STRUCTURAL ANALYSIS OF INDIAN GOLD EXPORTS: PERSPECTIVES FOR TRADE POLICY DEVELOPMENT

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Abstract: Gold is an important trade item, and India is the second leading importer and fifth leading exporter of gold in the world. Though India has a prominent position in the gold trade, it generates huge trade deficient that significantly erode the foreign exchange reserves of the country. This paper attempts to offer policy directions for India's economic development by limiting imports of gold. The study uses historical trade data from the International Trade Center (ITC) website www.trademap.org. The study adopts descriptives, revealed comparative advantage, future predictions using Markov chain analysis, etc to gain the insights about various trends in India's

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gold trade. India's export of gold jewelry is highly dependent on the United Arab Emirates, and other markets in the Middle East are under-explored. India's export to major gold importers in the World is meager, and no changes in export directions predicted. For competitiveness, curbing of gold imports is essential. Policy level efforts that discourage the diversion of imported gold to domestic market, attracting domestic gold for export production, limiting gold import licenses to a specific percentage of exports achieved, etc are suitable for a positive change in the trade deficit position in gold trade.

Keywords: gold; import; export; trade deficit; Markov chain; forecasting.

2010 AMS Subject Classification: 60J20.

1. INTRODUCTION

Gold has been consistently occupying one of the top slots in India's foreign trade [1,2,3]. In the Harmonized Commodity Description and Coding System (HS), an international coding system developed by World Customs Organization for classification of products in global trade, the chapter 71 contains articles made of gold. As per International Trade Center (ITC) website www.trademap.org, world trade in 2017 (calendar year) world trade, chapter 71 contributed to approximately 655 billion USD. In 2017, India's imports in chapter 71 stood at 74.37 billion USD and exports 42.57 billion USD with a trade deficit of 31.8 billion USD equivalent to 21.46% of India's total trade deficit. A scrutiny of India's trade balance position in 2017 revealed that the India has more exports than imports in 49 out 97 chapters in Indian Trade Classification, totaling to 92.53 billion USD. In 48 chapters, India has imports over exports amounting to 240.74 billion USD to result in an overall trade deficit of 148.2 billion USD. The items in chapter 71 that include gold articles, is the third highest contributor to India's trade deficit after petroleum products and electrical machinery and equipment.

At six-digit level, world trade in chapter 71 comprised of approximately 55 tariff lines describing different products and of which about 12 lines are related to gold. In value terms, about 67% of global trade in chapter 71 are gold items. For India, the import of gold items constitutes 51.33 % of imports in chapter71, whereas only 25.19% of exports are gold related. Similarly, for items

covered in chapter 71, India is the second leading importer in the world with 11.4% share in world imports, but only fifth largest in world exports with only 6.5% share. On examining the trade balance position that contributes to the current account position and net income from foreign trade [4], India's trade in chapter 71 was always negative. Even though schemes like gold monetization etc were introduced by the government to reduce India's massive gold imports, no significant changes are visible till date [5,6].

This paper evaluates the competitiveness of Indian gold exports to gain some insights for proposing policy suggestions for addressing India's trade deficit in gold trade. The paper has three parts. The first part provides a trend analysis of gold trade of India with details related direction of imports and exports etc. The second part attempts to evaluate the Revealed Comparative Advantage and perform a Markov chain analysis to predict structural transformation in India's gold exports. In the last part, based on observations from the study, policy interventions are proposed to boost the export competitiveness of India in gold trade.

2. PRELIMINARIES

Data: Secondary time series data from 2001 to 2017 from the website www.trade map.org, an international portal developed by ITC was used for exploring gold trade trends. The Harmonized Commodity Description and Coding System, also known as the Harmonized System (HS) of tariff nomenclature is an internationally standardized system of names and numbers to classify traded products [7]. The HS is organized into 21 sections, which are subdivided into 97 chapters. The 97 HS chapters are further subdivided into tariff lines of four digit and six-digit levels to describe different product profiles. The chapter 71 is meant for items made of 'Natural or Cultured Pearls, Precious or Semi-Precious Stones, Precious Metals, Metals clad with Precious Metal, and articles thereof; Imitation Jewellery; Coin' etc.

The HS codes of major tariff lines of gold items in chapter 71 are presented in table 1. These HS codes are used to refer items in the following sections of the manuscript.

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Table 1: HS Codes of Major Gold Items in International Trade

HS Code	Description
710811	Gold, incl. gold plated with platinum, for non-monetary purposes
710812	Gold, incl. gold plated with platinum, unwrought, for non-monetary purposes
710813	Gold, incl. gold plated with platinum, in semi-manufactured forms, for non-monetary purposes
710820	Monetary gold
710900	Base metals or silver, clad with gold, not further worked than semi-manufactured
711230	Ash containing precious metal or precious-metal compounds
711291	Waste and scrap of gold, incl. metal clad with gold, and other waste and scrap containing gold
711419	Articles of goldsmiths' or silversmiths' wares or parts thereof, of precious metal
711420	Articles of goldsmiths' or silversmiths' wares and parts thereof, of base metal clad with precious material
711590	Articles of precious metal or of metal clad with precious metal, n.e.s.
711319	Articles of jewellery and parts thereof, of precious metal other than silver, whether or not plated or clad with precious metal
711320	Articles of jewellery and parts thereof, of base metal clad with precious metal

Analysis Methods: To determine India's export competitiveness and comparative advantage in gold trade, Revealed Comparative Advantage (RCA) and Revealed Symmetric Comparative Advantage (RSCA) [8,9] were computed. The Revealed Comparative Advantage (RCA) index measures competitiveness of a country in export of a specific product [10,11,12]. RCA is measured as a ratio between the product shares in the country's exports in relation to its share in the world exports [13]. If, RCA>1, it implies that the country has an advantage. The RSCA is an extension of RCA and if, RSCA<0, the commodity has a disadvantage in export or if the RSCA>0, the commodity has advantage in export of a particular commodity [14,15,16]. The RCA index is measured by this formula:

$$RCA = (XiP/XP) / (XiW/XW) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where:

X iP is India's total value of good i (for eg HS 711319) exports to the international market,

XP is India's total export to the international market,

XiW is the value of total world exports of good i,

XW is the value of total world exports.

