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ESSP 2 Discussion Paper 004

## Foreign Exchange Rationing, Wheat Markets and Food Security in Ethiopia

Paul Dorosh and Hashim Ahmed

Development Strategy and Governance Division, International Food Policy Research Institute – Ethiopia Strategy Support Program 2, Ethiopia

Ethiopia Strategy Support Program 2 (ESSP2)

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## ABSTRACT

In spite of remarkable growth in Ethiopia's agricultural production and overall real incomes (GDP/capita) from 2004/05 to 2008/09, prices of major cereals (teff, maize, wheat and sorghum) have fluctuated sharply in both nominal and real terms. International prices of cereals also fluctuated widely, particularly between 2006 and 2008. However, the links between Ethiopia's domestic cereal markets and the international market are by no means straightforward. Among the major staples, only wheat is imported or exported on a significant scale. And frequent changes in trade and macro-economic policies, movements in international prices and fluctuations in domestic production have at times eliminated incentives for private sector imports of wheat.

From July 2005 to March 2007, private sector wheat imports were profitable and domestic wheat prices closely tracked import parity prices. Then, from April 2007 to May 2008, good domestic harvests coincided with increase international wheat prices, so private sector wheat imports were no longer profitable. Most recently, rationing of foreign exchange for imports effectively stopped private sector wheat imports beginning in about April 2008. Partial equilibrium analysis shows, however, that government imports and sales in 2008-09 effectively increased domestic supply and lowered market wheat prices. These sales at the low official price also implied that recipient households, traders and flour mills enjoyed a significant subsidy.

Allowing the private sector access to foreign exchange for wheat imports or auctioning government wheat imports in domestic markets would eliminate these rents and generate additional government revenue, while having the same effect on market prices as government subsidized sales

## INTRODUCTION

Ethiopia enjoyed remarkable growth in agricultural production and overall real incomes (GDP/capita) from 2004/05 to 2008/09, due to a combination of factors, including good weather, increased efforts in agricultural extension, increased usage of fertilizer, and foreign capital inflows that funded major increases in private and public infrastructure investments. In spite of these developments, prices of major cereals (teff, maize, wheat and sorghum) have fluctuated dramatically in both nominal and real terms. International prices of cereals also fluctuated dramatically, particularly between 2006 and 2008. However, among Ethiopia's major cereals, only for wheat is international trade a major source of supply (or demand).

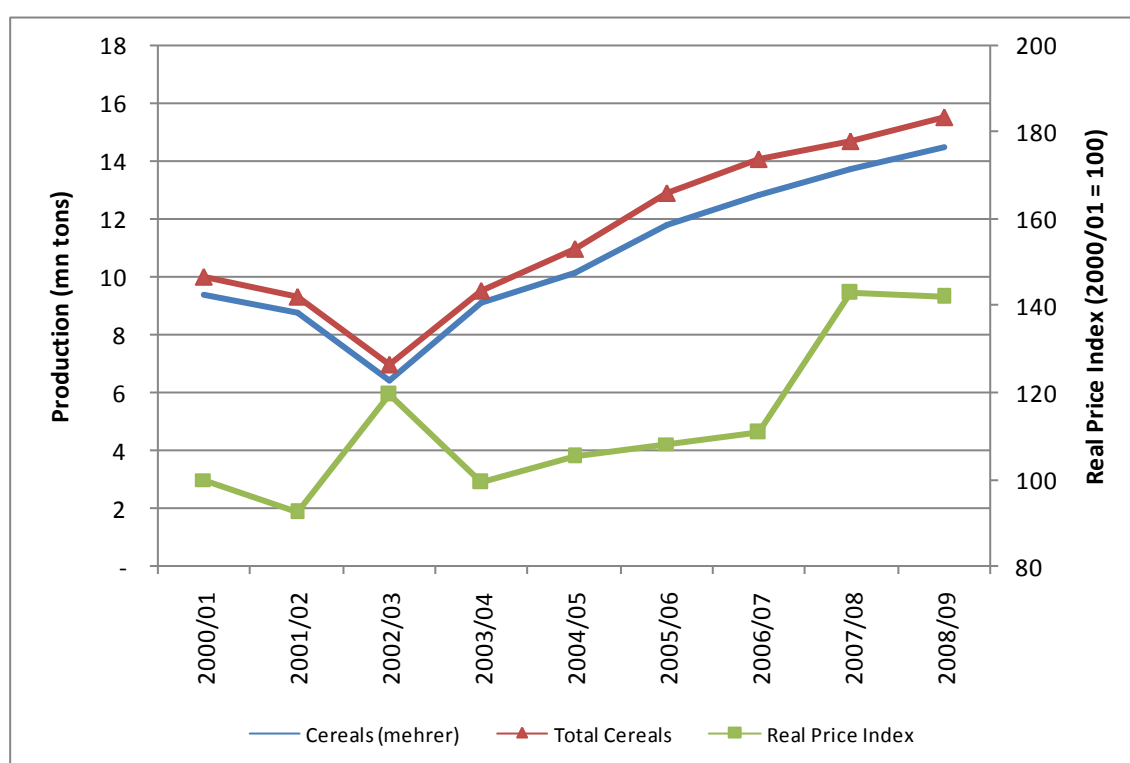
Nonetheless, the links between Ethiopia's domestic wheat market and the international market are by no means straightforward. Frequent changes in trade and macro-economic policies, movements in international prices and fluctuations in domestic production have at times eliminated incentives for private sector imports of wheat. In particular, after major external shocks to Ethiopia's economy (including increases in world prices of fuel in 2007 and early 2008) exacerbated foreign exchange shortages, access to foreign exchange for imports was restricted (rationed) in March 2008 to avoid excessive drawdown of foreign exchange reserves. As a result, the private sector was not able to freely import wheat, even though high domestic prices relative to international prices made imports potentially very profitable. Instead, the government imported wheat commercially in mid-2008 (in addition to food aid inflows) to increase total supplies and stabilize rising domestic cereal prices.

This paper examines these developments in Ethiopia's wheat markets, including the links between international and domestic prices for wheat, the implications of foreign exchange rationing (that effectively stopped private sector wheat imports), and the effects of sales of government wheat imports in 2008-09. Section 2 discusses the evolution of production and prices of cereals in Ethiopia, from 2000/01 to 2007/08, a period characterized by substantial increases in production accompanied by an upward trend in real prices. The macro-economic setting is described in Section 3, focusing particularly on developments from 2004/05 to 2008/09. Section 3 also includes a discussion of the basic analytical framework for assessing the effects of rationing on real exchange rates and domestic prices of wheat. Section 4 focuses on wheat markets, and includes a decomposition of nominal and real wheat prices over time and a description of the various wheat trade regimes that determined the relationship between domestic and international wheat prices in recent years. This section also includes results of a partial equilibrium analysis of the effects of alternative levels of government import sales on domestic prices and consumption of wheat. The final section summarizes the results of the analysis and presents policy implications.

## CEREAL PRODUCTION, AVAILABILITY AND PRICES

Cereal production has increased rapidly in Ethiopia since the 2002/03 drought year (Table 1 and Figure 1). Production in that year was only 7.0 million tons, more than 30 percent below the previous peak of 10.0 million tons achieved in 2000/01. With good rains, production recovered in 2003/04, and by 2004/05, production had reached 10.96 million tons, 9.3 percent greater than the 2000/01 harvest. Although growth in production decelerated from 18 percent in 2005/06 to only 5 and 6 percent in 2007/08 and 2008/09, respectively, production in 2008/09 was still 55 percent higher than in 2000/01. Overall, production grew by an average of 5.6 percent per year between 2000/01 and 2008/09. Sorghum (7.7 percent per year), teff (7.1 percent per year) and wheat (6.2 percent per year) increased at the fastest rates; barley and maize increased by 4.9 and 3.3 percent per year, respectively.

**Figure 1: Production and Real Prices of Major Cereals in Ethiopia, 2000/01 to 2007/08**



**Source:** Calculated from Central Statistical Authority (CSA) production data and Ethiopian Grain Trading Enterprise (EGTE) wholesale price data for Addis Ababa. 2008/09 belg season production is estimated.

