Currency Devaluation and Economic Growth

The case of Ethiopia

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Abstract

Devaluation of currency has an ambiguous effect on economic growth of a country. In this paper I analyze the effects of devaluation on GDP per capita growth in Ethiopia using time series data from 1980 to 2010. Beside the exchange rate I use variables such as education, private investment, openness to determine Ethiopian GDP per capita growth. The study showed that devaluation has a negative effect on GDP per capita the same year whereas the coefficient for the one year lagged exchange-rate was significantly positive thus devaluation has a time varying effect. Education had an expansionary effect and drought a contractionray effect on GDP per capita growth.

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1. Introduction

Today, in many countries, especially the developing ones, the weakening of their currency i.e. the decrease or depreciation of their own currency in terms of foreign currencies has become a central growth issue. These currency changes can have an expansionary or contractionary effect on economic growth. Many development organizations like International Monetary Fund (IMF) support the idea of devaluation of currency as one means of economic growth besides the financial aid and loans to their member countries for the development of domestic firms. It will increase competitiveness of firms and increase the production of domestic products and output. However, some researchers focusing on developing countries (Krugman & Taylor, 1978) shed light on the negative effect of devaluation on output. Despite ambiguous results from empirical studies devaluation of currency has been used as a growth strategy by many developing countries. Ethiopia, which is one of the sub-Saharan countries, is listed as the least developed countries in the world. Many factors explain the weak economic development of the country. Policies like building up institutions, privatization of the public sector and devaluation of the currency were used in the last twenty years in order to create a sustainable economic development.

The purpose of the paper is to analyze whether devaluations in Ethiopia have had a positive or negative effect on GDP per capita growth. For that purpose I have made a time series analysis of Ethiopia based on data from 1980 to 2010. My multiple regression study also considers the effects of factors other than devaluations and it also tries to distinguish the mechanisms behind a relationship between devaluations and GDP per capita growth.

Even though the study focuses on Ethiopia, the results from my study can hopefully be used when evaluating the growth effects of currency devaluations in other developing countries.

The remaining section of the paper is as follows: Section 2 will describe the growth performance and devaluation strategy of Ethiopia. Section 3 and 4 provides a review of the previous theoretical and empirical literature respectively. Section 5 presents analysis and interpretation of the study. Section 6 compares my results with those from previous studies. Some concluding remarks will be made in the final section.

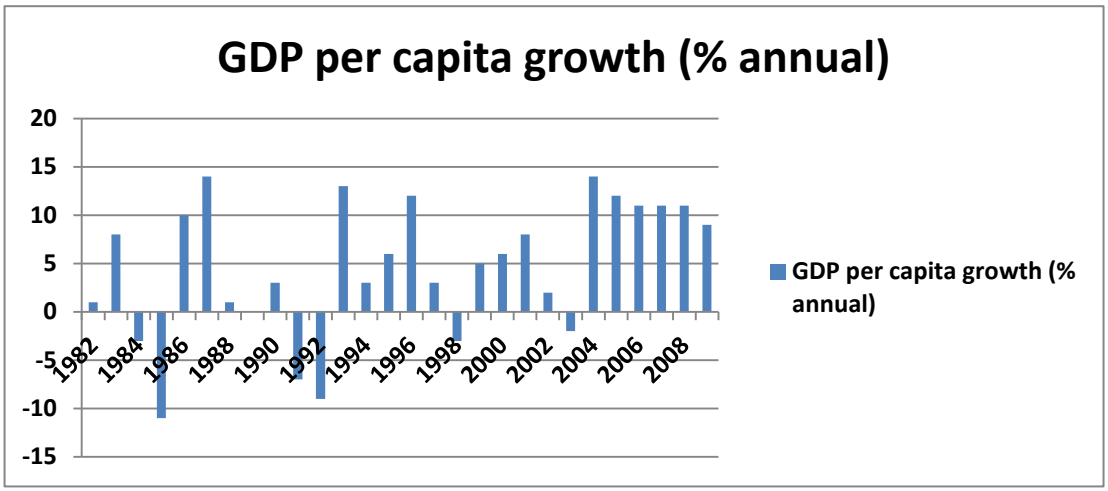
2. Growth and Devaluation in Ethiopia

2.1 Economic growth in Ethiopia

Economic growth of the country has shown various changes in different political regimes. These change in government structure created a problem of inconsistency in implementing the policies by previous regimes as well as natural disaster like famine and drought had a depressing effect on the history of economic growth of the country. Thus in my study I have tried to compare the present and the last two regimes.

