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Trade Balance and Exchange Rate Evidence from Ethiopia: Impulse Response Function (IRFs) and The Forecast Error Variance Decompositions (VDCs) based on VAR and VECM

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Abstract
The paper attempted to analyze trade balance and exchange rate based on impulse response function and the forecast error variance decompositions. The short run effect of devaluation can be captured by the impulse response functions.
Impulse response results show that trade balance in Ethiopia after real depreciation of currency follows J-curve patter .More importantly the obtained estimates suggest that upon real depreciation in the first three years trade balance deteriorates ('short run') and subsequently improves. The forecast error variance decomposition for each variable reveals the proportion of the movement in this variable due to its own shocks versus the shocks in other variables. Further information on the linkages between the trade balance and its determinants can be obtained from variance decompositions, which measure the proportion of forecast error variance in a variable that is explained by innovations (impulses) in itself and the other variables. Discussion was conducted on analyzing trade balance variance decomposition over a period of 10 years.
The variance decomposition of trade balance reveals that changes in its own shock, trade balance is the predominant source of variation in the logarithm of trade balance. The result showed own series shock of trade balance explain most of the forecast error variance of the series in both based on VAR and VECM. The change in the real effective exchange rate represents the second source of variation in trade balance with a percentage of 1.4%, and 1.28% in the second and third year forecast horizons based on VAR respectively.
Finally, the results also prove the relative ineffectiveness of the industrial production index in affecting trade balance in Ethiopia based on both in VAR and VECM
Keywords: Trade Balance, Real Exchange Rate, impulse response function (IRFs), The Forecast Error Variance Decompositions (VDCs),

Introduction

Economists for a long period of time put emphasize on the relation between exchange rates and the trade balance. Since the middle of the twentieth century, there has been development in macroeconomic analysis that shows results on this issue. For an open economy, the reaction of the exchange rate fluctuations on the trade balance is important to understand because of the possibility to target the trade balance to get the optimal national income. Devaluation under a fixed exchange rate regime is typically expected to eliminate persistent trade balance deficits. A theory that explains this relationship and makes it easier to predict the outcome of devaluation or depreciation of the exchange rate for policymakers is the theory of the J-curve (Anderson and Sofia, 2010).

Despite encouraging growth of exports in Ethiopia, the trade deficit of the country continued to remain wide as the growth of imports also accelerated fast. The country's industrial base has remained weak and failed to boost the export of manufactured products or to produce commodities capable of substituting imports in order to narrow the ever widening trade deficit. The export growth performance achieved in the past emerged mainly from the agricultural sector and not from the manufacturing sector. The surprise devaluation of the birr on August 31, 2010 from a value of 13.63 to the US dollar to 16.35 was apparently undertaken to boost export performance and bring about structural change in the economy. However, by itself, this move might fall short of addressing the trade problem, which is manifest in a low trade share of GDP and a yawning trade deficit and which reflects numerous and complex factors, While persistent over-valuation of the currency was an important contributing factor to the widening of Ethiopia's trade deficit, it was only one of many factors hampering Ethiopia's exports.

Does devaluation improve trade balance?

For devaluation to be successful, domestic supply of output must be responsive to meet the existing and surging demand, which is caused by the depreciation of the birr. If demand surges for Ethiopian exportable products, an excess or spare capacity must have existed ready to meet the demand for domestic products. .As indicated above, devaluation also adversely affects intermediate and capital goods that are imported from overseas thereby affecting domestic production in a negative way. For state-owned, private and even party-owned enterprises, which heavily depend on imported intermediate/capital goods (inputs), the devaluation measure will raise their cost of production thereby adversely affecting their capacity utilization capabilities. In

the unlikely event that other trading partners follow suit (that is, devalue their currency so that Ethiopia would not take advantage of them), or take other retaliatory measures. The measure may also trigger a potentially damaging mini trade war involving Ethiopia, its neighbors and her major trading partners (Bienen et.al, 2010)

