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IMPACT OF EXCHANGE RATE FLUCTUATIONS ON THE ECONOMY OF MOZAMBIQUE

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1.0 Introduction

The exchange rate is a central price in the economy of Mozambique. It is a key variable in establishing the domestic price level. It is the principal equilibrating variable in the country's international trade and payments. And, ultimately, it is a major facilitating variable in determining the rate and pattern of economic growth. To underscore the importance of the exchange rate in the economy of Mozambique just ask any taxi driver in Maputo for the latest US dollar or Rand or Euro exchange rate and he can tell you right away. But ask him about other important prices, such as the latest bank interest rates or evolution of the consumer price index, and he will generally draw a blank. The taxi-driver's intimate knowledge of exchange rates stems from the fact that foreign currency rates are ubiquitous to everyday life in Mozambique. Trade integration with global markets has risen fast over the last several decades, particularly in terms of imports, and foreign currency is widely used locally for consumer and business transactions (e.g., rent payments on apartments, buying consumer goods across the border, accounts payable in business), as well as for savings. This ever-present nature of foreign currency in daily life amplifies the importance of exchange rate fluctuations on the economy and captures the interest of policymakers.

The purpose of this study is to assess the impact of exchange rate shocks on the economy. The focus of attention will be on five transmission channels through which fluctuations in the exchange rate affect economic activity. The first is via domestic price determination. Changes in exchange rates generate changes in import and export prices. In the case of prices of imports, these shocks then reverberate through the pricing chain to consumer prices and producer costs. In the case of export prices, exchange rate shocks impact exporter margins and international sales. The second transmission channel is via trade flows. Exchange rate swings have expenditure-switching effects on trade volumes, as a country's products and services become more or less expensive relative to foreign goods and services. This, in turn, leads to shifts in global demand away from or toward a country's products. Third, changes in exchange rates impact firm profits in a number of ways. One way is via changes in competitiveness, which has an impact

on export volumes and/or on sales of import substitutes on domestic markets. Another way is through changes in the price of firm assets and liabilities, which impacts the company net worth. The fourth transmission channel is by way of changes in valuations. Exchange rate shocks can have valuation effects on the domestic currency value of foreign assets and liability holdings. These valuation changes produce wealth effects on consumers and on firms that influence aggregate spending and investment. Fifth, the cumulative impact of all these effects of exchange rate changes can have important consequences for economic growth.

The paper is organized to follow the order of the five transmission channels enumerated above. Section 1 reviews the history of exchange changes since 1994 when the government moved to a more liberal exchange rate regime. Section 2 looks at the impact of exchange rate movements on prices. Section 3 examines the effects of exchange rates on trade flows. Section 4 reviews the impact of the exchange rates on firm earnings. Section 5 assesses the effects of exchange rate swings on valuations of assets and liabilities. Section 6 looks at the exchange rate-growth link. Lastly, section 7 concludes with policy implications of the study.

2.0 Overview of Developments in the Metical Exchange Rate Since 1995

Since independence in the mid 1970s, Mozambique has experienced a number of exchange rate regimes (Pimpao 1996). Until 1986, fixed rates reigned, followed by devaluation and intensive shock therapy in 1987-88, and thereafter a crawling peg regime prevailed until the early 1990s when the exchange rate was unified and liberalized into a floating-rate regime in 1994. We begin our examination of exchange rate patterns one year after the floating-rate regime was established.

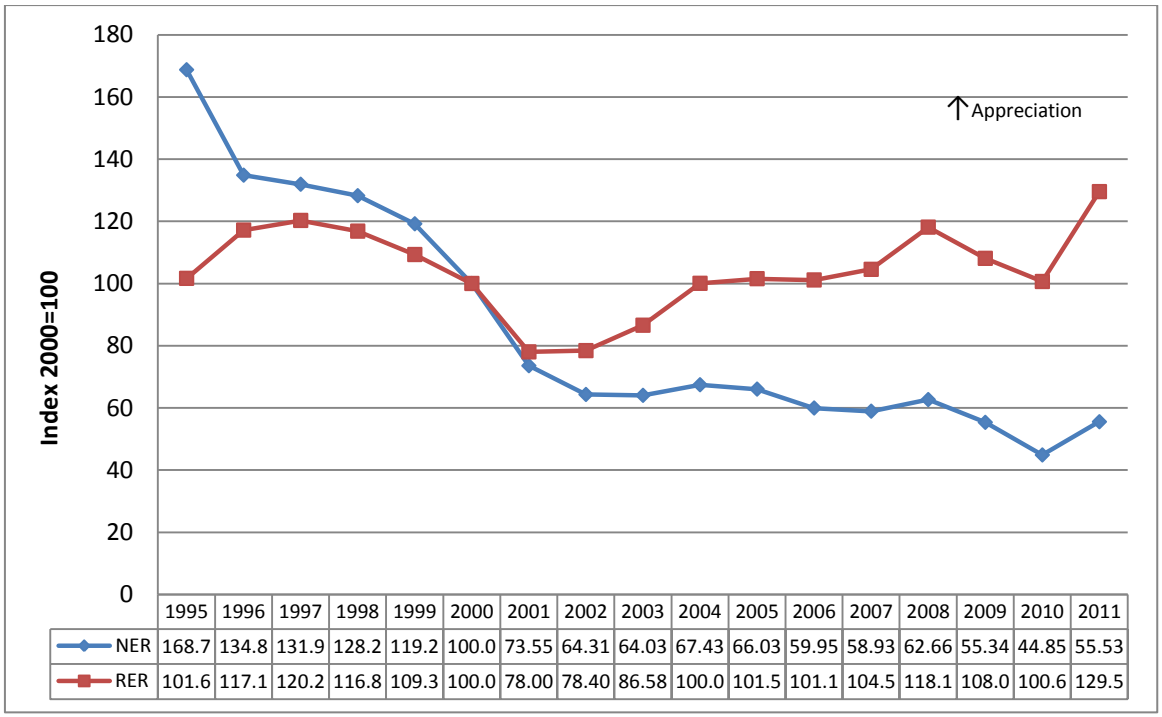
2.1 Bilateral Rates

Figure 1 shows the history of the bilateral nominal US dollar/metical exchange rate and the real, inflation-adjusted US dollar/metical exchange rate for the period 1995-August 2011. The real $/MT exchange rate in this case is adjusted for differences in relative prices between the two countries using applicable CPI measures. It is clear from the figure that for most of the period the

nominal $/MT exchange rate has depreciated with slight deviations from this trend beginning in mid 2000s. Most of the depreciation occurred in the years 1995 to 2003 when there was a nominal depreciation of more than 62 percentage points. Thereafter things leveled out with minor appreciations and depreciations until 2009-10 when there was a significant deprecation of 29 percent. Much of this nominal depreciation was reversed in the first eight months of 2011, as the metical appreciated by more than 23 percent against the US dollar.

As figure 1 shows, there are major differences in the nominal bilateral and real bilateral $/MT exchange rates owing to accumulated inflation differentials between the two trading partners. Inflation has been much higher in Mozambique than in the US since 2000; so the real bilateral $/MT rate is positioned above the nominal bilateral rate for all the years to 2011. In inflation-adjusted terms, the $/MT rate depreciated from 1995 to 2000. Subsequently there has been a significant real appreciation of 30 percentage points from 2000 to August 2011. Much of this real appreciation occurred in the 2000-08 period when the real bilateral $/MT rate jumped 20 percent. Thereafter, following the nominal bilateral rate down, there was a significant real depreciation in 2009-10; after that, a 28.9 percent real appreciation occurred reversing this downtrend in January to August 2011. When all is said and done, the metical has been appreciated against the US dollar in real terms since 2004 and today stands roughly 30 percentage points above its 2004 level.

Figure 1: Bilateral Nominal (NER) and Real (RER) Exchange Rates: US$/Meticais

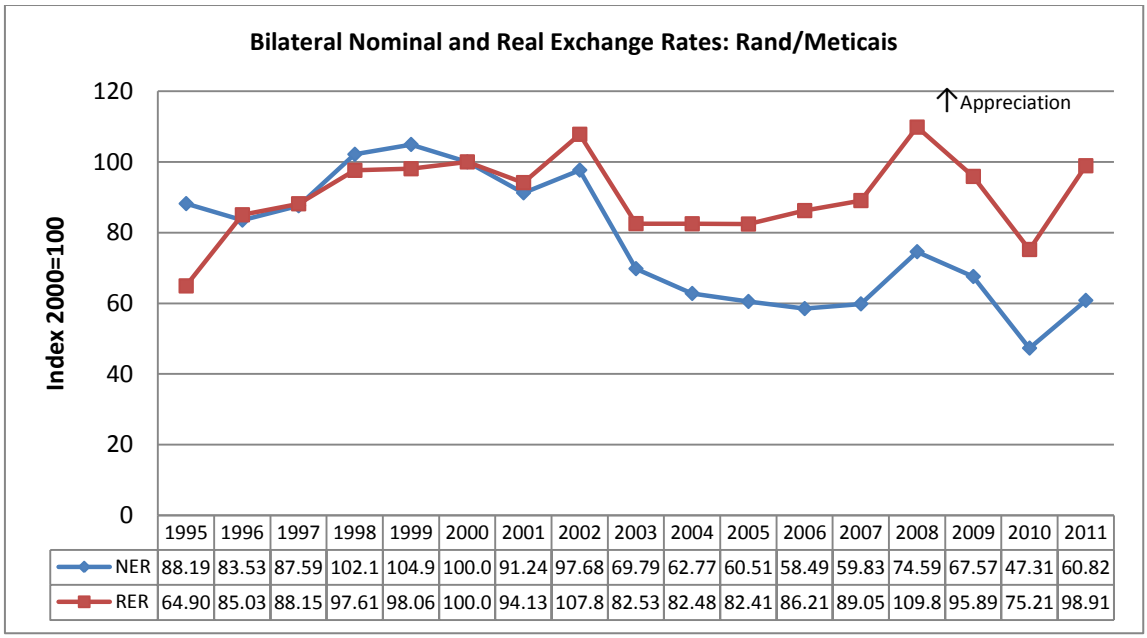


	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
NER	168.7	134.8	131.9	128.2	119.2	100.0	73.55	64.31	64.03	67.43	66.03	59.95	58.93	62.66	55.34	44.85	55.53
RER	101.6	117.1	120.2	116.8	109.3	100.0	78.00	78.40	86.58	100.0	101.5	101.1	104.5	118.1	108.0	100.6	129.5

Source: IMF

Turning to the nominal bilateral rand/ metical exchange rate in figure 2, we see that from 1995-2011 the metical has depreciated against the rand by 31 percentage points over the period. Much of this nominal depreciation occurred from 2001-2010 when the rand/MT rate depreciated by almost 50 percent. This trend was dramatically reversed in 2011, as the metical has risen 28.5 percent against the rand up to August. In real, inflation adjusted terms, there was a substantial 66 percent appreciation of the medical against the rand from 1995 to 2002. In the years following, there has been significant volatility – a substantial depreciation of 23 percent in 2003, an appreciation of 33 percent 2005-08, a reversal of this appreciation of 31 percent in 2009-10, and finally an appreciation again of 31 percent up to August 2011 – however, after all this variability the real bilateral rand/metical rate ended the period only one percentage point lower than it was at the beginning of the decade.

Figure 2: Bilateral Nominal (NER) and Real (RER) Exchange Rates: Rand/Meticais



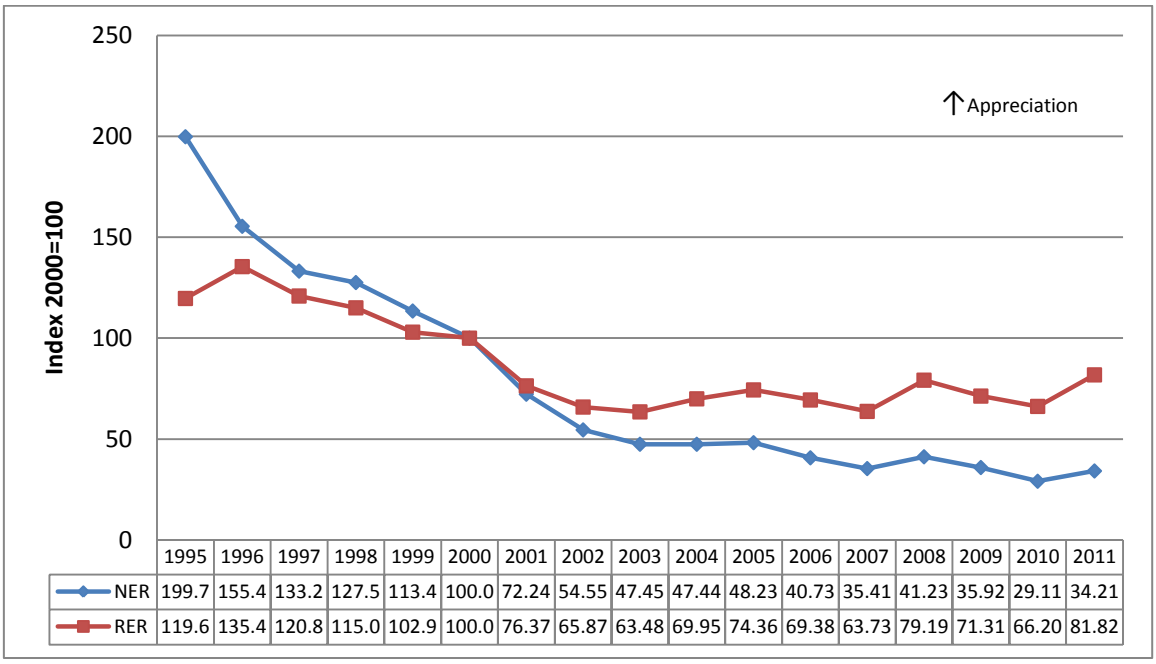
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
NER	88.19	83.53	87.59	102.1	104.9	100.0	91.24	97.68	69.79	62.77	60.51	58.49	59.83	74.59	67.57	47.31	60.82
RER	64.90	85.03	88.15	97.61	98.06	100.0	94.13	107.8	82.53	82.48	82.41	86.21	89.05	109.8	95.89	75.21	98.91

Source: IMF

Trends in the nominal bilateral euro/metical exchange rate, pictured in figure 3, indicate a sizable depreciation of the metical against the euro throughout the 1995 to August 2011period. In just the years from 2000 to 2011, the nominal euro/metical rate depreciated by 66 percentage points. Most of this depreciation occurred in the 2000-07 period. Since that point, the nominal

euro/metical rate depreciated only about an additional 3 percent. The real, inflation-adjusted bilateral euro/metical rate also indicates continuous depreciation over most of the period; however the rate of depreciation has been much less steep due to differential rates of inflation in the EU and Mozambique. Real depreciation of the metical against the euro since 2000 has been about 18 percent. There has been some significant volatility during the decade with a large real depreciation of 36 percentage points in the 2000-03 period, a long period of gradual real appreciation thereafter of about 25 percent, and then a substantial appreciation in the first eight months of 2011 of 23 percentage points.

