St. MARY'S UNIVERSITY

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INSTITUTE OF AGRICULURE AND DEVELOPMENT STUDIES

DETERMINANTS OF INFLATION IN ETHIOPIA: EVIDENCE FROM REGIONAL INFLATION PANEL DATA

BY

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A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF St. MARY'S UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN DEVELOPMENT ECONOMICS

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APPROVAL OF BOARD OF EXAMINERS

As a member of the Board of Examiners of the Master Thesis open defense examination, we testify that we have read and evaluated the thesis prepared by Biniyam Gezahegn and examined the candidate. We recommended that this thesis be accepted as fulfilling the thesis requirements for the degree of Master of Arts in Development Economics.

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Declaration

I hereby declare that this thesis titled "DETERMINANTS OF INFLATION IN ETHIOPIA: EVIDENCE FROM REGIONAL INFLATION PANEL DATA" has been written by me and it is record of my own research work. No part of this work has been presented in any previous application for another degree or diploma at any institution. All borrowed ideas have been duly acknowledged in the text and a list of reference provided.

Biniyam Gezahegn …….

Endorsement

This thesis has been submitted to St. Mary's University, School of Graduate Studies for Examination with my approval as a university master's student advisor.

Maru Shete (PhD) ……..

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List of Abbreviations and Acronyms

AA	Addis Ababa
ADB	Africa Development Bank
CPI	Consumer price index
CSA	Central Statistics Agency
D/DAW	Dire Dawa
FE	Fixed Effect
GMM	Generalized Method of Moment
GTP	Growth and Transformation Plan
ICT	Information Communication Technology
IMF	International Monetary Fund
MD	Money Demand
MoFED	Minister of Finance and Economic Development
NBE	National Bank of Ethiopia
NNS	New Neoclassic Synthesis
OLS	Ordinary Least Square
SNNP	Southern Nations Nationalities of People
VAR	Vector Autoregressive

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Abstract

Maintaining stable level of inflation rate has become one of the prime macroeconomic objectives of National Bank of Ethiopia in recent years since inflationary pressure has increased onward of 2003. The impact and magnitude of inflationary pressure also varies across regions in the country. As high and persistent inflation introduces uncertainties into the economy and may lead to slowdown of economic growth by discouraging domestic as well as foreign investments most importantly affecting the consumption pattern and saving by reducing real income. Thus, factors contributing for this inflationary pressure should be properly identified and needs to be tackled. The main objective of this study is to identify the determinants of regional inflation in Ethiopia. In order to achieve this objective, panel dataset over the period 2003-2015 from seven regions were collected and analyzed using System Generalized Method of Moment (System GMM) model. The finding of the study indicated that regional inflation was negatively influenced by regional real interest rate and positively by exchange rate. The study recommended to adopt regional real interest rate as a policy instruments to tackle the impact of inflation.

Keywords; Regional inflation, Panel data, System GMM, Ethiopia

CHAPTER ONE: INTRODUCTION

1.1. Background of the study

There has been no unanimity among scholars regarding conceptualization while some consider it as a phenomenon of rising prices, others considers it as a monetary phenomenon. For instance Crowther defines inflation as a "state in which the value of money is falling, i.e., the prices are rising''; Ackley defines it as "a persistent and appreciable rise in the general level or average of prices" and Coulborn conceptualized, inflation as a situation in which "too much money chasing too few goods" (Hajel, 2009).

Even thought there is no single definition of inflation, it is generally considered as an upward movement in the average prices of goods and services over given period of time. According to Keynes, inflation is a phenomenon of full employment that starts only after economy operates at full employment, and when aggregate demand is in excess aggregate supply. In case, thus, rising prices are indications of the existence of this situation.

In recent years, many central banks have placed increased emphasis on price stability. Monetary policy-whether expressed in terms of interest rates or growth of monetary aggregates-has been increasingly geared toward the achievement of low and stable inflation. Central bankers and most other observers view price stability as a worthy objective because they think that inflation is costly. Some of these costs involve the average rate of inflation and others relate to the variability and uncertainty of inflation. But the general idea is that businesses and households are thought to perform poorly when inflation is high and unpredictable (Barro, 2013).

