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

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Abstract

One benefit of bilateral 'mirror' data, that are especially available in the sphere of foreign trade and international investment, is that it can be cross-checked and analysed to examine any intended manipulation. Our present work tries to utilise that benefit to examine and analyse the motivated mis-reporting of foreign trade and investment data by the international traders and investors by taking up the long bilateral export and import data (1960–2017) between India and the USA which are supplemented by a small time series data on FDI movement between same bilateral partners (2000–2017). We show that misreporting exists in exports, imports and FDI. In particular under-invoiced export from India seems to finance imports as imports are also under-invoiced, generally in contrast with the Chinese case which has been discussed elsewhere. We provide a VAR analysis of such a phenomenon and a simple analytical model which traces the incentives behind such misreporting. Later we consider the estimate of unrecorded capital flows and misrepoprted FDI flows from USA and Mauritius to India.

JEL Classification: F32
Keywords: Misreporting, Mirror Data, Under-invoicing, Capital Outflow

I. Introduction

The purpose of this work is to throw some light on informal transactions in external account of a country. 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.

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Unlike other social science database, international trade and investment data have the benefits of being cross-checked and verified as these data are kind of 'mirror' in nature where bilaterally both the countries keep records of the same database. Utilizing that 'mirror' character and taking into account the IMF prescription of adjusting cif/fob values (Marini et al., 2018) when comparing export and import values (from Direction of Trade Statistics yearbook), our present work first analyses the long time series (1960 – 2017) of India – USA export and import data and observes that there exists a definite trend of mismatch, both in exports and imports (see figures 1 & 2).

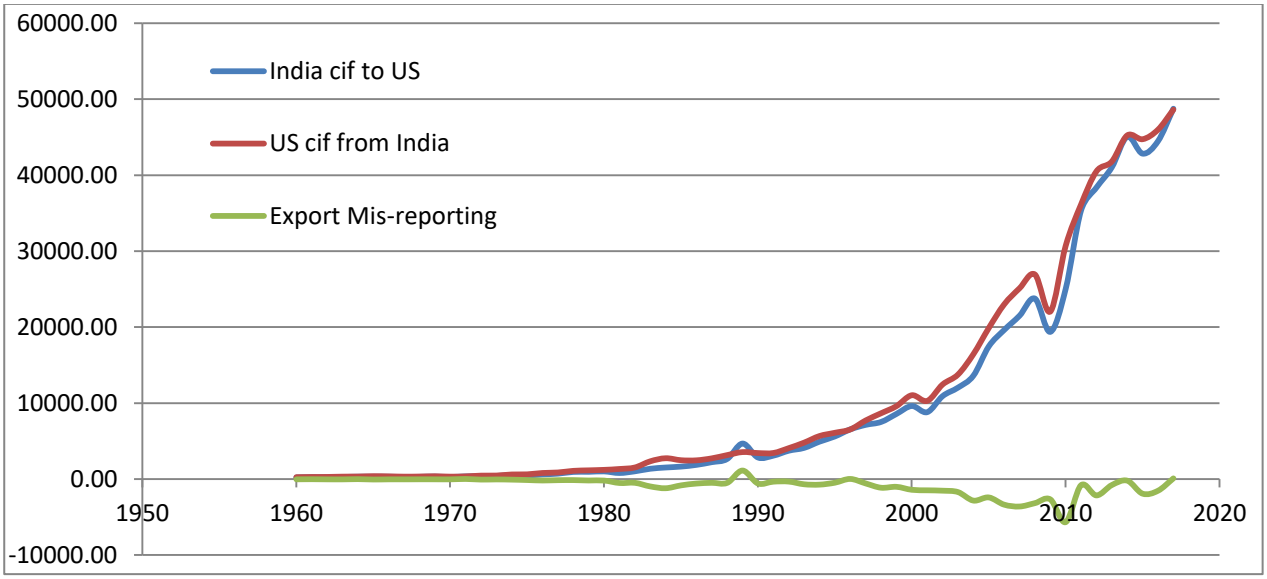

Figure 1**: India's export misreporting with trade partner, the USA**
(Source: DOTS, IMF)