Figure 3: Bilateral Nominal and Real Exchange Rates: Euro/Meticais



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
NER	199.7	155.4	133.2	127.5	113.4	100.0	72.24	54.55	47.45	47.44	48.23	40.73	35.41	41.23	35.92	29.11	34.21
RER	119.6	135.4	120.8	115.0	102.9	100.0	76.37	65.87	63.48	69.95	74.36	69.38	63.73	79.19	71.31	66.20	81.82

Source: IMF

2.2 Effective Exchange Rates

Bilateral movements in exchange rates can be misleading indicators of the overall change in the metical's value, therefore, in figure 4, we present nominal effective and the real effective exchange rates for the years 1995-August 2011, calculated using IMF methods (Alessandro and Desruelle 1997).[1] The

[1] Effective exchange rate indexes based on IMF data are used for the analysis in this study rather than indexes based on data from the Bank of Mozambique for several reasons. First, BOM data were not available to the author going back to the years before 2000. Second, as figure 5 below shows, the Bank of Mozambique's real effective exchange rate index trends a bit differently than the IMF's index, particularly in the years prior to 2006. This difference does not reflect differences in methods used in calculating the indexes in each case, rather it reflects some differences in the trading partner countries included in the calculations in particular years and

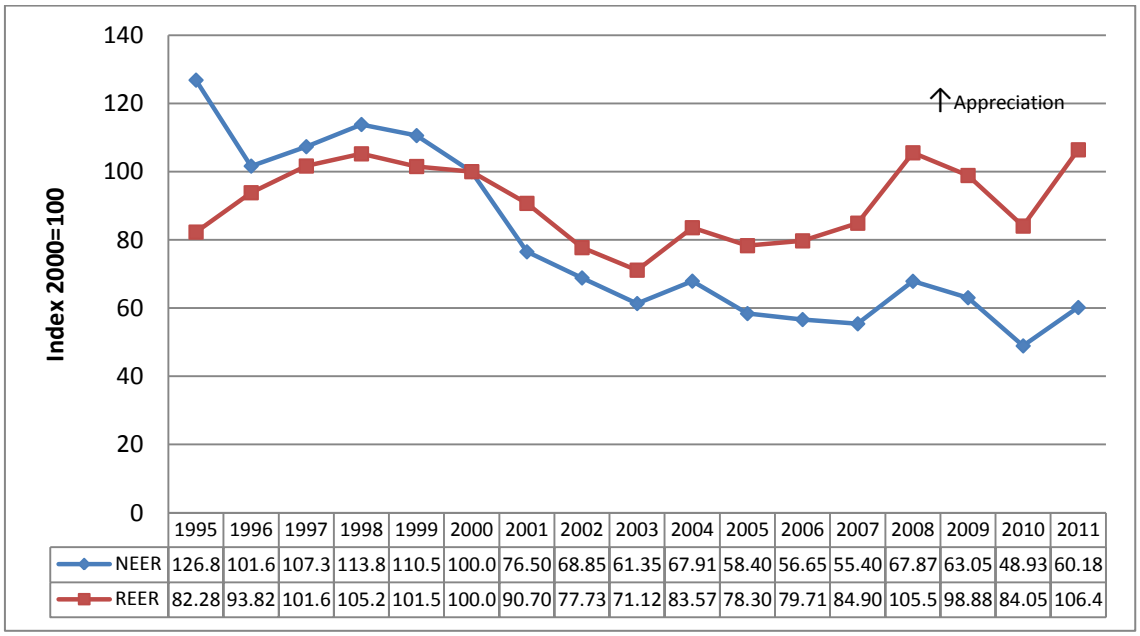
nominal effective exchange rate index is an average of the bilateral nominal exchange rates between Mozambique and each of its trading partners, weighted by the respective trade shares of each partner, and therefore represents a much broader measure of movements in the metical in relation to global markets. In recent years, Mozambique's major trading partners have expanded from the traditional "big three" – EU, South Africa, and the USA, to include China and India. However, the high trade weights with EU and South Africa continues – EU (55.7 percent) and South Africa (36.3 percent), while China (3.2 percent), India (2.6 percent) and the USA (2.2 percent) make up the remaining portion of the total. The real effective exchange rate index adjusts the nominal effective rate for differing rates of inflation in trading partner countries, employing relevant CPI measures. As the real effective exchange rate is a relative price index, measuring price changes in Mozambique verses its major trading partners, it is generally used as a measure of price competitiveness.[2] In addition, the real exchange rate can also be thought of as a ratio of tradable to non-tradable prices in the economy.

The nominal effective rate shown in figure 4 indicates a significant depreciation in the medical against all its major trading partners over the whole period of more than 50 percent. Just since 2000 alone, the nominal metical has depreciated by 40 percent. In addition, the nominal effective rate has experienced substantial volatility over the period – a 45 percent depreciation 2000-07, a 23 percent appreciation in 2007-08, a 28 percent depreciation 2008-09, and finally a 23 percent appreciation again in 2010-August 2011. The real effective rate has exhibited a good deal of volatility as well, particularly since 2000. Focusing on the last decade, one can observe that, after a significant real depreciation of 30 percentage points against its major trading partners in 2000-03, the metical tended to lose competitiveness for the rest of the decade, appreciating by almost 50 percent up to August 2011, with the exception of a 15-percentage point depreciation in 2010. A good part of this decline in competitiveness appears to be due to much higher rates of inflation in Mozambique compared with its major trading partners. However, taking the decade as a whole, the real effective exchange rate, despite significant volatility, ended up only slightly appreciated (6.4 percent) above where it began in 2000.

differences in the trade weights applied to these countries in the pre-2006 years. After 2006, the indexes of the two institutions, as one can observe in figure 5, track quite closely at a correlation of about .95.

[2] However, because applicable CPI's are used to adjust for differences in inflation in each country and the CPI includes prices of non-tradables, the real effective exchange rate index in this case is not a perfect measure of price competitiveness of tradables. Other deflators could be used to develop a more appropriate competitiveness measure, such as unit labor costs, but data for these deflators are not available for Mozambique.

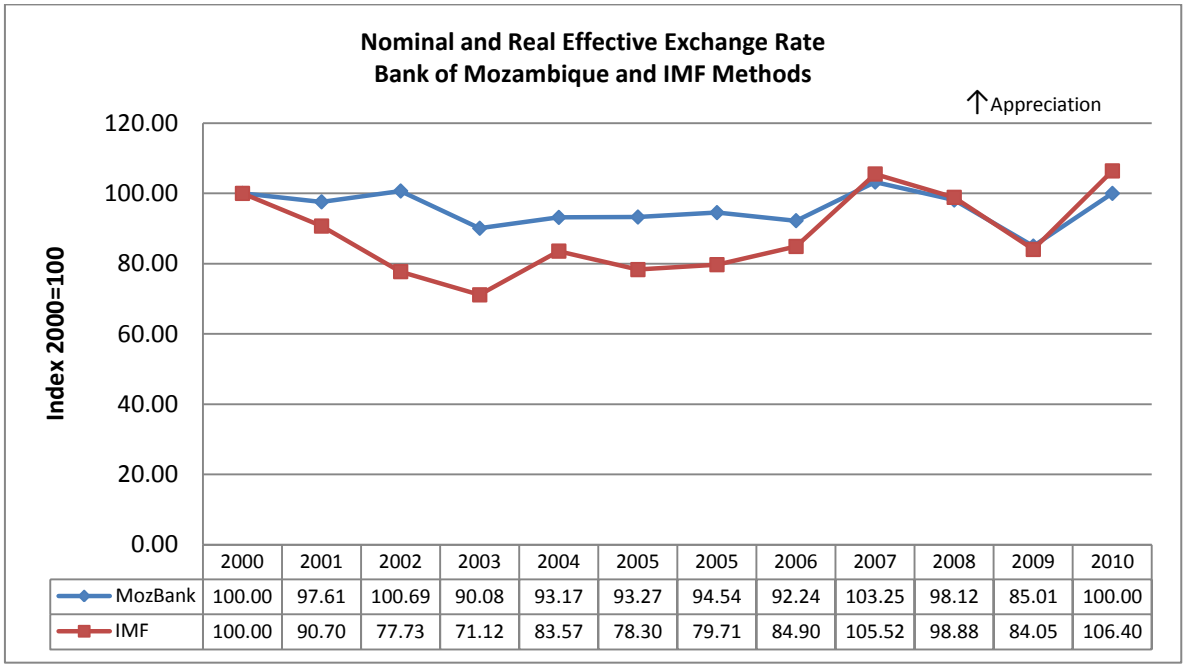
Figure 4: Nominal and Real Effective Exchange Rates (IMF)



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
NEER	126.8	101.6	107.3	113.8	110.5	100.0	76.50	68.85	61.35	67.91	58.40	56.65	55.40	67.87	63.05	48.93	60.18
REER	82.28	93.82	101.6	105.2	101.5	100.0	90.70	77.73	71.12	83.57	78.30	79.71	84.90	105.5	98.88	84.05	106.4

Source: IMF

Figure 5: Nominal and Real Effective Exchange Rates (Bank of Mozambique and IMF)



	2000	2001	2002	2003	2004	2005	2005	2006	2007	2008	2009	2010
MozBank	100.00	97.61	100.69	90.08	93.17	93.27	94.54	92.24	103.25	98.12	85.01	100.00
IMF	100.00	90.70	77.73	71.12	83.57	78.30	79.71	84.90	105.52	98.88	84.05	106.40

Source: IMF, Bank of Mozambique

2.3 Volatility

A striking feature of metical exchange rate movements highlighted in this review of the 1995-2011 period has been persistent volatility. Figure 6 and table 1 present a picture of Mozambique's real exchange rate volatility, employing

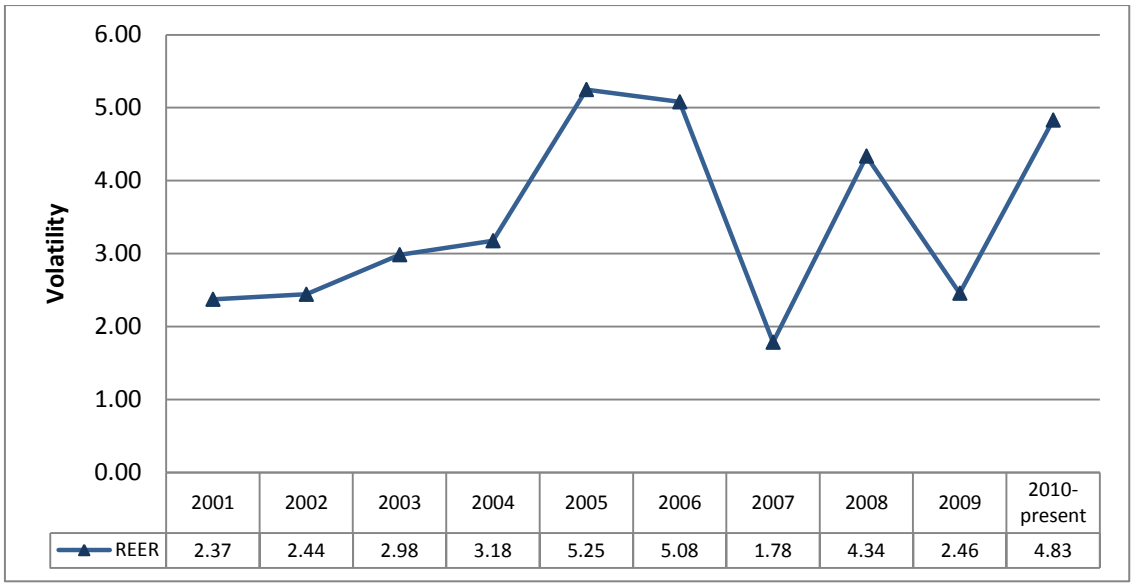
the most widely used measure for calculating exchange rate volatility – the standard deviation of the first difference of logarithms of the exchange rate (Clark, Tamira, and Wei 2004). While exchange rates are often volatile, the extent to which they become a source of uncertainty and risk is a function of whether fluctuations are expected. When individuals can hedge, this predicted part of volatility can be removed and thus may not have much of an effect on economic decisions. The standard deviation of the first difference of logarithms measure we use has the property that it will equal zero if the exchange rate follows a constant trend, which presumably could be anticipated and therefore would not be a source of uncertainty. We compute the change in the exchange rate over one month, using end-of-month data. The standard deviation is then averaged over a one-year period, as an indicator of short-run volatility, which is plotted in figure 6 and shown in the first half of table 1. We also average volatility over a three-year period to capture longer-run volatility, which is shown in the second half of table 1. All the volatility estimates are for the real effective exchange rate for the period 2000-11.

Estimates in table 1 and figure 6 indicate that average real exchange rate volatility is high in Mozambique. The long-run average standard deviation for the whole period is 3.9. In addition, volatility appears to have risen over the decade – increasing 40 percent, from an average volatility of 2.6 in the first half of the decade to 3.7 in the second half. To put these estimates in perspective, we can compare Mozambique with real exchange rate volatility measures for 150 countries shown in Clark, Tamira, and Wei for the period 1970-2002, computed using the same approach in this study. Mozambique's average real exchange rate volatility in such a comparison is shown to be almost twice as high as in advanced countries, where volatility averaged between 2 and 2.5 for the years 1970-2002. Lower average exchange rate volatility is, of course, expected in advanced countries, as they have greater stability in economic policies and adjust more smoothly to shocks, given their more diversified economies. In addition, the foreign exchange markets in which advanced country currencies trade are large and liquid, with many instruments available to hedge volatility, helping these markets to clear quickly and reducing potentially large movements in exchange rates.

When benchmarked against exchange rate volatility in other developing countries, Mozambique compares more favorably, although it is still a bit on the high side. Developing countries as a group tend to have roughly twice

the average volatility of advance countries. However, the bottom group of countries (in terms of volatility) in the developing country cohort generally exhibited average volatilities of less than 3.0, while the top end of the cohort averaged around 5.0. Splitting up this developing country group a bit further, Mozambique appears to fit most naturally with a group of developing countries classified as non-fuel primary exporters, which exhibit the highest levels of average real exchange rate volatility across the world. In this developing country cohort, Mozambique's average exchange rate volatility ranks about in the middle. As a rule, these countries are small and subject to more frequent terms of trade shocks, owing to time-honored volatility in global commodity markets, which probably explains some of the higher volatility. Empirical research has found that swings in macroeconomic fundamentals, such as inflation and choice of foreign exchange regime, together with structural factors in financial and foreign exchange markets, have an important effect on the average levels of exchange rate (NEER) volatility (Canales-Kriljenko and Habermeier 2004).[3]

Figure 6: Volatility of Real Effective Exchange Rate



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010-present
REER	2.37	2.44	2.98	3.18	5.25	5.08	1.78	4.34	2.46	4.83

Source: Author estimates based on IMF data

[3] The structural factors in financial and foreign exchange markets, which are associated with lower exchange rate volatility, are (a) decentralized dealer markets (b) regulations on use of domestic currency by nonresidents (c) acceptance of Article VIII obligations and (d) limits on bank's foreign exchange positions.