Historically, Ethiopia has not suffered from high inflation. The annual average was only 5.2 percent from 1980/81-2003/04, and major inflationary episodes have occurred during only conflict and drought. Annual average inflation reached a record of 18 percent during 1984/85 because of drought, 21 percent in 1991/92 at the peak of war with Eritrea, and again 16 percent during the 2003 drought (Durevall et al, 2010).

Geda and Tefera (2008) also indicated that inflation in Ethiopia was not generally considered as a problem before2002/03during which the government exercised tight fiscal and monetary policies that were inherited from previous government regimes. However, in

the period post 2002/03,inflationbegan to appear as a major problem following the government's move towards less conservative monetary and fiscal policy and state activism as a developmental sate in the economy breaking the institutional legacy of fiscal and monetary policy conservatism.

The highest inflation rate in Ethiopia is recorded during the fiscal year of 2007/2008 in which the rate climbed to 64.20% in July of 2008 while the food inflation recorded was 49 % in August 2008.In 2008, Ethiopia had the highest rate of month-on-month food inflation rate in the developing world, at 3.5% per month. Most of this inflation is driven by higher staple food prices, such as maize, wheat and teff (Headey et al, 2012).

Inflation has been also continued to be the challenge during the implementation of the first Growth and Transformation Plan 2010/2011to 2014/15. According to the annual report of NBE of 2010/11 the economy has begun witnessing inflationary pressure during the implementations of the first two years of GTPI. According to this report, the annual average of general inflation at the end of the fiscal year 2010/11 hiked up to 18.1 percent, about 15.3 percentage point higher than the preceding year. The hike was largely attributed by the surge in the prices of food items which contributed 14.1 percentage point to the total annual change in headline inflation. While annual food inflation, scaled up to 15.7 percent from -5.4 percent in June 2010 registering a 21.1 percentage point increase on account of higher food prices in the international market, domestic supply side constraints and reserve money growth largely due to higher NFA. Annual average core inflation also slightly increased to 21.8 percent from 18.2 percent at the end of last fiscal year, owing to higher commodity prices, mainly fuel prices in the international market.

As of the annual report of NBE of 2014/2015, in contrast to the hike of inflationary pressure in the fiscal year 2010/2011, the annual average national headline inflation at the end of the fiscal year 2014/15 has dropped to 7.6 percent showing 0.5 percentage points lower than the previous year level. Meanwhile the annual food & non-alcoholic beverages inflation were 7.4 percent and 7.9 for the non-food inflation. The report indicated that tight monetary policy, prudent fiscal policy and various administrative measures taken by the government have contributed for the single digit rate. Despite the achievement of single digit inflation rate, the country has continued maintaining double digit economic growth

rate the target set by the first GTP achieving 10.2 growth rate for the fiscal year of 3012/2015 (NBE, 2015).

1.2 Statement of problem

Inflation is usually considered as one of macroeconomic problems of an economy since maintaining a stable price level is one of the key indicators of macroeconomic stability and economic prosperity. Early studies (Tafere 2008,Tezera 2013) on the determinants of inflation in Ethiopia were focused on identifying the determinants of national inflation.

Tafere(2008) by developing a synthesis model of monetarist and cost-push inflation theories and estimated using a vector autoregressive (VAR) and single equation error correction models to identify the short run and long run determinants of inflation at national level. He indicated that there is difference in determinants of inflation across sector (food and non food) and the time horizons under his consideration.

He has also explained that there was regional variation in level of inflation during the period 2002/03-2006/07 explaining that the inflation rate in agriculturally productive regions like Amhara and Oromia were higher while Somalia and Dire Dewa regions have the lowest inflation even below the national average inflation rate. This explains that the nature and magnitude of inflation across different regions of the country is different and calls for detail investigation.

Using a quarterly data for the period 1998-2010 and adopting Granger causality model approach Tezera(2013), investigated the determinant and impacts of dynamic inflation in Ethiopia. He indicated that, there existed a bi-directional causality between broad money supply growth and inflation and unidirectional causality between currency devaluation and inflation as well as oil price and inflation. The causality running from inflation to broad money supply growth was stronger than that the other way round. And also it was consistent with the view that in a high inflationary economy, inflation does have a feedback effect on money supply growth and this generates a self-sustaining inflationary process. On the other hand the relationship between inflation and economic growth showed that there was no short-run causality from inflation to economic growth for the complete sample period.