Almost all of the increase in production in the four major cereals (teff, wheat, maize and sorghum) was due to increases in smallholder meher season production, which accounted for 93.2 percent of total production in 2007/08. Production of the four major cereals by large farms (2.5 percent of production in 2007/08) increased by 5.5 percent per year between 2000/01 and 2008/09, essentially the same rate as that of small farms in the meher season (5.6 percent per year). Production of major cereals (mostly maize) in the belg season grew much faster (13.3 percent per year), but still accounted for only 4.2 percent of total annual production in 2007/08

**Table 1: Cereal Production in Ethiopia, 2000/01 to 2007/08**

Crop Year Ethiopian Calendar Year	2000/01 1993	2001/02 1994	2002/03 1995	2003/04 1996	2004/05 1997	2005/06 1998	2006/07 1999	2007/08 2000	2008/09 2001	2000/01 -08/09
<b>Teff</b>	1,764	1,658	1,450	1,692	2,044	2,379	2,511	3,027	3,063	7.1%
<b>Wheat</b>	1,738	1,571	1,192	1,740	2,377	2,683	2,720	2,572	2,820	6.2%
<b>Maize</b>	3,428	3,147	2,101	2,830	2,994	3,569	4,426	4,337	4,439	3.3%
<b>Sorghum</b>	1,585	1,608	1,089	1,826	1,758	2,200	2,379	2,726	2,876	7.7%
<b>Barley</b>	1,115	988	816	1,098	1,388	1,639	1,483	1,470	1,635	4.9%
<b>Other cereals</b>	394	364	350	362	400	472	541	562	682	7.1%
<b>Total Production</b>	10,024	9,337	6,998	9,548	10,961	12,944	14,059	14,694	15,515	5.6%
<b>(percentage change)</b>		-7%	-25%	36%	15%	18%	9%	5%	6%	---
<b>Four Major Cereals</b>										
<b>Meher Small Farms</b>	8,072	7,499	5,377	7,659	8,404	9,823	10,993	11,807	12,303	5.4%
<b>(percentage change)</b>		-7%	-28%	42%	10%	17%	12%	7%	4%	---
<b>Belg Small Farms</b>	224	311	330	247	550	761	761	538	538	11.5%
<b>(percentage change)</b>		39%	6%	-25%	122%	38%	0%	-29%	0%	---
<b>Large Farms</b>	218	175	125	182	219	248	280	317	358	6.4%
<b>(percentage change)</b>		-20%	-28%	45%	21%	13%	13%	13%	13%	---
<b>Total</b>	8,514	7,985	5,832	8,088	9,173	10,833	12,035	12,662	13,198	5.6%
<b>(percentage change)</b>		-6%	-27%	39%	13%	18%	11%	5%	4%	---

Source: Calculated from CSA data.

Note: Belg production data for 2008/09 are estimates. Large farm production data for 2007/08 and 2008/09 are estimates.

In spite of these increases in production (and net supply<sup>1</sup>), however, both the nominal and real prices of major cereals rose between 2003/04 and 2007/08, with especially large price increases in 2007/08 (Tables 2 and 3; Figures 2 and 3). From 2003/04 to 2006/07, the average real price of the four major cereals (teff, wheat, maize and sorghum)<sup>2</sup> rose by 12 percent; including 2007/08, the real price increase was 45 percent. The average real price of the four cereals actually declined slightly (by 1 percent) in 2008/09, though.

Nonetheless, the steady increases in real cereal prices that accompanied significant increases in per capita cereal supply from 2003/04 to 2007/08 remain a puzzle. Rapidly increasing domestic demand is one major factor. Population growth averaged 2.8 percent per year and per capita incomes grew by 7.1 percent per year between 2003/04 and 2006/07. Assuming a (high) income elasticity of demand for cereals of 1.0 on average, total cereal demand would increase by 10.1 percent per year (21.2 percent over two years). This figure is still significantly less than the 31.2 percent increase in cereal production over this period, however, suggesting that real prices should have fallen significantly rather than rising by 5 percent. The surge in real cereal prices in 2007/08 is even more puzzling, though it may have been due in part to expectations of a possible poor harvest or reduced levels of imports (after the start of foreign exchange rationing in March 2008).

Considering only the wheat market, the supply and demand calculations appear more consistent with the observed 30 percent increase in real prices from 2000/01 to 2007/08. During this period, population increased by a total of 21 percent and wheat production rose by 52 percent, but per capita availability of wheat increased by only 14 percent since wheat imports changed little. Given the large increase in per capita incomes over this period and a positive income elasticity of demand for wheat, it is likely that per capita demand increased faster than per capita supply. Thus higher real prices of wheat are broadly consistent with main supply and demand factors, but further analysis is needed to explain the magnitude of the real price trends.

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<sup>1</sup> There is very little external trade in teff, maize and sorghum, so net availability is essentially determined by production less seed use and losses. For wheat, external trade is significant, particularly food aid imports which averaged 630 thousand tons per year over this period. However, food aid plus government commercial imports in 2007/08 (about 700 thousand tons) was not much different than food aid in 2001/02 (630 thousand tons).

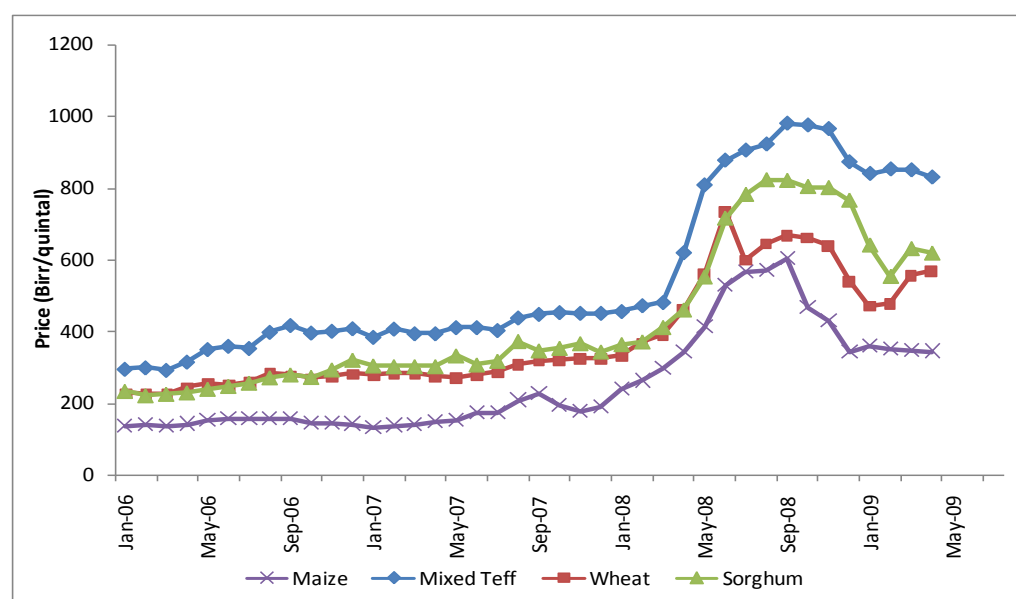
<sup>2</sup> The real price index reported here is a 2007-08 production-weighted average of the four major cereals.

**Table 2: Nominal Wholesale Prices of Major Cereals in Addis Ababa (birr/quintal)**

<b>Nominal Prices</b>				
	<b>Teff</b>	<b>Wheat</b>	<b>Maize</b>	<b>Sorghum</b>
<b>Oct97-Sept98</b>	229.9	175.6	102.8	196.9
<b>Oct98-Sept99</b>	252.5	196.6	126.7	180.7
<b>Oct99-Sept00</b>	272.8	205.8	121.8	203.0
<b>Oct00-Sept01</b>	244.3	149.1	68.1	163.1
<b>Oct01-Sept02</b>	216.4	128.2	69.6	136.9
<b>Oct02-Sept03</b>	252.3	198.0	136.7	205.9
<b>Oct03-Sept04</b>	249.0	172.0	113.7	162.1
<b>Oct04-Sept05</b>	259.0	185.1	146.0	198.1
<b>Oct05-Sept06</b>	324.8	241.5	143.6	241.6
<b>Oct06-Sept07</b>	406.9	283.6	159.7	313.1
<b>Oct07-Sept08</b>	650.6	472.5	369.1	507.1
<b>Oct08-Sept09</b>	869.8	527.1	362.3	625.6
<b>Annual Change</b>				
	<b>Teff</b>	<b>Wheat</b>	<b>Maize</b>	<b>Sorghum</b>
<b>1997/98 - 1998/99</b>	9.8%	11.9%	23.2%	-8.2%
<b>1998/99 - 1999/00</b>	8.0%	4.7%	-3.8%	12.3%
<b>1999/00 - 2000/01</b>	-10.4%	-27.6%	-44.1%	-19.7%
<b>2000/01 - 2001/02</b>	-11.4%	-14.0%	2.2%	-16.0%
<b>2001/02 - 2002/03</b>	16.6%	54.4%	96.3%	50.4%
<b>2002/03 - 2003/04</b>	-1.3%	-13.1%	-16.8%	-21.3%
<b>2003/04 - 2004/05</b>	4.0%	7.6%	28.4%	22.2%
<b>2004/05 - 2005/06</b>	25.4%	30.5%	-1.7%	22.0%
<b>2005/06 - 2006/07</b>	25.3%	17.4%	11.2%	29.6%
<b>2006/07 - 2007/08</b>	59.9%	66.6%	131.1%	62.0%
<b>2007/08 - 2008/09</b>	33.7%	11.5%	-1.9%	23.4%
<b>2004/05 - 2008/09</b>	<b>235.8%</b>	<b>184.8%</b>	<b>148.1%</b>	<b>215.8%</b>

Source: EGTE data.