During the Imperial Regime (1930- 1974), the county had an experience for modern technology , developments in infrastructure and industries that showed an increase in the rate of GDP in the late 1960 and beginning of 1970's compared to the previous periods. But during the last years of the Imperial regime the GDP growth rate started to fall mainly due to famine in some parts of the country. In addition the rise of opposition parties and political disorder in the country had enormous role for the decrease in GDP (Geda & Befekadu, 2005)

Under the Derg regime (1975- 1991), known for its socialist policy, Ethiopia's GDP growth became lower. These was related to the takeover of the private sector by the government, high pressure from different opposition parties within the country as well as war with Somalia within the first three years were some of the major effects behind the fall in output growth in the country during the Derg Regime. The severe drought that took place in 1984/85 was also additional factor for the decrease in total GDP.(Ibid) In 1984 and 1985 the severe drought declined the growth rate by 3% and 10% in per capita respectively. The figure below shows the annual change GDP per capita growth.



Source:-World Bank (2010)

Fig.1 GDP per capita (% annual) in Ethiopia from 1982 to 2009

From the graph we can see that in 1983, 1986 and 1987 there was an increase in the GDP per capita compared to the other years. After the fall of the Derg regime, a Transitional Government of Ethiopia (TGE) led by the Ethiopian People's Revolutionary Democratic Front (EPRDF) (1991- Present) took power. In this regime new polices where some of the private sector can involve in the market was set even though some of the services like telecommunications, electricity … are under the control of the government. In addition new programs like Structural Adjustment Program (SAP) and Agricultural Development Led Industrialization (ADLI) were implemented to increase economic growth this regime policies. The main purpose of the Structural Adjustment Program was to increase productivity and decrease government debit. As part of this program devaluation of the exchange rate was introduced in order to encourage the export sector as well as increase the production of domestic goods.(Mulat, Guta, & Tadele, 2003)

During the EPRDF regime the GDP growth decelerated by 3% and 2% in 1998 and 2003 respectively. On the other hand GDP rate grew by 14% in 2004 which is the highest growth rate up to present time.

2.2 Devaluation of Ethiopian Birr

The devaluation of the Ethiopian Birr (ETB) per US dollar officially began during the EPRDF regime. Previously the country used to have a fixed exchange rate with a rate of 2.07 Birr per US dollar. Some researchers held during the 1970 and 1980 the birr was overvalued leading to a trade and also public budget deficit**.** (Kidane, 1994) said that the overvaluation of currency was the result of the problem in the management. This overvaluation of currency highly discouraged the export as well as domestic production by making the price of imported goods cheap. In addition there was shortage of exchange rate and only few people had the chance to enter the market.

As a result of the overvaluation and scarcity of the foreign currency the unofficial or parallel exchange rate began to spread in the country. In mid 1980 the unofficial rate reached 6 or 7 birr per US where the official rate was still 2.07 birr per US dollar. Taking this into account the transitional government of Ethiopia decided to devaluate the currency to 5 birr per US dollar in 1992. The devaluation of exchange rate was expected to increase output by encouraging the export sector as well as increase domestic production.(Taye, 1999)

After the devaluation in 1992 the exchange rate is changed from fixed to flexible rate in order to control overvaluation through a gradual depreciation of domestic currency every year. The gap between the unofficial and official rate also decreased compared to the period when the exchange rate was fixed. However during the fiscal year 2007/08 the rate of depreciation against other foreign currencies increased compared to the previous years.[1] In the 2009/10 and September 2010/2011 the Ethiopian Birr was depreciated to 23.7% and 16.5% respectively against the US dollar. This huge devaluation was expected to "decrease overvaluation and increase competiveness" (IMF, 2010; MOFED, 2009).