Moreover, there a doubt about enough available domestically (Ethiopian) produced goods which both domestic and foreign consumers wish to buy. As It was argued elsewhere, one of the major causes of the 2008 (and thereafter) rampant inflation is shortages of goods, particularly food items. Given that the country's imports are three to four times than the value of its exports, thereby indicating already-existing shortages, the measure will largely be ineffective at best. In fact, the measure will exacerbate the shortages as there are no sufficiently locally produced goods ready to meet foreign demand for domestic products, since shortages exist within the Ethiopian economy, supply is inelastic. The times, how long will it take for both domestic and foreign consumers to adjust their preferences and switch towards Ethiopian-made goods matter as well. If they take relatively larger time to change their preference from imported goods to domestically produced goods, the devaluation measure will be largely ineffective. Devaluing the birr could also have a negative effect on trade. In particular, weakening the birr means that products in countries with stronger currencies become more expensive. If Ethiopia, now with a weakened birr, fails to curb imports, it will need more money to pay for the same amount of foreign goods. In this case, the measure will fail to improve Ethiopia's serious trade imbalance (Seid , 2010)
Others bring, however, the traditional theory of the J-curve in play, suggesting that, even though the depreciation of the birr may worsen the country's current balance of payments position in the short-run, the devaluation measure could lead to improved trade balances in the long run. Other economists disagree with this contention, arguing that given the awful past and current balance of payments of the country (both the current and capital), it is not clear for them if the J-curve theory is applicable to Ethiopia.

The study tried to investigate the short run and long run relationship between real exchange rate and trade balance

Methodology of the study
In empirical analysis the logarithms of trade balance (TB) real effective exchange rate and domestic GDP and world industrial production index as a proxy for foreign income are used These series are at yearly basis running from 1974-2010. While the trade balance is expressed as the ratio of import over export, the import and export values are used for calculation purpose. Regarding with the real effective exchange rate the research employed the data from the National Bank of Ethiopia. Furthermore, the researcher took the real GDP for domestic income variable in the model.

Model specification
We have adopted a model trade balance by using a reduced form model employed by Rose and Yellen (1989),Bahmani-Oskooee (1991)and Petrovic and Gligoric (2009).

The volume of imports demanded domestically, Md, and the quantity of imports demanded by the rest of the world, M*d, are given by equations (1) and (2):

$$\mathbf{Md} = F(Y,P_m,P)\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

$$\mathbf{Md}^* = F(Y^*e,P^*_m,P^*)\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Where Y is domestic income, P_M the domestic currency price paid by domestic importers and P denotes the overall domestic price level, i.e. the price of all domestically produced goods. In equation (2), Y* represents foreign income, e the exchange rate expressed as the domestic currency price of foreign exchange, P^*_M denotes the foreign currency price paid by domestic importers and P* the overall foreign price level. In other words, the demanded quantity is a function of the level of money income in the importing region, the imported goods' own price and the price of domestic substitutes. D[1]ividing the explanatory variables on the right hand side by P. This way arguments of the demand function are expressed in real terms - real income and relative prices of import to domestically produced goods. As a result of these modifications we can re-write equations (1) and (2) as

[1] Due to homogeneity assumption

$$Md = F(Y_r, RP_m, \ldots\ldots\ldots\ldots \text{ where } RP_m = P_m/P \ldots (3)$$

$$Md^* = F(Y_r^*, RP_m^*) \ldots\ldots\ldots\ldots \text{where } RP_m^* = P_m^*/P^* \ldots (4)$$

Since the relative price of imports is equivalent to the foreign currency price of foreign exports adjusted for the exchange rate we may define the relative price of imports as

$$RPm = eP^*x/P = (EP^*/P)(P^*x/P) = (1/Q)RP^*x \quad \ldots\ldots\ldots (5)$$

Where P*x is the foreign currency price of foreign exports
P and P* are domestic and foreign price index of all goods respectively
Q is the real exchange rate defined as the relative price of domestic to foreign goods
{ i.e Q=P/(EP*)} and RP*x the relative price of foreign exports to foreign produced goods with Q thus here defined a decrease in its value indicates a real devaluation of the domestic currency. Substituting RPm from equation 5 in to equation 3 we obtain:

$$Md = Md(RPx^*/Q, Y) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Similarly foreign country's demand for imports depends up on foreign income and domestic relative export price;

$$M^*d = Md^*(RPxQ, Y^*) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Where * indicates again the foreign country.
Given that domestic exports are foreign imports and vice versa that is

$$Xs = M^*d, \quad X^*s = Md \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Simple to understand export for Ethiopia to one nation is an import for another country let USA we write the trade balance TB as the following ratio

$$TB = Md / Xs = Md / M^*d = Md(RPx^*/Q, Y) / Md^*(RPxQ, Y^*) \quad \ldots\ldots\ldots\ldots (9)$$