The RCA index values are classified in to four groups [17], where class a: RCA values vary from 0 to 1; class b: RCA index varies in the interval from 1 to 2; class c: RCA values vary in the interval from 2 to 4; class d: RCA values are higher than 4. Class a includes all products or industries / sectors by which a country does not have revealed comparative advantage; other three classes (b, c, d) approximately divide the products related to revealed comparative advantage into three levels: "weak comparative advantage" – class b, "medium comparative advantage" – class c, and "strong comparative advantage" – class d. In order to prevent the problem of asymmetry, the modification of RCA index – symmetric revealed comparative advantage (RSCA) [13] was calculated. The value of RSCA ranges from -1 to +1. The nearer the value is to +1, the higher the competitiveness of a country in the product of interest [18].

$$RSCA = (RCA\text{-}1 / RCA\text{+}1) \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

The Markov chain analysis, using the time series data from 2001 to 2017 helps to determine market share [19] and changing direction [20] of gold trade of India over time. The assumption was that average export from India to importing countries in any period depends on export in the previous period and this dependence is the same along all periods. Further, an attempt was made to predict future tendency of Indian gold export for the period 2018-2022 using auto regressive approach.

3. MAIN RESULTS

Preliminary Explorations on Trends in Gold Trade (World vs India): A systematic exploration of World trade (export and imports) of identified HS codes was conducted from the historic data for the period 2011 to 2017 available at www.trademap.org. Table 2 provides world trade in value terms for major 12 tariff lines at six-digit level.

Table 2: World Trade in Major Gold Tariff Lines at Six Digit Level for the Period 2001 to 2017

Year	Trade	HS Code of Gold items Value in billion USD											
		710812	'710811	'710813	'710820	'710900	'711230	'711291	'711419	'711420	'711590	'711319	'711320
2001	Import	21.617	0.158	5.048	0.000	0.019	0.000	0.000	0.131	0.044	0.657	14.844	0.130
	Export	14.722	0.248	7.734	0.000	0.019	0.000	0.000	0.158	0.053	0.683	17.574	0.151
2002	Import	24.241	0.157	4.648	0.000	0.010	0.230	1.014	0.105	0.045	0.596	17.384	0.145
	Export	14.454	0.200	7.308	0.000	0.021	0.119	1.285	0.137	0.069	0.614	19.746	0.236
2003	Import	28.310	0.125	7.225	0.000	0.010	0.198	1.442	0.413	0.045	0.694	19.511	0.131
	Export	20.262	0.066	9.727	0.000	0.026	0.191	2.323	0.495	0.072	0.731	21.506	0.146
2004	Import	31.083	0.189	10.832	0.007	0.018	0.205	2.034	0.418	0.053	0.942	23.207	0.156
	Export	24.625	0.086	12.253	0.063	0.046	0.406	2.451	0.573	0.076	1.212	26.093	0.163
2005	Import	32.375	0.169	14.041	0.000	0.030	0.440	3.017	0.193	0.057	0.979	26.049	0.181
	Export	24.506	0.124	11.397	0.000	0.034	0.448	2.802	0.415	0.101	1.413	29.771	0.176
2006	Import	32.759	0.068	18.564	0.000	0.027	0.899	4.050	0.525	0.079	1.651	30.924	0.176
	Export	36.631	0.268	19.463	0.000	0.054	0.726	3.538	0.877	0.098	2.081	35.104	0.230
2007	Import	44.176	0.065	25.860	0.001	0.026	1.097	4.600	0.344	0.055	1.916	34.813	0.231
	Export	46.653	0.195	23.186	0.000	0.041	0.905	4.850	0.776	0.108	2.793	41.584	0.376
2008	Import	74.245	0.160	31.962	0.002	0.021	0.484	6.211	0.257	0.067	2.976	36.865	0.242
	Export	73.837	0.147	30.154	0.003	0.043	1.030	5.778	1.245	0.133	2.952	47.661	0.474
2009	Import	63.748	0.193	17.976	0.000	0.015	0.504	4.937	4.741	0.064	2.931	37.937	0.224
	Export	84.852	0.373	29.670	0.002	0.030	0.459	6.216	3.887	0.147	2.438	45.063	0.816
2010	Import	100.032	0.267	18.132	0.000	0.027	0.489	6.464	3.440	0.094	4.397	43.577	0.237
	Export	111.406	0.427	34.218	0.004	0.050	1.160	8.544	4.962	0.154	2.984	52.584	0.619
2011	Import	157.118	0.302	23.047	0.001	0.046	0.751	9.817	2.054	0.349	4.857	61.935	0.360
	Export	172.924	0.823	51.990	0.001	0.086	1.332	11.147	8.785	0.383	7.957	74.953	0.341
2012	Import	296.660	0.273	34.381	0.000	0.078	0.373	10.554	0.516	0.084	4.507	62.939	0.368
	Export	330.274	0.523	52.550	0.000	0.056	1.284	11.912	3.604	0.091	19.475	104.607	0.269
2013	Import	373.478	0.169	37.408	0.000	0.044	0.388	6.489	0.381	0.092	3.942	61.199	0.276
	Export	356.489	0.544	120.864	0.000	0.038	1.475	6.009	2.748	0.077	15.387	104.754	0.307
2014	Import	244.569	0.155	35.958	0.000	0.032	0.711	5.779	0.332	0.095	4.080	64.652	0.294
	Export	247.218	0.708	65.189	0.010	0.035	1.427	4.329	1.826	0.076	9.015	134.700	0.390
2015	Import	290.090	0.113	40.427	0.000	0.035	0.729	6.780	0.249	0.110	3.873	62.719	0.236
	Export	239.468	0.955	71.035	0.009	0.051	1.073	4.198	0.569	0.076	5.753	98.259	0.299
2016	Import	278.574	0.055	89.386	0.000	0.045	0.733	10.256	0.589	0.091	3.588	59.348	0.230
	Export	271.266	0.554	64.586	0.008	0.072	0.934	7.353	1.055	0.075	3.815	94.103	0.227
2017	Import	283.136	0.056	67.703	0.000	0.036	1.087	8.603	2.188	0.068	2.593	64.016	0.228
	Export	249.752	0.438	71.069	0.007	0.061	1.100	7.553	2.016	0.081	2.901	93.828	0.266

A similar examination of India's trade in gold items was conducted and table 3 provides India's

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trade in value terms for major 12 tariff lines at six-digit level.

