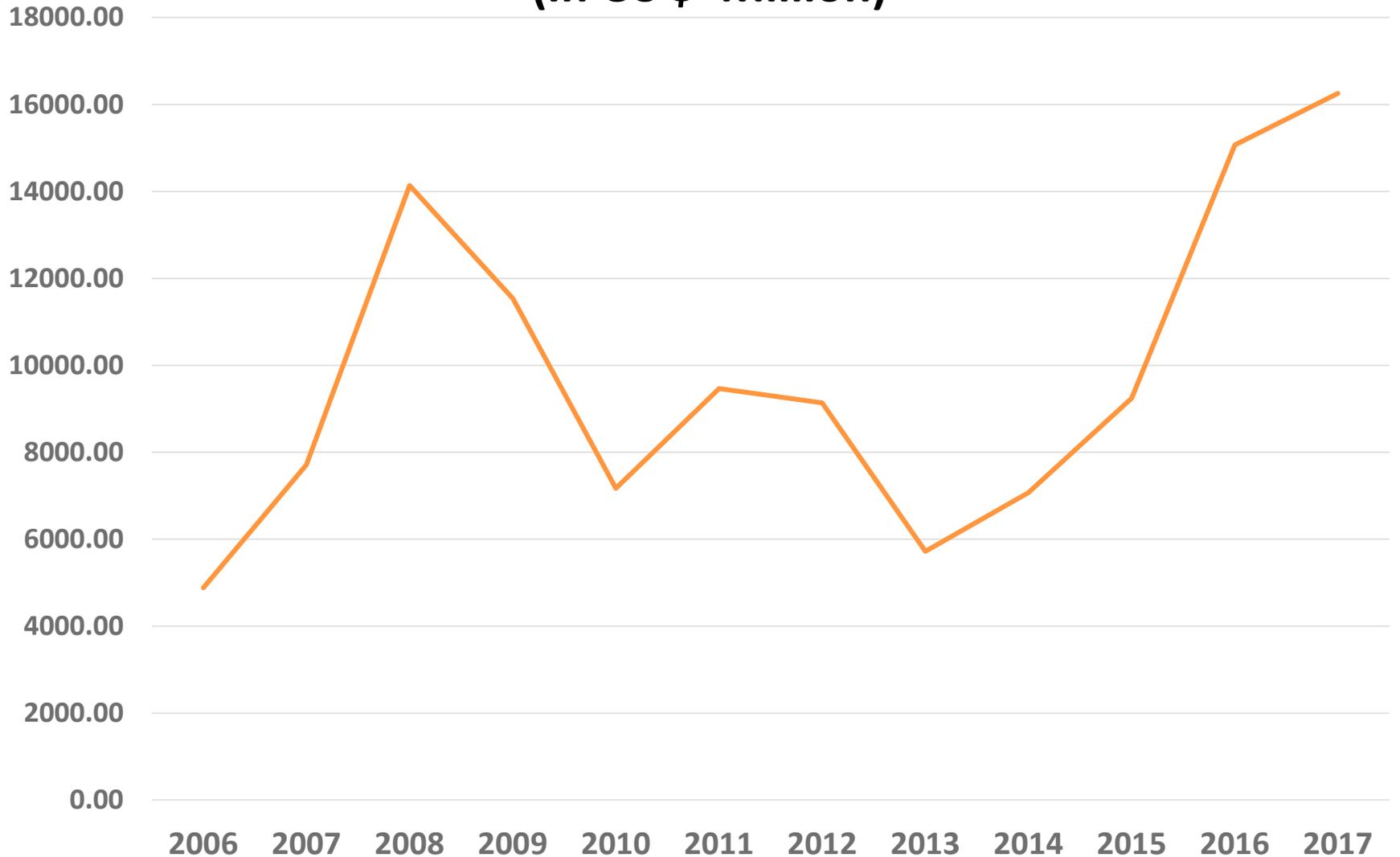


Unrecorded Foreign Investment

FDI Under-reporting of India with USA (In US \$ Million)



FDI Over-reporting of India with Mauritius (In US \$ Million)



Empirical Findings

We consider a simple multi equation reduced form VAR model with new variables defined as rates , not levels, to make them unit free.

$$\bar{M}_t^{\text{Mis}} = c_0 + \sum_{i=1} \alpha_i \bar{M}_{t-i}^{\text{Mis}} + \sum_{i=1} \beta_i \bar{X}_{t-i}^{\text{Mis}} + u_t$$

$$\bar{X}_t^{\text{Mis}} = c_1 + \sum_{i=1} \theta_i \bar{M}_{t-i}^{\text{Mis}} + \sum_{i=1} \gamma_i \bar{X}_{t-i}^{\text{Mis}} + v_t$$

Mis-reporting series are related through lags. This is justified in the sense that the amount of capital that is generated through under-reporting of export can only be utilized by under-reporting importers in the next period.