Assuming constant or stationary values of RPx and RPx* we can write the above equation in general form:

$$TB = TB(Q, Y, Y^*) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

This model express the balance of trade as a function of the real exchange rate and then level of domestic and foreign income .The consensus among all recent studies is that the trade balance should depend on a measure of domestic income, a measure of foreign income and the real exchange rate. Thus, following Rose and Yellen (1989) and many other studies such as Gligoric and Petrovic (2009) the researcher adopt this functional form. The researcher uses the reduced form equation (10) as the basis of our empirical study. In regression analysis the choice of an appropriate functional form is an important task. Though we know the variables which are endogenous and exogenous variables from the theory, the true functional form is rarely known and is to be decided by the data analyst. Two functional forms are generally used in the literature; linear and the log-linear functional forms. The linear regression techniques can be used and the parameters can be interpreted easily. On the other hand, the log-linear functional form is preferred because the regression coefficients can be directly interpreted as elasticity with which the economists are generally familiar. Thus we rewrite equation (10) in logarithm terms, using a log-linear approximation for the function:

$$\text{Log } TB_t = \alpha + \beta \text{ Log } Y_{d,t} + \gamma \text{ Log} Y_{W,t} + \lambda \text{ Log REER}_t + \varepsilon_t \quad (11)$$

Data results and discussion

Impulse response function (IRFs)

The short run effect of devaluation can be captured by the impulse response graph indicated below.

Impulse response enables one to track the evolution of the trade balance over time subsequent to an exchange rate shock, e.g. a real devaluation of the currency. Thus it explicitly gives an estimate of the J-curve, if present, i.e. its shape and the timing. It encompasses both the period in which trade balance deteriorates ('short run'), and the ensuing phase when trade balance improves ('long run'). Below is the impulse response of trade balance following exchange rate shock.

Impulse Response Functions (IRFs) based On Unrestricted VAR

Table 1. Impulse Response of Trade Balance Following Exchange Rate Shock[1]: Effect of One S.D LREER innovation on LTRB[2]

1	**0.000000**
	(0.00000)
2	**-0.042719**
	(0.04398)
3	**-0.015616**
	(0.04847)
4	**0.016016**
	(0.05099)
5	**0.038117**
	(0.05259)
6	**0.048471**
	(0.05031)
7	**0.050781**
	(0.04548)
8	**0.049333**
	(0.04154)
9	**0.047110**
	(0.04008)
10	**0.045505**
	(0.04050)
Ordering	**LREER LIPI LRGDP LTRB**

[1] Strictly speaking since in this paper trade balance is defined as ratio of import over export, Table 1 and 2 Figures 1 and 2 represent evolution of trade balance following real exchange rate appreciation. Therefore the results above show that after appreciation; trade balance first improves ('decreases') and subsequently deteriorates ('increases'). Nevertheless, the same Table 1 and 2 Figures 2 and 2, would be obtained if trade balance is determined as export over import, and hit by real exchange rate depreciation. So we opted for this latter interpretation as a more insightful one.

[2] Defined trade balance as ratio of export to import here

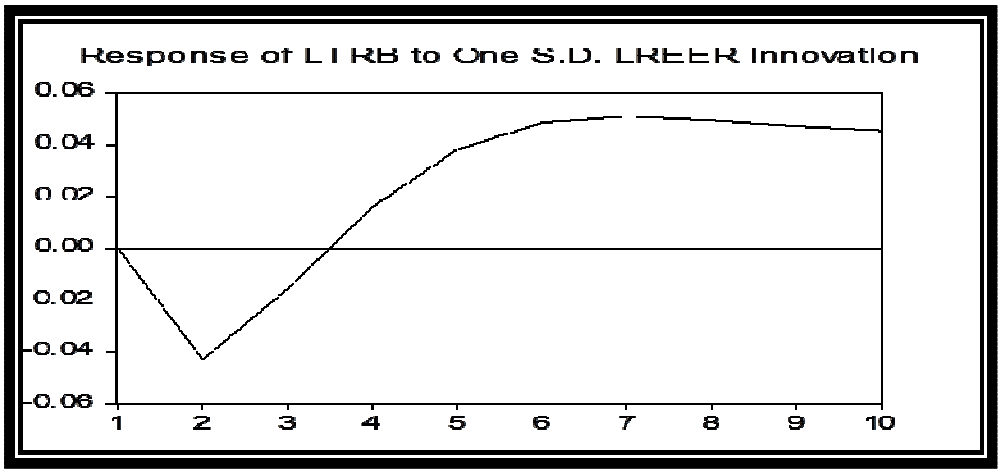

Figure 1. Evolution of Trade Balance Following Real Currency Depreciation: J-curve in Ethiopia (based on unrestricted VAR)