The increase in depreciation rate was expected to encourage the export sector. The higher increase in export rate, the better the rate of growth of the economy. The export of goods and services was 11% of the GDP in 2009 and yet the trade balance is negative. The world financial crisis where the major importing countries decreased their import quota might have a negative

[1] The Ethiopian fiscal year(EFY) is from July 8th to July 7th

Calendar year is from September 11 to September 10

role in the decrease of the export as well as low growth since export is one part of the GDP (NBE, 2010).

3. Theoretical literature review

3.1 Pros of devaluations

Traditional views in macroeconomics such as Keynesians approach emphasize the expansionary effects of devaluation to output and growth. In this approach output is determined by aggregate demand and devaluation will have positive effect by simulating aggregate demand and output. Devaluation has an expansionary effect through "expenditure switching and reducing effect". It can help shift the demand from foreign goods to domestically produced goods (Taye, 1999). In addition when there is devaluation in a country the price of imported goods will increase whereas the price of domestic goods will decrease which in turn will increase the export of goods. And if the Marshall- Lerner condition is satisfied devaluation of currency can improve the trade balance as well as GDP in the long run. [2]

(Paul, 2006) provided a support for the positive effects of devaluation on economic growth on firms that produce both in the local and foreign market. When a currency is devaluated the amount of profit gained by a firm producing in the foreign market increases when converted to the local currency. This increase in profit can be used for the development of the R& D as well as innovations of new technologies. Finally the improvement and introduction of new technologies through profit will decrease their previous cost used which in turn increase output.

(Gala, 2007) also made a similar argument with investment. He added the increase in export sector and innovations will lead to "investment- led growth" .This rise in investments will result in growth in GDP.

Devaluation can bring growth through improvements in price competition. (Harris, n d) mentioned that devaluation may also lead to higher growth by the reduction in relative firm's price having a positive effect on their profits. As cost of imported goods increase people will

[2] "According to the Marshall-Lerner condition, devaluation of currency will have a positive effect on trade balance if the sum of price elasticity of export and import is greater than 1" (Ratha, 2010)pp.249)

shift to domestic goods. The increase opportunity to the foreign market and the increase in the consumption of domestic as a result of devaluation will reduce the cost of production. In this case producers will provide cheaper price that can enable them to increase their profit and become competitive in the market and growth.

Devaluation can also be used as one means of increasing growth by stabilizing the economy by increasing exports and improving the current account as well controlling overvaluation of the exchange rate that increase import of goods (Branson, 1986).

3.2 Cons of devaluation

Despites its expansionary effect devaluation of currency has a negative impact on the growth of a country. (Krugman & Taylor, 1978) mentioned devaluation will induce an increase in profits share of GDP having a negative effect on aggregate demand if the saving propensity of firms and capital owners is higher than for wage earners.

For a country that is highly dependent in the non tradable sector devaluation can have a negative impact. The distribution of resource from the profit gained in the exposed sector to the non exposed sector and the cost of price for imported goods used for production will not be proportional. Due to this, the unexposed sectors as well as the total output growth will lose. (Goldberg, 1990; Stryk, Jr, & H., 2000).

Devaluation can result in high profit for firms that are exposed to the market. But sometimes this high profit will make firms idle if there is less competition, favorable situation and finally result in no change in the long run. According to the theory of transformation firms will increase their productivity and become more creative when there is high competition, sudden fall in the demand of products or an increase production cost and result in a low profit (Erixon, 2007).

The increase in price of goods as a result of devaluation may decrease the total money in circulation (real money). A devaluation will push the interest rate up wards and decrease the aggregate demand ceteris paribus. Domestic firms that use bank loan for production will also be affected as a result of the increase in the interest rate. For countries that borrow money and are highly in debt, the increase in interest rate together with devaluation of currency will make situations even worse as the amount will increase.(Bird & Rajan, 2003; Domac, 1997)

Countries that use devaluation as one strategy for growth and provide low price in the foreign market may at the end get a zero profit in the long run. This is true for developing countries specially those who are new comers to the world market and devalue their currency with respect to the developed ones, are usually highly in debt. So the gain through lower price will be offset by the increase in the amount of debt in foreign currency which will be more expensive if the country devaluate its currency and will result in stagnancy in the economy. (Blecker & Razmi, 2007).