Table 3: India's Trade in Major Gold Tariff Lines at Six Digit Level for the Period 2001 to 2017

		HS Code of Gold items											
		Value in billion USD											
Year	Trade	710812	'710811	'710813	'710820	'710900	'711230	'711291	'711419	'711420	'711590	'711319	'711320
2001	Import	4.283	0.000	0.508	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.033	0.000
	Export	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	1.053	0.000
2002	Import	3.419	0.000	0.252	0.000	0.000	0.000	0.000	0.001	0.000	0.002	0.043	0.000
	Export	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.302	0.000
2003	Import	4.152	0.000	1.275	0.000	0.000	0.000	0.000	0.002	0.000	0.005	0.073	0.001
	Export	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.001	1.607	0.000
2004	Import	5.573	0.000	3.273	0.000	0.000	0.000	0.000	0.001	0.000	0.006	0.127	0.000
	Export	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.035	0.001	0.001	2.719	0.000
2005	Import	6.162	0.000	5.504	0.000	0.000	0.000	0.000	0.005	0.000	0.002	0.138	0.000
	Export	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.034	0.001	0.000	3.131	0.000
2006	Import	7.832	0.000	5.483	0.000	0.000	0.000	0.000	0.002	0.000	0.006	0.300	0.000
	Export	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.240	0.000	0.001	4.505	0.000
2007	Import	9.717	0.000	7.493	0.000	0.000	0.000	0.000	0.005	0.000	0.011	0.339	0.001
	Export	0.002	0.000	0.002	0.000	0.000	0.000	0.000	0.035	0.000	0.003	4.966	0.000
2008	Import	15.493	0.007	4.376	0.000	0.000	0.000	0.000	0.012	0.000	0.013	0.195	0.000
	Export	0.001	0.000	0.000	0.000	0.000	0.006	0.000	0.018	0.000	0.001	4.475	0.000
2009	Import	23.172	0.001	0.192	0.000	0.000	0.000	0.000	0.034	0.001	0.004	0.503	0.000
	Export	0.183	0.000	0.009	0.000	0.000	0.005	0.000	2.818	0.002	0.001	10.337	0.000
2010	Import	37.295	0.000	1.058	0.000	0.000	0.000	0.000	0.005	0.002	0.003	0.224	0.000
	Export	0.107	0.000	0.002	0.000	0.000	0.000	0.000	1.132	0.000	0.004	7.477	0.000
2011	Import	50.085	0.000	3.600	0.000	0.000	0.000	0.000	0.007	0.001	0.015	0.697	0.001
	Export	0.440	0.000	0.002	0.000	0.000	0.000	0.001	1.334	0.265	0.002	13.660	0.002
2012	Import	48.908	0.001	3.698	0.000	0.000	0.000	0.000	0.002	0.002	0.022	5.088	0.000
	Export	0.031	0.000	0.003	0.000	0.000	0.076	0.001	1.195	0.000	0.001	17.277	0.001
2013	Import	34.389	0.000	3.323	0.000	0.007	0.000	0.000	0.002	0.002	0.017	0.774	0.000
	Export	2.443	0.000	0.017	0.000	0.000	0.008	0.001	0.106	0.000	0.002	9.573	0.001
2014	Import	30.435	0.000	0.604	0.000	0.000	0.000	0.000	0.002	0.001	0.008	0.735	0.000
	Export	2.433	0.000	0.000	0.000	0.000	0.006	0.028	0.021	0.000	0.003	11.222	0.000
2015	Import	34.665	0.001	0.333	0.000	0.000	0.000	0.000	0.001	0.001	0.005	0.686	0.000
	Export	5.312	0.000	0.000	0.000	0.000	0.002	0.000	0.034	0.000	0.001	7.393	0.000
2016	Import	22.804	0.000	0.141	0.000	0.000	0.000	0.000	0.038	0.001	0.004	0.301	0.000
	Export	4.330	0.002	0.004	0.000	0.000	0.002	0.000	0.174	0.000	0.004	9.206	0.000
2017	Import	36.066	0.000	0.065	0.000	0.000	0.000	0.000	1.349	0.001	0.005	0.693	0.000
	Export	2.248	0.000	0.000	0.000	0.000	0.010	0.000	0.074	0.000	0.002	8.388	0.001

In 2017 calendar year, four tariff lines such as HS 710812, 710813, 711291 and 711319 accounted for approximately 98% of world trade in gold and are thus items of special interest in world gold trade. The picture is slightly different with respect to India. HS 710812, 711419 and 711319 together accounts for 98 % of gold imports for India in 2017 with HS 710812 alone accounts for 94.5% in 2017. Also, 99% exports in 2017 were from HS 710812 and HS 711319, where about 78 % coming from HS 7113119 alone. Considering the value of traded items, HS 711291 is not an item of much trade significance for India. Also, HS 710813 is generally an import item which has only marginal share in total gold imports in India as evident from table 3. Therefore, HS 710812 is the major import item and HS711319 is the major export item for India. Hence, further explored the trade trends related to these two tariff lines were carried out.

Detailed Trend Analysis of HS 710812 and 711319: Table 4 illustrates a comparative picture of trade in HS codes 710812 and 711319 in the world an India.

Table 4. Comparison of Gold trade in HS 710812 and 711319 (World vs India) for 2001 to2017

Year	Trade	710812			'711319		
		World	India	India share	World	India	India share
2001	Import	21.617	4.283	19.81%	14.844	0.033	0.22%
	Export	14.722	0.000	0.00%	17.574	1.053	5.99%
2002	Import	24.241	3.419	14.10%	17.384	0.043	0.25%
	Export	14.454	0.000	0.00%	19.746	1.302	6.59%
2003	Import	28.310	4.152	14.67%	19.511	0.073	0.37%
	Export	20.262	0.000	0.00%	21.506	1.607	7.47%
2004	Import	31.083	5.573	17.93%	23.207	0.127	0.55%
	Export	24.625	0.000	0.00%	26.093	2.719	10.42%
2005	Import	32.375	6.162	19.03%	26.049	0.138	0.53%
	Export	24.506	0.000	0.00%	29.771	3.131	10.52%
2006	Import	32.759	7.832	23.91%	30.924	0.300	0.97%
	Export	36.631	0.000	0.00%	35.104	4.505	12.83%
2007	Import	44.176	9.717	21.99%	34.813	0.339	0.97%
	Export	46.653	0.002	0.01%	41.584	4.966	11.94%