The result of Impulse Response Function (IRFs) based on unrestricted VAR shows upon real depreciation in the first three years trade balance deteriorates ('short run') and subsequently improves. The response of trade balance to real exchange arte innovation/change look like letter J-implying trade balance first(in short run) deteriorates then in long run improves as a result of real depreciation of domestic currency birr.

Impulse Response Functions (IRFs) Based on Error correction model

Table 2. Impulse Response of Trade Balance Following Exchange Rate Shock

Period	
1	0.000000
2	-0.020121
3	-0.011405
4	0.015631
5	0.055647
6	0.075118
7	0.083954
8	0.102753
9	0.124091
10	0.143074

Ordering: LTRB LREERLIPI
LRGDP

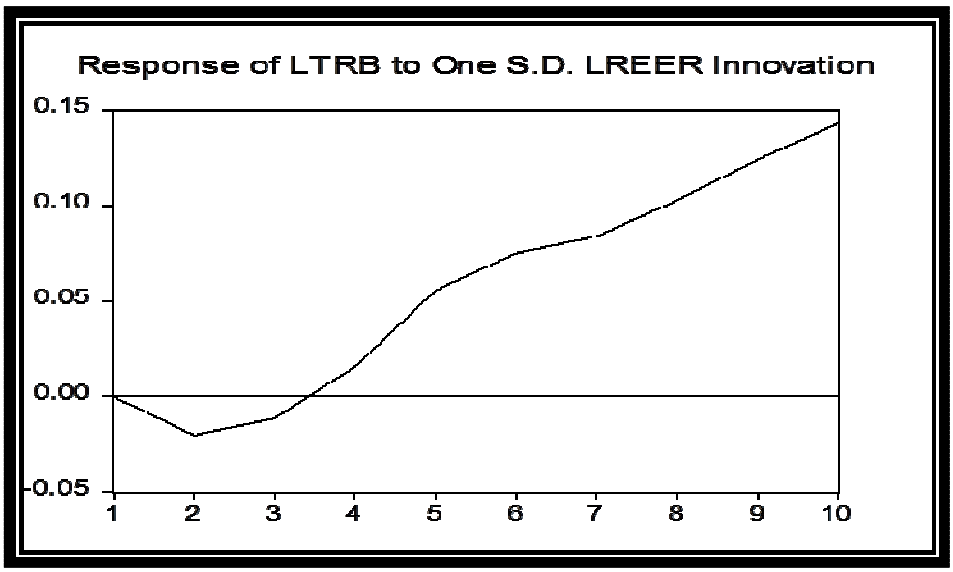

Figure 2. Evolution of Trade Balance Following Real Currency Depreciation: J-curve in Ethiopia (based on VECM)

The results given in both tables and Figures here based on VECM show that trade balance in Ethiopia after real depreciation of currency follows J-curve patter .More importantly the obtained estimates suggest that upon real depreciation in the first three years trade balance deteriorates ('short run') and subsequently improves.

The Forecast Error Variance Decompositions (VDCs)

The forecast error variance decomposition for each variable reveals the proportion of the movement in this variable due to its own shocks versus the shocks in other variables. Hence, while the IRFs show the direction of the dynamic response of the variables to different innovations, the VDCs provide the magnitude of the response to the shocks. Further information on the linkages between the trade balance and its determinants can be obtained from variance decompositions, which measure the proportion of forecast error variance in a variable that is explained by innovations (impulses) in itself and the other variables. However, since LTB is the target variable, the discussion below focus on analyzing its variance decomposition over a period of 10 years. In other words, variance decompositions give the proportion of the movements in the dependent variables that are due to their 'own' shocks (innovations), versus shocks to the other variables (Brooks, 2002).