Devaluation of currency in a country where there is a wage indexation may have contractionary effect. When the price of goods increase as a result of devaluation of currency the real wage will fall and producers will be forced to increase the wage rate in order to make workers attain sustainable rate of living cost. This will decrease the profit of producers as their cost will increase (Acar, 2000).

In addition studies show that the result of anticipated and unanticipated devaluation might have different effects on the long run growth rate. (Serven & Solimano, 1992) suggested that expected devaluation can have a negative effect on the growth of an economy. The increase in the depreciation of real exchange rate is one factor for the increase in the interest rate. And when investors expect the rise in the depreciation rate they will not be willing to invest and this will retard investment and hamper growth in the long run. (Courchene, 2002) also added anticipated devaluation will decrease the rate of technology and discourage innovation in investment as investors expect the increase in the price of imported inputs. Whereas when companies don't expect devaluation they won't fear anything so they will invest and it will not have effect on the investment rate.(Serven, 1990)

*3.3 Summarizing the **theoretical** literature*

In general the above argument about the positive and negative effect of devaluation can be summarized as:-

Table 1. Impact of devaluation in the short run and long run growth

	Short-run Growth effect	Long-run Growth effect
Import prices	Contractionary	Contractionary
Profits (in unexposed sector)	Contractionary	Expansionary + Contactionary
Interest rates	Contractionary	Contractionary
Price competition	Expansionary	No (Zero) effect

***Import prices*:** A devalaution will increase import prices which will reduce real wages due to the increae in the price of traded goods and have a negative effects on consumption demand in the short run. Higher import prices may also have a negative effect on investments especially if firms are expecting devaluations in the future.

Profits: Higher profits of GDP will reduce private consumption since capitalists and companies save more than wage earners. Devaluation can result in the loss of profit of the service (unexposed) sector in the short run.

Devaluation can also delay structural change within the exposed sector by particularly favoring established firms industries. Higher profits gained by the exposed sector will reduce innovations (e.g.new products and technologies) if devalaution makes competitors “lazy” (they are earning profits without efforts and by discriminating new firms in different respects.) For example high profits for established firms may make it more difficult for new firms to get access to external finance (banks will loan to established companies).

But one the other hand ,higher profits as a result of devaluation will increase investments e.g. new products , R&D and technologies and decrese their cost of prodcution in the long run.

***Interest rates*:** Negative short run effect on growth because of higher rates of interest, both in the short and long run. The increase in interest will decrease domestic demand, consumption and investment the short run. In the long run due to high interest rate investments are retarded.

Price competition: Short run effects are negative if firms use the devaluation to reduce their prices in relation to 'foreigners'. But this price competition effect of devaluation is only temporary and has zero result in the long run.

4. Empirical Literature Review of Developing Countries

Devaluation of currency has ambiguous result towards growth. Many countries**,** specially developing one**s,** use currency devaluation as a strategy to achieve short and long run growth. A study by (Ratha, 2010) of India confirmed the Keynesian positive view of devaluations and the multiplier effect on the increase in export, one component of GDP and growth. The result showed a contractionary effect in the short run but changed to expansionary effect in the long run.

(P. K. Narayan & S. Narayan, 2007) supported the IMF strategy that encourages the devaluation of domestic currency to increase economic growth. Their study on Fiji indicated that devaluation of currency increased output with "2.3% and 3.3% in the short and long run" respectively.

However (Agénor, 1991) envisaged about the negative side of devaluation in his study of sample 23 developing countries. The main emphasis was the effect of expected and sudden depreciation in the exchange rate. The result showed that expected devaluation has contractioanry effect. The one year lagged expected devaluation has also the same result where as the unexpected devaluation has an expansionary effect.

Furthermore various empirical studies have tested the effect of devaluation in the short and long run growth. Most of the results confirmed that devaluation has contractioanry effect in the short run and zero or no effect in the long run growth. (Edwards, 1986) studied 12 developing countries based on a hypothesis about a negative effect of devaluation. He used the lagged variable to differentiate the effect of exchange rate in the short and long run. The result showed devaluation of the exchange rate in the same year has a negative effect in the short run. But after one year the effect was reversed and resulted in a positive relation. In the long run according to

the author this conflicting effects will cancel each other and result in zero effect in the long run. (Acar, 2000) also used the lagged variable as additional variable to test the relation between growth and devaluation. He took sample of 18 LDC's with different export performance. His result however showed a negative relation between devaluation of currency and output only during the first year, a positive effect the next year and zero growth in the long run as the two effects cancel out in the future. Even though (Edwards, 1986) and (Acar, 2000) got the same result the countries used in the sample as well as the functional form of the dependent and independent variables used in their study is different.