Table 1: Volatility of Real Effective Exchange Rate

Year	Real Effective Exchange Rate
2001	2.37
2002	2.44
2003	2.98
2004	3.18
2005	5.25
2006	5.08
2007	1.78
2008	4.34
2009	2.46
2010-present	4.83
Period	**Real Effective Exchange Rate**
2001-2003	2.55
2004-2006	4.65
2007-2009	3.65
2010-Present	4.83

Source: Author estimates from IMF International Financial Statistics

2.4 Assessment of Exchange Rate Misalignment

The fluctuations in the real effective exchange rate index we have observed tell us something about trends in competitiveness over various time spans and about volatility, but they do not provide a benchmark for assessing the "correctness" of the exchange rate in terms of its real value or purchasing power. A currency is valuable because it buys goods. Therefore, the "correct" exchange rate (or the benchmark for assessing value) between two national currencies should be the one that equalizes their purchasing powers: That is, the hypothetical exchange rate that equalizes domestic and foreign prices of a basket of tradable goods and services. Any movement in the real exchange rate away from this "equilibrium" or "purchasing power parity" exchange rate may be considered a currency misalignment.[4]

That said, not all deviations in the real effective exchange rate from purchasing power parity necessarily indicate fundamental misalignment. One

[4] This is a simple straightforward way to estimate real exchange rate equilibrium. However, there are several other ways to go about measuring equilibrium and misalignment. The IMF now uses three notions of exchange rate equilibrium – the macro balance approach, the external sustainability approach, and the reduced form equilibrium real exchange rate approach. Both the macro balance and the external sustainability approaches measure the change in the exchange rate necessary to bring the current account back to its "norm," based on an other things being equal assumption. The current account norm in the macro balance case is derived via regressions of many variables on countries with similar characteristics as the country under review. The norm in the external sustainability approach is derived as a level that stabilizes the level of external indebtedness. The reduced form approach derives the equilibrium rate from estimated long-run (co-integrating) relationships.

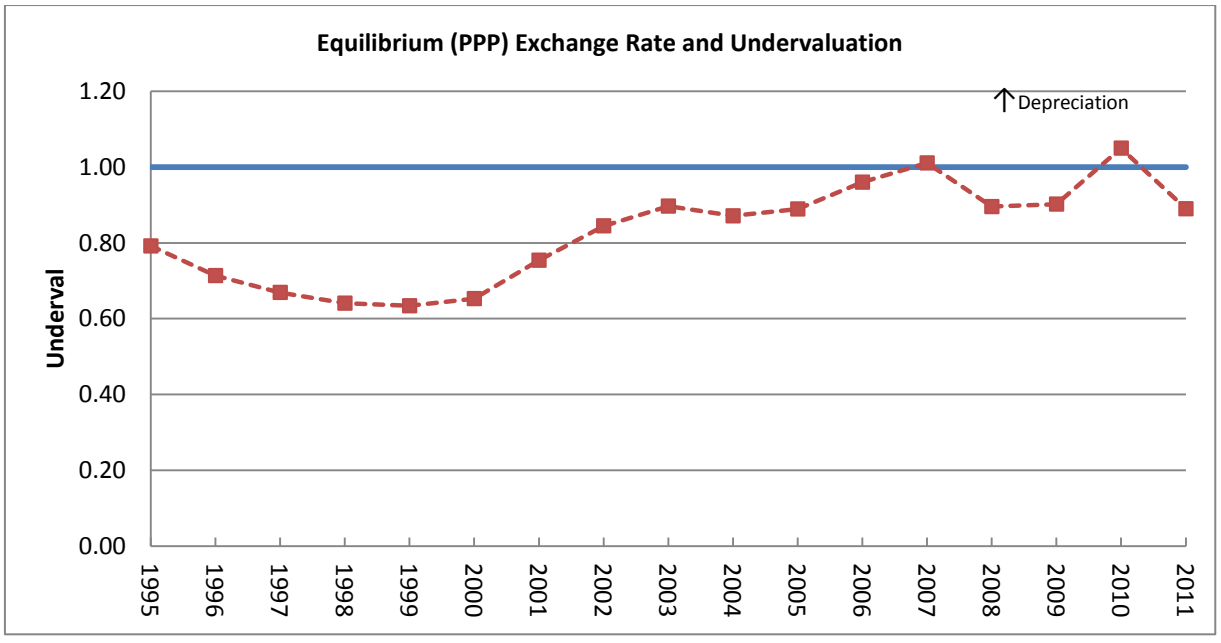
important example is due to innovation in tradable goods sectors in advanced countries known as the "Balassa-Samuelson effect," which elevates real exchange rates in advanced countries above those in less developed countries. Innovation in richer countries leads to higher productivity, which reduces production costs and prices of tradables and leads to higher wages in tradable sectors. Lower prices for tradables are then passed on to other countries through global competition. As there is less competition and innovation in non-tradable goods and services around the world, the prices of tradables will tend to decline over time relative to non-tradables. In addition, rising wages in tradables due to productivity improvements will pull up wages in non-tradable sectors as firms compete for workers. Rich countries with higher productivity growth and a large weight of non-tradables (e.g., housing) in consumption will thus have higher average CPIs relative to poorer countries. Put another way, as countries grow richer, relative prices of non-tradables tend to rise due to higher productivity in tradables. This price level effect will tend to appreciate the real effective exchange rate as incomes rise.

To assess whether Mozambique's real exchange rate is misaligned and by how much, we construct a time-varying index of real exchange rate undervaluation, based on purchasing power parity price-level measures in the Penn World Tables, following Rodrik (2008). The index is essentially a purchasing power parity real exchange rate adjusted for the Balassa-Samuelson effect. It captures the relative price of tradables to non-tradables in the economy, adjusting for the income effect on the relative prices of non-tradables. The computed index of undervaluation is shown in figure 7 for the 1995-2011 period.[5] As constructed, when the undervaluation index is greater than one it indicates that the value of the currency is lower (more depreciated) than is indicated by purchasing-power parity and thus is undervalued; when the index is less than one the currency is overvalued. Table 2 presents 3-year averages for the exchange rate and undervaluation indexes, and shows the percent of undervaluation for each period (a negative sign indicates overvaluation). One can see from figure 7 that

[5] The equilibrium real exchange rate is computed as the nominal exchange rate (NER) divided by the purchasing power parity (PPP) index, measured as national currency units per US dollar.
Ln(RER) =ln(NER/PPP). When RER is greater than 1, it indicates that the value of the currency is lower (more depreciated) than what is indicated by purchasing power parity. However, as non-traded goods are cheaper in poorer countries, an adjustment is required in the following way:
Ln RER=a+bln(GDP per capita)+time dummies + error . This provides an estimated RER adjusted for the Balassa-Samuelson effect. The difference between actual RER and this estimated purchasing power parity RER provides the measure of "undervaluation". If the Index is greater than 1, then the currency is undervalued.

the medical has been overvalued for most of the period. However, the degree of overvaluation has steadily declined. The last column of table 2 shows that the degree of overvaluation has fallen from a high of 36 percent in the years 1997-2000 to just 3 in 2010-2011. By 2007, in fact, the Mozambique's real exchange rate had reached purchasing power parity with the US dollar, as the undervaluation index equaled one in that year. Since then, the metical has moved in a range from about 10 percent overvalued to close to equilibrium in 2010.[6] So far in 2011 the metical has move back toward overvaluation again – increasing the extent of over valuation by an estimated 11 percent, if we calculate the undervaluation index using the average exchange rate for the for the eight months through August 2011. Alternatively, if we were to use the actual exchange rate as of the end of August 2011 to compute the undervaluation index, the extent of overvaluation would be 39%. Considering the amount of volatility in the exchange rate, exhibited in table 1, however, there is little reason to believe this large increase in overvaluation is a permanent trend.

Figure 7: Equilibrium (PPP) Exchange Rate and Undervaluation



Source: Penn World Tables (1995-2009); Economywatch.com (2010-2011)

[6] It is interesting to noted that the IMF, in its June 2011 Country Report, reaches the same conclusion using its more complex three approaches method: macro balance , the external sustainability, and reduced form equilibrium real exchange rate approaches.

Table 2: Degree of Undervaluation of the Metical 1995-2011

	Nominal Exchange Rate Average $/MT	Real Exchange PPP Rate Average	Undervaluation Index (Equilibrium PPP=1)	Undervaluation (%)
1995-1997	10.62	98.22	0.72	-28%
1997-2000	13.29	94.43	0.64	-36%
2001-2003	22.72	128.08	0.83	-17%
2004-2006	23.68	122.16	0.91	-9%
2007-2009	26.84	122.11	0.94	-6%
2010-Aug.2011	31.25	132.14	0.97	-3%

Source: Author calculations. A negative sign in the undervaluation column indicates overvaluation. The PPP real exchange rate is computed using IMF data up to 2009. Data for CPI and exchange rates for 2010 and 2011 are obtained from various country sources. The trade weights (fixed) are obtained from the Bank of Mozambique.

The levels and volatility of metical exchange rates we have observed over the 1995-2011 period can have important consequences for the economy. We turn in the next sections of this study to a discussion of the major channels of transmission through which these exchange rate shocks influence economic outcomes, together with estimates of some of the main impacts.

3.0 Exchange Rate Fluctuations and Prices

A key transmission channel through which exchange rate movements affect the economy is via their influence on prices. The principal direct effect occurs through the impact on import prices, which, via the pricing chain, triggers changes in consumer prices and producer costs. These price effects, in turn, generate indirect and second-round impacts by way of changes in real incomes, consumer spending, and trade flows, which have added consequences for the overall direction of changes in the consumer price index (CPI). The other direct effect of exchange rate changes on prices occurs via the impact on export prices, which leads to changes in exporter profit margins and trade volumes.

The crucial variable in understanding the magnitude of these exchange rate links to prices is the "exchange rate pass-through" (ERPT) to prices at different stages of the pricing chain. The ERPT elasticity on the import side measures the degree of price transmission between foreign prices, exchange rates,

and domestic prices, and thus provides valuable insights into the major determinants of consumer prices. On the export side, the ERPT elasticity measures the degree of price transmission between exchange rate changes and export prices, and thus can provide information on how exporting firms adjust margins according to business strategies in foreign markets.

Research on ERPT around the world shows that pass-through of exchange rate changes is not perfect (Ca'Zori and Schatz 2007; Campa and Goldberg 2005; Frankel Parsley and Wei 2005; ECB 2008). In developed countries, the ERPT to import prices averages around 60 to 70 percent. Import prices, however, are the first link in the pricing chain directly affected by exchange rate changes. Farther down the pricing chain, the ERPT to final consumer prices gets progressively smaller in developed countries, averaging only between 13 and 30 percent (Campa and Goldberg 2006).

Several factors can cause this incomplete pass-through of exchange rate movements. First off, there is the effect of pricing behavior of major trading partners on import prices, which can reduce the pass-through elasticity by engaging in higher pricing-to-market behavior (i.e., absorbing more of any exchange rate fluctuations in their margins). Asian exporters did this following the Asian crisis in the late 1990's to increase trade flows. Second, some of the incomplete pass-through can be due to threshold effects. There can be thresholds to arbitraging behavior of market participants, whereby prices converge only if price differentials are above a certain threshold level that makes arbitrage profitable. More complete pass-through would be evident once thresholds of inaction are taken into consideration. Third, import price responses to exchange rate changes can be larger than consumer price responses because (a) there are non-tradables in the CPI, (b) distribution channel costs reduce the foreign content value of imports, and (c) imperfect competition in the distribution channel lets distributors adjust their profit margins to exchange rate changes in order to expand market share.

A study by Cirera and Nhate (2006) provides an estimate of the ERPT to domestic prices in Mozambique. Using Customs Authority data for 2000-05, this study examines price transmission in a pooled sample of 25 important products, across three regional provinces (Maputo, Beira, Nampula), spanning Mozambique. The consumer price of an imported product should be equal to fob price adjusted to include insurance and freight (cif price), plus tariffs and other border taxes, such as VAT, plus transport costs, plus a retail margin. As

Mozambique is a small country, with limited ability to influence pricing-to-market behavior of foreign exporters (i.e., the fob price), one would expect a high pass-through to import prices. Figure 7 shows movements in Mozambique's import price index along with nominal exchange rates over the past 15 years. It is clear there is a close relationship. We confirm this tight correlation in a regression, which indicates an estimated pass-through to import price elasticity of .71.[7] The Cirera and Nhate study focuses on the next step in the pricing chain, ERPT transmission from border cif prices of imports to consumer prices. They find that the transmission of exchange rate changes to consumer prices is also very high in Mozambique. There is almost complete pass-through. ERPT to retail consumer prices is upwards of 75 percent.[8] Therefore, consumer prices appear to be highly responsive to exchange rate swings.[9] The Cirera and Nhate study also shows that this high price transmission is symmetrical. Exchange rate appreciations and depreciations are transmitted equally to consumer prices. Comparing the ERPT elasticity for appreciations and for depreciations indicates only a marginal difference – with the elasticity for appreciations being slightly larger at 1.05 times the elasticity for depreciations.

The fact that there is high pass-through of exchange rate changes to retail prices in Mozambique demonstrates that firms in the pricing channel for these imports generally have a constant mark-up of price over costs. Why do firms in more developed countries behave so differently than they do in Mozambique, resulting in a lower ERPT to consumer prices in advanced countries? The answer is that market structure in Mozambique is much different from that in most advanced countries. Import penetration in the Mozambican economy is very high.[10] Imports play a large role in GDP – averaging in some

[7] Pass-through of exchange rates to import prices is estimated by the exchange rate elasticity of .71, according to the following regression.

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	2.76409	0.30318	9.12	<.0001
Log(exchrate)	1	0.71246	0.10299	6.92	<.0001

[9] Vicente (2007), using a co-integration approach and an associated error correction model on a small sample of monthly 2001-06 data in Mozambique, finds a much lower transmission effect. His study finds that a 1 percent exchange rate depreciation leads to a .15 increase in the price level. His study also finds that changes in South African prices and money supply swings are relatively more important than exchange rates in explaining domestic price variations . As Vicente notes, however, the difference in results in his study may, in part, be due to his small sample size and modeling strategy. Omar (2003) reports a pass-through elasticity for exchange rates to domestic prices in Mozambique that is more in line with the higher Cirera and Nhate results.

[10] Import penetration is the share of imports in total domestic demand.

years more than 30 percent of domestic value-added, and imports make up roughly a 25 percent share of total domestic demand. For some product categories, import penetration is much higher – penetration in manufactures, for example, reaches nearly 60 percent of domestic demand. This enhances the pricing ability of foreign firms (as there is no incentive to defend these large foreign market shares through active pricing-to-market behavior) thus raising the ERPT to import prices. Second, local markets for these products in Mozambique also do not exhibit intense competition. In most cases, there are no, or very few, local substitutes, and there are only a few large firms competing in the distribution and retail segments of the pricing chain. Lastly, price mark-ups are passed-through to consumers who generally have rather inelastic demands for these basic imports.