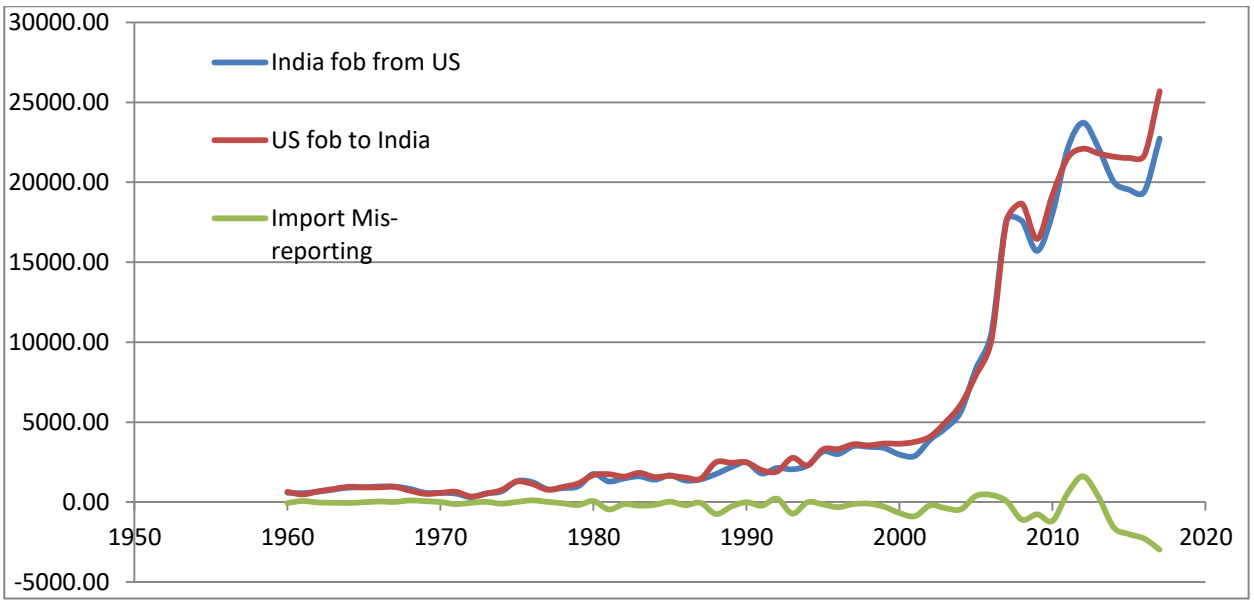

Figure 2: **India's import misreporting with trade partner, the USA**
(Source: DOTS, IMF)

Both the figures clearly demonstrate that in most of the years, India, in comparison to the USA, have underreported both the export and import values. These trends are very interesting as other large developing countries like China and Brazil usually over-report import values along with export underreporting to unofficially move the capital abroad. Lots of literature have been devoted in measuring the amount of trade misreporting and possible capital flight from China (see for example, Cheung et al.(2016), Kar and Freitas (2012), Kar and Spanjers (2014), Ma and McCauley (2008), Cheung and Qian (2009), Prasad et al. (2007) among others).

Another strand of literature has examined the bilateral trade misreporting phenomenon and attributed it to different policy formulations. Morgenstern (1963) first employed this method comprehensively to prove that there existed corrupt activities among international traders and went on to measure the extent of misreporting by using partner country statistics for the European countries. Bhagwati (1974) took up the import data of Turkey and the export data of her partner countries and rationalised import misreporting by attributing it to the import duties and the black market premium (BMP) on foreign exchange. Fisman & Wei (2004) linked up the

Chinese import misreporting (missing imports) 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 (2018) identified institutional constraints on trade policy and on illicit cross-border economic activity and examined trade policy and government revenue.

The Indian case of studying misreporting behavior is relatively new in nature and was taken up first by Marjit et al. (2000, 2008) and Biswas and Marjit (2005). They 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 therefore 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 is supposed to fly out through export under-reporting and unless imports are over-reported part of illegal capital may even fly in.