(Acharya, 2010) provided evidence that devaluation will increase the price of import leading to high production export products by the agricultural and industrial sector by studying Nepalese currency. According to Acharya's study the expansion of the industrial sector will decrease the service sector and so does the agricultural sector. But the overall GDP will grow due to the increase in the production of the industrial sector as well as the consistent increase in the export of agricultural products.

(Nunnenkamp & Schweickert, 1990) tested the hypothesis of contractionary effect of devaluation on growth by using data for 48 developing countries. They made a pooled time series cross country analysis of different income groups of developing countries to test the relation between GDP growth per capita and exchange rate. [3] They included other explanatory variables such as government expenditure, terms of trade etc. Their result rejected the hypothesis that countries that exported manufactured goods mainly faced contractionary effect in the short run but these effects were offset by the positive effects. And for exporters of agricultural product devaluation has an expansionary effect on the short run and in the long run. At the end they added low economic growth and the effect of devaluation shouldn't always be related because the low economic growth of some countries might be related to problem in poor economic policies

The ambiguity of the result for the studies using econometric approach of various countries might be due to the difference in the country's economic growth. Having this in mind (Domac,

[3] The sample countries in the study were categorized as low, lower middle and upper income countries based on their income from the World Bank data.

1997) tried to study the hypothesis of contractionary effect of devaluation (both anticipated and unanticipated) on growth by taking the case of Turkey The empirical result showed that unexpected devaluation has expansionary effects where as expected devaluation has a contractionary but statistically insignificant effect. This contractionary effect according to the author might be due to the multiplier effect of the negative trade balance that arises from the decrease in export by foreigners future expectations of an appreciation of the currency.

The result in price competition can help the growth rate at the expense of other country and become misleading. Taking these in mind (Blecker & Razmi, 2007) tested a hypothesis on devaluation of currency with respect to competing developing country as well as developed country. They focused on price competition as a result of devaluation in developing countries involved in the export of manufactured goods to the developed countries. Their result suggested that devaluation of currency with respect to market competing developing country will result in short run growth and decrease the growth of the competing country. On the other hand devaluation of currency with respect to the developed country where the final goods are exported will lead to a contractionary growth especially in those developing countries with high dept rate and high import dependant countries.

5. The empirical study

5.1 The Regression model

The main objective of my regressions is to study the relationship between GDP per capita level (dependent variable) and the exchange rate (main independent variable). My regression study also includes a couple of control variables, variables that are also used to distinguish the mechanism behind a relationship between the exchange rate and growth.

My regression equation is the following:

GDP per capita growth= f (Education, Private investment, Public expenditure, Net trade,

Demographic factor, Exchange rate, Drought and famine, War)

Education is included to incorporate the idea in the growth literature that human capital has a positive effect on growth. Human capital can increase through the development of the workers'

skill. My equation also contains the investment rate (physical capital as a ratio of GDP), considering that physical investments plays a major role for at least temporary growth in growth economics (see for example the Solow model)**.**

The public sector as a ratio of GDP is another explanatory variable in my regression analysis (see, for example, (Agell, Thomas, & Henry, 1997)As one major component of economic growth the public sector provides and share goods and services to the society**.** (Seentanah & Rojid, 2011) maintain that openness of trade is a determinant of economic growth. When a country is involved in trade it will have access to international market**,** exchange knowledge with other countries and assimilate new technologies that can help it to achieve a better economic development. Accordingly openness in international trade is included as a control variable.

Furthermore, according to growth economics, demographic factors are important for growth. Growth in GDP per capita is affected by the number of people below or above the working age which is normally between 15 to 65 (Barro & Sala-i-Martin, 2004)**.** Political instability like wars is another factor that can affect output growth (Yiheyis, 2006). Moreover natural disaster**s** like famine and drought should be considered in a growth equation.