The ERPT to export prices in Mozambique is generally expected to be lower than the ERPT to import prices. A practical indicator of the degree of pass-through in this case is the correlation coefficient between exchange rate fluctuations and changes in the export price index. Figure 8 shows a plot of the relationship between the real effective exchange rate and Mozambique's export price index for the period 1995-2009.[11] In addition, we regressed the export price index on the real exchange rate to obtain an estimate of the elasticity of export prices to movements in the real exchange rate. One does observe some correlation between prices and exchange rates over the period in the figure. However, the statistical exercise finds the elasticity to be relatively low at .32 – the regression shows that movements in the real effective exchange rate explain only 16 percent of variation in export prices.[12] So, only about one third of exchange rate shocks are passed-through to export prices in Mozambique. While this is a relatively low ERPT, the same experience of lower pass-through to export prices than to import prices is generally true of other countries, even in more advanced economies. In EU countries, for example, the ERPT to import prices averages around 70 percent, the ERPT to export prices is only 43 percent (ECB 2008).

The reasons for this difference in exchange rate pass-through revolve around the particulars of the composition of the export basket, competitive

[11] Data for the export price index were not available for 2010 or 2011 when this study was carried out.

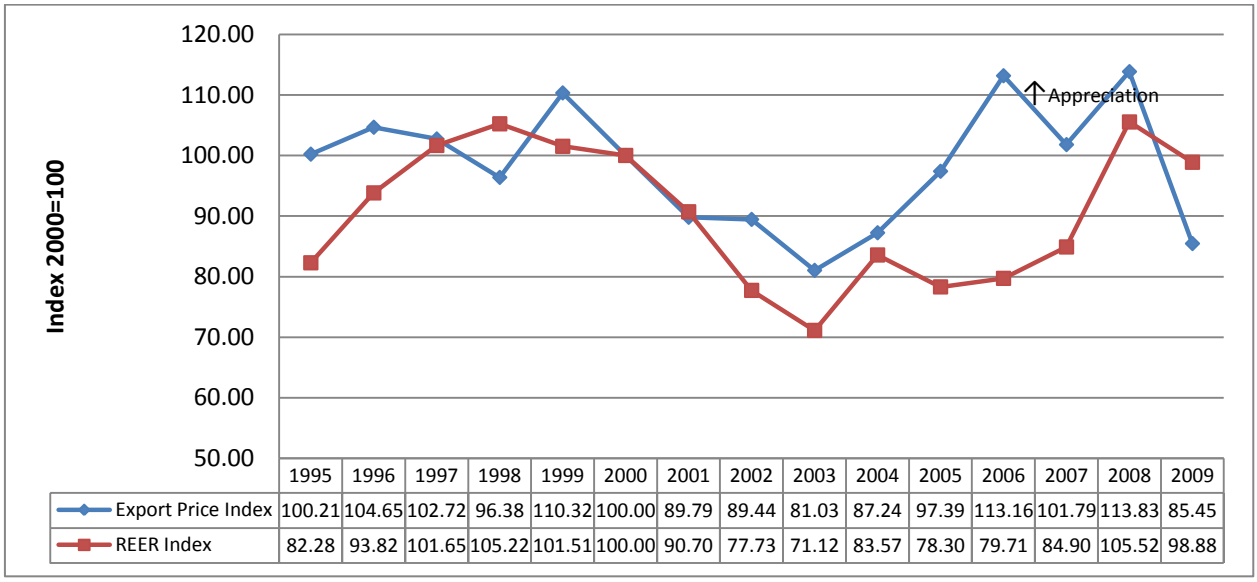
[12] The REG Procedure
Model: MODEL1
Dependent Variable: lexpprice
Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	3.13607	0.74730	4.20	0.0010
lREER	1	0.32285	0.16673	1.94	0.0749

Adj R-squared 0.1641

pressures in foreign markets, and exporter pricing-to-market behavior. The developed-country export basket, for example, is made up largely of manufactures where pricing-to-market behavior is most prevalent. Increased competitive pressures from emerging markets, such as China, have caused EU exporters to vary their mark-ups more and export prices less in response to exchange rate movements (ECB 2008). In the case of Mozambique, exports are limited in

Figure 8: Real Effective Exchange Rate and Export Prices



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Export Price Index	100.21	104.65	102.72	96.38	110.32	100.00	89.79	89.44	81.03	87.24	97.39	113.16	101.79	113.83	85.45
REER Index	82.28	93.82	101.65	105.22	101.51	100.00	90.70	77.73	71.12	83.57	78.30	79.71	84.90	105.52	98.88

Source: IMF

number and narrowly concentrated (World Bank CEM 2011). Only 14 products record exports of more than $1 million. Exports from so-called "mega projects" (aluminum, electricity, gas, and titanium) account for more than 79 percent of the export basket with 12 primary products making up the remaining 21 percent.[13] Overall, exports also exhibit a low level of processing. The few products that might receive some further conversion, such as wood, cotton, oil seeds, and tobacco are exported at a very low stage of processing – for example, cotton is ginned in Mozambique, logs are milled to some degree, and cashews receive some processing. While Mozambique is a commodity exporter, where pricing-to-market behavior is generally less apparent than in manufactures, its export basket exhibits several characteristics that reduce the degree of exchange rate pass-through to export prices.

Most important is the fact that mega-project export prices are not very sensitive to exchange rates. The multinational companies involved in this

[13] The remaining 21 percent of exports are composed of (in order of rank in value exported) Tobacco, sugar, frozen shrimp, cotton, wood, cashew nuts, sesame seeds, bananas, coconut oil, tea, maize.

trade generally negotiate fixed-term contracts in foreign currency, based on commodity prices determined in world markets. For example, the majority of electricity exports involve long-term contracts that usually do not allow for large price fluctuations. In the cases of aluminum, coal, and minerals, export prices are also subject to long-term contracts that typically take the form of a fixed market price with a negotiated standard escalation (Bucuane and Mulder 2007). Prices of all these commodities are expected to increase over time with developments in emerging markets, but in an orderly fashion. For the remaining products in the export basket, the ERPT should be somewhat higher. However, relatively small Mozambican primary product exporters, with limited ability to hedge, are sometimes compelled to engage in pricing-to-market behavior, according to interview respondents for this study. Mozambique's export penetration in major markets is low and exporters face stiff competition and rigid contracts. Exporters also have a bit of leeway to behave strategically in some export destinations in the form of trade-preferences. The EU, for example, offers unilateral tariff preferences to Mozambique's exports, which provides some cushion in margins for strategic behavior. In their study of preferential tariff pass-through to Mozambique export prices in EU markets, Alfieri and Cirera (2008) provide evidence of exporter willingness to reduce margins to defend markets. When, for one reason or another, exporters cannot obtain proper documentation to enter the EU under available special tariff preferences, rather than renege on contracts, Alfieri and Cirera note that exporters enter at higher tariff levels, absorbing losses in their margins.[14]

4.0 Exchange Rates and Trade Flows

A second key transmission channel through which exchange rates influence economic activity is via expenditure-switching effects on trade flows. Exchange rate appreciations, for example, make a country's goods and services more expensive relative to foreign goods and services. This, in turn, leads to a shift in global demand away the country's goods and towards foreign goods. Consequently, the country's exports decline and imports increase, and there is a resulting deterioration in the trade balance and a decline in the contribution of net trade to GDP growth.

A crucial element in this scenario, however, is the ERPT. The overall effect of an exchange rate change on trade flows is highly dependent on the

[14] This study also shows that preference margins in EU markets are unable to explain most of the variance in Mozambique's export price margins in EU markets, suggesting, among other things, that exporter pricing-to-market behavior is an important factor in determining these price margins.

magnitude of ERPT to import and export prices. It is only when a nominal change in exchange rates turns into a realized change in import and export prices in the buyer's currency that a demand response will occur. To the extent that Mozambique exporters engage in pricing-to-market behavior, reducing margins in response to an appreciation and maintaining export prices, or to the extent that mega-export contracts are of long duration with price escalation clauses, the export response to appreciation will be restrained. On the demand side, by contrast, it is clear that expenditure switching or demand responses in foreign markets to any price-related effects of exchange rates on Mozambique's primary exports will be substantial. When the substitutability between products and suppliers is high (as in the case of most of Mozambique's primary agricultural exports), changes in relative prices between products from different source countries generally result in a pronounced demand response to exchange rate swings.

In addition to price-related effects, other factors can be expected to have an important impact on the supply response of trade flows to exchange rate changes. One is "sunk" trading costs. These are the costs of entering a new market, which cannot be recouped in the event an exporter must exit the market at a later date. Examples are initial marketing expenses and costs of establishing a distribution network. These sunk costs introduce a degree of slowness in the responsiveness of trade flows. Without them exchange rate movements would not present a problem for incumbent, or newly entering, exporters, as they could react to changes with no loss in initial investment. For example, in the presence of sunk costs, incumbent exporters may not immediately react to a deterioration in profit margins after an exchange rate appreciation in order to protect the value of sunk investments. And new entrants might choose to delay entry into export markets a bit longer to ensure that the exchange rate moves in their favor, as initial outlays could be squandered. In Mozambique, exporters complain that sunk trading costs are high. Local fixed costs of exporters, in the form of initial investments in acquiring land, dealing with the bureaucracy, getting infrastructure up and running, establishing local trade facilitation networks with transportation, ports, and customs, and so on, are considerable. And foreign fixed costs of establishing trading relationships and establishing distribution channels add to these totals. According to exporters, these high sunk trading costs introduce a good deal of inertia into the export response to exchange rate changes.

Another factor that may influence the exchange rate elasticity of aggregate trade flows is the import content of exports. When domestic value-added is low, and imported inputs play a large role in export production, the impact, for example, of an appreciation on the foreign currency price of exports, is lessened, as the price of imported inputs falls. This mitigating effect of imports may be important in shaping the export response in Mozambique, as the import content of some important exports is sizeable. Exporters note that most export companies are "green field" investors, lacking the support of key suppliers in almost every area – capital equipment, intermediate inputs, packaging, technical expertise, spare parts, and so on. All these critical inputs have to be imported.

A further potential mitigating factor for supply response revolves around hedging. To the extent Mozambique's exporters can hedge exchange rate exposure, they can reduce the supply response to any adverse movements in exchange rates. However, as noted earlier, the ability to hedge in Mozambique is somewhat limited, given the level of financial development. To hedge foreign exchange exposure exporters have the following narrow options available. For exporters that can afford the fees and other costs, large banks in Mozambique offer three hedging products: forward foreign exchange contracts (for imports and exports), funded forward foreign exchange contracts, and foreign exchange swaps. To date banks in Mozambique do not deal in foreign exchange options because of the cost (or premium) that would be charged to the client owing to the absence of an active interbank financial derivatives market.[15] For smaller exporters that cannot, or will not, pay the costs of such products, the options available are to reduce foreign exchange exposure as much as possible, hold different types of foreign exchange in their accounts, or speculate in the local foreign exchange market through banks or exchange bureaus.

Lastly, the business environment is an important factor in shaping the exchange rate-trade flow link. Mozambique's rank in the World Bank's "Doing Business Report" has improved somewhat in the last couple of years, but it continues to be positioned near the bottom of the list of countries with poor business climates (World Bank 2011). Its global competitiveness index, as

[15] A foreign exchange forward contract is a contract to exchange two currencies at a future date at an agreed rate. These forward contracts are used, among other things, for hedging forward foreign exchange exposure for know or likely future currency receivables and payments. A funded forward is the same as a forward contract but it involves bank funding along with it. A foreign exchange swap is a contract under which two counterparties agree to exchange two currencies at a set rate and then to re-exchange those currencies at an agreed upon rate at a fixed date in the future. A foreign exchange option is an option to enter into a currency contract sometime in the future.

measured by the World Economic Forum, also languishes around the lower rungs of the competitiveness ladder compared with its peers (World Economic Forum 2010). Financial constraints register as one of the worst elements in this lackluster business environment, and, according to the 2011 Doing Business Report, this feature of the business climate has actually deteriorated in the past few years. Firms complain in surveys that both cost and availability of credit are problems (World Bank Investment Climate Survey 2009). A number of studies on other developing countries have found that these business environment problems, particularly financial constraints, reduce the exchange rate elasticity of trade flows (see Colacelli 2010 for a recent review of some of these studies).

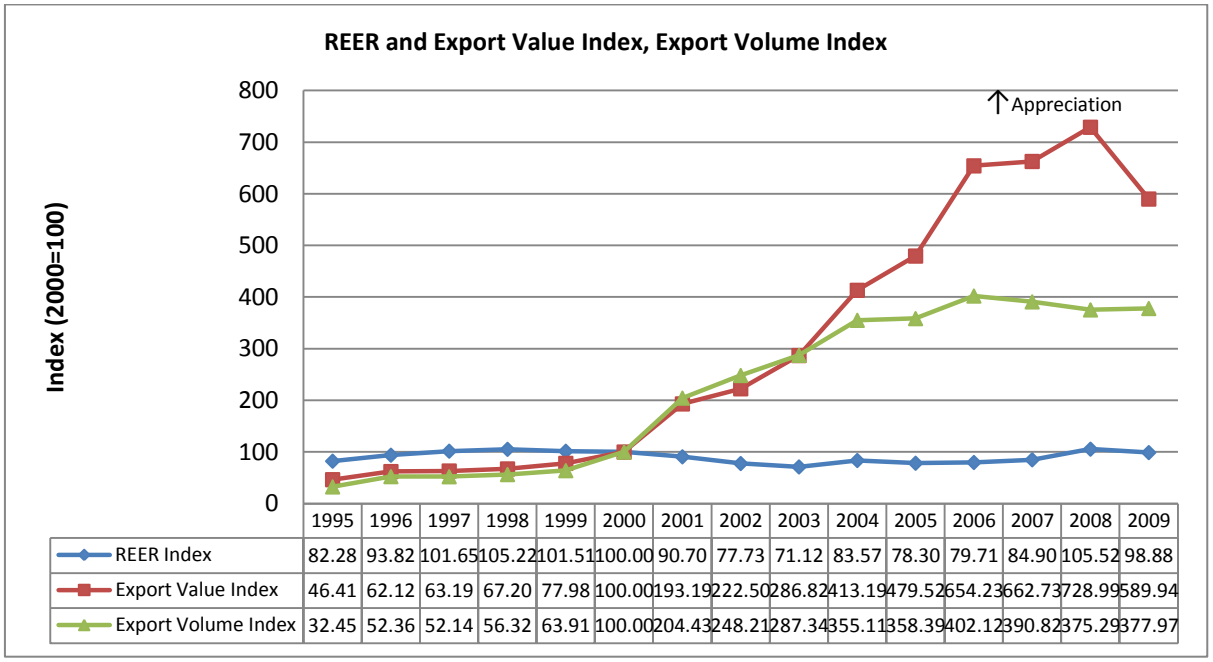
Estimates of the exchange rate elasticity of trade flows have been carried out for a number of developed and developing countries at least since the 1950s. This work has been at the center of a long debate about how sensitive exports are to real exchange rate changes. Views have swung from "elasticity pessimism" in the 1950s and 1960s, particularly for developing countries, to a more sanguine stance on the ability of changes in the real exchange rate to improve the trade balance (Ghei and Pritchett 1999; Reinhart 1994). Much of this debate has been driven by improvements in estimation techniques and in computing power through the years. A recent study by Colacelli (2010) improves on the results by focusing on bilateral exchange rates, on a larger sample of countries, and on a wider number of sectors. Colacelli examines the export response to real exchange rate fluctuations in a sample of 136 countries, during the 1980s and 1990s, for 440 sectors. Given this large and in depth sample, the investigation has the ability look at exchange rate elasticity in both developed and developing countries, as well as in separate product groups.