Our present work is different from the existing literature which suggests that under-reported exports and over-reported imports are signals of illegal capital flows out of the country. But the Indian case is curiously different as both exports are imports are primarily under-

reported. It demands special attention and we therefore first propose to enquire for a more intrinsic relationship between degree and magnitude of export and import mis-reporting to intuitively conclude about unofficial cross-border capital movement before looking into the FDI database. We believe part of foreign currency saved via the export channel may be used to finance the part of unreported import basket. If the gap between export and import under-reporting becomes positive, the money may be used as illegal capital flight. Our exercise is important and unique as, to our knowledge, there is hardly any existing study linking the export and import mis-reporting where both the series are grossly under-reported. The paper is devided into five sections. The second discusses data, methodology and empirics of mis-invoicing export and import. The third provides a simple analytical model of incentive to import. The fourth section highlights anomalies in FDI flows to India from USA and Mauritius. The last section concludes.

II. Data, Methodology & Empirics

First we try to assess whether export mis-invoicing causally affects import underreporting. Thus a part of misreported expiated export is noted to finance actual imports. We show that we cannot reject the hypothesis and our conjecture cannot be undermined. The data on misreporting is appropriately constructed.

Second, one could do the same with misreported capital flow from India to USA and underreported export or one could eliminate the residual misreported exports after accounting for import financing. The fact that a part of export earnings is not reported in India, even after accounting for import-financing would imply that such earning is used for unrecorded foreign investment as well as brought into India in a disguised form. Such a decomposition is impossible to capture with publicly available data.

In order to address the issue of inter-linkage between import and export mis-invoicing, we consider quarterly data from 1960-2017. Note that annual data might be too long an interval for studying the inter-relationship. Furthermore the degrees of freedom also increase when quarterly data are used.

Define

$$\mathrm{M}^{\mathrm{Mis}} = \text{India's Import from USA as reported by India} - (\text{USA's Export to India as reported by USA} \times 1.06)$$

$$\mathrm{X}^{\mathrm{Mis}} = \text{India's Export to USA as reported by India} - \left(\frac{\text{USA's Import from India as reported by USA}}{1.06}\right)$$

$$\overline{\mathrm{M}}^{\mathrm{Mis}} = \frac{\mathrm{M}^{\{\mathrm{Mis}\}}}{(\text{USA's Export to India as reported by USA} \times 1.06)}$$

$$\overline{\mathrm{X}}^{\mathrm{Mis}} = \frac{\mathrm{X}^{\{\mathrm{Mis}\}} \times 1.06}{(\text{USA's Import from India as reported by USA})}$$

Throughout this paper we only deal with rate of import and export mis-invoicing. This is because the rate series are unit free. Further, if import increases substantially at some point then one might also expect that mis-invoicing would also increase. The rate is a relative measure and thus normalizes this type of cases.

We address the issue following a simple multi equation reduced form VAR model. The model can be written as follows:

$$\overline{\mathrm{M}}_{\mathrm{t}}^{\mathrm{Mis}} = \mathrm{c}_0 + \sum_{\mathrm{i}=1} \alpha_{\mathrm{i}} \overline{\mathrm{M}}_{\mathrm{t-i}}^{\mathrm{Mis}} + \sum_{\mathrm{i}=1} \beta_{\mathrm{i}} \overline{\mathrm{X}}_{\mathrm{t-i}}^{\mathrm{Mis}} + \mathrm{u}_{\mathrm{t}}$$

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

Note that by construction of the above two equations, 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 utilised by under-reporting importers in the next period. Following Table-1 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 $\overline{X}_t^{Mis}$ at period t-1, increases $\overline{M}_t^{Mis}$ at period t. On the contrary an increase of $\overline{X}_t^{Mis}$ at period t-2, negatively effects $\overline{M}_t^{Mis}$ at period t.