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2008	Import	74.245	15.493	20.87%	36.865	0.195	0.53%
	Export	73.837	0.001	0.00%	47.661	4.475	9.39%
2009	Import	63.748	23.172	36.35%	37.937	0.503	1.33%
	Export	84.852	0.183	0.22%	45.063	10.337	22.94%
2010	Import	100.032	37.295	37.28%	43.577	0.224	0.51%
	Export	111.406	0.107	0.10%	52.584	7.477	14.22%
2011	Import	157.118	50.085	31.88%	61.935	0.697	1.12%
	Export	172.924	0.440	0.25%	74.953	13.660	18.22%
2012	Import	296.660	48.908	16.49%	62.939	5.088	8.08%
	Export	330.274	0.031	0.01%	104.607	17.277	16.52%
2013	Import	373.478	34.389	9.21%	61.199	0.774	1.26%
	Export	356.489	2.443	0.69%	104.754	9.573	9.14%
2014	Import	244.569	30.435	12.44%	64.652	0.735	1.14%
	Export	247.218	2.433	0.98%	134.700	11.222	8.33%
2015	Import	290.090	34.665	11.95%	62.719	0.686	1.09%
	Export	239.468	5.312	2.22%	98.259	7.393	7.52%
2016	Import	278.574	22.804	8.19%	59.348	0.301	0.51%
	Export	271.266	4.330	1.60%	94.103	9.206	9.78%
2017	Import	283.136	36.066	12.74%	64.016	0.693	1.08%
	Export	249.752	2.248	0.90%	93.828	8.388	8.94%

As per 2017 statistics, India's 94.47 % of imports and 20.98% exports among articles listed in table 1 pertains to HS 710812. Gold bar in unwrought form is classified under HS Code 710812 and are mainly used as raw materials for jewelry industry. The major export market for India HS710812 is UAE, which imports nearly 99.9 % of Indian exportable in this code. The top countries from which India imports HS 710812 are Switzerland and UAE with 51.51% and 11.34 % respectively of total imports made by India in 2017

HS 710812 is the major raw material used for producing gold jewelry. The major value-added produce from this unwrought gold is covered mostly under HS711319 which includes jewelry and parts thereof. India's major export items in gold are covered in HS711319.   In 2017, India exports amounted to 9.39 billion USD in HS711319.   India's exports represent 8.9% of world

exports for this product, its ranking in world exports is 5. India could generate a trade surplus of 7.695 billion USD in HS711319.An attempt was made to analyze the trade balance position of India combing trade particulars of both HS 710812 and 711319. The details for the period 2011 to 2017 are furnished in table 5. Even though, a slight improvement in trade balance position could be visible from the analysis, the overall picture is still shaky. The findings portray a clear dominance of imports of gold which significantly reduces India's overall gains from gold trade.

Table 5: India's trade balance in gold trade during the period 2001 to2017

Year	Imports (Both HS710812 and 711319) in billions USD	Exports (Both HS710812 and 711319) in billions USD	Trade Balance (combined) in billion USD
2001	4.317	1.053	-3.264
2002	3.462	1.302	-2.160
2003	4.225	1.607	-2.618
2004	5.700	2.719	-2.981
2005	6.300	3.131	-3.169
2006	8.132	4.505	-3.627
2007	10.056	4.968	-5.087
2008	15.688	4.476	-11.211
2009	23.675	10.520	-13.156
2010	37.518	7.584	-29.934
2011	50.782	14.099	-36.683
2012	53.997	17.308	-36.689
2013	35.163	12.016	-23.147
2014	31.170	13.655	-17.515
2015	35.352	12.705	-22.647
2016	23.104	13.536	-9.569
2017	36.759	10.637	-26.122

To get a clear idea about the directions of gold jewelry exports, leading 10 countries importing gold jewelry in HS711319 in the world are identified. The export trends revealed that except India and China, all leading exporters increased their supply to world basket in HS711319 irrespective of the fact that global demand registered an overall decline during 2012 to 2017. The

details are illustrated in table 6.

Table 6:   Leading Gold Jewelry Exporting Countries in the World

	2012	2013	2014	2015	2016	2017
World (in billion USD)	104.61	104.75	134.70	98.26	94.10	93.83
United Arab Emirates	11.55	9.16	11.52	10.85	11.54	14.19
Switzerland	7.85	8.98	10.75	11.02	10.95	11.14
China	22.21	28.03	47.59	17.73	12.38	10.27
United States of America	7.78	9.09	9.75	9.11	8.96	9.10
India	17.28	9.57	11.22	7.39	9.21	8.39
Italy	5.43	6.19	6.19	5.63	5.35	6.30
Hong Kong, China	5.81	6.25	6.89	5.98	5.39	5.71
France	3.16	3.74	4.43	4.39	4.59	4.92
United Kingdom	5.20	4.31	5.06	6.12	4.42	4.61
Turkey	2.56	3.31	4.24	3.66	3.68	4.03

Also, on evaluating trends in global imports in HS 711319 (Table 7), it is evident that the global demand was almost stable but the supply from Switzerland has significantly increased during the period 2012-17.

Table 7: Leading Gold Jewelry Importing Countries in the World

	2012	2013	2014	2015	2016	2017
World (billion USD)	62.939	61.199	64.652	62.719	59.348	64.016
Switzerland	8.876	8.706	9.330	9.810	8.789	11.062
Hong Kong, China	10.887	11.256	12.826	9.224	9.136	9.562
United States of America	4.855	5.233	5.556	5.804	7.005	7.473
United Arab Emirates	8.924	9.062	9.513	7.063	6.702	5.343
France	2.697	3.332	3.703	3.718	3.807	4.078
Iraq	0.000	0.000	0.000	3.069	3.143	3.427
Singapore	4.032	3.836	3.664	3.109	3.123	2.566
United Kingdom	3.613	3.489	3.646	3.497	2.991	2.489
Japan	1.511	1.459	1.579	1.516	1.674	1.775
Qatar	0.296	0.376	0.426	0.370	0.332	1.635
Italy	1.152	0.997	1.035	1.273	1.185	1.519

As per 2017 trade data, the leading importer of HS711319 from India was UAE (57.77% of total exports) followed by USA (17.96%) and Hong Kong, China (11.70%). These three destinations account for 87.7% of India's exports in HS711319. On value terms, the exports to UAE have declined by 12% during the period 2013-17. During this period, UAE's imports from Switzerland has increased by 12%.