The study finds that the elasticity of export response to real exchange rate changes of an average exporter in a developed country is .67, while the elasticity in developing countries is .13. These results are broadly consistent with other estimates of close to one for developed countries (for example, the average elasticity for EU countries is found to be .80, ECB 2010) and well below one for developing countries. Colacelli also finds that there are significant sectoral differences in the export response. Overall, exports of differentiated product sectors (such as manufactures) are found to respond more to real exchange rate swings than those of homogeneous products (such as commodities). This would explain some of the difference in the exchange rate response elasticity between developed and developing countries, as the export mix in developing countries is

generally heavily concentrated in primary products. But the study also finds that the differences in response elasticity between product groups in developing countries are quite small; so export composition does not explain as much as one would expect. Colacelli's conjecture, supported by research in other countries, is that this lower export response to exchange rate fluctuations in developing countries is due importantly to credit constraints.

Considering Mozambique's low ERPT to export prices and obstacles in the business environment, one might expect the export response to exchange rate changes to be restrained. To examine this issue, we present a graph of the real effective exchange rate along with indexes of Mozambique's aggregate exports by volume and by value for the years 1995-2009 in figure 9. One does not observe much of an association in the figure between exchange rate movements and the export indexes largely due to the exponential rise in the export value index, which rose from 100 in 2000 to 728 in 2008 blowing out the y-axis of the graph.

Figure 9: Real Effective Exchange Rate and Export Value Index, Export Volume Index



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
REER Index	82.28	93.82	101.65	105.22	101.51	100.00	90.70	77.73	71.12	83.57	78.30	79.71	84.90	105.52	98.88
Export Value Index	46.41	62.12	63.19	67.20	77.98	100.00	193.19	222.50	286.82	413.19	479.52	654.23	662.73	728.99	589.94
Export Volume Index	32.45	52.36	52.14	56.32	63.91	100.00	204.43	248.21	287.34	355.11	358.39	402.12	390.82	375.29	377.97

Source: IMF

To take a closer look at the trade elasticities in this case, we estimate an export supply function using annual data on trade flows for the period 1990-2010. A priori, exports should be determined by global purchasing power and by relative price competitiveness. Thus, we estimate the following export supply

equations, one with export volumes as the dependent variable and the second with export unit values as the dependent variable:

$$\mathbf{X_t = \alpha + \beta_1 GDP_t^w + \beta_2 REER_t + \varepsilon_t}$$

$$\frac{X_t^v}{P_t^x} = \alpha + \beta_1 GDP_t^w + \beta_2 REER_t + \varepsilon_t$$

where X_t is the export volume index and $\frac{X_t^v}{P_t^x}$ is the export unit values (the numerator is the export value index and the denominator is the export price index); α is a constant term, is world purchasing power, proxied by the real trade-weighted average GDP of Mozambique's major trading partners; $REER_t$ is the real effective exchange rate, as computed in section 1, and ε_t is an error term. All variables are in logs. One expects β_1 to be positive and β_2 to be negative in the estimated export supply equation.

Since we are dealing with time series, we checked our data for stationarity using the Augmented Dickey-Fuller (ADF) unit-root tests and found the log of all variables to be non-stationary, specifically to be I(1). Results from the bivariate analysis of the export volume equation indicate that foreign purchasing power and the real exchange rate are both significant and have the correct signs. The equation has an adjusted R^2 of .96. The global income effect is shown to have a pronounced influence on export supply with a positive coefficient of 8.62. The responsiveness of export volumes of goods to exchange rate changes is indicated by an elasticity of -0.83.[16] Thus, a 10 percent sustained depreciation (appreciation) in the real effective exchange rate will result in an 8 percent increase (decrease) in export volumes. One shortcoming of the single equation model used above is the assumption of instantaneous response of trade flows to the variables in the system. Typically, however, the export response to a 10 percent sustained movement in the real exchange rate will occur after a

16

Parameter Estimates					
Variable	Degrees of Freedom	Parameter Estimate	Standard Error	t - value	Pr > |t|
Intercept	1	242.48994	14.0627	-17.24	<.0001
lwtgdp	1	8.61677	0.45703	18.85	<.0001
lreer	1	-0.83373	0.36125	-2.31	0.0338

considerable lag. To estimate this lag in response, however, would require more time-series observations than we have available.

We know from previous research on trade elasticities that our estimate of the short-run export supply response to exchange rate changes is probably biased downward to some degree because of aggregation bias, simultaneity bias, lags, and other factors (Goldstein and Khan (1985). Hence, it is conceivable that one might reveal a higher elasticity if additional data were available to deal with such estimation issues. Our estimated elasticity of export supply is somewhat lower than the elasticity used by the IMF in its calculations of the macro-balance approach to exchange rate valuation in Mozambique (see IMF Staff Report June 2011). The IMF's export supply elasticity estimate for Mozambique is -1.17 for the 2001-04 period (see Tokarick 2010). This estimate, however, is not derived using econometric techniques. It is calculated from a procedure that uses a standard general equilibrium model of international trade and data from The Global Trade Analysis Project for the years 2001 and 2004. Give these different estimation approaches, it is difficult to compare the two estimates side-by-side. On balance, though, both estimates do show that the short-run response of trade volumes to real exchange rate fluctuations is substantial.

Estimation of the export unit value equation above did not find a significant export supply elasticity. The foreign purchasing power effect was found to be highly significant, with a coefficient of 7.4, but, while the elasticity of response to exchange rate fluctuations had the correct sign, it was not significant (significant only at the 85 percent level).

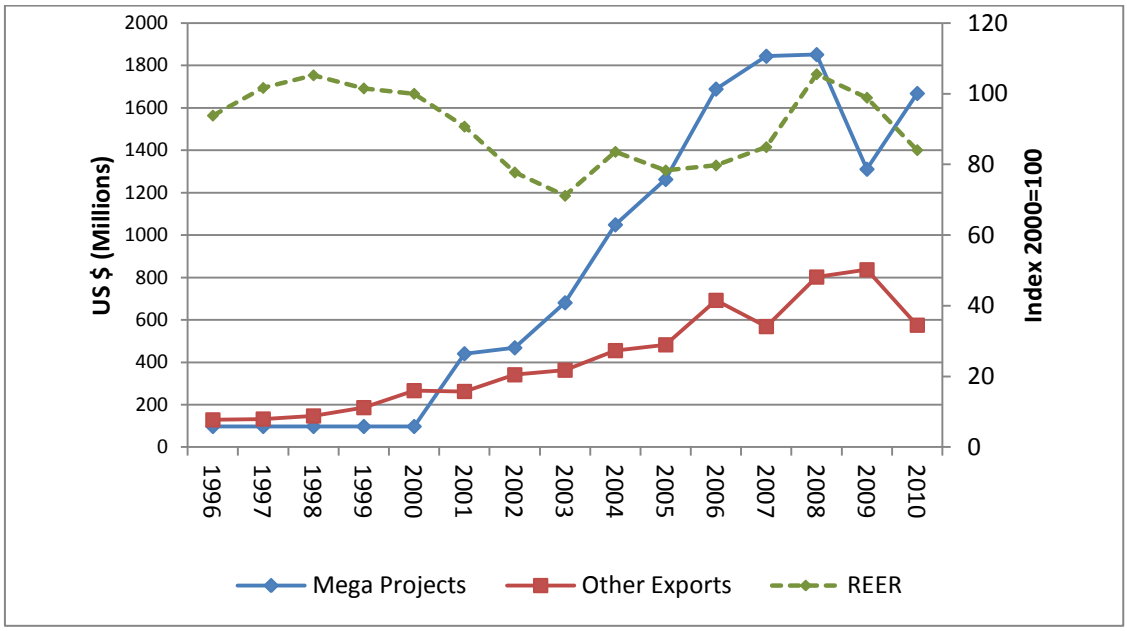
Figure 10, shows a plot of disaggregated trade flows, classified by mega and non-mega exports, together with the real effective exchange rate. To investigate whether the elasticity of export supply might differ within these two categories of exports, as suggested earlier, we estimated export supply equations for each cohort as specified for total exports above. Unfortunately, disaggregated data is only available for mega and non-mega export values, so we were unable to estimate export volume equations for each category, which seem to provide a better fit. The results show that, for both mega and non-mega exports, global purchasing power is highly significant, but the exchange rate effect on export unit values has the wrong sign and is not significant (see appendix I for results) . Hence, we are unable to provide support for the conjecture that mega exports are less sensitive to exchange rate fluctuations than exports in the non-mega cohort. Part of the problem here is that we are forced to deflate mega and non-mega

export values by the CPI rather than the export price index for each series, as separate export price indexes for mega and non-mega exports are not available. This injects added noise into the data producing poor quality results.

To gain additional insights into the relationship between exchange rates and trade, we disaggregated Mozambique's export data further to look at individual commodities within the non-mega cohort. Fortunately, enough time-series data were available for cotton exports to facilitate this exercise. We estimated export supply equations for cotton using both export volume and export value data. Results for the export volumes specification show that global incomes and the real effective exchange rate explain about 75 percent of the variance in cotton exports. In addition, both foreign purchasing power and the real exchange rate are significant at the 95 percent level.[17] The elasticity of response of cotton export volumes to changes in the real exchange rate is found to be -1.30, indicating that the impact of exchange rate fluctuations on cotton export volumes is sizeable. The export value specification of the cotton export equation indicates that global income is important and significant, but, while the response to exchange rate changes has the correct sign, it is not significant (significant only at 80 percent level). Unfortunately, we did not have enough data on other non-mega exports, such as tobacco and cashew, to explore additional export elasticity estimates.

[17] See Appendix I for regression results.

Figure 10: Mega Project Exports, Other Exports and Real Effective Exchange Rate



Source: IMF

Finally, we examined the impact of exchange rates on import demand. A priori, imports should be explained by national income, exchange rates, and prevailing trade policies. Data are available only on import values; hence we estimated the following import demand equation:

$$\frac{M_t^v}{P_t^m} = \alpha + \beta_1 GDP_t^m + \beta_2 REER_t + \varepsilon_t$$

Where $\frac{M_t^v}{P_t^m}$ is import unit values (import value index divided by the import price index); α is a constant term; GDP_t^m is domestic real GDP, $REER_t$ is the real effective exchange rate; and ε_t is an error term. The results demonstrate that the level of domestic real GDP has a pronounced impact on import demand – the estimated elasticity is .92 and is significant at the 99 percent level. The effect of the real exchange rate, however, is shown to have the wrong sign and is not significant.[18] The results of this exercise are surely influenced by the fact that we did not have a measure of prevailing trade policy that we could use as a control variable in the regression.

[18] See Appendix I for regression results.

Another possible effect of exchange rates on trade flows stems from exchange rate volatility. Risk averse exporters could be adversely affected by volatility, particularly in the absence of hedging mechanisms, and this may have consequences for trade. Overall, the consensus of most of the research on the subject of exchange rate volatility and trade is that there is at most a weak negative effect of volatility on aggregate trade flows (Mckenzie 1999; Clark, Tamirisa, and Wei 2004; Darby and MacDonald 2008). Where volatility has, its greatest impact appears to be on the composition of trade – even when aggregate trade flows remain relatively stable, or decline slightly, in the face of high exchange rate volatility, the export basket can change meaningfully.

Raddatz (2011) examined the impact of exchange rate volatility on the structure of trade in 129 countries using detailed product data. She found that exchange rate volatility matters relatively more for products that lack a "natural hedge" and are therefore more exposed to volatility. A natural hedge against exchange rate volatility, which is provided by a negative correlation between a product's international price and the country's nominal exchange rate, is shown to influence a country's export patterns, even after controlling for other standard determinants of export composition, such as factor content of trade and export patterns of countries with similar levels of income. The reason for this outcome is that products and sectors with international prices that are negatively correlated with the country's exchange rate have relatively more stable prices in local currency than do other products and sectors. Given that fluctuations in local currency prices matter for incentives for trade and resource allocation, these goods should become relatively more important in the country's export basket following sustained periods of exchange rate volatility. Thus, the fact that Mozambique exhibits high exchange rate volatility could be having some impact on the country's export composition. Unfortunately, we did not have the detailed data available to look into this issue.

5.0 Exchange Rates and Enterprise Profits

In this section, we turn to a microeconomic examination of the impact of exchange rates, with a shift of focus to firm performance. Exchange rate changes can affect the profitability of firms in a number of ways. First, appreciations (depreciations) can result in a loss (gain) of international price competitiveness. Export volumes and export earnings are apt to fall (rise) as a

result. Any decline in profitability due to, for example, an appreciation may be offset to some degree by two factors: (a) exporter pricing-to-market behavior: an exporter may decide strategically to absorb a portion of the exchange rate change in margins per unit of exports (reducing export price in domestic currency), thereby avoiding a fall off in export volumes, and (b) a decrease in cost of imported inputs following appreciation. Second, profitability of firms not directly engaged in international transactions, such as firms active in import substitution operations, can be affected by exchange rate changes through competition in domestic markets from changing import prices. Third, exchange rate fluctuations can affect firm profitability through shifts in the valuation of assets and liabilities on the company's balance sheet. The size of this valuation effect will depend on the firm's foreign exchange exposure – i.e., the value of holdings in asset portfolios and loans in foreign currency. Firms may decide to remove a portion of their foreign exchange exposure, and reduce the possibility of valuation and other exchange rate impacts, through various forms of hedging.

In sum, the impact of exchange rate fluctuations on firm profits depends on (a) the extent to which a firm is involved in trade, either in terms of exports or imports, (b) the competitive environment within which a firm operates, and (c) the extent of foreign exchange exposure of a firm's balance sheet. In international markets, it influences pricing-to-market behavior. In domestic markets, any positive impact of an exchange rate shock, for example declining imported-input prices owing to an appreciation, might have to be passed on to consumers.

In the end, the link between firm profits and exchange rate changes is largely an empirical issue, as it is difficult to say in advance what the final outcome will be in all cases, as it depends on the characteristics of the firm and its products, as well as the nature of competition. One empirical study on a large sample of developed and developing countries, using stock market earnings data, found that exchange rate movements do not matter much for the value of industries (Griffin and Stulz 2001). This was especially true for the US economy where exchange rates seem to have a very low impact on firm earnings. A more recent investigation by the European Central Bank (2010) finds a more substantial impact. It examined exchange rate shocks in six industrialized countries, using earnings data of listed companies and classifying these companies by the extent of their international sales. The ECB found that (a) most of the time exchange rate changes have a positive effect on earnings of non-exporters, but the impact is

relatively small, suggesting that the sourcing-imported-inputs effects of exchange rate movements generally out-weight competition effects for non-export companies, (b) for exporters, competition effects out-weight sourcing effects, indicating that appreciations reduce exporter earnings, (c) firms with above-average export sales are not necessarily affected to a larger degree by exchange rate changes, suggesting that these larger multinationals can find ways to manage their way around, or hedge, exchange rate exposure.