Table 1: **Causal Relationship Import and Export Misinvoicing**

	Dependent Variable	
	$\bar{M}^{Mis}$	$\bar{X}^{Mis}$
$L.\bar{M}^{Mis}$	0.17***(2.70)	-0.03(-1.00)
$L2.\bar{M}^{Mis}$	0.08(1.23)	0.02(0.52)
$L.\bar{X}^{Mis}$	0.32***(2.61)	0.35***(5.75)
$L2.\bar{X}^{Mis}$	-0.35***(-2.86)	0.35***(5.63)
Constant		
C	-0.04**(-2.15)	-0.04***(-3.88)
Frequency and Log-Likelihood		
NOS	234	234
LL	54.46	213.74
Granger Causality Test		
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

Notes:

Lag length has been selected using the Schwartz BIC criterion.
NOS is the number of observations and LL=Log Likelihood.
The row All corresponding to column 2 in the Granger Causality Test tests $\bar{X}_t^{Mis}$ Granger causes $\bar{M}_t^{Mis}$ if and only if the Null hypothesis $H_0 : \alpha_1 = \alpha_2 = .. = \alpha_{p_1} = \beta_1 = \beta_2 = .. = \beta_{p_2} = 0$ can be rejected. Similarly $\bar{M}_t^{Mis}$ Granger causes $\bar{X}_t^{Mis}$ if and only if the Null hypothesis $H_0 : \theta_1 = \vartheta_2 = .. = \theta_{q_1} = \gamma_1 = \gamma_2 = .. = \gamma_{q_2} = 0$ can be rejected. The same for row Lags tests the null: $H_0 : \beta_1 = \beta_2 = .. = \beta_{p_2} = 0$ and $H_0 : \theta_1 = \vartheta_2 = .. = \theta_{p_2} = 0$ is presented in column 2 and 3, respectively. Both test statistics confirms that only the first hypothesis (i.e., $\bar{X}_t^{Mis}$ Granger causes $\bar{M}_t^{Mis}$) can be rejected.
Both import and export misreporting rates are stationary.

Granger Causality Test presented at the bottom of the distribution confirms that only export mis-invoicing series causes import mis-invoicing series. That is

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

Similar results also holds even if we study the relationship of the above two variables at their first difference. Finally our results also holds if we consider annual data instead of quarterly data. The result remains unchanged even after conducting the same analysis with annual data (instead of quarterly) of the two countries.

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.

Table-2: 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*

Both the variables are stationary. Results has been omitted.

The fact that export granger causes import mis-invocing 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 Import Misinvocing = f (Export Misinvocing)