Table 3. Variance decomposition of LTB (based on VAR)

Period	S.E.	LTB	LREERI	LIPI	LRGDP
1	0.271474	100.0000	0.000000	0.000000	0.000000
2	0.360347	98.22696	1.405375	0.359119	0.008545
3	0.402118	97.68773	1.279362	0.501879	0.531026
4	0.422675	96.23515	1.301527	0.639477	1.823846
5	0.436771	93.68372	1.980525	0.905778	3.429980
6	0.449469	90.60999	3.033224	1.504482	4.852300
7	0.462338	87.39825	4.073119	2.634023	5.894605
8	0.476037	84.13818	4.916067	4.359847	6.585907
9	0.490759	80.83307	5.547042	6.587947	7.031942
10	0.506372	77.50547	6.017836	9.143025	7.333670

The variance decomposition of LTB based on VAR reveals that changes in its own shock, LTB is the predominant source of variation in the logarithm of trade balance. The researcher also observed that own series shock of LTB explain most of the forecast error variance of the series in a VAR. The high explanatory power of the innovations in LTB is sustained over the entire forecast horizon. As seen in table above LTB explains 100% of the forecast error variance for the change LTB in the first year. This percentage decrease considerably to the entire forecast horizon in 10 years. The LRGDP, LREER and LIPI are insignificant variables for the variation of trade balance in the first period. The change in the LREER represents the second source of variation in LTB with a percentage of 1.4%, and 1.28% in the second and third year forecast horizons respectively. In these periods LRGDP accounts 0.008% and 0.5% respectively. While LIPI accounts 0.35%, and 0.5% respectively in the second and third period. In the forecast period fourth to ninth the second largest variation in LTB comes from LRGDP. In the tenth period, the second and third predominant source of variation in LTB explained by changes in LIPI and LRGDP respectively. The percentage figure of LREER as a source in variation of logarithmic of trade balance showed improvement almost (excluding the third forecast period which showed a decrease trend to the previous period of forecast) in all forecast period. It runs with zero percentage value in the first forecast period to 6% at end, the tenth forecast period.

Finally, the results also prove the relative ineffectiveness of the industrial production index in affecting trade balance in Ethiopia since LIPI accounts on average for a small percentage of the variation in the LTB sequence.

Table 4. Variance decomposition of LTB (based on VECM)

Period	S.E.	LTB	LREERI	LIPI	LRGDP
1	0.292107	100.0000	0.000000	0.000000	0.000000
2	0.405280	99.27580	0.246486	0.466791	0.010918
3	0.472272	99.18416	0.239841	0.386811	0.189192
4	0.527226	98.75039	0.280332	0.809938	0.159343
5	0.574319	96.96934	1.175031	1.238241	0.617384
6	0.615197	95.01080	2.514915	1.288885	1.185399
7	0.654322	93.12491	3.869335	1.183420	1.822340
8	0.697153	90.52961	5.580785	1.096086	2.793523
9	0.742069	87.20280	7.721922	1.042555	4.032725
10	0.786693	83.39473	10.17821	0.984486	5.442575

The variance decomposition based on VECM reveal the predominant source of variation in the logarithm of trade balance is its own shock. Its own series shock of LTB explains most of the forecast error variance of the

series in a VECM. Upto the five forecast period, the second predominant source of variation in trade balance is industrial production index .The change in the effective exchange rate / LREER represents the second source of variation in LTB after the six forecast period. In the first forecast period the total variation inn trade balance comes from its own shock. However the share of its own shock show declining from first to 10th forecast period. Industrial production index ineffectiveness in affecting trade balance.

CONCLUSION

Impulse response results show that trade balance in Ethiopia after real depreciation of currency follows J-curve patter .More importantly the obtained estimates suggest that upon real depreciation in the first three years trade balance deteriorates ('short run') and subsequently improves. The forecast error variance decomposition for each variable reveals the proportion of the movement in this variable due to its own shocks versus the shocks in other variables. The variance decomposition of trade balance reveals that changes in its own shock, trade balance is the predominant source of variation in the logarithm of trade balance. The result showed own series shock of trade balance explain most of the forecast error variance of the series in both based on VAR and VECM. Finally, the results also prove the relative ineffectiveness of the industrial production index in affecting trade balance in Ethiopia based on both in VAR and VECM.