Exchange rate volatility can also influence firm earnings, causing substantial swings in profitability in some cases. The impact of exchange rate volatility on profits depends on how exchange rate volatility correlates with a firm's product price and costs, as we noted earlier. Some firms export products whose international price co-moves negatively with nominal exchange rate fluctuations. As a consequence, the prices of their products in local currency are more stable than the product prices other firms, so their profits do not fluctuate as much with exchange rate movements. These firms, as we noted above, have a "natural hedge" against nominal exchange rate volatility. For other firms that are more exposed to volatility, the oscillation of prices and profits matters, particularly in developing countries where financial markets are less developed. In these low-income countries, swings in relative prices and profitability can cause difficulties in capital markets, as there is limited ability to bear this type of elevated risk. The result can be underinvestment in the activities of these firms and resource shifts toward products and firms with less volatile profits (Hausmann and Rigobon 2003; Raddatz 2011).

Mozambique does not have detailed time-series data on firm earnings in various industries to examine the microeconomic impacts of exchange rate shocks. What we can do, however, is look at examples in a few sectors to get some idea of the direction and magnitude of possible effects.

5.1 Agriculture

Turning first to agriculture, an important issue for entrepreneurs and firms making investment decisions is how exchange rate shocks affect relative producer price incentives between sectors, such as agriculture and industry. A central tenant of economic policy in developing countries has been to "get prices right" so that investment decisions are not distorted. Trade and macroeconomic

policies in many developing countries are often viewed as having negative effects on relative producer price incentives in agriculture verses industry, hindering development of the agriculture sector (Krueger, Schiff, and Valdés, 1988). The common policy prescription for this problem is to reduce these distortions to improve agricultural price incentives for investors. A key element in this cure is to remove any overvaluation in exchange rates, as appreciation is seen as an important negative for investment is tradable agricultural goods.[19] So what can be said about the importance of exchange rate effects for relative price incentives in Mozambique?

Jensen, Robinson and Tarp (2002) address this question using general equilibrium models for 15 developing countries, including Mozambique. They find that changes in exchange rates in a general equilibrium system prove to be quite important for relative price incentives. However, exchange rates have differing impacts on relative agriculture price incentives depending on specific country characteristics. Differences in impact depend crucially on a country's relative trade shares between agriculture and industry and on the relative elasticity of import demand and export supply.

In Mozambique, trade shares of primary agriculture are low and there is a bias toward imports. Agriculture's use of imported inputs is also relatively low. Industry's trade shares, by contrast, are high, especially when mega projects are included, and industry's use of imported inputs is high. Accordingly, real appreciation of the metical would be expected to improve relative price incentives in agriculture and real depreciation to worsen them. Real appreciation generally works to lower the terms of trade for exports and lower input costs for sectors using imported inputs.

That is why in countries with large agricultural trade shares, the impact of terms-of-trade effects (often combined with trade protection) dominate import-cost effects, such that exchange rate appreciation generally worsens relative price incentives for the most intensively traded sector. In Mozambique, however, because of the low aggregate trade shares of primary agriculture, the impact of appreciation is just the opposite – imported-input cost effects dominate terms of

[19] As Jensen et. al. argue, the assumption of tradability is quite important. The earlier research on bias in agricultural price incentives assumed that domestic agricultural products and world market goods are perfect substitutes, and that essentially all agricultural goods are traded. This can lead to overstating the bias in agricultural price incentives, as we will see in Mozambique, since variation in agricultural tradability is crucial for the transmission from policy interventions to relative domestic price incentives.

trade effects, leading to improved relative agricultural price incentives (see table 3).

Table 3: Trade Shares and Imported Inputs

Product	Trade Shares (%)		Imported Inputs (%) *	
	Exports (a)	Imports (b)	Family F	Commercial F
Cassava	<1	0	15	17
Maize	12	11.5	15	30
Rice	<1	60	10	20
Wheat	<1	99	(na)	(na)
Cotton	98	0	14	16
Soybeans	<1	0	11	12
Cashew	65	0	12	22
Tobacco	90	0	(na)	(na)
Horticulture	<15	(na)	(na)	(na)
Manufactures	>70	(na)	(na)	60

Source: Arlindo and Keyser (2007); Donovan and Tastao (2010); GTZ/Technoserve 2010.
(a) Exports as a percentage of production; (b) Imports a percentage of consumption;
*Imported input costs for all stages of production (farm production, processing, assembly and logistics) as a % of final shipment value.
Family F = family farm and Commercial F = commercial farm; (na) not available.

However, this aggregate impact of exchange rates on relative agricultural price incentives conceals differences in outcome across specific products. Individual agricultural commodities differ significantly in their trade shares and use of imported inputs, consequently the impact of exchange rate changes on producer price incentives within agriculture differs product by product. Estimates of the differences in trade shares and imported input use for important agricultural product categories are presented in table 3. Primary food crops, which dominate value-added in the sector, have low trade shares (although export shares vary somewhat year to year depending on prices) and imported input use differs depending on whether the staple crop is grown on a family or a commercial farm – on the whole, imported input costs are a relatively modest proportion of a family farm budget, while they play a more significant part in total costs of a commercial farm, as might be expected. As a result, the terms-of-trade effect of an appreciation tend to be small, while imported-input effects improve incentives, especially for commercial farms. Conversely, real exchange rate depreciation exacerbates relative price incentives.

Export crops, on the other hand, such as cotton, tobacco, and cashew, are shown in table 3 to have much larger trade shares than staples. Accordingly,

real exchange rate shocks should have a more substantial impact on the export terms of trade for these commodities. Real appreciation, in the case of these tradables, worsens relative producer price incentives and real depreciation improves them, as negative export terms-of-trade effects will dominate positive imported-input effects. We found support for this in section 3 in the case cotton exports. The response elasticity of cotton exports to real exchange rate changes is such that a 10 percent sustained depreciation (appreciation) will result in an estimated 13 percent increase (decrease) in cotton export volumes. In Mozambique, these tradable agricultural products provide the majority of cash income for rural smallholders who constitute the bulk of the population. Therefore, any extended episode of real exchange rate appreciation can have adverse consequences for the cash incomes of a large segment of society, including the poorest segments of the populace who are part of this smallholder cohort.

For domestic import-substitution investments in staple foods, particularly in crops such as rice and wheat with large import shares in consumption, appreciation will tend to reduce producer price incentives, as competitive effects from falling import prices of these staples out-weight any positive effects from lower costs of imported inputs. The impact of exchange rate swings on the competitiveness of these investments is important because it influences Mozambique's ability to deal with rising world food prices, which is becoming an ever more pressing problem, considering the country's large requirements for imported staples to feed a low-income, growing population. Import substitution will have to play an increasing role in meeting these food deficits in the future, and competitiveness of local production is key to accomplishing this objective. In the case of maize, the overall impact of declining import prices in the aftermath of an appreciation is somewhat more ambiguous, given its smaller import share and the relatively sizeable use of imported inputs, particularly on commercial farms. Additionally, VAT is levied on imports of maize, although large-scale processors who import and process for sale locally receive a VAT rebate (which is not costless in most cases, as according to interviews with processors there are often delays in repayment of VAT).[20] Other aspects of trade policy also do not play much of a role in shaping exchange rate

[20] Donovan and Tostao (2010) report, however, that this VAT rebate helps to give large processors a clear advantage over maize meal from small-scale processors, as the small-scale firms without a VAT rebate have to buy higher-cost maize from local suppliers, which increases substantially in price after the main marketing season.

impacts on price incentives, as Mozambique has an open trade policy for staple foods.

An additional important point that needs to be stressed, in addition to the impact of exchange rates on import substitution, is that Mozambique today has very poor business conditions in agriculture – infrastructure, transportation, extension services, input suppliers and so on, are all important constraints to production improvement. This puts most import-substitution ventures in staple foods in a fragile position. For the most part, given such a poor business environment, these investments are only marginally competitive at present.

Rice import substitution is a good example. Rice is a staple food crop where increased import substitution could make an important difference. Rice is the third largest source of staple food calories in Mozambique behind cassava and maize and consumption is growing at the rate of about 18 percent per annum. Currently somewhere around 60 percent of rice consumption is imported and these imports have been rising steadily as consumption growth outstrips sluggish local production. Domestic rice cultivation is centered in the most populous central and northern provinces of the country; so strategies to increase yields and improve competitiveness of production would not only improve food security but would also contribute to poverty alleviation. Ninety-seven percent of rice production is cultivated under rain-fed conditions and there is very limited use of improved seeds, fertilizers, and chemicals, so yields are some of the lowest in sub-Saharan Africa. In addition, about 15 percent of rice is lost post-harvest and high-cost transportation adds 30 to 40 percent to the consumer price. The 3 percent of farms that are in irrigated areas and use improved seed fare better with yields roughly three times higher. But, even under these improved, irrigated conditions, competitiveness of domestic rice production has traditionally been under pressure from cheap Asian imports.

In 2006/07, the world market situation for rice changed and prices began to rise sharply – the price of a ton of Pakistani 25 percent broken white rice (generally what Mozambique imports) jumped from $230 fob Pakistan in 2006 to $372 in 2010, an increase of 62 percent (in 2008 the world price peaked at $498). Mozambique's domestic rice prices have risen in tandem with this upsurge in world prices. This has spurred increased interest in the donor community and in the private sector in expanding domestic rice production, particularly in the

country's irrigated areas, and several large investments have been made.[21] The central question is, is the competitiveness of domestic rice production high enough to compete with imports in the wake of these world market price changes? In 2006, an agricultural supply-chain study showed that a ton of Asian white rice landed at Beira was $430 cif. Converted at the going 2006 exchange rate of $1= 25MT, this ton of imported rice was 10825MT, while a competing domestic ton of rice, delivered to the same location, was 9725MT, a local competitive margin of just 11percent (Arlindo and Keyser 2007). Clearly, a margin this slim is not enough to induce much domestic investment in import substitution. Typical year-to-year exchange rate volatility in Mozambique shown in this study could wipe out any domestic profits – for example, an exchange appreciation from 25 to 22MT per dollar, would drive the margin of domestic rice into negative territory. This is why expert opinion at the time deemed intensive rice production "an unlikely economic prospect in Mozambique" (Walker et. al. 2006).

Today, investors are hoping to use improved seeds, fertilizers, and agronomic methods to double yields in the country's irrigated perimeters from 3 to 5 or 6 tons per hectare in order to raise profitability. Currently, the cost of a landed ton (Beira/Nacala) of 25 percent Pakistani broken white rice is $600, while the delivered cost of local rice from these new investments is roughly $500 (including transportation and milling), a local competitive margin of 20 percent. This profit margin is realized with yields of 5 tons per hectare, according to local investors. It is clear that the higher yields of these new investments are increasing domestic competitive margins. However, considering the many uncertainties involved in such ventures, driven by the possibility of weather shocks, fluctuating yields (which, in addition to weather depend on getting quality inputs on time), and the ever-present volatility of metical exchange rates, risk-adjusted returns on rice import substitution continue to be quite slim, even though margins appear to be improving.[22]

[21] Japanese and Chinese donors have provided funds for investments and Olam, a large private agricultural trading company from Singapore, has made a $35m investment in rice production in the Central Mozambique province of Zambezia in the Tewe irrigation system.

[22] Another example of the fragility of import substitution and the impact of exchange rate swings on competitiveness comes from poultry. Currently imported frozen chickens are cheaper than Mozambican chickens.

Live Mozambican chickens weighing 1.1 kilos are being sold for between 140 and 150 meticals (5.2 to 5.6 US dollars). But an imported frozen chicken of the same size costs between 125 and 130 meticais. With the imported chickens seizing their market, many Mozambican poultry farmers, finding it difficult to pay their bank loans, have given up poultry altogether. It is reported that Mozambican chickens had been competitive in the first few months of 2011, but not anymore after about a 23 percent appreciation in the nominal metical exchange rate since January 2011. There is now an excess supply of imported chickens, and it has become difficult for Mozambican

5.2 Tourism

Tourism is a service-export sector where firms can be importantly affected by exchange rate shocks. The direction and magnitude of effects on relative investor price incentives in tourism, as in agriculture, will depend on export trade shares and on the relative elasticity of import demand and export supply. Mozambique does not have a great deal in the way of available time-series data on tourism on which to base a detailed examination of exchange rate shocks, other than basic arrival data beginning in 2004. What we do have available, however, is a tourism value-chain study carried out by the International Finance Corporation of the World Bank in 2006. This study provides a detailed value-chain cost analysis for four basic travel itineraries for tourist visits to Mozambique. The analysis focuses on itineraries chosen to represent the varied tourism products, destinations, and market segments offered by the country's tourism experience. The following itineraries were selected for the analysis:

1. Lisbon - Maputo – Vilanculos/Bazaruto Archipelagos (Southern Leisure Tourism)

2. London/Johannesburg - Maputo – Pemba/Quirimbas (Northern Leisure Tourism)

3. Europe – Maputo (Business/Conference Tourism)

4. Nelspruit - Maputo – Inhambane - Vilanculos – Bilene – Maputo (Southern Adventure Tourism)

The different value-chain cost structures in each of these itineraries result in differences in export trade shares, as large portions of the revenues from the trips are appropriated by foreign entities – e.g., foreign tour operators or foreign airlines. Table 4 shows the export trade shares for the four itineraries along with an estimate of imported input use in the production of domestic tourism services. It is clear that, although foreign entities appropriate a significant slice of value-added in some cases, effective export trade shares in tourism are large. In addition, imported inputs play a substantial role in producing value-added in the sector. Hotels and restaurants in particular import a large proportion of their food and beverages, so much so according to the IFC that these imports raise costs 5

farmers to make a profit. The government in response to this problem has decided to remove the 17% VAT from companies producing chicken feed, as feed represents 60% of production costs. This story comes from the September 26, 2011 edition of the Maputo daily "Noticias".

percent above the average costs of competing export businesses in surrounding countries, such as Tanzania and Kenya (IFC 2006). In addition, Mozambique's tourism businesses use a lot of imported diesel fuel to run generators due to electricity problems, as well as imported building materials and foreign technical personnel. Thus, it is probably not an over statement to estimate that imported inputs represent roughly 35 to 40 percent of costs. Given the indicated high domestic value-added of tourism, real appreciation of the exchange rate would be expected to lower the terms of trade for tourism service exports and lower imported input costs for tourism facilities. The net effect would be to reduce relative tourism price incentives for investors, as terms-of-trade effects will dominate import-cost effects.