- We observe that the first and second lag of the export mis-invoicing series significantly affect the import mis-invoicing series. While the first lag is positive, the same for the second lag is negative. This implies that an increase of \bar{X}_t^{Mis} at period t-1, increases \bar{M}_t^{Mis} at period t. On the contrary, an increase of \bar{X}_t^{Mis} at period t-2, negatively effects \bar{M}_t^{Mis} at period t.

Table: Causal relationship Import and Export Mis-invoicing

	Dependent Variable	
	_M_Mis	X_Mis
L.M ^{Mis}	0.17***(2.70)	-0.03(-1.00)
L2. M ^{Mis}	0.08(1.23)	0.02(0.52)
L.X ^{Mis}	0.32***(2.61)	0.35***(5.75)
L2. X ^{Mis}	-0.35***(-2.86)	0.35***(5.63)
_cons	-0.04***(-2.15)	-0.04***(-3.88)
Frequency and Log-Likelihood		
NOS	234	234
LL	54.46	213.74
Granger Causality Tests		
All	9.85***	1.11
Lags	9.85***	1.11
Unit Root Tests: with trend		
ADF	-9.31***	-2.91
PP	-12.60***	-8.71***
Unit Root Tests: without trend		
ADF	-9.33***	-2.85*
PP	-12.57***	-8.66***
Zivot Andrews Unit Root Tests		
Min t	-13.62***	-5.49**
Break year	Q1- 1970	Q1-1986

- We try to assess whether export mis-invoicing causally affects import underreporting, i.e. whether a part of misreported export is used to finance part of hidden imports. We show that we cannot reject the hypothesis and our conjecture cannot be undermined.
- Granger Causality Test presented at the bottom of the distribution confirms that only export mis-invoicing series causes import mis-invoicing series. That is

$$\bar{M}_{Mis} = f(\bar{X}_{Mis})$$

- Similar results also holds even if we study the relationship of the above two variables at their first difference.
- In order to check robustness of the analysis we re-run the entire exercise with two period moving average of both the missing invoicing series.

Causal Relationship between Moving Average Import and Export Mis-invoicing Series

	Dependent Variable	
	M_Mis	X_Mis
L.M_mis_MA	0.76***(12.16)	-0.06**(-1.98)
L2.M_mis_MA	-0.24***(-3.89)	0.06**(2.04)
L.X_mis_MA	0.39***(2.92)	1.01***(15.49)
L2.X_mis_MA	-0.45***(-3.36)	-0.18***(-2.81)
_cons	-0.03***(-2.70)	-0.02***(-3.72)
Frequency and Log-Likelihood		
NOS	234	234
LL	176.96	343.78
Granger Causality Tests		
All	11.3***	4.93*
Lags	11.3***	4.93*