**Figure 2: Wholesale Prices of Cereals in Addis Ababa, 2006-09**



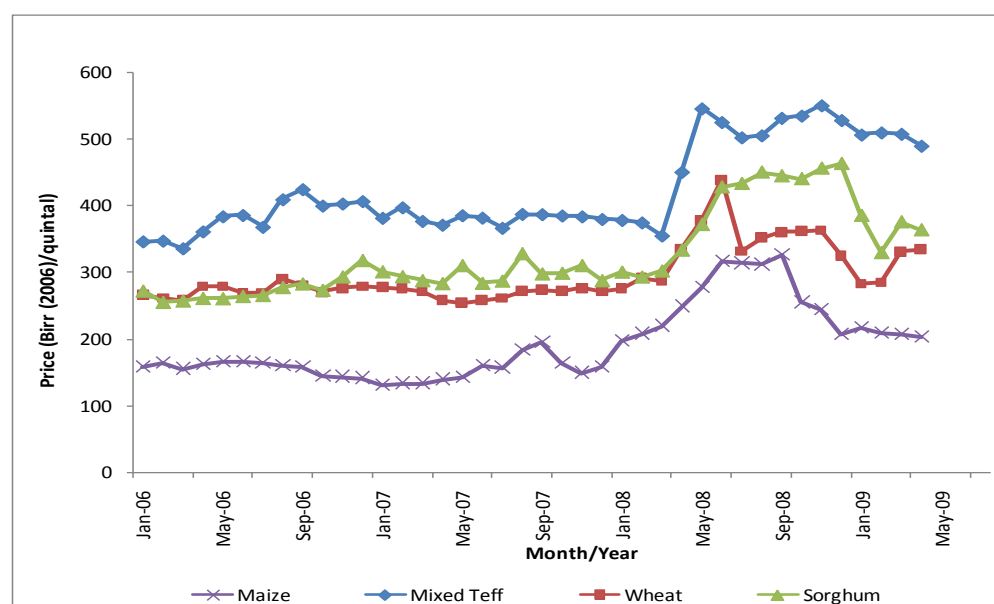
Source: EGTE data.

**Table 3: Real Wholesale Prices of Major Cereals in Addis Ababa (birr (2006)/quintal)**

	<u>Real Prices</u>			
	<b>Teff</b>	<b>Wheat</b>	<b>Maize</b>	<b>Sorghum</b>
<b>Oct97-Sept98</b>	388.6	297.2	173.8	332.7
<b>Oct98-Sept99</b>	397.6	309.0	198.4	285.1
<b>Oct99-Sept00</b>	417.3	315.1	186.3	310.4
<b>Oct00-Sept01</b>	405.7	246.8	112.6	270.2
<b>Oct01-Sept02</b>	368.5	217.5	117.7	232.3
<b>Oct02-Sept03</b>	363.7	285.5	196.6	296.7
<b>Oct03-Sept04</b>	343.0	236.7	156.3	223.0
<b>Oct04-Sept05</b>	325.4	232.1	182.9	248.1
<b>Oct05-Sept06</b>	361.7	269.7	160.5	270.1
<b>Oct06-Sept07</b>	387.4	269.9	151.1	297.6
<b>Oct07-Sept08</b>	440.8	321.3	244.2	343.5
<b>Oct08-Sept09</b>	507.8	307.2	211.0	364.8
	<u>Annual Change</u>			
	<b>Teff</b>	<b>Wheat</b>	<b>Maize</b>	<b>Sorghum</b>
<b>1997/98 - 1998/99</b>	2.3%	4.0%	14.1%	-14.3%
<b>1998/99 - 1999/00</b>	5.0%	2.0%	-6.1%	8.9%
<b>1999/00 - 2000/01</b>	-2.8%	-21.7%	-39.5%	-13.0%
<b>2000/01 - 2001/02</b>	-9.2%	-11.9%	4.5%	-14.0%
<b>2001/02 - 2002/03</b>	-1.3%	31.2%	67.0%	27.7%
<b>2002/03 - 2003/04</b>	-5.7%	-17.1%	-20.5%	-24.8%
<b>2003/04 - 2004/05</b>	-5.1%	-1.9%	17.0%	11.2%
<b>2004/05 - 2005/06</b>	11.1%	16.2%	-12.3%	8.9%
<b>2005/06 - 2006/07</b>	7.1%	0.1%	-5.9%	10.2%
<b>2006/07 - 2007/08</b>	13.8%	19.1%	61.6%	15.4%
<b>2007/08 - 2008/09</b>	15.2%	-4.4%	-13.6%	6.2%
<b>2004/05 - 2008/09</b>	<b>56.0%</b>	<b>32.3%</b>	<b>15.4%</b>	<b>47.1%</b>

\* Real prices calculated using the national consumer price index as a deflator (December 2006=100).

**Figure 3: Real (Dec 2006) Wholesale Prices of Cereals in Addis Ababa, 2006-09**



Source: Calculated from EGTE data and CSA consumer price index.

## THE MACRO-ECONOMIC SETTING: THE INVESTMENT BOOM AND FOREIGN EXCHANGE RATIONING

The sharp increase in cereal production in recent years coincided with rapid overall economic growth, as well. Between 2004/05 and 2007/08, government policies of expanded domestic credit to finance private investment and increased foreign borrowing to finance public investment contributed to sustained economic growth in excess of 10 percent per year. Increased investment implied increased demand for imports (and for foreign exchange), however, since private (and public) sector investors had access to foreign exchange to finance imported intermediate and capital goods. As a result, merchandise imports surged by 87 percent (US\$3,178 mn) between 2004/05 and 2007/08. Half of this increase in merchandise imports was financed by a 195 percent increase in private transfers; increases in merchandise exports each financed 16-19 percent of the increase in merchandise imports (Table 4 and Figure 4).

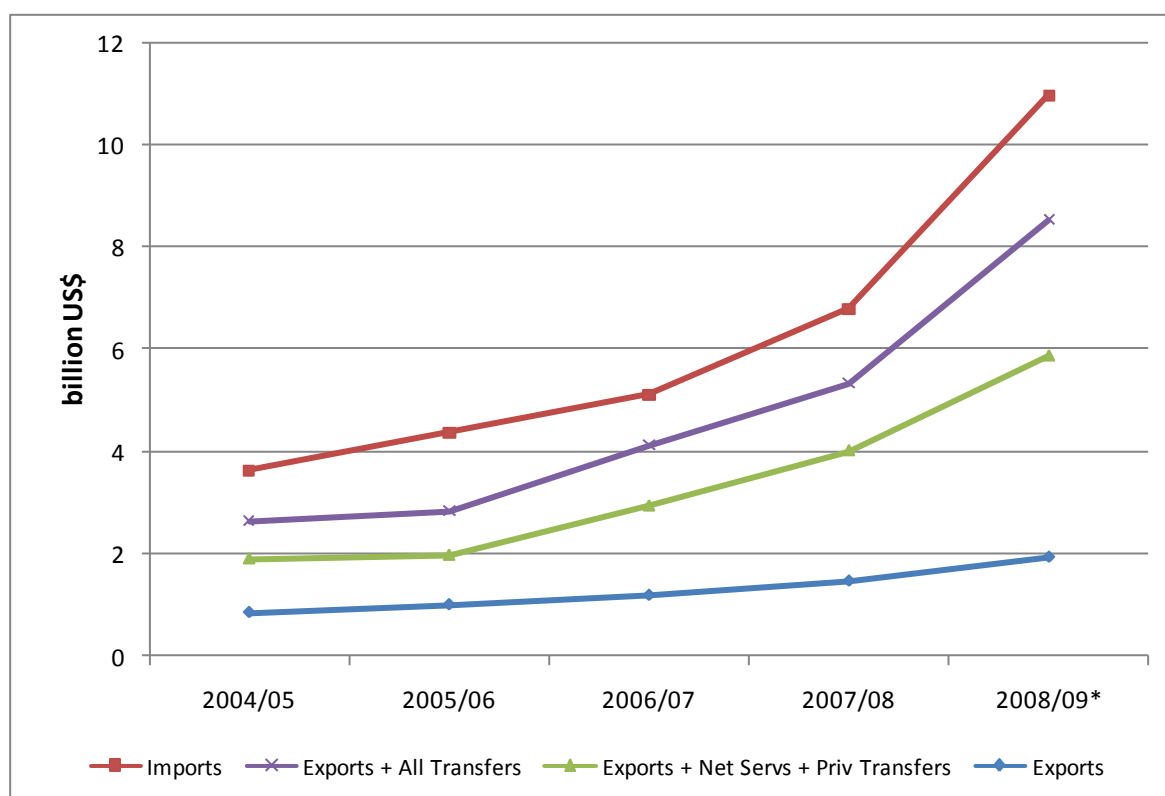
**Table 4: Ethiopia Imports and Import Financing, 2004/05 to 2007/08**

	2004/05	2007/08	Average 2004/05 to 2007/08	Average 2004/05 to 2007/08	Change 2004/05 to 2007/08
	mn US\$	mn US\$	mn US\$	Imports	percent
<b>Imports (Merchandise)</b>	3,633	6,811	3,178	100%	87%
<b>Exports (Merchandise)</b>	847	1,466	619	19%	73%
<b>Net Services</b>	242	160	82	-3%	-34%
<b>Private Transfers</b>	811	2,393	1,582	50%	195%
<b>Public Transfers</b>	750	1,312	563	18%	75%
<b>Capital Inflows</b>	983	1,480	496	16%	50%
<b>Subtotal</b>	3,633	6,811	3,178	100%	87%

Source: National Bank of Ethiopia data.