On other hand Durevall and Sjö (2012), adopted a single-equation error correction models for the Consumer Price Index and identified the determinants of inflation in Ethiopia and Kenya. They found that, the inflation rates in both countries were driven by similar factors; where world food prices and exchange rates have a long run impact, while money growth and agricultural supply shocks have short-to-medium run effects. There was also evidence of substantial inflation inertia in both countries. They concluded that, there was no nominal anchor for inflation in either country in the form of a clear and well-functioning monetary or exchange rate policy

Theoretically, different monetary policies such as devaluation of exchange rate, an increase in money supply, decreases in interest rate and fiscal policies like decrease in taxes level and increase in government expenditures have strong implications in determining inflation level of a given economy Romer (1996), Mankiw(2009). Since the Ethiopian government officially adopted the developmental state model in which the government is actively engaged in various economic activities, the government's interventions should be investigated carefully to see if it did not bring inflationary pressure to the economy.

Besides, there have been different views regarding the determinants of inflation among government officials and business men and researcher. Governmental officials argued that, the causes of inflation in Ethiopia are mainly related to greedy merchants (using popular Ahmaric word of <SigbegibNegadewoch)> and economic growth of the country. While the business community and researchers associate it with a failure in government fiscal and monetary policies. As a result of the government's position, the country has implemented different policy packages to control and stabilize price level fluctuation including rationing of basic consumer goods such as sugar and cooking oils through different cooperatives.

An increase in money supply, devaluations of Ethiopian Birr against US dollar, negatives real interest rate, low agricultural productivity as well as government intervention failure in the market are the main factors commonly argued by the researchers and business community for the cause inflation in Ethiopia. They also state that huge public investments in infrastructure such as major hydropower projects ,telecommunication, sugar factories and rail way projects are the cause of inflation by crowding out the private sector and by

increasing the money supply through printing money(Tafere 2008; Tezera 2013; Durevall and Sjö 2012; Teshome 2011; Ademe 2015).

In general, despite the plethora of different studies that investigated the determinants of inflation in Ethiopia, the studies focused on identifying the determinants of inflation based on time series aggregate data at national level, and have found mixed results in their analysis. Beside this, there have been paradigm shift in government development strategies by adopting the interaction of monetary and fiscal policies and controversial arguments are raised on the determinants of inflation among different interested groups of the society. Given these gaps, the study will investigate the determinants of inflation in Ethiopia by disaggregating into regional inflation level analysis. By identifying the regional determinants of inflation, it will finally provide generally acceptable set of explanations for the cause of inflation in Ethiopia in general, and in the different regional states in particular.

1.3 Objectives of the study

1.3.1 General objective

The general objective of the research is to investigate the determinants of regional inflation in Ethiopia evidence from regional nature and causes of the inflation

1.3.2 Specific objectives

a. To identify the determinants of regional inflation in Ethiopia based on the regional data set.

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1.4 Significance of the study

The study identified the determinants of inflation across deferent regions of the country breaking the traditional methodology of investigating factors contributing to inflationary pressure in the economy at macro-level. Therefore, this study is expected to provide information to the government about the determinants of inflation at meso-level and thus will

shed light on alternative policy interventions needed to be adopted by the government and informs researchers about the need for further research at sub-regional level.

1.5 Scope and Limitations of the study

The study is restricted to data collected through survey method by CSA of Ethiopia for last 14 years covering the period of 2003 -2015. The geographical scope of the study is delimited Afar, Tigray, Amhara, Oromia, Somalia, SNNP and Benshangula Gumuz. The study only considered market places and cities covered by the survey of the CSA in these regions. Market price for more than 400 different food and non-food commodities were included in the survey.

The study is limited by the difficulty of getting region-specific variables like the money supply, government expenditure, road and ICT infrastructures and some omitted variables due to lack of secondary time-series data set at regional level.

1.6 Organization of the thesis

The research is organized into five chapters where chapter one provides introduction of the topic. Theoretical as well as empirical reviews of literatures on inflation are organized in chapter two. Chapter three presents the research approach and design, data sources and variables, as well as model specification. Chapter four deals with descriptive analysis on the overview of inflation in Ethiopian economy from 2002/03 and discusses findings from econometric model. Finally, chapter five presents the conclusions and policy implication of the study.