The exports in HS 711319 in quantity terms was just 170 tons in 2017 indicating the possibility of huge domestic consumption since in the same year import quantity was in tune of 1027 tons. Therefore, from preliminary analysis, it appears that to improve India's competitiveness in gold trade, significant increase in the export of HS711319 is required. Also, India should initiate efforts to curb imports in HS710812 and focus more on increasing exports in HS711319 using indigenous gold as raw material for export production. In the next section, a detailed analysis to understand competitive position of India in export of gold jewelry and future trends in trade directions are done.

Export competitiveness of India's Gold Exports: Table 8 illustrates RCA and RSCA of India's gold exports calculates on value terms (billion USD)

Table 8: RCA and RSCA Analysis of Indian Gold Exports during 2001 to 2017

year	India's gold Exports	World's total gold Exports	India's total exports	World's total Exports	RCA	RSCA
2001	1.05	17.57	43.88	6127.47	8.37	0.79
2002	1.30	19.75	50.10	6424.39	8.45	0.79
2003	1.61	21.51	59.36	7486.20	9.42	0.81
2004	2.72	26.09	75.90	9100.00	12.49	0.85
2005	3.13	29.77	100.35	10340.86	10.84	0.83
2006	4.50	35.10	121.20	11956.26	12.66	0.85
2007	4.97	41.58	145.90	13832.34	11.32	0.84
2008	4.48	47.66	181.86	15978.25	8.25	0.78
2009	10.34	45.06	176.77	12348.64	16.02	0.88
2010	7.48	52.58	220.41	15094.32	9.74	0.81
2011	13.66	74.95	301.48	18083.38	10.93	0.83
2012	17.28	104.61	289.56	18388.30	10.49	0.83

2013	9.57	104.75	336.61	18878.63	5.13	0.67
2014	11.22	134.70	317.54	18874.64	4.95	0.66
2015	7.39	98.26	264.38	16413.29	4.67	0.65
2016	9.21	94.10	260.33	15885.52	5.97	0.71
2017	8.39	93.83	295.85	17585.23	5.31	0.68

The trends indicate that India has strong comparative advantage in gold exports but substantial decrease in competitiveness is noticed from 2013 onwards.

Prevailing Trade Directions of India's Gold Jewelry Exports: Considering the direction of gold exports from India, about 95% of the exports are to seven countries namely UAE, USA, Hong Kong (China), UK, Singapore, Australia and France. Over course of time, UAE has emerged as the major export of destination of gold jewelry from India contributing to about 57% of total value. The summary statistics in table tells the story of existing details of India's exports markets. Summary statistics are used to describe the basic features of the gold exports. Generally analytical tool starts with description and summarization of the information collected in any study. As such in this study also, to examine the nature of each series these have been subjected to various descriptive statistical measures. Table 9 illustrates basic descriptive statistics about India's gold export destinations.

Table 9: Descriptive Statistics of India's Export Destinations

	United Arab Emirates	United States of America	Hong Kong, China	United Kingdom	Singapore	Australia	France	others	world
Mean	3.995	1.345	0.721	0.201	0.160	0.069	0.029	0.437	6.958
Standard Error	0.851	0.090	0.167	0.014	0.028	0.012	0.005	0.077	1.117
Kurtosis	1.052	0.835	-0.852	-1.233	-1.604	-1.820	-1.319	2.025	-0.105
Skewness	1.071	-0.234	0.611	-0.096	0.161	-0.139	0.132	1.506	0.607
Minimum	0.213	0.561	0.020	0.109	0.026	0.004	0.004	0.106	1.053
Maximum	12.846	2.072	2.063	0.297	0.331	0.136	0.063	1.267	17.277
SGR (%)	369.894	28.660	543.386	19.869	127.382	432.220	282.679	49.986	118.436

India's gold jewelry exports during the period 2011 to 2017 increased from 1.053 billion USD to 17.28 billion USD registering a growth of almost 118.44 percent. Even though highest growth rate was noticed in exports to Hong Kong, China, the value contribution is relatively less compared to leading importer UAE. A clear dominance of UAE is visible from the trends. India is depending heavily on UAE for gold jewelry exports and that other markets are not growing at faster rate for better competitive advantage.

Future Prediction on Export Directions-Markov Chain analysis: The structural change in exports of gold jewelry is estimated by the one step transition probability matrix [21,22,23] using Markov Chain model. This econometric analysis helps to know the trend in sustaining existing market and informs about the shift in shares from one country to another over a period of time[24,25]. The share of export of gold jewelry to a particular country at time 't' was considered as a random variable and a linear relationship is assumed between the export share 'E $_{i,t}^{gold}$' to a country 'i' in the period 't'. The export share to other countries 'j' on time 't-1'i.e 'E$_{j, t-1}^{gold}$'with i,j:1,2,3,...,8 and t:1,2,...,16 is denoted as

$$E_{i,t}^{gold} = \sum_{j=1}^{8} p_{ij}(t) E_{j,t-1}^{gold} + \varepsilon(it) \ldots\ldots\ldots(1)$$

For estimation, at least two constraints should be integrated to the regression equation. They are

$$\sum_{j=1}^{8} p_{ij}(t) = 1 , \forall\, j: 1,2,\ldots,8.$$

$$p_{ij}(t) \geq 0.$$

On the assumption that the **stability of transitional matrices** is verified, the estimation is proceeded with p_{ij} and not $p_{ij}(t)$ .The elements in Eq. (1) are

E $_{i,t}^{gold}$:   Share of Gold exports from India to the ith country during the year t.

p_{ij}:   Probability that exports shift from the ith country to the ith country.

E $_{i,t-1}^{gold}$:   Share of Gold exports from India to the ith country during the year $t-1$.

$\varepsilon(it)$: error term assumed statistically independent of $\varepsilon(it-1)$.