Table 4

Itineraries	Total Tourist Expenditure ($)	Domestic Revenue (MT)	Export Trade Share (%)	Import Share of Cost
1.LMVB	2000	29040	44	>30
2.LJMQ	2846	75900	81	>30
3.Bus/Conf	2690	43230	49	>30
4.NMIVBM	1310	42405	98	>35

Source: IFC Tourism Study Mozambique 2006. Exchange rate in 2006 33MT = 1USD.

6.0 Exchange Rate Fluctuations and Changes in Valuations of Assets and Liabilities

6.1 Accounting for Valuation Effects

Exchange rate changes affect the prices of a country's assets and liabilities, thereby causing changes in portfolios and generating potentially large wealth effects that can influence the spending decisions of consumers and firms (Committeri 2000). Accounting for these changes in valuations of a country's assets and liabilities is summed up in balance sheet levels called the net international investment position (NIIP). NIIP shows the stocks of a country's international assets and foreign liabilities at a point in time. The NIIP consists of stock variables derived at the end of each year from changes in flow variables in the current and capital accounts of the balance of payments. For example, in terms of NIIP, a current account deficit corresponds to net financial transactions that

increase (decrease) an external debtor (creditor) position. A country is a net creditor (international assets > foreign liabilities) or a net debtor (international assets < foreign liabilities) depending on whether NIIP is in surplus or deficit. Put another way, we could say that, when NIIP is in surplus, the country's net external wealth position increased during the year, and, when it is in deficit, the country's wealth position decreased.

The impact of exchange rate changes on the wealth position of a country depends importantly on the currency denomination in which assets and liabilities are held. Exchange rate effects may be increased or decreased when the currency denomination of assets and liabilities vary. If assets and liabilities are denominated in the same currency and NIIP is in deficit, then exchange rate appreciation would reduce the NIIP deficit, and improve the country's wealth position, because the impact on the larger holdings of foreign liabilities would be more important than the impact on the smaller holdings of international assets. If, on the other hand, holdings of international assets are denominated in foreign currency while foreign liabilities are held in local currency, then this makes revaluation of external assets more responsive to exchange rate movements. An exchange rate appreciation, in this case, will increase the NIIP deficit, measured in domestic currency, and reduce the country's external wealth position.[23] If assets and liabilities were held in the same currency in a country with a NIIP of zero, then the net external wealth position would be unaltered by an exchange rate shock. As international assets and foreign liabilities are denominated in foreign currency in Mozambique, the issue of importance for exchange rate-induced valuation effects on the NIIP is the mix of foreign currencies in which these assets and liabilities are held and the differential rates of appreciation and depreciation of the metical against these currencies.

Table 5 shows Mozambique's NIIP from 2007 to 2010.[24] These data indicate that Mozambique is a debtor country with a net liability position of 91 percent of GDP in 2010. This reflected an accumulated increase in net liabilities over the period of almost 40 percentage points since 2007. What caused these changes in NIIP?

[23] That is, the value of the country's international asset position in local currency is lowered by appreciation while its foreign liability position remains the same, exacerbating the NIIP deficit and reducing the country's external wealth position. This issue of assets and liabilities being denominated in a foreign and local currency, however, generally only arises in highly industrialized countries with internationally convertible currencies.

[24] Data on Mozambique's NIIP are not available from the IMF's Balance of Payments Statistics before 2007.

The international investment position is valued based on existing market prices of assets and exchange rates at the end of period each year. Therefore, changes in the international investment position are explained by three basic factors (a) revaluations owing to changes in asset prices and exchange rates (b) changes due to net financial transactions involved in movements in the current account and capital account in the balance of payments and (c) changes due to "other adjustments". Since Mozambique runs a large balance of payments deficit (averaging about 11 percent of GDP after grants) requiring transactions to finance this shortfall, net financial transactions in the balance of payments had the largest impact on the NIIP over the period.[25] Revaluations due to exchange rates and prices played a significant but smaller part. We do not have the information to make a precise calculation of NIIP revaluations due to exchange rate fluctuations. However, we do have data to examine price and exchange rate revaluations to Mozambique's external debt position, which represents a large portion of NIIP liabilities, in that total external debt (public and private) amounted to roughly 60 percent of GDP in each year during the 2007-10 period. As table 5 indicates, revaluations to external debt due to prices and exchange rates were significant in every year. In 2007-08, when the real exchange rate appreciated, there were substantial downward revaluations to external debt, and in 2009-10, when the exchange rate depreciated, there were important upward revaluations. Over the whole period, revaluations due to prices and exchange rates netted out to be a downward revaluation of external debt of -3.3 percent of GDP or about -$265mn (see table 5).

Table 5: Mozambique' Net International Investment Position 2007-2010 ($mn)

	2007	2008	2009	2010
Current Account Balance (after grants)	-785	-1179	-1171	-913
Current Account Balance/GDP	-9.7	-11.9	-11.9	-9.3
NIIP	-6399	-7074	-8124	-8892
Total IIP Assets	3091	3320	4222	4422
Total IIP Liabilities	-9490	-10394	-12346	13314
NIIP/GDP	79	72	80	91
Δ Real Effective Exchange Rate (+ = appreciation)	2.3	17.2	-21.7	-9.9
Effect of Revaluations on External Debt/GDP	-3	-8.7	3	5.5

Source: IMF balance of Payments Statistics; IMF Country Report (Sixth Review) 2010; Bank of Mozambique

[25] This outcome is a bit different from what is found in more industrialized countries where there has been a growing importance of revaluation effects. The correlation coefficient between cumulative current account balances and NIIP changes in these countries declined from .6 in the 1980s to .3 in the 1990s due mostly to the effects of increased globalization on financial flows around the world (Lane and Milesi-Ferretti 2008).

6.2 Currency and Asset Substitution

As we noted above, the currency denomination of asset holdings in Mozambique influences the impact of exchange rate changes on the NIIP. Perhaps more importantly, it also influences the impact of exchange rate changes on ERPT and domestic price determination.

Mozambique is an economy significantly influenced by currency and asset substitution. Residents save and borrow in foreign currency and also use hard currencies for means of payment in business and consumption. "Dollarization," as it is often called, is part of the fabric of society. Three important questions for our discussion of exchange rate effects revolve around this issue of dollarization. First, just how dollarized (including other hard currencies like Euros and Rands) is the economy of Mozambique compared with other dollarized economies? Second, does the extent of dollarization affect the degree and speed of transmission of exchange rate shocks to domestic inflation? Third, if dollarization does affect ERPT, what are the implications for economic policy?

Asset substitution, or dollarization, can be measured in different ways, but the most often used gauge is foreign-currency denominated bank deposits as a share of total deposits. In terms of debt and ability to borrow in home currency, the best measure is foreign loans in the banking system as a share of total loans. Beginning with the ratio of foreign-currency bank deposits to total deposits, Mozambique has seen this ratio fluctuate around an average of about 40 percent since 2005 (Speed Policy Note 1/2011). Comparing this average deposit ratio with other dollarized countries in Asia and Latin America, using a ranking scheme devised by Reinhart, Rogoff and Savastano (2003), indicates that Mozambique is at the high end of a group of countries designated "moderately dollarized economies". Many of the high-end dollarized countries in Asia and Latin America had ratios of foreign-currency bank deposits in excess of 65 percent and some reached as high as 90 percent. The average ratio for moderately dollarized countries is in the neighborhood of 30 to 35 percent; so Mozambique is at the high end of this cohort. In terms of debt, the ratio of foreign loans in the banking system currently averages about 35 percent, where it stood at the beginning of the decade. This ratio, however, declined from a high of more than 60 percent in 2005 after the Bank of Mozambique instituted Aviso 5/2005, which

regulated banks to book a 50 percent provision on loans in foreign currency to non-exporters.

Research shows that high dollarization influences the effect of exchange rate fluctuations on the economy. Reinhart et. al. (2003) found that highly dollarized countries have larger ERPT's and higher exchange rate volatility than countries with limited dollarization. In addition, Alevarez-Plata and Garcia-Herrero (2008) substantiate these results, showing that the magnitude of ERPT in highly dollarized countries is much higher, on average, than pass-through in moderately dollarized economies. So, the fact that Mozambique verges on high dollarization means pass-through will tend to be intensified. A central reason why dollarization is so important for ERPT is that non-tradables are priced in foreign currency (e.g., rents and real estate sales) in dollarized countries; hence exchange rate changes in such a setting pass-through to a broader set of goods than in non-dollarized economies.

A high degree of dollarization and high ERPT to prices have important implications for economic policy. First, small open economies like Mozambique, with open current accounts, will have a difficult time conducting independent monetary policy because high dollarization and high ERPT limit the real effects of nominal devaluations. Monetary policy can have real effects by changing relative prices of tradables to non-tradables via the real exchange rate and by changing the interest rate on money in financial markets. In an economic setting with high dollarization and high ERPT, nominal devaluations will not have much of an impact on the real exchange rate, as the speed and magnitude of price level changes will undercut them. Thus, it is much more difficult for monetary policymakers to influence the real economy. Second, policymakers will have a heightened "fear of floating" in dollarized economies with high ERPT. Rather than allowing the exchange rate to float freely, it tends to float, in the words of Calvo and Reinhart (2002), with "a lifejacket". Interventions in the foreign exchange market are more frequent and reserves are maintained at higher levels, all at substantial cost. Finally, under a monetary policy regime with an inflation targeting objective and a floating exchange rate, which appears to be the state of affairs in Mozambique, dollarized economies face numerous disadvantages in achieving their inflation goals because of (a) relatively higher ERPT on prices and (b) the vulnerability of the economy to balance sheet or asset valuation effects (i.e., owing to 35percent of loans in foreign currency). These characteristics may

make the exchange rate flexibility required by the inflation targeting regime disruptive and costly (Alevarez-Plata and Garcia-Herrero (2008).

7.0 Effect of the Exchange Rate on Growth

The impact of exchange rate movements on economic growth results from the cumulative influence of all the effects on prices, trade flows, firm earnings, and asset and liability valuations discussed in previous sections of this paper. Exchange rate-induced changes in incentives, generated by these price and valuation effects, lead to structural shifts in resource allocation, which, in turn, drive changes economic growth. The key element is the relative price of tradables to non-tradables (the real exchange rate) which shapes incentives in the growth process. Rodrik (2008) shows that countries achieve higher growth when they are able to increase incentives for investment in tradables by means of an undervaluation in the real exchange rate. Tradables are shown to be "special," in that production of tradables has positive spillover effects on the rest of the economy in the form of learning-by-doing and technology transfer. However, tradables suffer disproportionately from institutional weaknesses and market failures that often cause the size of the tradables sector to be too small in low-income, developing countries. Therefore, providing incentives (to partially alleviate distortions) to shift the share of tradables in the economy via real exchange rate depreciation could have positive growth-promoting implications. Indeed, it is difficult to think of many developing countries that have sustained growth accelerations in the presence of an overvalued exchange rate (Eichengreen 2008; Hausmann, Pritchett and Rodrik 2004).

We examine this proposition in the context of Mozambique's economic development. Figure 11 shows a plot of the undervaluation index, computed as in section 1, together with changes in year-to-year GDP growth per capita for the period 1995 to 2010. As we noted in section 1, the real exchange rate has been overvalued for most of the period. However, overvaluation, as one can observe in figure 10 (recall that below 1 = overvaluation, above 1 = undervaluation), has been steadily declining since about 1999 and by the end of the decade was close to PPP equilibrium. So the bias in incentives against tradable activities has been improving for more than a decade, but Mozambique had not yet reached a point where the relative price of tradables had begun to act

as a second-best mechanism to alleviate distortions hindering tradables, which might help to foster desirable structural change. Over the same period trends in GDP growth per capita have oscillated up and down in multi-year swings – 2000-03 growth rose substantially, while in the years 2003-09 growth trended down. Given these trends there does not appear to be much of an association between the undervaluation index and GDP growth per capita over this period. The correlation coefficient shows that the undervaluation index is positively correlated with growth per capita, but the coefficient is not significant.[26] Following Rodrik (2008), we also analyzed the data using three and five-year averages to reduce some of the year-to-year noise and to allow time for adjustment to real exchange rate shocks, but there was no change in the results.

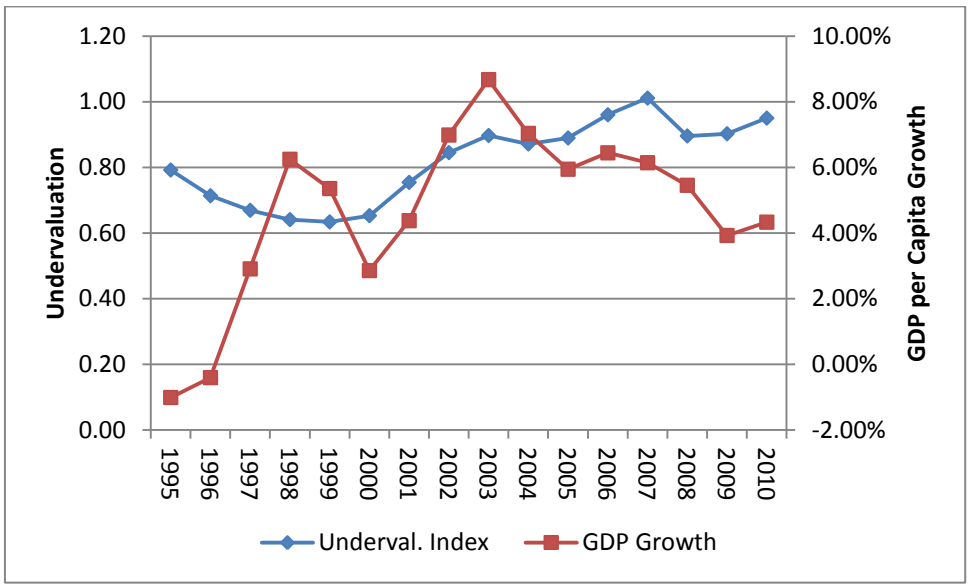
This finding is not surprising for several reasons. First, we are dealing with a relatively short time span in terms of observable changes in structural transformation large enough to spur growth. Second, as noted above, the real exchange rate by the end of the decade had just reached a point where it had removed much of the implied bias against tradable activities, however extreme volatility remains. Third, statistical evidence in studies of the impact of the real exchange on growth has not always been conclusive and for good reason. The real exchange rate should be thought of as a facilitating condition (Eichengreen 2008). Avoiding excessive overvaluation and excessive volatility enable a country to exploit its capacity for growth and development—to take advantage of good infrastructure, an experienced, well-trained labor force, a high savings rate, and a good business environment for foreign investment. As we will discuss in more detail in the final section of this study, an appropriately aligned real exchange rate will not have much impact on growth absent these other growth-promoting factors. Finally, we might uncover a deeper association between the undervaluation index and growth by conducting a more elaborate time-series analysis of this relationship, however this is difficult because one only has 15 years of observations and it is difficult to carry out a proper time-series analysis

[26] Pearson Correlation Coefficients, N = 18
Prob > |r| under H0: Rho=0

	underval	growth
underval	1.00000	0.34449 std. error 0.1615
growth	0.34449 0.1615	1.00000

including all the appropriate control variables. Quarterly data for all the variables was also not available, which could facilitate such an exercise.