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

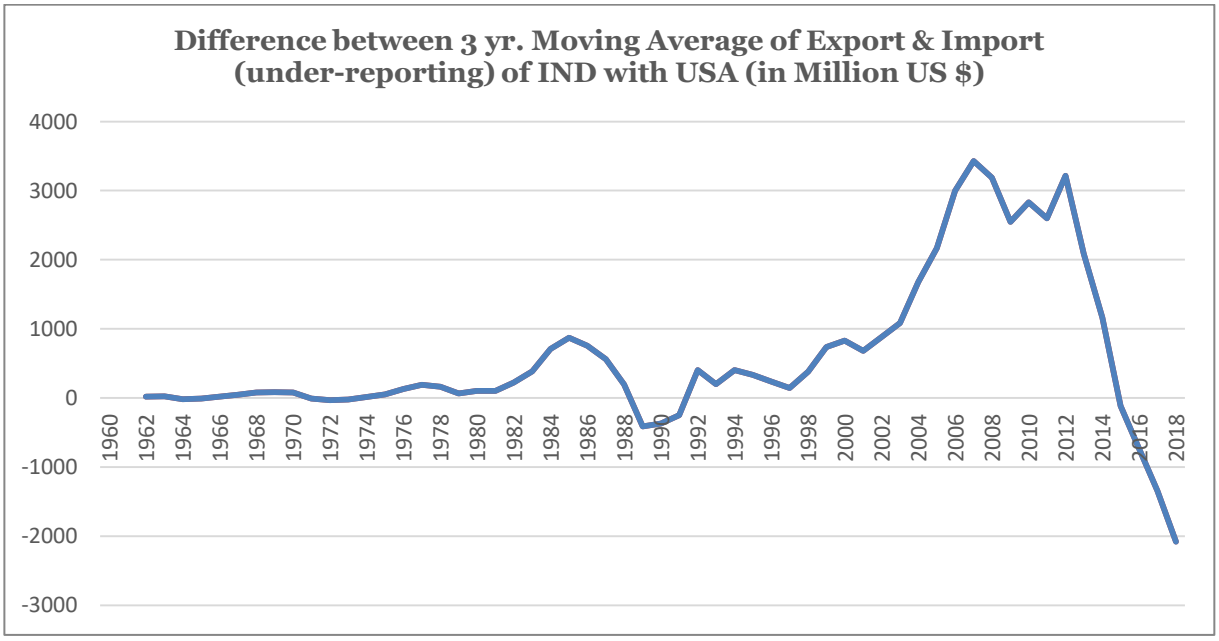

Figure-3

III. Analytical Example

Let us try to set up a simple decision model which determines the choice of misreporting by the representative agent who exports, imports and engages in foreign investment. The basic idea being that the agent under invoice export to finance import and foreign investment to save interest and other regulatory transaction costs. This is the main reason of misinvoicing transactions.

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

Let us define V as

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

$(\mu - 1)$ is the 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.

$(F - \tilde{F})$ is the 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 aggrement as we focus on misreporting. Suppose that the following holds and also $R_M = R_F = R$ and $R > \tilde{R}_M$, $R > \tilde{R}_F$

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

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

(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 (2017). Therefore, the objective function will look like

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

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

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

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

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 misrerporting is more profitable for F, less of underinvoiced exports will be spent on financing $(M-\tilde{M})$.

IV. Unrecorded Foreign Investment

Next we take up the official Indian FDI inflow figures and compare it with the USA outflow data to examine the deviations in bilateral FDI statistics between the US and India for a relatively shorter period of time based on the data availability (2000 – 2017, source: RBI, India & BEA, USA). Figure 4 shows that compared to the USA outflow figure, Indian FDI inflow data is also mostly under-reported.

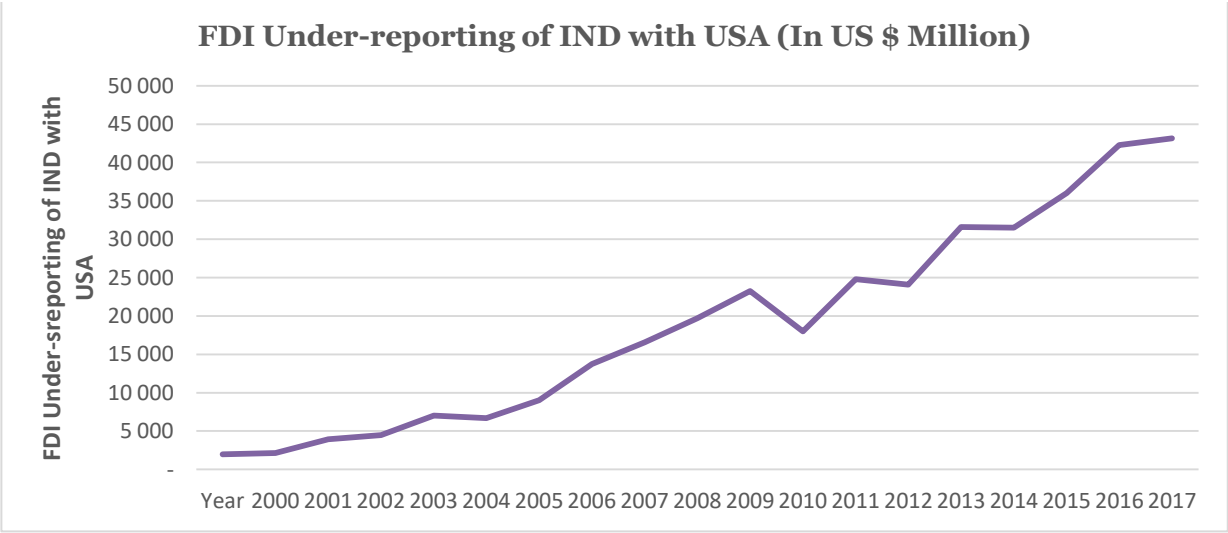

Figure 4: **Comparison between Indian FDI inflow & US FDI outflow (2000 – 2017)**

(*Source*: BEA, the USA department of Commerce & Reserve bank of India.)