In the present study, seven major importing countries of India gold are considered. The set of data is for the period (2001-2017). On incorporating the lagged dependency variable $E_{j,t-1}^{gold}$ as an explanatory; a loss of one degree of freedom (or an observation) was resulted. A lot of studies used the sum of mean deviance as an objective function [26, 27]. Here, the optimization problem is under the sum of squared errors as an objective function, and mathematically we work with a L^2 norm instead of L^1 norm.

$$\text{Min } \Phi(i) = \sum_{t=1}^{16} \sum_{j=1}^{8} \left(E_{i,t}^{gold} - p_{ij}(t) E_{j,t-1}^{gold} \right)^2$$

For the estimation and optimization process, several software and programs such as **Matlab, Mathcad, R, Excel Solver add-in.** etc are available. The simple one to deal with such optimization problem is Excel Solver add-in, which is used in this study. Values in the transition probability matrix will have different interpretations. Values in diagonal elements of the matrix indicates probability of retention of the previous year's values; values in columns reflect probability of gain of a particular country from other countries, and values in rows reflect probability that a country might lose to other countries with respect to gold exports. Table 10 presents the transitional probability matrix computed form Indian gold export data from 2001 to 2017

Table 10 : Transitional probability matrix of Indian Gold Export (2001-2017 data)

	UAE	USA	Hong Kong, China	UK	Singapore	Australia	France	Others
UAE	0,956	0,044	0,000	0,000	0,000	0,000	0,000	0,000
USA	0,000	0,904	0,004	0,038	0,000	0,000	0,000	0,053
Hong Kong, China	0,094	0,000	0,499	0,000	0,000	0,369	0,038	0,000
UK	0,000	0,005	0,000	0,641	0,000	0,000	0,233	0,122
Singapore	0,030	0,000	0,000	0,135	0,000	0,000	0,835	0,000
Australia	0,009	0,000	0,006	0,000	0,000	0,037	0,938	0,010
France	0,000	0,000	0,000	0,000	0,000	0,049	0,951	0,000
Others	0,022	0,097	0,090	0,000	0,734	0,000	0,000	0,056

By assuming stationary transition probabilities, projections of gold export structure were made over the period **(2018-2022),** the diagonal elements in transitional matrix **(table 10)** describe the level of loyalty of the importing country to the Indian gold for two year *(i.e),* the probability that the United Arab Emirates will continue to import the Indian gold next year is 0.956 , and it **(UAE)** is the most important customer of Indian's Gold, which further confirmed by the contribution of UAE to the total export value. The most stable markets for the Indian Gold are: UAE (as mentioned above), USA, France, and United Kingdom. The unstable markets are Singapore, Australia and the set of others countries.From a competitive point of view, the country that has benefited a lot from gains (in percentage and not in values) over the period **(2001-2017)** is **France**, these market shares are those of Australia and Singapore, with a probability: 0.938**, and** 0.835 respectively.

By a macro analysis, the export of Indian gold is highly dependent on the UAE market, so any crisis (*e.g.: a diplomatic crisis*) in this market would have repercussions on the gold export level. The decline in gold exports to World and UAE suffered in the period **2011-2013**, due to global economic crisis as evident from figure 1.

Figure 1: Export behavior of Indian gold in UAE and World
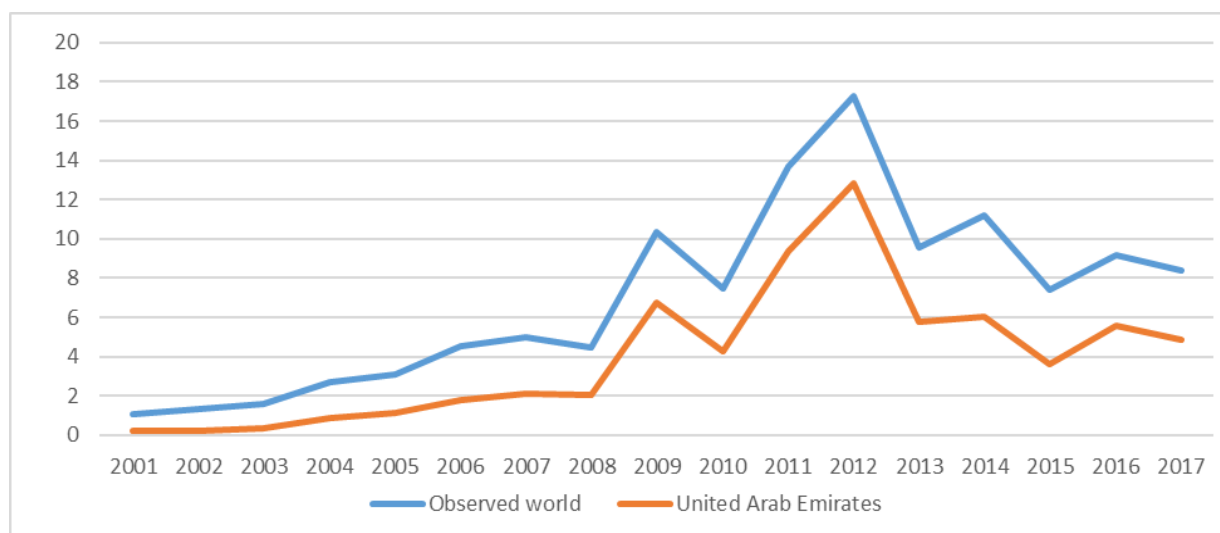
Projection and Tendency of Indian Gold Export over the period (2018-2022) *:* Next, to understand the future Indian gold export levels in the medium term, the projected estimates (prediction) for the period 2018 to 2022 is made. The projection of the import level of the ith country is estimated by using the formula :

$$\mathbf{E}\,^{gold}_{i,t+1} = \boldsymbol{p(i,j)} * \mathbf{E}\,^{gold}_{j,t}$$

Where:

$\mathbf{E}\,^{gold}_{i,t+1}$:The projected import of the $\boldsymbol{i^{th}}$ country on the year $\boldsymbol{t+1}$.

$\boldsymbol{p(i,j)}$:The probability vector of the $\boldsymbol{i^{th}}$ country in the transitional matrix $\boldsymbol{p(i,j)}$.

$\mathbf{E}\,^{gold}_{j,t}$: The import level of the $\boldsymbol{j^{th}}$ country on the year $\boldsymbol{t}$.

So, for the world export level, the whole matrix, (i.e), the export gold projected on the year $\boldsymbol{t+1}$ is given by:

$$\mathbf{E}\,^{gold}_{t+1} = \boldsymbol{p(i,j)} * \mathbf{E}\,^{gold}_{j,t}$$

Table 11 depicts the observed and predicted Indian Gold export level for the world over the period 2018-2022. The closeness between the two values indicates the goodness of fit of the method used. Over the projected period, a downward trend in export levels is noticed, this is principally explained by the Markov chain order and the Markov Chain property, (*i.e.*). The export level on the year $\boldsymbol{t+1}$ is just dependent of the export level on the year $\boldsymbol{t}$.So, on observance of a statistical autoregressive process of the one order **AR (1)**, the **equation (1)** is a Vector Autoregressive process of one order **VAR (1).** Therefore, a better forecast would be for a short time and not for long duration.