Taking all these variables into account the following equation is derived:-

$$GDPpc= \alpha+\beta_1 Edu+\beta_2 PI+\beta_3 PAB15+ \beta_4 OP + \beta_5 PE + \beta_6 ER +\beta_7 DF + \beta_8 W + \varepsilon_t \quad \text{.....(1)}$$

Edu:Education

PI: Private Investment

PAB15: Demographic factor

OP: Openness

PE: Public Expenditure

ER: Exchange rate

DF: Drought and Famine

W: War in the country

ε: error term

In addition to see the effect of the devaluation in different time period a one and two year lagged exchange rate is added to the original equation.

$$GDPpc= \alpha+\beta_1 Edu+\beta_2 PI+\beta_3 PAB15+ \beta_4 OP+ \beta_5 PE+\beta_6 ER+\beta_7 ER_{t-1}+\beta_8 DF + \beta_9 W + \varepsilon_t \ \ldots (2)$$

where ER_{t-1} is a one year lagged effect of the exchange rate on GDP per capita growth.

5.2. Definition and measures

The indicators of the variables in the regression equation shall be presented. To measure GDP per capita growth I use the annual change in GDP (GDP per capita) divided by the total population.

As (Barro & Lee, 1993) suggested human capital can be measured by the educational attainment level. I have used the secondary and tertiary school enrollment rate in Ethiopia. In addition the physical capital is measured as the relation between private investments and GDP in current prices.

The public expenditure is measured by the expense of the public sector excluding military expenses as a share of GDP. To measure openness I used export plus import over GDP as suggested by (Barro & Sala-i-Martin, 2004).

To measure demographic factors I used people below the age of 15 (PAB15) PAB15 is the percent of the population below the age 15.

The exchange rate in my study is the nominal exchange rate in terms of US dollar per Ethiopian Birr.

War is a dummy variable with the value 1 if there is a war in the country and 0 otherwise.

Drought and Famine is dummy variable used in the study taking 1 if there is a famine or drought and 0 otherwise.

5.3. Regression Techniques

The time series analysis is based on the ordinary least square (OLS) method. Before doing the regression I used the ADF test to check whether the variables have a unit root (non stationary series) or not. All variables except the GDP per capita and Population aged below 15 had a unit root; therefore I estimated the first differences of the variables. A new check confirmed that all these first differences were stationary. The variables GDP per capita and population aged 15 were used in their level form.

After running the first regression I used the New Weywest standard error test in order to correct if there was any auto correlation and if the residual variance is not constant. The corrected (robust) standard error is given in brackets in the section below presenting the regression results.

5.4. Time period and Data Sources

The analyzed time period begins in 1980 and ends in 2010. All data's used are in annual level. The data are brought from Central Statistical Agency in Ethiopia, Ethiopian Investment Agency, Ministry of Finance and Development in Ethiopia, National Bank of Ethiopia and the World**.** Since the official exchange rate was first announced in 1992, I have used the unofficial rate in my study from articles that used primary data sources.[4]

5.5 Regression Analysis and Results

In my first regression I used equation (1) i.e. the one including the exchange rate without a lag**.** The results are presented in table 3. The robust standard error is given in brackets**.**

Table 2:- Regression results without a lagged exchange-rate variable

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	52.52953	83.42874 (74.922540)	0.6296	0.53606
Edu	3.38269	1.25861 (1.19398) *	2.6876	0.014155
PI	0.10232	0.10381 (0.04446)	0.9857	0.336076
PAB15	-1.08165	2.05632 (1.682184)	-0.5260	0.604665
PE	0.41232	0.73503 (0.34388)	0.5610	0.581058

[4] See (Kidane, 1994)

OP	41.39764	23.36768 (17.19035)*	1.7716	0.091702
War	-1.8424	4.33071 (2.40676)	-0.4254	0.675068
DF	-9.04523	2.60929 (2.320714)**	-3.4665	0.002437**
ER	-0.75342	2.71088 (1.33767)	0.2780	0.783835

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Multiple R-squared: 0.5725, Adjusted R-squared: 0.4015 F.stat.3.991, p value:0.00634

As expected the control variables education, private investment, openness and public expenditure have a positive effect on GDP per capita growth . Furthermore the variables PAB15 and war have the expected negative effects on the dependent variable. But neither of these positive and negative relations are statistically significant with three exceptions - education and openness have a significant positive effect where as drought and famine has negative effect on GDP per capita.