Not all the capital remains abroad as some of the capital may take an U-turn to come back as official FDI inflow. To capture the exact nature of hidden capital flows across borders, along with the USA we might also check the India – Mauritius scenario as the later is one of the largest sources of FDI into India. But by crosschecking, we find that India hugely overreports the FDI inflows from Mauritius (see figure 5). The reason might be that part of the USA (also from some other foreign destinations) FDI may enter India via Mauritius. Hence our job would be, first, to analytically define and measure the optimum values of net capital flight that takes place unofficially in the presence of different rates of returns on capital, spot and future exchange rates and incentives provided to the internal investors.

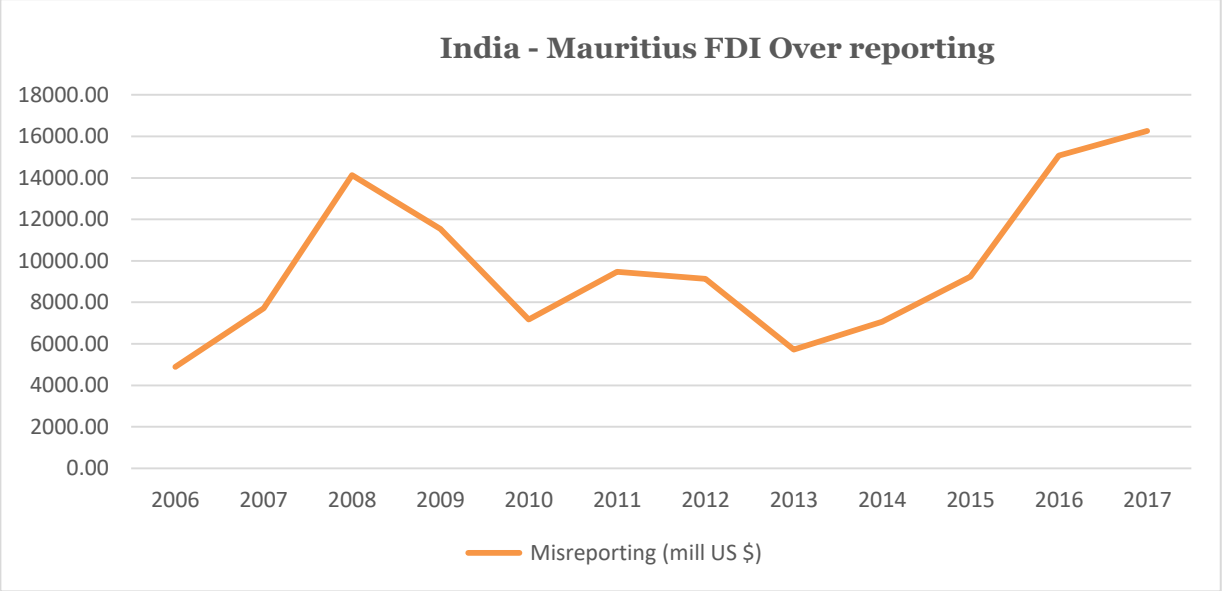

Figure 5: **India Over-reports its FDI receipt from Mauritius (2006 – 2017).**

V. Conclusion

GDP or for that matter quantam 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 underinvoiced.
b) Indian imports are underinvoiced.
c) FDI into India from USA is also underreported.

We argue that exports underreporting is being used to finance misreported imports, unlike in other countries where imports are overinvoiced. We provide a simple estimates of capital outflow from India related to excess of misreported exports over imports.

Also we point out, without proper explanation due to the lack of publicly available data, that while India undrerreports capital inflow with respect to USA, it overreports 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.