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Appendix bilateral exchange rate between birr and major trade partners currency (1971/72-2011/12)

Period	Belgium	France	Italy	Germany	Netherlands	Sweden	Switzerland
1971/72	2.11	2.99	5.31	1.43	1.60	0.48	0.61
1972/73	2.13	3.04	5.02	1.44	1.59	0.48	0.63
1973/74	2.18	2.98	4.84	1.61	1.71	0.47	0.68
1974/75	2.30	3.08	4.83	1.66	1.82	0.50	0.77
1975/76	2.16	3.03	3.84	1.59	1.72	0.47	0.80
1976/77	2.26	2.76	3.13	1.68	1.81	0.48	0.83
1977/78	2.49	2.86	2.75	1.88	1.98	0.45	0.99
1978/79	2.79	3.15	2.39	2.14	2.23	0.47	1.24
1979/80	2.91	3.27	4.17	2.27	2.32	0.49	1.25
1980/81	2.61	2.94	4.20	2.04	2.10	0.46	1.15
1981/82	2.06	2.31	3.24	1.74	1.77	0.37	1.07
1982/83	1.74	1.93	2.83	1.65	1.68	0.29	0.99
1983/84	1.54	1.67	2.47	1.52	1.52	0.26	0.95
1984/85	1.36	1.45	2.10	1.33	1.32	0.23	0.81
1985/86	1.66	1.78	2.39	1.64	1.64	0.27	1.00
1986/87	2.10	2.15	2.98	2.11	2.11	0.31	1.30
1987/88	2.33	2.34	3.18	2.35	2.36	0.34	1.45
1988/89	2.16	2.17	2.95	2.20	2.19	0.33	1.31
1989/90	2.28	2.28	3.10	2.30	2.30	0.33	1.34
1990/91	2.57	2.55	3.41	2.58	2.57	0.36	1.54
1991/92	2.47	2.44	3.25	2.47	2.47	0.35	1.41
1992/93	5.32	5.26	5.88	5.31	5.32	0.63	2.98
1993/94	5.88	5.82	6.11	5.98	6.00	0.64	3.52
1994/95	7.76	7.48	7.06	7.74	7.79	0.79	4.71
1995/96	8.53	8.30	7.77	8.52	8.57	0.92	5.31
1996/97	8.02	7.94	7.96	8.01	8.03	0.92	4.83
1997/98	7.55	7.55	7.62	7.55	7.55	0.88	4.67
1998/99	8.43	8.43	8.42	8.44	8.42	0.93	5.21
1999/00	8.33	8.33	8.33	8.33	8.17	0.96	5.12
2000/01	7.43	7.43	7.43	7.43	7.43	0.85	4.85
2001/02	7.67	7.67	7.67	7.67	7.67	0.82	5.18
2002/03	8.98	8.98	8.98	8.98	8.98	0.98	6.07
2003/04	10.27	10.27	10.27	10.27	10.27	1.13	6.62
2004/05	11.01	11.01	11.01	11.01	11.01	1.21	7.15
2005/06	10.56	10.56	10.56	10.56	10.56	1.13	6.79
2006/07	11.48	11.48	11.48	11.48	11.48	1.25	7.13
2007/08	13.61	13.61	13.61	13.61	13.61	1.46	8.36
2008/09	14.32	14.29	14.29	14.29	14.29	1.38	9.28
2009/10	17.90	17.90	17.90	17.90	17.90	1.77	12.14
2010/11	22.03	22.03	22.03	22.03	22.03	2.42	17.00
2011/12	23.03	23.03	23.03	23.03	23.03	2.56	19.76