The exchange rate has a negative effect on GDP per capita growth but the effect is not statistically significant. The negative sign shows a contractionary effect of currency devaluation on growth the same year but the result is not significant in this case.

I conclude on the basis of the R- square value that the independent variables in the regression equation can explain 49% of the change in the dependent variable GDP per capita during the studied time period.

In order to see the one year lagged effect of devaluation on GDP per capita growth I used equation (2). The results are shown in table 3.

Table 3 Regression results with a one-year lagged exchange-rate variable

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-37.756118	74.922540 (37.770848)	-0.5039	0.6204189

Edu	5.019746	1.030573 (0.482322) ***	4.8708	0.0001229
PI	0.046199	0.099766 (0.053349)	0.4631	0.6488609
PAB15	0.892266	1.663206 (0.832345)	0.5365	0.5981998
PE	0.110823	0.554274 (0.356044)	0.1999	0.8437674
OP	31.185022	19.107134 (14.143378) *	1.6321	0.1200264
War	-3.532057	3.254945 (1.669908) *	-1.0851	0.2921817
DF	-10.487035	1.982112 (1.341839) ***	-5.2908	4.969e-05
ER	-4.157924	2.352386 (1.453093) **	-1.7675	0.0940869
ERt_1	9.947194	2.351748 (1.193076) ***	4.2297	0.0005039

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Multiple R-squared: 0.7807, Adjusted R-squared: 0.671

F-stat.: 7.119 , p-value: 0.000221

In this case most of the control variables stand in a statistically significant relation with the independent variable. The R-squared value in the second result shows that 78% of the independent variables can explain the variations in the dependent variable. Education and openness have a significant positive effect on GDP per capita. The variables war and drought have a significant negative effect on GDP per capita growth. Natural disaster like low rainfall and its devastating effect on agricultural production as well as the Ethio- Eritrea war that affected the GDP growth can be used as an example for the negative relationship exchange rate and GDP per capita growth.

The nominal exchange rate the same year has a negative effect like equation No.1 but significant effect on GDP per capita growth in Ethiopia. This means, holding the other variables constant,

devaluations had a negative effect on Ethiopian GDP per capita growth in the very short run. But the lagged exchange rate had an expansionary effect on Ethiopian growth; this relation was statistically significant. Thus, devaluations were favorable to growth after a year**.** Additional F test was made to test whether the sum of the two effects (contemporaneous and lagged exchange rates) was zero**.** The result failed to reject the sum of the two effects is equal to zero. For this reason I added the two and three year lagged relationship between exchange rate and GDP per capita growth. The two-year lagged exchange-rate variable had a significantly positive effect on GDP per capita whereas the three-year lagged relationship was negative though not significant. This means the growth effect of a devaluation was positive after two years. But this delayed effect became negative, though not significantly so, after three years.

To test the relationship between the other variables with GDP per capita growth without the exchange rate I did another regression and the result is presented in table 4.

Table 4 The relationship between the control variables and GDP per capita

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	66.86537	75.05395 (71.782560)	0.8909	0.383078
Edu	3.36425	1.22894 (1.181695) **	2.7375	0.012337
PI	0.10062	0.10133 (0.044658)*****	0.9930	0.332007
PAB15	-1.396554	1.67816 (1.600282)	-0.8322	0.414665
PE	0.46563	0.69382 (0.336075)	0.6711	0.509469
OP	41.75451	22.81406 (16.948352)*****	1.8302	0.081450
War	-1.37320	3.89979 (2.132580)	-0.3521	0.728257
DF	-8.88101	2.48510 (2.286201)***	-3.5737	0.001792

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Multiple R-squared: 0.5709, Adjusted R-squared: 0.4278

F-stat: 3.991, p-value:0.00634

In this case education has still a significantly positive effect on GDP per capita growth. The coefficient has decreased when compared to the result with the time lagged effect of exchange rate. Private investment, public expenditure and openness have also a positive effect on GDP per capita growth. Private investment has now a significant positive effect on GDP per capita growth and the value of the coefficient has increased compared to the regression result with the exchange rate. The coefficient of openness has also increased strongly compared to the result with the exchange rate. Public expenditure also showed a slight increase. The significance effect of private investment on GDP growth can be related to the positive relation between devaluation and GDP per capita growth that must arose from the effect of devaluation on private investment. The increase in the value of openness and public expenditure can also be related to the positive effect of devaluation on trade and public investments that can lead to an increase in growth rate. The decrease in the coefficient of education might arise from negative effect of devaluation on growth and affected the development in the educational sector.