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CHAPTER TWO: LITERATURE REVIEW

2.1 Theoretical Review

2.2.1 Forms of inflation

Economic theories have reached a variety of conclusions about the source and relationship between inflation and macroeconomic variables in a given economy. Before discussing about the theories of inflation and sources and the relationship between inflation and macroeconomic variables, one should have to understand the different forms of inflation and their natures. Inflation categories in differ forms and called by different names based on its degree or rate of price rise and nature and government interference (Hajel 2009). According Hajel (2009) the most common forms of inflation are;

1. Degree of price rise

According to the degree of price rise, inflation has been named as creeping, walking, running and galloping or hyper inflation.

a. ***Creeping Inflation***. Creeping inflation is the mildest form and is conducive for economic progress and growth. In this form, the prices rise imperceptibly over a long period.
b. ***Walking Inflation***. If the price inflation gets help from some other factors and price rise becomes more marked, the situation is as that of walking inflation.
c. ***Running Inflation***. If the price rise becomes more rapid and the prices rise by fits and starts, the situation is that of running inflation.
d. ***Hyper Inflation***. In hyper inflation the price rises every moment, in fact limitlessly. Philip Cagan has concluded that hyper inflation begins when prices start rising at the rate of more than 50 percent a month. It is the most dangerous situation and economists have been scared of this type of inflation.

2. According to scope.

Inflation can be comprehensive and partial.

a. **Comprehensive inflation.** It is comprehensive or economy wide when prices of commodities rise throughout the economy without any exception.

b. **Partial Inflation**. Partial inflation is of a sporadic or sectional nature. It takes place when the price of some goods rise owning to a temporary shortage due to physical conditions. Thus, in a sporadic inflationary situation the rise in price is not due to the shortage caused by distortions in the price structure, i.e., either due to the rise in the price of raw materials or wages rates but due to restrictions imposed by physical conditions on the smooth supply of goods and commodities.

3. According to Government Interference

According to the degree of interference by the government, inflation can be open or suppressed.

a. **Open Inflation.** When government interference is nil, and prices rise freely, it is a situation of open inflation. In the opinion of Milton Friedman as open inflation is an "inflationary process in which prices are permitted to rise without being suppressed by government price control or similar techniques".
b. **Suppressed Inflation.** Suppressed inflation is the result of policies of the government relating to price control and rationing under which the prices are prevented from rising at least for some time, but they rise vigorously as soon as these control are lifted.

2.2 Theories of inflation

2.2.1 The Classical Theory of Inflation

The hallmark of classical macroeconomic theory is the separation of real and nominal variables. This classical dichotomy enables to examine the behavior of the real variables in the economic system while ignoring the nominal variables. To explain the determination of the nominal variables in the system, the classical economists subscribed to the quantity theory of money. More recently the quantity theory of money has been associated with the development of monetarism and the work of Milton Friedman, perhaps the most influential economist in the past quarter-century. Although the term 'monetarism' did not emerge until 1968, its main core proposition, the quantity theory of money, was well established in

classical macroeconomics following the publication of David Hume's influential essay, *Of Money*, in 1752 (Snowdon and Vane 2005).

According to Snowdon and Vane (2005) there were two highly influential versions of the quantity theory in the literature. The first version, associated with Marshall and Pigou, was known as the Cambridge cash-balance approach. The second version was associated with Irving Fisher.

Classical economists drew a clear distinction in their version of the quantity theory between the demand for money (*Md*) and the supply of money (*M*). The demand for money was primarily determined by the need to conduct transactions which will have a positive relationship to the money value of aggregate expenditure. And concluded that, considering the economy at full employment and labour market equilibrium, an increase in the quantity of money, by creating disequilibrium in the money market (*Md*<*M*), will lead to an increase in the demand for goods and services which result rise in price of goods and service. For a given nominal wage, an increase in the price level lowers the real wage and creates disequilibrium in the labour market creating an excess demand for labour. Competitive bidding by employers will drive the nominal wage up until it reaches a value of *W*1, which restores the real wage to its equilibrium value.

2.2.2 Monetary Theory of Inflation

Monetarism refers to the followers of Friedman (1912-2006) who hold that "only money matters", and as such monetary policy is a more potent instrument than fiscal policy in economic stabilization. According to the monetarists, the money supply is the "dominate, though not exclusive" determinant of both the level of output and prices in the short run, and of the level of prices in the long run. The long- run level of output is not influenced by the money supply (Totonch 2011).