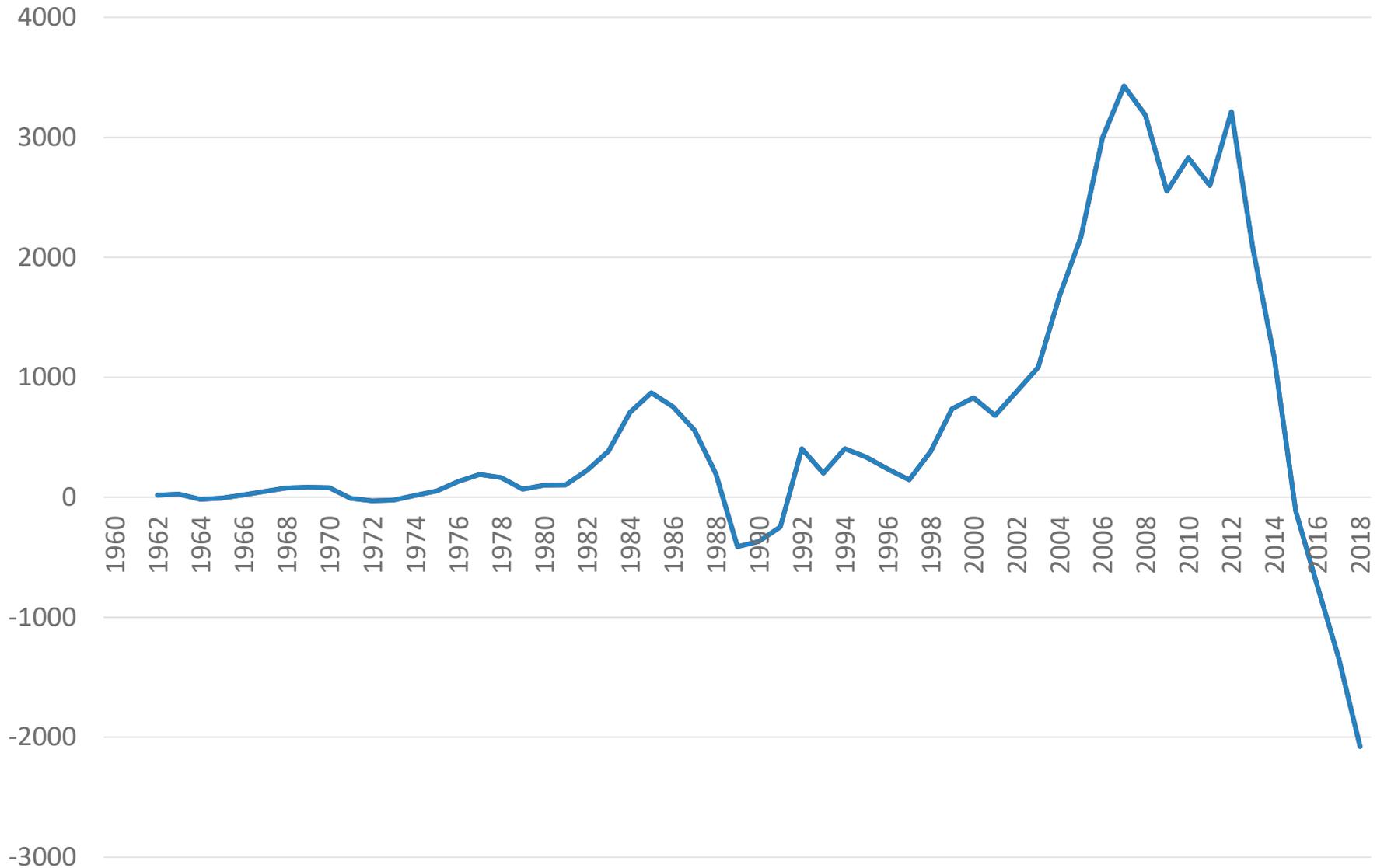
□ The fact that export granger causes import misinvoicing series is failed to be rejected at 10% level of significance. Since 10% is not a widely accepted, we decide to ignore this. Note that instead of considering two period moving average considering three period moving average the result is exactly similar as the previous one (this result is omitted). Hence we conclude that

$$\textit{Import Misinvoicing} = f(\textit{Export Misinvoicing})$$

Possible Indicator of Unaccounted Capital Outflow

- As a preliminary exercise we take a 3-year moving average of difference of export under invoicing and the import under invoicing to construct a proxy of the residual flow as possible indicator of unaccounted capital outflow. Following figure gives us some idea about the surplus left out after we account for import under-invoicing. Note that there are periods when there is over-invoicing of imports as somewhat conventional in this literature when we take China and Brazil as examples. Exact under-invoicing coupled with import over-invoicing reinforce the capital outflow hypothesis.

Difference between 3 yr. Moving Average of Export & Import (under-reporting) of IND with USA (in Million US \$)



Analytical Example

Let V define the gross earning of the agent without the consideration of expected punishment costs. Then a representative agent exports, imports and engage in foreign investment.

$X \rightarrow$ Exports, $M \rightarrow$ Imports, $F \rightarrow$ Foreign Investment

We think of a steady state model where same X , M and F feature every time period.

$(X, M, F) \rightarrow$ Total values.

$(\tilde{X}, \tilde{M}, \tilde{F}) \rightarrow$ Reported values.

Therefore $[(X - \tilde{X}), (M - \tilde{M}), (F - \tilde{F})]$ are unrecorded values.