6. Comparison with other studies

There are a lot of empirical studies on the effect of currency devaluation and growth. Some of these studies are summarized in table 5 and compared with my study.

Table 5 Result of previous Studies

Author and year	Countries examined	Result of the study
(Ratha, 2010)	India	Devaluation has contractionary effect in the short run but an expansionary effect in the long run
(Edwards, 1986)	12 developing countries	Devaluation has a contractionary effect in the short run, after one year it will have an expansionary effect and zero effect in the

		long run
(Acar, 2000)	18 less developed countries	Devaluation has a contracitonary effect in the first year and expansionary effect in the next year. In addition other control variables have positive and negative effect.
(P. K. Narayan & S. Narayan, 2007)	Fiji	Devaluation has an expansionary effect both in the short and long run.
(Yiheyis, 2006)	20 African countries	Devaluation has a contractionary effect in the short run. The lagged result showed a positive effect but it is only temporary.

My regression results showing a negative effect in the short run and a positive effect after one year between the exchange rate and GDP per capita growth are similar to those in (Edwards, 1986), (Ratha, 2010) and (Yiheyis, 2006). But in my study is different in the two year lagged effect which also resulted in a positive relation between the exchange rate and GDP per capita growth. However the third-year lagged relationship between the exchange rate and GDP per capita growth has a negative but insignificant sign**.** The estimates of the short run relationship between exchange rate and GDP per capita growth in (P. K. Narayan & S. Narayan, 2007) are different from my corresponding results. My result showed a negative relation where as their study showed a positive relation.

In my case I used a single country like (Ratha, 2010)and (P. K. Narayan & S. Narayan, 2007) to study the relationship between exchange rate and GDP per capita growth. I also added other control variables that may affect GDP per capita which is similar to most of the studies given in table 5.The length of time period used in my study is same as (P. K. Narayan & S. Narayan, 2007) but the regression techniques are different.

7. Conclusions

Currency devaluation has been used as a tool for boosting economic growth in the world. It was proposed by IMF as a strategy for growth, especially in developing countries. Ethiopia is one of the developing countries that have followed this growth strategy. The country devaluated and experienced its official devaluation of currency in 1992 after the change of government.

The main purpose of this study was to test if this currency devaluation had a positive or negative effect on GDP per capita growth during the time period from 1980 to 2010. In the first regression without any time lags the exchange rate had a negative but not significant effect, thus the devaluation of currency has no effect on GDP per capita growth. The second regression where time lags were accounted for showed that currency devaluation had a significant negative effect on GDP per capita the same year and a significant positive effect after a year.

Education and openness had an expansionary effect on GDP per capita. The coefficient showing the relation between private investment, public expenditure, population age below 15 and GDP per capita had all positive but insignificant effect. War and Drought had a negative and significant effect on GDP per capita growth. Natural disaster that mainly affects the agricultural sector results in drought and famine.

The third regression was to test the relation between the other variables on GDP per capita growth behind the effects of devaluation on GDP per capita growth. From the result we can see that the coefficient of openness has increased compared to the results with the exchange rate. The coefficient of public investment and private investment had also increased with a slight and significant positive effect respectively. Thus the relation between devaluation and GDP per capita growth might arose from the positive effect of devaluation on openness, private investment and public expenditure.

My result only focuses the effect of devaluation on GDP per capita growth on the same year and whether it has delayed effect or not. The change in the exchange rate might have a small short term effect and strong long run effect. But my study didn't test these effects of devaluation in the short and long run growth.

Finally my study tested the general effect of devaluation on growth. But its effect may vary between different types of firms. Devaluations can encourage old and established firms and

discourage new one or vice versa. Due to data unavailability I was unable to cover this issue but studies within this field are welcomed in the future.

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