The monetarists emphasized the role of money. Modern quantity theory led by Milton Friedman holds that "inflation is always and everywhere a monetary phenomenon that arises from a more rapid expansion in the quantity of money than in total output. Its earliest

explanation was to be found in the simple quantity theory of money. The monetarists employed the familiar identity of exchange equation of Fisher.

In his restatement of QTM, Friedman, unlike classical/neoclassical economists, considers the theory as a theory of demand for money not of demand for output. The quantity of money people wish to hold depends on their money income and cost of holding money. The cost of holding money depends on interest rate and inflation (Patinkin 1972; Barenjee 1975)

They further said that, when the money supply is increased in order to grow or increase production and full employment it creates an inflationary situation within an economy. Monetarist believes that increases in the money supply will only influence or increase production and employment levels in the short run and not in the long run. Accordingly, there will be a positive relationship between inflation levels and money supply. They further explain this relationship by using the theory of natural rate of unemployment (Tezera 2013). But in monetarist analysis, the money supply is viewed as the sole source of shifts in the aggregate demand curve while shrinking the aggregate supply curve resulting continues rise in the general price level. Monetarist analysis indicates that rapid inflation must be driven by high money supply growth (Mishkin, 2012)

2.2.3 Demand Pull Theory

Keynes (1883-1946) and his followers emphasized the increase in aggregate demand as the source of demand-pull inflation. The aggregate demand comprises consumption, investment and government expenditure. When the value of aggregate demand exceeds the value of aggregate supply at the full employment level, the inflationary gap arises. The larger the gap between aggregate demand and aggregate supply, the more rapid is the inflation. Keynesian (Keynes and his followers)do not deny this fact that even before reaching full employment production factors and various appearing constraint can cause increase in public price. This inflation constraint that appears quickly during prosperity is originally resulting from non proportioned section, branches and or various economic

resources that are accounted from natural properties of discipline based on market. Therefore, in one period of prosperity it is completely natural (Totonch 2011).

According to demand-pull inflation theory of Keynes, policy that causes decrease in each component of total demand is effective in reduction of pressure demand and inflation. One of the reductions in government expenditure is tax increase and to control volume of money alone or together, can be effective in reducing effective demand and inflation control. In difficult conditions, e.g. hyperinflation during war that control of volume of money or decrease in general expenditure may not be practical increase in tax can get along with direct action for control on demand.

2.2.4 Cost Push Theory

Cost-push inflation is caused by wage increases enforced by unions and profit increases by employers. The basic cause of Cost-Push inflation is the rise in money wages more rapidly than the productivity of labor. Cost-push inflation may be further aggravated by upward adjustment of wages to compensate for rise in cost of living. A few sectors of the economy may be affected by increase in money wages and prices of their products may be rising. In many cases, their products are used as inputs for the production of commodities in other sectors. As a result, cost of production of other sectors will rise and thereby push up the prices of their products. Thus wage-push inflation in a few sectors of the economy may soon lead to inflationary rise in prices in the entire economy. Further, an increase in the price of imported raw materials may lead to cost-push inflation (Totonch 2011).

2.2.5 Structural Inflation Theory

The structural inflation theory of inflation related the effect of structural factors on inflation.This inflation, giving the structural improvement, results as a cost in fact that is given for immediate economic growth. Structuralism, even the group that does not fine necessary for changing the present policy foundation for eradicating inflation, with the control of inflation through government intervention in the market structure and also, by adopting decisive plans for justly division of inflation pressure there is no opposition and in

fact stress is done on these arrangement. But, common anti-inflation measures especially contraction monetary and budget policy from their point of view, is nothing but only a prescription for stopping the economic growth of non-developing countries, that also through experts that or rationing developed investment countries and world organization under their supremacy (rule) and or by understanding less developed economy features are disabled (crippled) (Ibid).

Rapid and faster growth of the service sector that is related to population growth and immigration is another inflationary factor, which is more emphasized by the structuralism. Remaining structure of distribution network, exclusive quasi and structure some of the developed industry, obstacle structure and heavy cost of works and ten's of other small and big factors additionally to all these structuralism from the aspect of inflationary social policy structure is unaware. It should be noticed that level competition and various society crust for large possession share from National income is one of the main factors of the hidden inflation in the developed investment countries. Structuralism type from this competition in hyperinflation of less developed countries is effective.