Higher world prices, increased domestic credit, foreign capital inflows, changes in expectations and other factors contributed to increases in overall domestic inflation, however, which rose from 11.5 percent in 2004/05 (July 2004 to July 2005) to 64.5 percent in 2007/08 (July 2007 to July 2008), (Table 5 and Figure 5). Inflation slowed substantially thereafter, though, and between July 2008 and March 2009, the price level actually fell by 5.8 percent. Yet, with nominal exchange rates changing little relative to the US dollar, the real exchange rate appreciated by 13.8 percent between July 2004 and January 2008 and by a total of 33.8 percent through July 2008. Nominal depreciation of the Birr (from 9.83 to 11.39 Birr/US\$) between July 2008 and June 2009 helped reduce real appreciation of the birr to 26.3 percent, but this still represented a major reduction in incentives for production of tradables (export goods and import substitutes) since July 2004.

**Figure 4: Ethiopia Imports and Import Financing, 2004/05 to 2007/08**



Source: National Bank of Ethiopia data.

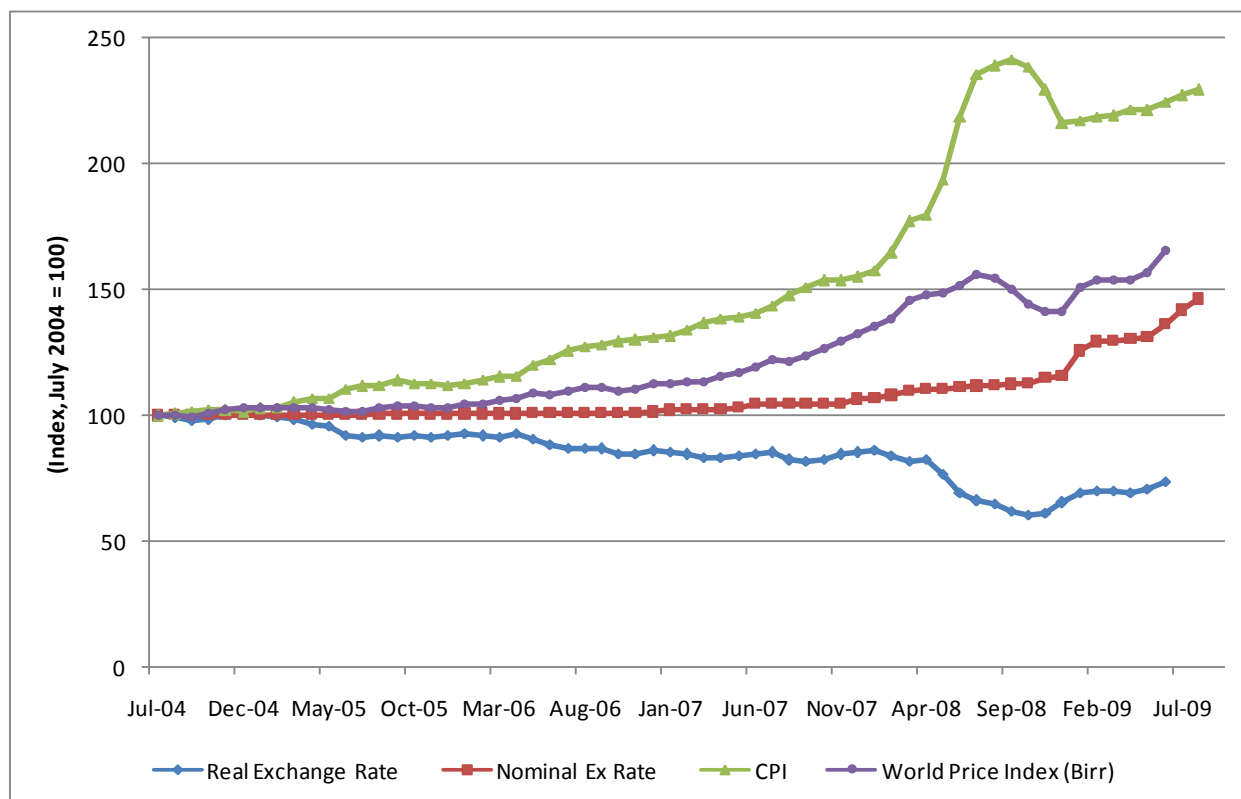
**Table 5: Ethiopia Nominal and Real Exchange Rates, 2004-2009**

	Nominal Exchange Rate (Birr/\$)	Nominal Exchange Rate (Birr/\$) (Index)	World Price Index (\$)	World Price Index (Birr)	CPI	Real Exchange Rate Index
July 2004	8.80	100.0	100.0	100.0	100.0	100.0
January 2005	8.83	100.3	102.7	103.0	102.9	100.1
July 2005	8.84	100.5	101.4	101.9	111.5	91.3
January 2006	8.86	100.6	104.1	104.7	112.8	92.8
July 2006	8.87	100.8	108.7	109.6	125.7	87.2
January 2007	8.99	102.1	110.4	112.7	131.6	85.7
July 2007	9.21	104.7	116.8	122.3	143.6	85.1
January 2008	9.40	106.9	127.0	135.7	157.5	86.1
July 2008	9.83	111.7	139.6	156.0	235.8	66.2
January 2009	11.06	125.7	120.0	150.8	217.0	69.5
June 2009	12.00	136.4	121.3	165.4	224.4	73.7
<b>July 04 - June 09 (percent change)</b>	<b>36.4%</b>	<b>36.4%</b>	<b>21.3%</b>	<b>65.4%</b>	<b>124.4%</b>	<b>-26.3%</b>

Source: EDRI and authors' calculations.

Moreover, Ethiopia had been increasingly financing its current account deficit through drawdown of official foreign exchange reserves. From the end of June 2007 to the end of March 2008, foreign exchange reserves fell by US\$381 mn (equivalent to 13 percent of the value of merchandise imports in that period). For 2007/08 as a whole (i.e. through June 2008), foreign exchange reserves fell by US\$264 million in 2007/08 (an amount equal to 5% of merchandise imports in 2006/07), in spite of large inflows of private and public transfers.