Let us define V as

$$V = X + (\mu - 1)M - \tilde{M} \cdot R_M - (M - \tilde{M})\tilde{R}_M - (F - \tilde{F})\tilde{R}_F - \tilde{F}R_F \quad (1)$$

Contd...

- $(\mu - 1) \rightarrow$ earning from import, with $\mu > 1$ as the mark up. \tilde{M} is next period's reported import. (Same as this period's as we assume Steady State) which needs to be financed.
- $(F - \tilde{F}) \rightarrow$ unrecorded capital outflow. \tilde{F} is next period's reported capital flows which needs to be financed now with a cost R_F , similarly for \tilde{M} it is R_M .
- (R_M, \tilde{R}_M) and (R_F, \tilde{R}_F) are not only financing costs but also may contain different regulatory costs in any economy. Thus $(\tilde{R}_M, \tilde{R}_F) > 0$, but $\tilde{R}_M \neq \tilde{R}_F$.

$R_M \neq R_F$, but this is not critical for our agreement as we focus on misreporting. Suppose that the following holds and also $R_M = R_F = R$ and $R > \tilde{R}_M, R > \tilde{R}_F$

Contd....

$$\lambda(X - \tilde{X}) = M - \tilde{M} \quad (2)$$

$$(1 - \lambda)(X - \tilde{X}) = F - \tilde{F} \quad (3)$$

(2) and (3) imply unreported export earnings finance misreported transactions.

Costs of Misreporting

$$C = \frac{1}{2}Z\lambda^2(X - \tilde{X})^2 + \frac{1}{2}Z(1 - \lambda)^2(X - \tilde{X})^2 \quad (4)$$

This is a standard quadratic cost structure which can be generated through various interpretations as evident from [Marjit, Misra and Mitra \(2019, Unpublished, CSSSC\)](#).

Therefore, the **objective function** will look like

$$\Omega(\tilde{X}, \lambda) = X + (\mu - 1)M - \left(M - \lambda(X - \tilde{X}) \right) R - [\lambda(X - \tilde{X})] \tilde{R}_M - \\ [F - (1 - \lambda)(X - \tilde{X})] R - (1 - \lambda)(X - \tilde{X}) \cdot \tilde{R}_F - C(\tilde{X}, \lambda) \quad \dots\dots\dots(5)$$

Simple algebra yields from F.O.C. $\frac{\delta\Omega}{\delta\tilde{X}} = 0$, $\frac{\delta\Omega}{\delta\lambda} = 0$ following optimum solutions.

$$\Rightarrow (X - \tilde{X})^* = \frac{\lambda^* \Delta_M + (1 - \lambda)^* \Delta_F}{Z(\lambda^{*2} + (1 - \lambda^*)^2)} \quad \dots\dots\dots(6)$$

$$\Rightarrow (1 - 2\lambda^*) = \frac{\Delta_F - \Delta_M}{(X - \tilde{X})^* Z} \quad \dots\dots\dots(7)$$

Contd...

Where $\Delta_M = R - \tilde{R}_M$, $\Delta_F = R - \tilde{R}_F$

- Note that higher Δ_M or Δ_F will increase misreporting i.e. $(X - \tilde{X})$ will rise. If $\Delta_M = \Delta_F = 0$, $\lambda^* = \frac{1}{2}$. This is intuitive.
- If $\Delta_F > \Delta_M$ then $\lambda^* < \frac{1}{2}$ i.e. if relative misreporting is more profitable for F, less of underinvoiced exports will be spent on financing $(M - \tilde{M})$.

Winding UP

- GDP or for that matter quantum of actual economic activity is critical for formulating policies. This paper provides an overview of the literature that tries to track **unrecorded international capital flows through misreported trade statistics**. In particular we apply the '*mirror data*' methodology in trade transactions between India and USA.
- We show that –
 - a) Indian exports are under-invoiced
 - b) Indian imports are under-invoiced and
 - c) FDI into India from USA is also underreported.

- ❑ We argue that export underreporting is being used to finance misreported imports, unlike in other countries where imports are over-invoiced.
- ❑ We provide a simple estimates of capital outflow from India related to excess of misreported exports over imports.
- ❑ We point out that while India under-reports capital inflow with respect to USA, it over-reports the same with respect to Mauritius.
- ❑ We propose in our future research to estimate how much of misreporting of trade and capital flows affects Indian GDP internalizing such estimates of unrecorded transactions.

THANK YOU