Table 11: Observed and Predicted Indian Gold Export over the period (2001-2022)

Year	Observed world	Predicted-World	Deviation
2001	1,05	--	--
2002	1,30	1,24	0,06
2003	1,61	1,55	0,05
2004	2,72	2,68	0,04
2005	3,13	3,10	0,03
2006	4,50	4,51	-0,01
2007	4,97	5,00	-0,04
2008	4,48	4,42	0,05
2009	10,34	9,82	0,51
2010	7,48	7,17	0,31
2011	13,66	13,11	0,55
2012	17,28	16,55	0,73
2013	9,57	9,39	0,18
2014	11,22	10,66	0,56
2015	7,39	6,59	0,81
2016	9,21	8,46	0,75
2017	8,39	8,16	0,22
2018	--	7,93	--
2019	--	7,67	--
2020	--	7,42	--
2021	--	7,18	--
2022	--	6,94	--

For the import projections for each country, a stability of imported gold is noticed for United-Kingdom (UK), Singapore, Australia, France and the Others Countries and a downtrend is recorded for United Arab Emirates (UAE), United States of America (USA) and slightly Hong Kong. The details are presented in table 12.

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Table 12: Predicted import level for each country over the period (2001-2022)

Year	UAE	USA	Hong Kong	UK	Singapore	Australia	France	Others
2001	--	--	--	--	--	--	--	--
2002	0,30	0,64	0,05	0,11	0,03	0,01	0,00	0,11
2003	0,35	0,85	0,04	0,12	0,03	0,01	0,01	0,15
2004	0,73	1,38	0,08	0,19	0,06	0,02	0,01	0,22
2005	1,04	1,47	0,12	0,14	0,06	0,02	0,01	0,24
2006	1,68	1,99	0,21	0,18	0,09	0,03	0,01	0,31
2007	2,01	2,09	0,26	0,17	0,10	0,04	0,02	0,32
2008	1,91	1,60	0,32	0,15	0,09	0,04	0,02	0,29
2009	4,59	2,69	0,96	0,43	0,24	0,10	0,04	0,77
2010	4,52	1,04	0,66	0,22	0,20	0,09	0,04	0,39
2011	7,31	2,18	1,66	0,36	0,36	0,19	0,10	0,95
2012	10,89	1,59	2,14	0,32	0,42	0,17	0,04	0,96
2013	6,53	0,64	1,27	0,12	0,25	0,10	0,02	0,47
2014	6,28	1,49	1,42	0,27	0,28	0,13	0,05	0,75
2015	3,71	0,87	1,03	0,23	0,17	0,08	0,03	0,46
2016	4,28	1,65	1,22	0,34	0,22	0,11	0,05	0,59
2017	4,75	1,35	1,00	0,21	0,22	0,10	0,05	0,49
2018	4,60	1,26	0,99	0,21	0,21	0,10	0,05	0,52
2019	4,45	1,18	0,96	0,22	0,21	0,10	0,05	0,50
2020	4,31	1,10	0,94	0,22	0,21	0,11	0,06	0,48
2021	4,17	1,04	0,92	0,22	0,21	0,11	0,06	0,47
2022	4,03	0,97	0,89	0,21	0,20	0,11	0,06	0,45

Discussions: The various analyses conducted to understand trends in gold trade revealed many valuable observations. First, India occupies top slot among leading gold importers in the world. Till 2011 India was the leader in import of gold in HS 710812 which was lost to Switzerland in 2012 and again to China in 2015. Now, India is only third leading importer of goldin HS 710812 after Switzerland and China.India's imports represent 12.7% of world imports for this tariff line.With little domestic production, India depends heavily on imported gold for its export

production as well as domestic consumption. In 2018 in first three quarters, India imported 728.74 tons of gold as per International Trade Centre data available at www.trademap.org. Figure 2 depicts the alarming increasing trend in gold imports in HS710812 and unappealing exports trends in HS711319 mapped up to 2018 Q3. The total demand of gold in India is highly dubious. However, as per industry reports India requires around 1000 tons of gold every year, but India produces hardly 1.5 tons on an average per year. Therefore, for the survival of Indian gold jewelry industry which contributes around 15% of country's GDP and employs 4.64 million workforce (https://www.ibef.org/industry/gems-jewellery-india.aspx), imports are essential.
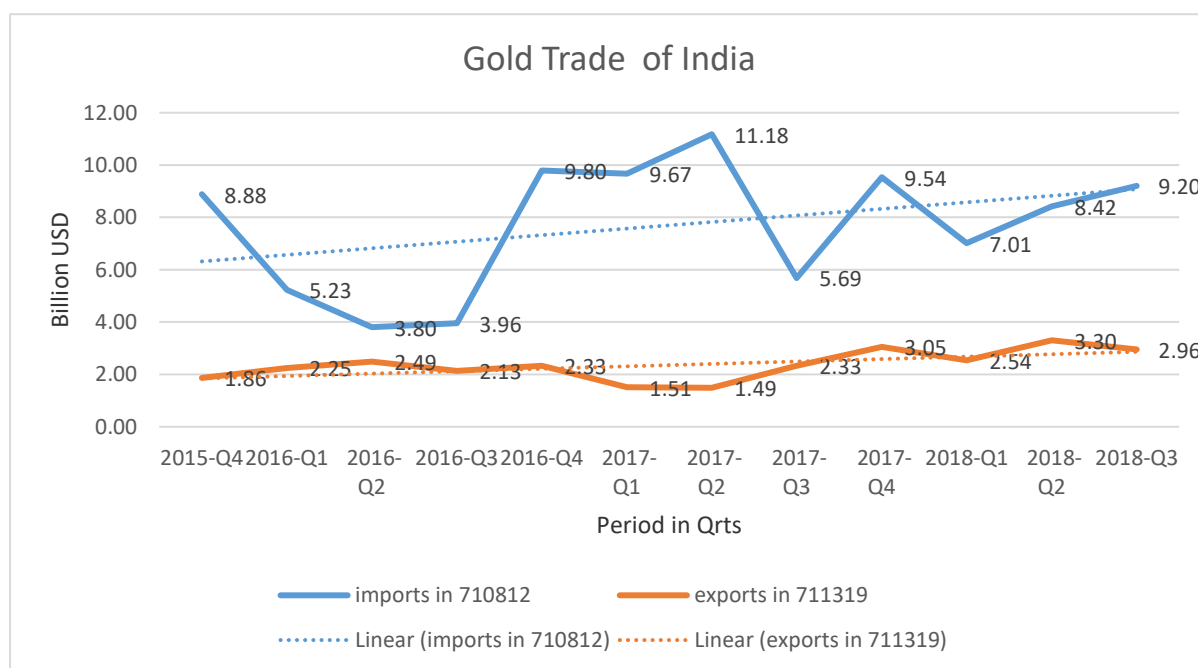
Figure 2: Import and export behavior for gold trade in India