**Figure 5: Ethiopia Nominal and Real Exchange Rates, 2004-2009**



**Source:** EDRI and authors' calculations.

**Note:** In this figures an appreciation of the real exchange rate is denoted as a decrease in the index.

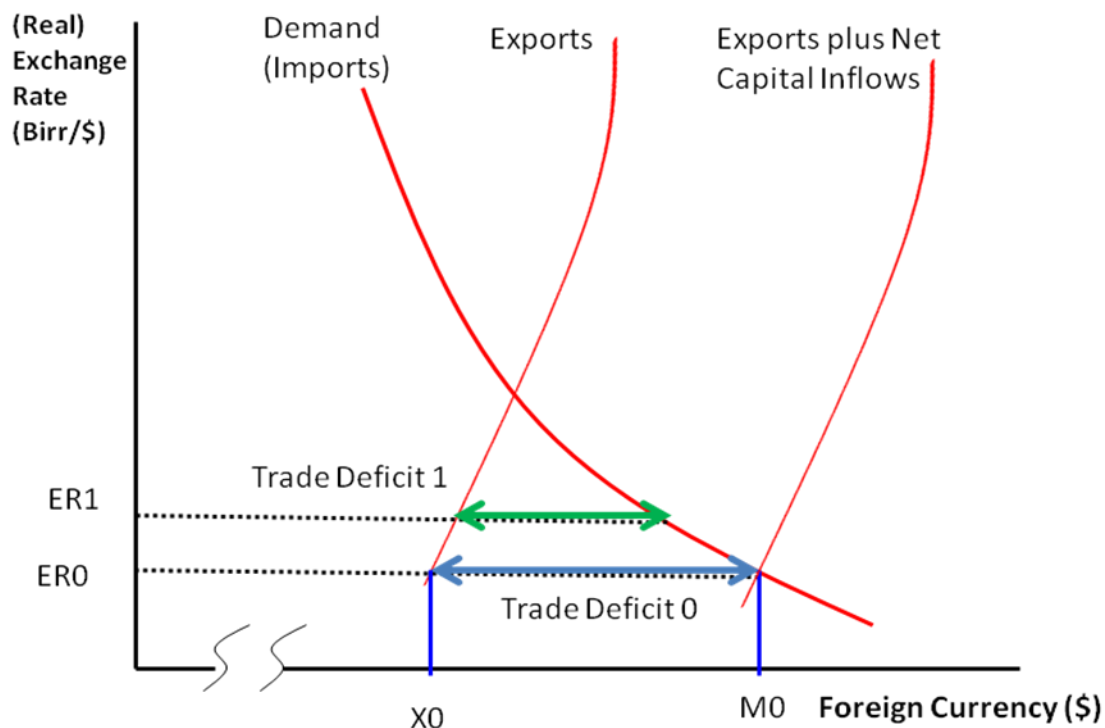
Thus, in early 2008, foreign exchange reserves were near zero and import demand was in excess of supply of foreign exchange at the prevailing official exchange rate. Rather than allowing the Birr to depreciate sharply to restore balance between supply and demand for foreign exchange, the government adopted a policy of foreign exchange controls (rationing) to restrict the effective demand for imports. The nominal exchange rate remained essentially unchanged relative to the dollar and, with continuing rapid domestic inflation, the real exchange rate continued to appreciate until late 2008, (when domestic inflation slowed and the nominal exchange rate was allowed to depreciate).

## FOREIGN CAPITAL INFLOWS, RATIONING AND THE REAL EXCHANGE RATE: ANALYTICAL FRAMEWORK

Similar to the goods market, in the foreign exchange markets, the supply of foreign exchange from exports (which includes merchandise and services exports, foreign aid, private transfers and other transfers) plus foreign exchange net capital inflows (equal to the current account deficit) equals demand for foreign exchange from imports.<sup>3</sup> However, the difference between the unrestricted and rationed foreign exchange markets is in the way these market forces (supply and demand) adjust in response to exchange rate changes (devaluation). Hence, the effects of an exchange rate devaluation in a market with foreign exchange rationing are much different from the effects of a devaluation in an unrestricted foreign exchange market.

In an unrestricted market for foreign exchange (Figure 6), the (real) exchange rate adjusts so that supply of foreign exchange from exports (and current account transfers) ( $X_0$ ) plus net foreign exchange capital inflows (Trade Deficit 0) equals demand for foreign exchange from imports ( $M_0$ ). In such an unrestricted market, a (real) exchange rate depreciation (from  $ER_0$  to  $ER_1$ ) tends to increase supply of exports and reduce demand for imports, lowering the trade (current account) deficit (to Trade Deficit 1).

**Figure 6: Impacts of a Devaluation in an Unrestricted Market for Foreign Exchange**

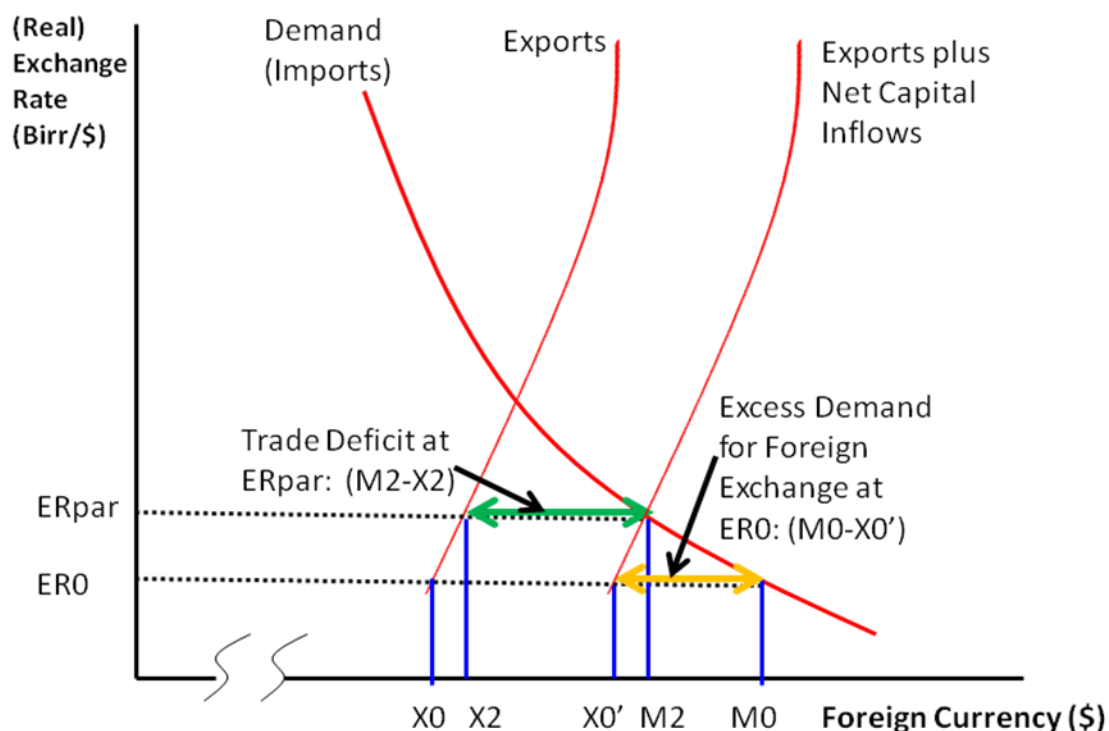


Source: Authors.

<sup>3</sup> Thus, the current account deficit, i.e. the difference between current account outflows (imports of goods and services, and private transfers to the rest of world) and current account inflows (merchandise and services exports, foreign aid, private transfers and other transfers), is equal to net capital inflows.

In a restricted or rationed market for foreign exchange, however (Figure 7), changes in the (real) exchange rate need not result in a reduction in imports. This is because in a ration regime, the demand for foreign exchange for imports ( $M_0$ ) at the official exchange rate ( $ER_0$ ) exceeds total supply of foreign exchange from export earnings ( $X_0$ ) and other sources of foreign exchange (including current account transfer earnings plus the available foreign exchange from capital inflows and reserve drawdown). This results in an unmet demand for foreign exchange ( $M_0 - X_0'$ ) at the official exchange rate ( $ER_0$ ). A parallel market for foreign exchange will tend to develop with an exchange rate ( $ER_{par}$ ) such that total demand for foreign exchange at this exchange rate ( $M_2$ ) equals total supply of foreign exchange.

**Figure 7: Demand and Supply of Foreign Exchange (Restricted Market)**



Source: Authors.

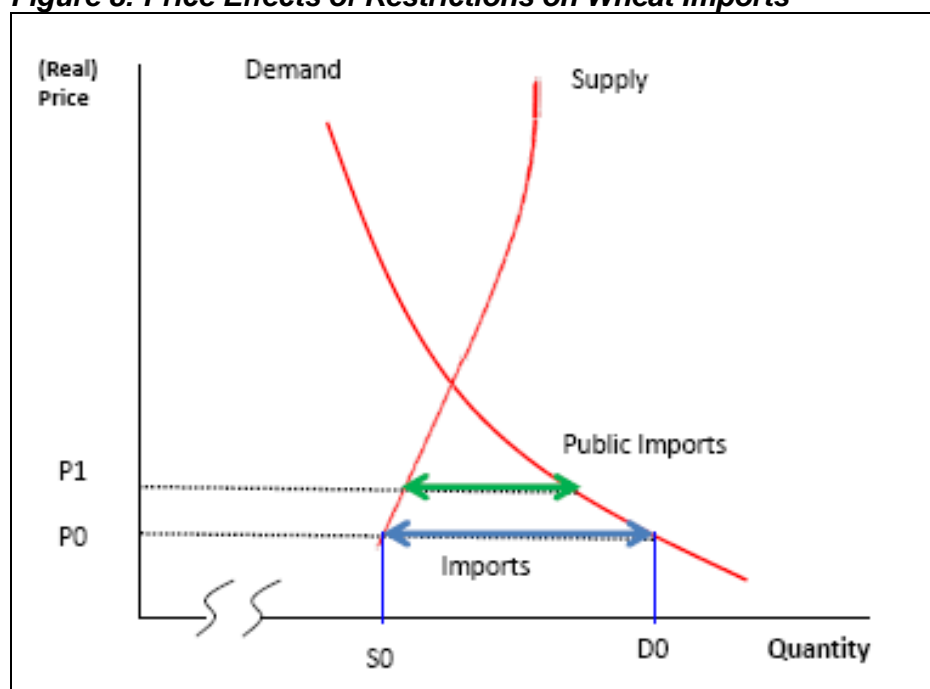
In this case, (which describes the foreign exchange market in Ethiopia from April 2008 to September 2009), a small devaluation will provide additional incentives for exports. However, import demand at that new exchange rate may still be in excess of available foreign exchange, so that foreign exchange rations will still be binding. In this case, the parallel market exchange rate would remain unchanged, as would the market price of imports. Even those importers that obtain the foreign exchange at the low official rate through rations would still sell at the higher rate.<sup>4</sup>

<sup>4</sup> In fact, the only instance that the depreciation will have an impact on prices is on those items whose import and supply are government controlled, and for which the government then passes on the higher cost to purchasers.