Period	UK	US	China	India	Japan	Korea[1]	Saudi Arabia	Egypt
1971/72	**6.05**	**2.39**	**1.01**	**0.32**	**0.01**	**0.01**	**0.56**	**5.56**
1972/73	**5.39**	**2.22**	**1.04**	**0.28**	**0.01**	**0.01**	**0.56**	**5.15**
1973/74	**4.94**	**2.07**	**1.06**	**0.26**	**0.01**	**0.01**	**0.58**	**5.06**
1974/75	**4.86**	**2.07**	**1.11**	**0.26**	**0.01**	**0.0040**	**0.59**	**5.31**
1975/76	**4.13**	**2.07**	**1.06**	**0.23**	**0.01**	0.004	**0.59**	**5.31**
1976/77	**3.54**	**2.07**	**1.09**	**0.23**	**0.01**	0.004	**0.59**	**5.31**
1977/78	**3.78**	**2.07**	**1.18**	**0.24**	**0.01**	0.004	**0.59**	**5.31**
1978/79	**4.15**	**2.07**	**1.28**	**0.25**	**0.01**	0.004	**0.62**	**4.13**
1979/80	**4.62**	**2.07**	**1.36**	**0.26**	**0.01**	0.004	**0.62**	**2.96**
1980/81	**4.74**	**2.07**	**1.32**	**0.26**	**0.01**	0.004	**0.62**	**2.96**
1981/82	**3.80**	**2.07**	**1.16**	**0.23**	**0.01**	0.004	**0.61**	**2.96**
1982/83	**3.35**	**2.07**	**1.05**	**0.21**	**0.01**	0.004	**0.60**	**2.96**
1983/84	**3.01**	**2.07**	**1.01**	**0.20**	**0.01**	0.004	**0.59**	**2.96**
1984/85	**2.54**	**2.07**	**0.77**	**0.17**	**0.01**	0.004	**0.58**	**2.96**
1985/86	**2.99**	**2.07**	**0.66**	**0.17**	**0.01**	0.004	**0.57**	**2.96**
1986/87	**3.16**	**2.07**	**0.56**	**0.16**	**0.01**	0.004	**0.55**	**2.96**
1987/88	**3.63**	**2.07**	**0.56**	**0.16**	**0.02**	0.004	**0.55**	**2.96**
1988/89	**3.56**	**2.07**	**0.56**	**0.14**	**0.02**	0.004	**0.55**	**2.96**
1989/90	**3.37**	**2.07**	**0.49**	**0.12**	**0.01**	0.004	**0.55**	**1.88**
1990/91	**3.85**	**2.07**	**0.41**	**0.11**	**0.02**	0.004	**0.55**	**0.84**
1991/92	**3.64**	**2.07**	**0.38**	**0.08**	**0.02**	0.004	**0.55**	**0.62**
1992/93	**6.74**	**4.27**	**0.75**	**0.15**	**0.04**	**0.01**	**1.14**	**1.28**
1993/94	**7.65**	**5.11**	**0.73**	**0.16**	**0.05**	**0.01**	**1.36**	**1.52**
1994/95	**9.27**	**5.86**	**0.69**	**0.19**	**0.06**	**0.01**	**1.56**	**1.73**
1995/96	**9.75**	**6.31**	**0.76**	**0.18**	**0.06**	**0.01**	**1.68**	**1.86**
1996/97	**10.50**	**6.50**	**0.78**	**0.18**	**0.06**	**0.01**	**1.73**	**1.92**
1997/98	**11.32**	**6.88**	**0.83**	**0.18**	**0.05**	**0.01**	**1.84**	**2.03**
1998/99	**12.33**	**7.51**	**0.91**	**0.18**	**0.06**	**0.01**	**2.00**	**2.21**
1999/00	**12.97**	**8.15**	**0.98**	**0.19**	**0.08**	**0.01**	**2.17**	**2.38**
2000/01	**12.10**	**8.33**	**1.01**	**0.18**	**0.07**	**0.01**	**2.22**	**2.24**
2001/02	**12.34**	**8.54**	**1.03**	**0.18**	**0.07**	**0.01**	**2.28**	**1.94**
2002/03	**13.60**	**8.58**	**1.04**	**0.18**	**0.07**	**0.01**	**2.29**	**1.68**
2003/04	**15.00**	**8.62**	**1.04**	**0.19**	**0.08**	**0.01**	**2.30**	**1.40**
2004/05	**16.08**	**8.65**	**1.04**	**0.19**	**0.08**	**0.01**	**2.31**	**1.45**
2005/06	**15.43**	**8.68**	**1.08**	**0.19**	**0.08**	**0.01**	**2.32**	**1.51**
2006/07	**17.00**	**8.79**	**1.13**	**0.20**	**0.07**	**0.01**	**2.35**	**1.54**
2007/08	**18.52**	**9.24**	**1.27**	**0.23**	**0.08**	**0.01**	**2.47**	**1.69**
2008/09	**16.75**	**10.44**	**1.53**	**0.22**	**0.11**	**0.01**	**2.79**	**1.87**
2009/10	**20.36**	**12.89**	**1.89**	**0.28**	**0.14**	**0.01**	**3.44**	**2.32**
2010/11	**25.67**	**16.12**	**2.43**	**0.36**	**0.19**	**0.01**	**4.30**	**2.82**
2011/12	**27.31**	**17.25**	**2.72**	**0.34**	**0.22**	**0.02**	**4.60**	**2.88**

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[1] An "approximation" value is though taken for all countries, here the researcher didn't take an approximate value for Korea ,had it been taken ,instead of 0.004 we have the figure 0.00 which look sense less.