Figure 11: Undervaluation and Economic Growth



Source: Penn World Tables

8.0 Conclusions and Policy Implications

Mozambique's real exchange rate has been overvalued for most of two decades, creating disincentives for investment in tradable goods and services. However, overvaluation throughout this period has been declining steadily, from a peak of 36 percent in the 1995-2000 period to close to PPP equilibrium by 2010. In 2011, the medical has appreciated substantially, particularly against the US dollar, and has again become misaligned. Using the average $/MT rate for the first eight months of 2011 to estimate the extent of real exchange rate overvaluation, we find that the real metical is today about 11 percent overvalued. Using the $/MT rate reached in August of this year, the real metical exchange rate is estimated to be more than 30 percent overvalued.

Mozambique's real exchange rate volatility is high, which could be having negative effects on trade and investment. Using the standard deviation of the first difference of logarithms of the exchange rate to estimate the degree of volatility, we find that Mozambique's volatility over the 1995-2011 period has averaged 3.9. When benchmarked against the level of exchange rate volatility in other developing countries, however, Mozambique's high average volatility is not

abnormal for a developing country that is a primary commodity exporter. This cohort of developing countries exhibits the highest exchange rate volatility in the world, largely owing to time-honored shocks in global commodity markets.

Five transmission channels are highlighted in the study through which exchange rates influence economic events. We examine each of these mechanisms to see how recent levels and volatility of the medical are affecting Mozambique's economy. The first transmission mechanism is via prices. Exchange rate fluctuations influence both import and export prices. On the import side, exchange rate changes first pass-through (ERPT) to import prices. Next, it reverberates down the pricing chain to consumer and producer costs. The ERPT to export prices leads to changes in exporter profit margins and trade volumes. We show that the ERPT to import prices, and on down the pricing chain to consumer prices, is very high – estimated to be upwards of 75 percent. In other words, here is almost complete pass-through. This has significant policy implications, which we will discuss in more detail below. As for the ERPT to export prices, we find it to be low – somewhere around 30 percent. The reasons for this revolve around the particulars of the composition of the export basket, competitive pressures in foreign markets, and exporter pricing-to-market behavior. As we noted in section 2, mega-project exports are relatively insensitive to metical exchange rate shocks, and small, non-mega exporters are often compelled to engage in pricing-to-market behavior to protect their foothold in highly competitive markets.

The second transmission channel we examined is the link between exchange rate changes and trade flows. A crucial element in this association is the ERPT. The overall effect of an exchange rate change on trade flows is dependent on the magnitude of the ERPT to import and export prices. Given that the ERPT to export prices in Mozambique is only about 30 percent and significant constraints exist in Mozambique's business environment, one might expect that the trade response to exchange rate changes is somewhat restrained. However, we find that there is a significant correlation between aggregate trade flows and exchange rate shocks. The elasticity of export supply (export volumes) to real exchange rate changes is -.83. When one looks at individual exports one also finds a significant association between exchange rates and trade volumes. In the case of cotton exports, for example, a 10 percent depreciation (appreciation) of the real effective exchange rate is estimated to increase (decrease) export volumes by 13 percent.

Third, we look at the microeconomic impact of exchange rate fluctuations on firm earnings. The effect of exchange rates on enterprise profits depends on the extent to which a firm is involved in trade, in terms of either exports or imports, the competitive environment within which a firm operates, and the extent of foreign exchange exposure of a firm's balance sheet. In the end, the link between firm profits and exchange rate changes is largely an empirical issue, as it is difficult to say in advance what the final outcome will be in all cases, as it depends on the characteristics of the firm and its products, as well as the nature of competition. The study focuses on firms in agriculture and tourism.

Turning first to agriculture, an important issue for entrepreneurs and firms making investment decisions in agriculture is how exchange rate shocks affect relative producer price incentives between sectors, such as agriculture and industry. Trade and macroeconomic policies in developing countries have often been distorted, producing negative effects for relative producer price incentives in agriculture. The policy prescription for this problem is to "get prices right" by reducing these distortions to improve agricultural price incentives for investors. A key element in this treatment has been to remove any overvaluation in exchange rates, as appreciation is generally seen as an important negative for tradable agricultural goods. However, exchange rates have differing impacts on relative agriculture price incentives depending on specific country characteristics. Differences in impact depend crucially on a country's relative trade shares between agriculture and industry and on the relative elasticity of import demand and export supply.

Trade shares of primary agriculture in Mozambique are quite low and there is a bias toward imports. Agriculture's use of imported inputs is also relatively low. Industry's trade shares, by contrast, are high, especially when mega projects are included, and industry's use of imported inputs is high. Accordingly, real appreciation of the metical would be expected to improve (or have very little impact on) relative price incentives in agriculture and real depreciation to worsen them. Real appreciation generally works to lower the terms of trade for exports and lower input costs for sectors using imported inputs. Thus, in Mozambique, because of the low aggregate trade shares of primary agriculture, imported-input cost effects of appreciation dominate terms of trade effects, leading to improved relative agricultural price incentives.

But this aggregate impact of exchange rates on relative agricultural price incentives conceals differences in outcome across specific products.

Individual agricultural commodities differ significantly in their trade shares and use of imported inputs. As a consequence, exchange rate impacts on producer price incentives within agriculture differ product by product. Primary food crops, which dominate value-added in the sector, have low trade shares and imported input use is generally low. Export crops, on the other hand, such as cotton, tobacco, and cashew, have much larger trade shares than staples. Accordingly, real exchange rate shocks have a more substantial impact on the export terms of trade for these commodities. Real appreciation, in the case of these tradables, worsens relative producer price incentives and real depreciation improves them, as negative export terms-of-trade effects will dominate positive imported-input effects. We found support for this outcome with regards to cotton, as noted above. Since it is these tradable agricultural products that provide the majority of cash income for rural smallholders, any extended episode of real exchange rate appreciation can have adverse consequences for the livelihoods of a large segment of society, including the poorest segments of the populace who are part of this smallholder cohort.

For domestic import-substitution investments in staple foods, particularly in crops such as rice and wheat with large import shares in consumption, appreciation will tend to reduce producer price incentives, as competitive effects from falling import prices of these staples out-weight any positive effects from lower costs of imported inputs. The impact of exchange rate swings on the competitiveness of these investments is important because it influences Mozambique's ability to deal with rising world food prices, which is becoming an ever more pressing problem, considering the country's large requirements for imported staples to feed a low-income, growing population. Focusing on domestic rice production, this study shows that competitive margins in import-substitution investments are thin; hence, exchange rate appreciation can have serious consequences for investor returns, reducing domestic production capacity and food security.

The fourth transmission channel through which exchange rates affect the economy is via valuation affects. Exchange rate fluctuations affect the prices of Mozambique's assets and liabilities, thereby causing changes in portfolios and generating potentially large wealth effects that can influence the spending decisions of consumers and firms. Accounting for these changes in valuations of Mozambique's assets and liabilities is summed up in balance sheet levels called the net international investment position (NIIP). NIIP shows the stocks of a

country's international assets and foreign liabilities at a point in time. We examine Mozambique's NIIP for the years 2007-10 to see the impact of exchange rate changes on the country's net asset position.

Mozambique is shown to be a debtor country with a net liability position of 91 percent of GDP in 2010. This reflected an accumulated increase in net liabilities over the period of almost 40 percentage points since 2007. Changes in this international investment position are explained by three basic factors: revaluations owing to changes in asset prices and exchange rates; changes due to net financial transactions involved in movements in the current account and capital account in the balance of payments; and changes due to "other adjustments". Given that Mozambique runs a large balance of payments deficit (averaging about 11 percent of GDP after grants), which requires transactions to finance this shortfall, net financial transactions in the balance of payments had the largest impact on the NIIP over the period. Revaluations due to exchange rates and prices played a significant but smaller part. Price and exchange rate revaluations to Mozambique's external debt position, which represents a large portion of NIIP liabilities (roughly 60 percent of GDP in each year during the 2007-10 period), were significant in every year. In 2007-08, when the real exchange rate appreciated, there were substantial downward revaluations to external debt of -3 percent and -8.7 percent of GDP. In 2009-10, when the exchange rate depreciated, there were important upward revaluations of +3 and +5.5 percent of GDP. Over the whole period, revaluations due to prices and exchange rates netted out to be a downward revaluation of external debt of -3.3 percent of GDP or about -$265mn.

The fifth effect of exchange rate movements on the economy is through their impact on economic growth. The effect on economic growth results from the cumulative effects of exchange rates on prices, trade flows, firm earnings, and asset and liability valuations discussed above. Exchange rate-induced changes in prices and valuations influence incentives, which, in turn, lead to the structural shifts in resource allocation that drive changes economic growth. The key element in this chain of events is the relative price of tradables to non-tradables (the real exchange rate) which shapes incentives in the growth process. Countries have been shown to achieve higher growth when they are able to increase incentives for investment in tradables by means of an appropriately valued real exchange rate. We examined the growth-exchange rate link in Mozambique, but we were unable to find an association between our computed index of exchange rate undervaluation and growth over the 1995-2011 period.

The correlation coefficient shows that the undervaluation index is positively correlated with growth per capita, but it is not significant. As other researchers have noted, statistical evidence in studies of the growth-exchange rate link has not always been conclusive because the real exchange rate is a facilitating condition not a direct growth driver. Avoiding excessive overvaluation and excessive volatility enable a country to exploit its capacity for growth and development. Without a well-functioning infrastructure, a disciplined labor force, a high savings rate, and a good investment climate, an appropriately aligned real exchange rate will have little impact on growth.

Policy Implications

The implications of these findings for policy can be stated as follows. Policymakers have done a relatively good job in Mozambique over the last decade managing macroeconomic variables to bring the real effective exchange rate back into rough PPP equilibrium. This has substantially improved incentives for investment in tradable activities over the 1995-2010 period. So far, in 2011, however, the real exchange rate has become misaligned again to the point where tradable investments are now being disadvantaged and exporters of primary agricultural products and import substitution activities are feeling the pinch.

As a policy matter, the real exchange rate is best thought of as a **facilitating condition**: maintaining it at competitive levels and avoiding excessive volatility facilitate efforts to capitalize on opportunities for growth. In particular, the real exchange rate can be critical for jump-starting growth, as it shapes incentives that encourage the redeployment of resources into tradables, which can produce immediate productivity gains. However, policymakers should be mindful that **exchange rate policy cannot substitute for the absence of other fundamental growth drivers –** good infrastructure, well-trained labor force, supportive business environment and so on. In addition, the real exchange rate is a relative price and therefore is not under direct control of the authorities. It can, however, be influenced by policy. Hassan and Simione (2010), for example, find in their study of exchange rate determination in Mozambique that nominal exchange rates are driven by macroeconomic fundamentals (such as money supply), which are clearly under the influence of policymakers.

Mozambique's relatively high dollarization and high exchange rate pass-through to prices have implications for monetary policy. First, the real effects of nominal devaluations via changes in the real exchange rate are limited when pass-through is high. Second, there tends to be a "fear of floating," which increases costly interventions in the foreign exchange market and increases costly holdings of foreign exchange reserves. Third, inflation-targeting monetary regimes with floating exchange rates, which, according to the IMF, Mozambique is currently working towards, face disadvantages that impede the ability to achieve inflation objectives. High ERPT and balance sheet effects often make the exchange rate flexibility required by inflation-targeting disruptive and costly.[27]

Exchange rate volatility is high in Mozambique, but it is not abnormal for a low-income, developing country that exports primary products. The implications of high exchange rate volatility for financial stability and growth depends on the presence or absence of relevant hedging markets—and on the depth and general level of development of the financial sector. Mozambique has been improving in this area, but there is good reason to believe from research in other countries that, where financial markets are underdeveloped, a more variable exchange rate is negatively associated with growth, particularly productivity growth. The central reason is that firms and households lack the instruments needed to manage volatility. Thus, there is a need for the authorities to avoid excessive volatility (realizing that Mozambique's volatility will normally be higher than in other countries) by prioritizing stable monetary and fiscal policies, intervening in the foreign exchange market as needed to prevent spikes (excessive volatility) in the nominal and hence the real exchange rate, and improving structural factors in financial and foreign exchange markets (see footnote 3 above).

It is clear from the study that the exchange rate has an important impact on Mozambique's economy, in terms of domestic price determination, competitiveness of export and import substitution investments, and asset valuations. These outcomes highlight some difficulties for policymakers. On the one hand, to keep down domestic inflation and to keep urban consumers of staple foods happy, exchange rate appreciation has some desirable short-run benefits. Primary among them is that high pass-through to prices means that imports of consumer goods and staple foods will be cheaper, which is especially important

[27] The IMF notes that the Mozambican authorities are still benefitting from the IMF's technical assistance on monetary policy formulation and operations and are working towards an inflation-targeting monetary regime over the medium term.

for urban household budgets. On the other hand, overvaluation of the real exchange rate can hurt long-run growth prospects by reducing incentives for investment in tradable activities, including important import substitution investments for food security. This tension between short-run political necessity and long-run growth prospects may become more evident in the future as mega-investment trade flows put upward pressure on the exchange rate. Authorities will have to pay closer attention to this policy trade-off as export revenues ratchet up, and should keep in mind that development experience – highlighted by the high-growth economies of Asia, but also development experience more generally, tells us that keeping the real exchange rate at competitive levels can be critical for growth prospects, particularly in low-income countries.

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Appendix I

Regression Results: Trade Elasticities

Dependent Variable: Export Volumes	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-242.48994	14.0627	-17.24	<.0001
lwtgdp	1	8.61677	0.45703	18.85	<.0001
lreer	1	-0.83373	0.36125	-2.31	0.0338
Dependent Variable: Export Value Index/Export Price Index	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	1	-194.42856	10.0957	-19.26	<.0001
lwtgdp	1	7.43934	0.32811	22.67	<.0001
lreer	1	-0.37645	0.25934	-1.45	0.1648
Dependent Variable: Mega Export Values/CPI	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	1	-252.67634	18.15729	-13.92	<.0001
lwtgdp	1	8.83483	0.5901	14.97	<.0001
lreer	1	0.07341	0.46643	0.16	0.8768
Dependent Variable: Non-Mega Export Values/CPI	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	1	-245.22867	13.87507	-17.67	<.0001
lwtgdp	1	8.52095	0.45093	18.9	<.0001
lreer	1	0.30366	0.35643	0.85	0.4061
Dependent Variable: Cotton Export Volumes	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	1	-49.92496	15.84774	-3.15	0.0062
lwtgdp	1	2.24763	0.51365	4.38	0.0005
lreer	1	-1.2965	0.39313	-3.3	0.0045
Dependent Variable: Cotton Export Values/CPI	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	1	-60.09264	21.62098	-2.78	0.0134
lwtgdp	1	2.51217	0.70076	3.58	0.0025
lreer	1	-0.73404	0.53635	-1.37	0.19
Dependent Variable: Import Values/Import Price Index	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	1	-0.60767	1.63715	-0.37	0.7151
lgdp	1	0.92479	0.05533	16.71	<.0001
lreer	1	0.08042	0.14706	0.55	0.5916