Only if the devaluation is large (i.e. greater than ER2 in Figure 7) will it reduce import demand and increase export supply enough so that the gap between foreign exchange demand and supply is eliminated, the trade deficit is reduced, and imports fall to less than the quota amount.

The precise effects of foreign exchange rationing for the market of each importable good, however, depend not only on the overall rationing of foreign exchange (which determines the real exchange rate), but also the size of the ration of foreign exchange for the particular importable good. Figure 8 illustrates the case of wheat imports. If the amount of the ration is less than the amount of goods that would be imported in the absence of rationing ( $D_0$  minus  $S_0$ ), then the market clearing price will rise (in this case from  $P_0$  to  $P_1$ ). This same analysis applies whether the rationed amount is imported by the public sector or the private sector, (apart from possible income effects on demand arising from additional incomes of households receiving rationed or subsidized imports). Thus, restrictions on foreign exchange have direct implications for domestic prices of tradable goods, including key food imports like wheat.

**Figure 8: Price Effects of Restrictions on Wheat Imports**



Source: Authors.

## DOMESTIC WHEAT PRICE FORMATION AND INTERNATIONAL TRADE

From 2000 to 2009, wheat markets in Ethiopia have been governed by several different regimes of price determination (Box 1). From mid-2000 through 2004, domestic prices of wheat in Addis Ababa were generally below import parity levels but above export parity levels, thus providing little incentive for private imports or exports of ordinary wheat (Table 6 and Figure 9). Domestic prices were on average 24 percent below import parity levels in this period, in part because food aid inflows helped to depress prices to the benefit of net wheat consumers and the detriment of net wheat producers.<sup>5</sup>

Then, from early 2005 to early 2007, domestic prices of wheat (wholesale, Addis Ababa) tracked import parity prices, as private sector wheat imports constituted the marginal supply of wheat in Ethiopia, given levels of domestic production and food aid inflows. Thus, from 2004/05 through 2006/07, domestic prices of wheat were on average only 0.8 percent higher than import parity prices (Table 6).

### **Box 1: Wheat Market Regimes in Ethiopia, 2000 to 2009**

#### **Regime 1: January 2000-June 2005: Domestic wheat prices were generally between import and export parity**

- Given levels of official imports (including food aid), there was little incentive for private sector imports of ordinary wheat
- Domestic prices were determined by domestic supply (including official imports) and demand

#### **Regime 2: July 2005-March 2007: Domestic wheat prices were generally at import parity levels**

- Private sector imports adjusted to equate total supply and domestic demand at the import parity price

#### **Regime 3: April 2007- May 2008: Domestic wheat prices were again below import parity**

- Given sharp increases in world prices, private sector imports were not profitable

#### **Regime 4: June 2008 – May 2009: Domestic wheat prices were above import parity**

- Restrictions on foreign exchange for imports prevented private imports from taking advantage of profitable import opportunities

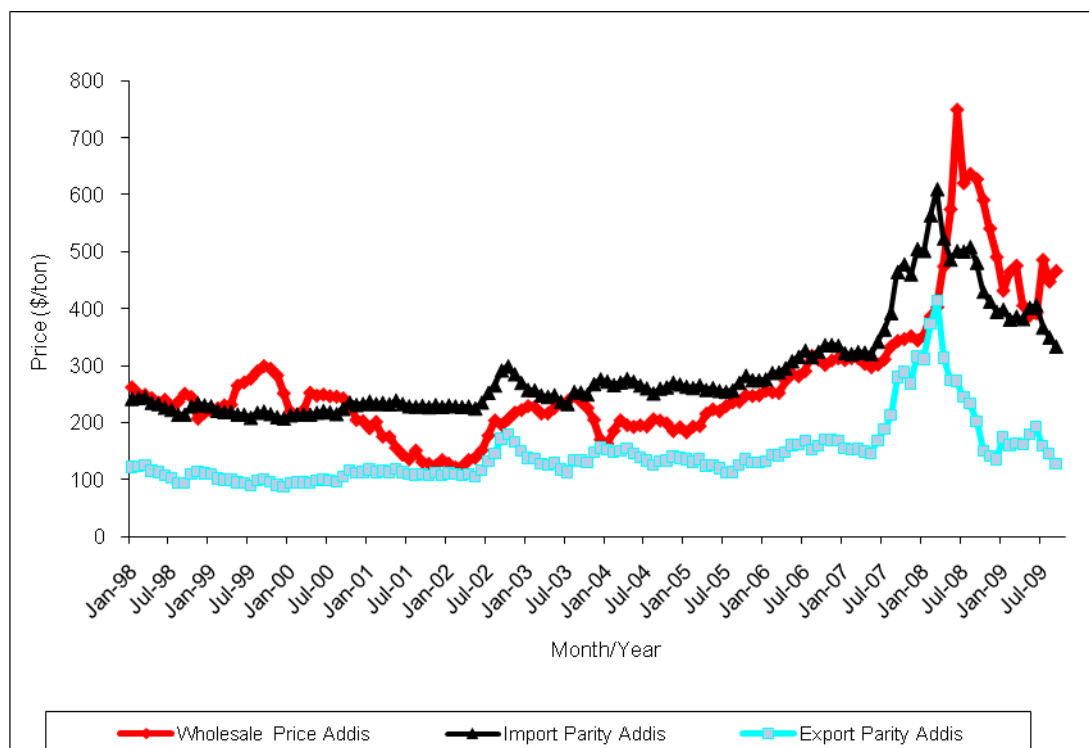
<sup>5</sup> See Rashid, Assefa and Ayele (2008) for estimates of price distortions in Ethiopian agriculture.

Crop Year (October-September)	White Wheat Wholesale Addis (Birr/kg)	Exchange Rate (Birr/\$)	White Wheat Wholesale Addis (\$/ton)	Wheat Import Parity Addis (\$/ton)	Nominal Protection Coefficient (percent)
1998-99	1.97	7.87	248.9	221.8	12.7%
1999-00	2.06	8.30	248.0	215.9	15.0%
2000-01	1.49	8.52	175.4	233.5	-24.9%
2001-02	1.28	8.69	147.5	239.7	-38.9%
2002-03	1.98	8.72	227.1	257.7	-11.3%
2003-04	1.72	8.78	195.8	266.1	-25.8%
2004-05	1.85	8.83	209.6	262.4	-17.7%
2005-06	2.42	8.86	272.5	297.8	-3.6%
2006-07	2.84	9.06	313.1	348.7	-2.1%
2007-08	4.73	9.60	489.3	510.1	8.2%
2008-09	5.27	11.39	465.2	387.3	40.5%
<b>Ave. 2000-01 - 04-05</b>	1.66	8.71	191.1	251.9	-23.7%
<b>Ave. 2005/06 - 07-08</b>	3.33	9.17	358.3	385.5	0.8%

\* Average of data from October 2008 through April 2009.

Source: Authors' calculations from Ethiopian Grain Trading Enterprise (EGTE) data.

**Figure 9: Domestic, Import and Export Parity Prices of Wheat in Ethiopia, 1998 – 2009**



**Note:** Import and export parity figures are calculated using U.S. Hard Red Winter Wheat Price (fob Gulf of Mexico) plus international shipping (estimated at US\$30/ton for December 2008) and domestic handling and transport from Djibouti to Addis (estimated at approximately 1,350 Birr/ton in December 2008).

Source: Authors' calculations from Ethiopian Grain Trading Enterprise (EGTE) data.

Since mid-2007, however, domestic wheat prices have NOT been determined by international prices. World prices (import parity Addis Ababa) were higher than domestic prices from mid-2007 through March 2008. Thus, during this period, there were very little imports of ordinary wheat by the private sector as private imports of ordinary wheat were not profitable.