Second, import of gold significantly affects India's trade balance. The extant of trade deficit due to imports in chapter 71 was to the tune of 21.46% of total trade deficit of India in 2017. Table 13 depicts the last 10year trend in India's trade deficit in comparison with chapter 71. With the kind of long-standing affair Indians have with gold, curbing domestic consumption seems to be difficult.India's love affair with gold causes economic dislocations, as many priority sectors could not be offered adequate attention of policy makers since huge import of gold contributes to a current account deficit.India's demographics are also driving the demand for gold. India has one of the world's fastest-growing populations with majority of them below 35 yrs of age. The

emerging middle class and their view of gold as a safe investment propels further demand for gold. The inability is seen in utilizing the huge gold reserves in Indian household for a better productive purpose.

Table 13: Historic trends in India's trade deficit in Chapter 71

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total Trade Balance (billion USD)	-133.85	-89.64	-129.62	-160.92	-199.41	-129.43	-141.82	-126.36	-96.38	-148.21
Trade balance in Ch.71 (billion USD)	-14.92	-10.02	-36.17	-43.58	-38.49	-23.34	-19.14	-21.14	-5.84	-31.80
As a % of Total Trade Balance	11.15	11.17	27.90	27.08	19.30	18.03	13.50	16.73	6.06	21.46

Third, major observation was that, India's export of gold jewelry is highly dependent on UAE market. Table 14 illustrates share of leading importers in India's total export of jewelry during the period 2008 to 2017

Table 14: Share of leading importers of Indian jewelry during the period 2008 to 2017.

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
UAE	46.09	65.18	57.17	68.48	74.35	60.18	54.08	49.31	60.62	57.77
USA	27.99	14.27	17.10	9.62	7.13	14.22	11.77	19.05	17.42	17.96
Hong Kong, China	8.88	4.51	12.37	11.28	11.94	12.71	16.72	15.88	11.48	11.70
United Kingdom	4.72	2.37	2.69	1.65	1.35	2.48	2.42	4.02	2.95	2.81
Singapore	3.42	1.99	3.60	2.42	1.78	3.40	2.37	2.17	2.12	2.68
Australia	1.06	1.24	1.33	0.66	0.70	1.42	0.97	1.44	1.15	1.33
France	0.43	0.54	0.68	0.24	0.23	0.39	0.37	0.51	0.51	0.76
Canada	0.49	0.44	0.61	0.54	0.35	0.80	0.72	1.01	0.76	0.64

India's import to UAE was always high and has even touched about 75% of total jewelry exports. In the first three quarters of 2018, India's total gold jewelry exports was 8.8 billion USD(www.trademap.org) and out of that exports to UAE were 5.88 billion USD, i.e. 66.8% of total exports. There is a surge in gold jewelry exports from India in 2018, and the reason for this

increase is mainly attributed to UAE. UAE's exports represent 15.1% of world exports in gold jewelry and its ranking in world exports is 1. UAE generated a trade surplus of 8.85 billion USD from trade of gold jewelry. Among UAE's leading export markets Iraq (17.4%), Iran (10.6%) and Switzerland (10.1%) are in the top list. India's penetration the above markets and many other markets in Middle East region negligible. The competitive advantage UAE created in Middle East markets for gold jewelry appears to be highly indebted to Indian produce. The observation also points out the inability of India to capitalize its potential in gold jewelry exports in Middle East markets.

Fourth, the Markov chain analysis predicts the dominance of UAE in India's jewelry exports in future also. India being an import dependent country for export production jewelry, reliance on few countries for export market can be highly detrimental. The world market for gold jewelry is 300 billion USD big and leading consumers are China, India, USA, Germany, Switzerland etc. 17.3% of world jewelry imports in 2017 are destined to Switzerland and India's share is meager. Similarly, Hong Kong, China is the second largest jewelry importer in the works with of 15%, but India's supply is grossly inadequate. Therefore, identification of new export markets for Indian jewelry should be given top priority.

Fifth, 2016 was a better year for India in gold trade in terms of trade balance as evident from figure 3. The imports in HS 710812 in 2016 was 648 tons at 22.8 billion USD which was less than average import for last 10years i.e. 827 tons. Interestingly. In 2016, India could export jewelry for 9.21 billion USD to result in a relatively less trade deficit. On quantity terms average imports of gold by India is around 850 tones and exports in the tune of just 70 tons. This observation leads to a conclusion that majority of imported gold is consumed in domestic market and are not utilized for export production.

The explorations conclude that, to improve competitiveness of Indian gold industry certain policy initiatives to curb gold imports is essential. In India, a major portion of imported gold is diverted to domestic market and hence foreign exchange earnings from export of gold jewelry doesn't commensurate the huge outlay of foreign exchange from gold imports. Better schemes to

attract domestic gold for export production is required. The policy makers should impose restriction of gold imports and introduce a scheme for issuing gold import licenses to exporters as a percentage of gold exports achieved in the preceding period to limit gold imports. Similarly, an awareness creation about domestic investments in other assets than gold should be created.

This study was mostly descriptive, and the purpose was more to understand the prevailing trends. No attempt was made to understand the implications of existing policy on gold imports to India or to examine the impact of existing export promotion schemes on gold. The challenges to the industry in attracting domestic gold worth a detailed investigation. To what extent the gold industry act as a driver to the Indian economy requires further investigation. The present attempt is a modest step in the domain many future studies about economy of gold.

CONFLICT OF INTERESTS

The author(s) declare that there is no conflict of interests.

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