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Data Appendix

Year	Export Under-reporting cif (in Million US $)	3 yr. Moving Average of Export Under-reporting cif (in Million US $)	Import Under-reporting fob (in Million US $)	3 yr. Moving Average of Import Under-reporting fob (in Million US $)	Diff. b/w 3yr. MA of Export & Import (in Million US $)
1960	21.584		53.7		
1961	9.214		-72.85		
1962	25.72	18.83933333	20.43	0.426666667	18.41266667
1963	29.832	21.58866667	37.66	-4.92	26.50866667
1964	-1.25	18.10066667	48.96	35.68333333	-17.58266667
1965	48.082	25.55466667	8.38	31.66666667	-6.112
1966	24.552	23.79466667	-43.74	4.533333333	19.26133333
1967	26.288	32.974	-14.53	-16.63	49.604
1968	19.678	23.506	-107.38	-55.21666667	78.72266667
1969	20.2386	22.0682	-61.15	-61.02	83.0882
1970	26.4692	22.1286	-6.29	-58.27333333	80.40193333
1971	-22.6784	8.0098	117.4	16.65333333	-8.643533333
1972	58.1934	20.6614	40.76	50.62333333	-29.96193333
1973	36.3698	23.9616	-19.88	46.09333333	-22.13173333
1974	64.196	52.91973333	92.06	37.64666667	15.27306667
1975	115.698	72.08793333	-16.01	18.72333333	53.3646
1976	175.3714	118.4218	-113.59	-12.51333333	130.9351333
1977	134.4724	141.8472667	-19.14	-49.58	191.4272667
1978	124.6142	144.8193333	71.92	-20.27	165.0893333
1979	178.1456	145.7440667	181.69	78.15666667	67.5874

1980	184.4482	162.4026667	-70.33	61.09333333	101.3093333
1981	509.6328	290.7422	455.05	188.8033333	101.9388667
1982	484.4683143	392.8497714	124.7	169.8066667	223.0431048
1983	959.9111198	651.3374114	220.3	266.6833333	384.654078
1984	1199.176624	881.1853527	171.83	172.2766667	708.908686
1985	821.3563112	993.4813517	-27.81	121.44	872.0413517
1986	580.2529967	866.928644	187.37	110.4633333	756.4653106
1987	484.5527215	628.7206765	45.56	68.37333333	560.3473431
1988	489.567	518.1242394	739.25	324.06	194.0642394
1989	-1137.88948	-54.5899195	284.39	356.4	-410.9899195
1990	566.0943023	-27.40939257	0.7	341.4466667	-368.8560592
1991	331.49486	-80.1001059	218.56	167.8833333	-247.9834392
1992	320.3653429	405.9848351	-216.03	1.076666667	404.9081684
1993	675.9177619	442.5926549	719.51	240.68	201.9126549
1994	722.9662101	573.083105	2.2	168.56	404.523105
1995	467.671	622.1849907	141.17	287.6266667	334.558324
1996	-27.16129346	387.8253055	311.43	151.6	236.2253055
1997	564.9825	335.1640688	116.4	189.6666667	145.4974022
1998	1129.785	555.8687355	92.35	173.3933333	382.4754022
1999	1012.153	902.3068333	286.61	165.12	737.1868333
2000	1406.055	1182.664333	678.88	352.6133333	830.051
2001	1472.522201	1296.910067	878.46	614.65	682.260067
2002	1522.755348	1467.11085	202.33	586.5566667	880.554183
2003	1706.479908	1567.252486	372.83	484.54	1082.712486
2004	2827.070166	2018.768474	452.35	342.5033333	1676.265141
2005	2411.379072	2314.976382	-389.66	145.1733333	2169.803049
2006	3366.307278	2868.252172	-449.16	-128.8233333	2997.075505
2007	3611.107083	3129.597811	-57.04	-298.62	3428.217811
2008	3167.945544	3381.786635	1092.8	195.5333333	3186.253302
2009	2666.379507	3148.477378	760.88	598.88	2549.597378
2010	5678.643861	3837.656304	1170.32	1008	2829.656304
2011	793.4396682	3046.154345	-584.31	448.9633333	2597.191012
2012	2144.893944	2872.325824	-1612.77	-342.2533333	3214.579158
2013	774.9183096	1237.750641	-339.43	-845.5033333	2083.253974
2014	198.6613505	1039.491201	1575.19	-125.67	1165.161201
2015	1917.041418	963.5403594	2000.21	1078.656667	-115.1163073
2016	1530.863935	1215.522235	2279.04	1951.48	-735.9577655
2017	-197.899848	1083.335168	2998.54	2425.93	-1342.594832
2018	-303.408791	343.1850987	1985.15	2420.91	-2077.724901