However, when poor rains in many parts of Ethiopia in early 2008 led to a failure of the *belg* season harvest and concerns about adequacy of rainfall for planting of the upcoming 2008 *meher* crops (harvested in October-December), domestic prices rose sharply.<sup>6</sup> Private imports of wheat were apparently again profitable, but restrictions on foreign exchange for imports of wheat (and other goods) were imposed in March 2008.

As a result, import parity did not provide a ceiling on domestic prices of wheat. Instead, domestic wheat prices rose above world prices beginning in May 2008, reflecting the inability or unwillingness of private importers to take advantage of the profitable trade opportunity. Factors such as lack of access to foreign exchange, policy uncertainty related to government imports and domestic sales, and concern over possible seizure of private stocks all likely contributed to this lack of private sector import supply response.

In lieu of private sector imports, government policy in mid-2008 was to contract for its own imports of wheat and then sell the wheat at fixed prices in the domestic market (generally 300 Birr/quintal, only about half of the wholesale price of wheat in Addis Ababa market), (Figure 10).

Most of this wheat (55 percent) was sold to flour mills; 23 percent of the subsidized wheat was sold to consumers and 18 percent of the wheat was sold to cooperatives (Table 7). Overall, less than 2 percent of the wheat (8,100 tons) was sold to traders, and none after September 2008, due to concerns that traders did not pass on the huge implicit subsidy to consumers.

Simple partial equilibrium wheat market analysis suggests that the announcement of the wheat imports and the subsequent government wheat sales accounted for the real price decline (see Table 8).<sup>7</sup> Given wheat production in 2007-08 of 2.31 million tons and a 17 percent adjustment for seed, feed and wastage, net wheat production was 1.91 million tons. Adding approximately 400 thousand tons of food aid and net public stock changes gives a total net wheat supply of 2.31 million tons. Average wheat consumption per month is thus about 192 thousand tons per month, and using this average for the July to October 2008

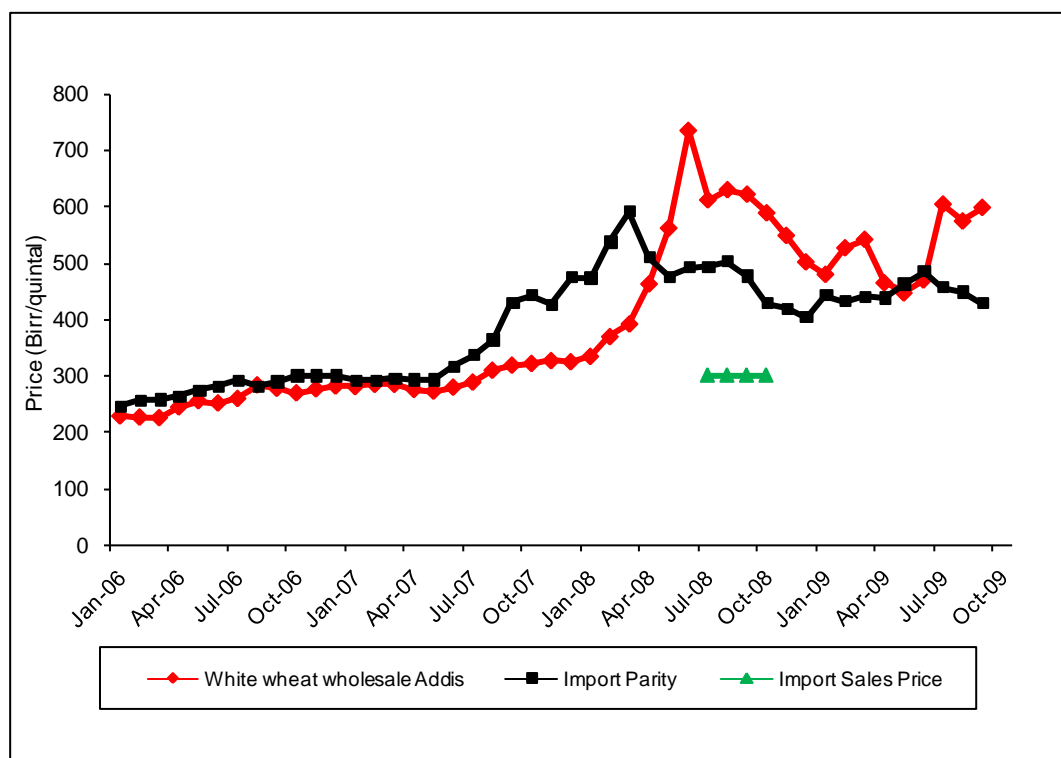
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<sup>6</sup> The *belg* harvest accounts for about 15 percent of annual maize production, but less than 2 percent of annual teff, wheat and sorghum production.

<sup>7</sup> The equations used for this partial equilibrium analysis are given in Appendix 1. This methodology is a one-commodity simplified version of the multi-market model outlined in Dorosh, Dradri and Haggblade (2009), used for Zambia. See Braverman and Hammer (1986) and Sadoulet and de Janvry (1995) for a detailed description of multi-market models. A first version of this analysis of the potential price impact of injections of government wheat imports on the domestic wheat market was first presented in Gabre-Madhin, Dorosh and Kulkarni (2008). See Diao et al. (2007) and Rashid et al. (2009) for more detailed multi-market model analyses for Ethiopia.

period (i.e. the four-month period before the major meher season wheat harvest), wheat consumption would be 192 thousand tons per month x 4 months = 770 thousand tons.

**Figure 10: Wholesale, Import Sales Prices of Wheat (Addis Ababa, Birr/quintal)**



Source: Authors' calculations from Ethiopian Grain Trading Enterprise (EGTE) data.

**Table 7: Ethiopia: Distribution of Public Wheat Imports, June 2008 to April, 2009 ('000 tons)**

	Flour mills	Cooperatives	Traders	Consumers	Others	Total
June	-	-	-	-	-	9.2
July	-	-	-	-	-	9.7
August	65.1	9.7	3.8	16.2	-	94.8
September	70.9	15.9	4.4	30.3	-	121.5
October	32.9	19.4	-	12.1	2.1	66.4
November	42.6	12.6	-	12.6	2.9	70.6
December	20.4	7.9	-	7.0	0.4	35.8
January '09	14.6	4.0	-	2.1	4.4	25.1
February	8.8	4.5	-	5.1	0.0	18.4
March	19.2	11.9	-	19.7	3.1	53.9
April	9.8	9.4	-	14.2	0.1	33.5
<b>Total</b>	<b>284.3</b>	<b>95.3</b>	<b>8.1</b>	<b>119.2</b>	<b>13.1</b>	<b>538.9</b>
<b>Total (Aug-Apr)</b>	<b>284.3</b>	<b>95.3</b>	<b>8.1</b>	<b>119.2</b>	<b>13.1</b>	<b>520.0</b>
<b>Share</b>	<b>54.7%</b>	<b>18.3%</b>	<b>1.6%</b>	<b>22.9%</b>	<b>2.5%</b>	<b>100.0%</b>

Source: Ethiopian Grain Trading Enterprise (EGTE) data.

Injecting an additional 200 thousand tons of wheat on the market over the four month (July – October) period, as in Simulation 1, increases net supply by 26 percent. Using an own-price elasticity of demand of -0.35, simulated market prices fall by 48 percent in real terms (i.e. adjusted for overall inflation in the CPI). Using an own-price elasticity of demand of -0.8, real market prices fall by 25 percent. Sales of 300 thousand tons (almost exactly what was actually sold) would lower real market prices by 61 percent with the more price-inelastic demand (elasticity of -0.35) and 34 percent with the more elastic demand (elasticity of -0.8).<sup>8</sup>

**Table 8: Partial Equilibrium Estimates of Impacts of Government Wheat Sales in 2008**

Simulation	1a	1b	2a	2b
<b>Assumptions</b>				
Government imports (mn tons)	0.200	0.200	0.300	0.300
Elasticity of wheat demand	-0.35	-0.80	-0.35	-0.80
<b>Base Data</b>				
Wheat Supply (mn tons/month)	0.192	0.192	0.192	0.192
4 month wheat supply (mn tons)	0.770	0.770	0.770	0.770
<b>Results</b>				
% change in net supply	26%	26%	39%	39%
New wheat price (Birr/quintal)	349	506	264	447
% change wheat price	-48.3%	-25.1%	-61.0%	-33.7%
<b>Reference</b>				
Actual real price decline: June-Oct	-19.7%	-19.7%	-19.7%	-19.7%
Expected seasonality (2% per month)	8.2%	8.2%	8.2%	8.2%
Actual real price relative to expected price	-25.8%	-25.8%	-25.8%	-25.8%

**Note:** The wholesale market price of wheat in Addis Ababa in mid-August 2008 was 675 Birr/quintal.

**Source:** Authors' calculations.

Sales of government imported wheat reduced real wheat prices in domestic markets from July through October, but not by as much as initially expected, as market wheat demand ultimately proved to be quite price-elastic. Announcement of planned imports of 157,500 tons of wheat and disbursements to millers and wholesale traders contributed to a 12 percent fall in wholesale wheat prices in Addis in July 2008 relative to the June 2008 price (24 percent in real terms). Wheat prices rose slightly in real terms in August, but averaged about 20 percent below June 2008 real price levels from August through October 2008. October 2008 real prices were 26 percent below a projected real price without the import intervention (the June price plus an estimated 2 percent per month real seasonal price rise), somewhat less than the 33.7 percent decrease in simulation 2 using an elasticity of demand of -0.8.

<sup>8</sup> Ultimately, the government distributed 292.4 thousand tons of commercially imported wheat through various channels from July through October 2008.

Two factors likely accounted for the smaller than expected real price decline. First, wheat millers may not have milled all the wheat received or sold all the wheat flour produced by October 2008. Second, imported wheat is not a perfect substitute for locally produced wheat, so increases in imported wheat quantities would likely have smaller effects on prices of locally produced wheat than on prices of domestic sales of imported wheat.

Nonetheless, sales at below-market prices implied huge rents (excess profits) for traders and millers who were able to purchase wheat at 300 Birr/quintal and sizeable income transfer to poor households who were able to purchase government wheat directly. (If the cooperatives sold the wheat at market prices, they would also reap huge rents. Otherwise, the value of these rents would be passed on to consumers as a subsidy.) The total value of these rents and subsidies reached about 900 million Birr (about US\$90 million), (Table 9).

**Table 9: Ethiopia: Subsidy on Government Wheat Sales, August-October, 2008**

	Quantity Sold ( <b>'000 tons</b> )	Sales Price ( <b>Birr/ton</b> )	Market Price ( <b>Birr/ton</b> )	Subsidy ( <b>Birr/ton</b> )	Total Subsidy <b>mn Birr</b>	Total Subsidy <b>mn \$</b>
<b>August</b>	94.8	3,000	6,600	3,600	341	34.3
<b>September</b>	121.5	3,000	6,375	3,375	410	40.5
<b>October</b>	66.4	3,000	5,375	2,375	158	15.5
<b>Total (Average)</b>	282.7	3,000	6,215	3,215	909	90.4

**Source:** Authors' calculations from EGTE data.

Following the 2008 meher harvest, domestic wheat prices fell sharply, but nonetheless have still remained above import parity levels in spite of a 16 percent depreciation of the birr relative to the US dollar and a 27 percent reduction in the international price of wheat (fob US Gulf) from October 2008 to April 2009. Thus, the divergence between international and domestic prices remained.

Nonetheless, in real terms, domestic wholesale prices in Ethiopia in 2008-09 were at essentially the same level as in 1999-2000 and 2000-01 (Table 10). Real domestic prices have increased by 17.7 percent since 2003-04, the year after the major drought of 2002-03, however. International wheat prices (cif Djibouti), which rose steeply in 2007-08 have again returned to more normal levels and in 2008-09 were only 19.5 percent higher than in 2003-04. If not for the real exchange rate depreciation of 13.7 percent during this period (and changes in transport costs), import parity prices would have increased by a similar amount in real terms.

**Table 10: Real Domestic and Import Parity Prices of Wheat in Ethiopia, 1998 – 2009**

	Import Price CIF Djibouti (\$/ton)	Real Import Price CIF Djibouti (\$2004/ton)	Real Exchange Rate (Jly 2004=100)	Real Import Price CIF Djibouti (Birr 2004/qntl)	Real Import Parity Price (Birr 2004/qntl)	Real Wholesale Price (Birr 2004/qntl)
<b>1998-99</b>	161.8	186.2	94.3	149.1	204.4	228.9
<b>1999-00</b>	155.9	180.7	95.2	146.7	203.2	233.4
<b>2000-01</b>	173.5	209.1	95.8	181.9	244.8	182.8
<b>2001-02</b>	179.7	215.2	99.4	196.8	262.7	161.1
<b>2002-03</b>	197.7	220.4	94.7	185.2	241.2	211.5
<b>2003-04</b>	204.6	208.8	99.8	183.6	238.8	175.3
<b>2004-05</b>	195.2	190.9	96.4	161.0	216.3	172.0
<b>2005-06</b>	222.5	209.6	90.4	163.2	218.6	199.8
<b>2006-07</b>	262.4	232.4	84.2	167.0	222.1	199.9
<b>2007-08</b>	401.5	307.2	77.2	204.6	258.4	238.0
<b>2008-09*</b>	272.4	223.6	67.9	133.9	190.0	227.6
<b>Ave 00-01 to 04-05</b>	190.1	208.9	97.2	181.7	240.7	180.6
<b>Ave 05/06 to 07-08</b>	295.4	249.7	83.9	178.3	233.0	212.6
<b>03/04-08/09 %change</b>	<b>55.4%</b>	<b>19.5%</b>	<b>-13.7%</b>	<b>-1.9%</b>	<b>-3.2%</b>	<b>17.7%</b>

\* Real exchange rate data are from October 2008 through June 2009.

**Note:** Import and export parity figures are calculated using U.S. Hard Red Winter Wheat Price (fob Gulf of Mexico) plus international shipping (estimated at US\$30/ton for December 2008) and domestic handling and transport from Djibouti to Addis (estimated at approximately 1,350 Birr/ton in December 2008).

**Source:** Authors' calculations from Ethiopian Grain Trading Enterprise (EGTE) data.

## CONCLUSIONS

Wheat price formation regimes have changed several times between 2000 and 2009: For most of this period, domestic prices have not been determined by international border prices. Given foreign exchange rationing starting in March 2008, private sector wheat importers have had restricted access to foreign exchange. Domestic wheat prices have been above wheat import parity prices since May 2008, indicating that it would be profitable for private traders to import wheat if they had access to foreign exchange at the official exchange rate.

The partial equilibrium analysis in this paper shows, however, that government imports and sales in 2008-09 effectively increased domestic supply and lowered market wheat prices. These sales at the low official price also implied that recipient households, traders and flour mills enjoyed a significant subsidy. Allowing the private sector access to foreign exchange for wheat imports or auctioning government wheat imports in domestic markets would eliminate these rents and generate additional government revenue, while having the same effect on market prices as government subsidized sales.

Although government imports and sales reduced market prices from their extremely high June 2008 levels, market prices still averaged 36 percent above import parity prices from July to October, 2008. Inhibiting private sector imports through foreign exchange rationing thus resulted in lower wheat imports, higher wheat prices, lower wheat consumption, and reduced welfare for net wheat consumers.<sup>9</sup> Depreciation of the nominal and real exchange rates from December through June 2009 substantially reduced the gap between domestic wholesale market prices and import parity and thus the negative effects of foreign exchange rationing on net wheat consumers. Restoring a liberalized trade regime would likely completely eliminate the gap between import parity and domestic wholesale prices, while allowing the private sector to respond to future production shocks with timely imports.

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<sup>9</sup> The efficiency and distributional effects of foreign exchange rationing go far beyond the wheat sector, however. See Dorosh, Robinson and Ahmed (2009) for an economy-wide analysis of these impacts.

## ANNEX 1: MODEL EQUATIONS

### Supply

$$S = \underline{X} * (1-\text{loss}) + \text{MPRIV} + ( \underline{\text{GOVSALE}} - \underline{\text{GOVPURCH}} ) + \underline{\Delta\text{STOCKS}}$$

### Demand (Consumption)

$$D = C = C0 * (P/P0)^{\text{ed}} (\underline{Y}/Y0)^{\text{ey}}$$

### Equilibrium

$$S = D$$

### Trade

Under free trade:  $\text{MPRIV} = C - \underline{X} * (1-\text{loss}) - ( \underline{\text{GOVSALE}} - \underline{\text{GOVPURCH}} ) - \underline{\Delta\text{STOCKS}}$

$$P = \underline{PM}$$

Under quotas:  $\text{MPRIV} = \underline{\text{MPRIV}}$   
P is endogenous

### *Variable names*

C = wheat consumption

C0 = base level of wheat consumption

D = total wheat demand

GOVPURCH = government domestic wheat purchases

GOVSALE = government domestic wheat sales and distribution

MPRIV = net private wheat imports

P = wheat price

P0 = base wheat price

S = total wheat supply

$\Delta\text{STOCKS}$  = changes in private sector wheat stocks

X = wheat production

Y = household income

### *Parameter names*

ed = own price elasticity of demand for wheat

ey = income elasticity of demand for wheat

loss = combined rate of storage loss and use as animal feed

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