2.2.6 New Neoclassical Synthesis (NNS)

As popularized Paul Samuelson, the Neoclassical Synthesis was advertised as an engine of analysis which offered a Keynesian view of determination of national income and Neoclassical principle to guide macroeconomic analysis. The so-called New Neoclassical Synthesis has become a focus of research in the area of monetary policy and is developing into a framework that might establish itself as a standard-model in macroeconomics literature. Since the early 1990s, the sharp difference between the emphasis of new Keynesian and new classical economists on the major origins of business cycles and price movements has been increasingly softening, and a NNS is now on the agenda of macroeconomics (Totonch 2011).

2.2.7 New Political Macroeconomics of Inflation

The major important theories as mentioned above mainly focus on macroeconomic determinants of inflation and simply ignore the role of non- economic factors such as institutions, political process and culture in the process of inflation. Political forces, not the social planner, choose economic policy in the real world. Economic policy is the result of a decision process that balances conflicting interests so that a collective choice may emerge.

The new political economy, literature provides fresh perspectives on the relations between timing of elections, performance of policy maker, political instability, policy credibility and reputation, and the inflation process itself. The case for Central Bank independence is usually framed in terms of the inflation bias (deviation) present in the conduct of monetary policies. However, the theoretical and empirical work suggests that monetary constitutions should be designed to ensure a high degree of Central Bank autonomy.

2.3 Arguments for inflation and Costs of inflation

2.3.1 Arguments for inflation

Many economists argue that eliminating inflation would reduce output and employment, and the cost of the lost output and employment would more than offset the gains from establishing price stability, still others argue that the costs of inflation are small anyway, and could be dealt by other means like indexing the fiscal system. While most economists agree that inflation is "bad" no consensus exists over how bad it is or what should be done about it. Some believe that inflation is a major, even catastrophic, evil, and argue that monetary policy or monetary reform should be geared toward its outright elimination (Dornbusch and Fischer, 1994).

Dornbusch and Fischer argue that there is no direct loss of output from inflation, as there is from unemployment. According to the classical theory of money, a change in the overall price level is like a change in the units of measurement. It is as if we switched from measuring distances in feet to measuring them in inches: numbers get larger, but nothing really changes. Imagine that tomorrow morning you wake up and find that, for some reason, all dollar figures in the economy have been multiplied by ten. The price of

everything you bought have increased tenfold, but your wage and the value of your savings too. What difference would this make? All numbers would have an extra zero at the end, but nothing else would change. Your economic well-being depends on relative prices, not the overall price level (Mishkin 2012).

Some economists believe that a little bit of inflation say, 2 or 3 percent per year can be a good thing. The argument for moderate inflation starts with the observation that cuts in nominal wages was rare: firms are reluctant to cut their workers' nominal wages, and workers are reluctant to accept such cuts. For this reason, some economists argue that inflation "greases the wheels" of labor markets. Only a little inflation is needed: an inflation rate of 2 percent lets real wages fall by 2 percent per year, or 20 percent per decade, without cuts in nominal wages. Such automatic reductions in real wages are impossible with zero inflation (Mankiw, 2009).

Gokal and Hanif (2004) argued that, inflation can lead to uncertainty about the future profitability of investment projects (especially when high inflation is also associated with increased price variability). This leads to more conservative investment strategies than would otherwise be the case, ultimately leading to lower levels of investment and economic growth. T can also reduce a country's international competitiveness, by making its exports relatively more expensive, thus impacting on the balance of payments. Moreover, inflation can interact with the tax system to distort borrowing and lending decisions. Firms may have to devote more resources to dealing with the effects of inflation (for example, more vigilant monitoring of their competitors' prices to see if any increases are part of a general inflationary trend in the economy or due to more industry specific causes).

2.3.2 Costs of inflation

Economists argue a relevant distinction of inflation between a perfectly anticipated and taken into account in economic transaction, and imperfectly anticipated or unexpected, inflation should be made (Dornbusch and Fischer 1997; Mankiw2009; Mishkin 2012).

2.3.2.1The costs of perfectly anticipated inflation

Suppose that an economy has been facing a 5 percent of inflation for a long time, and that everyone accurately anticipates that the rate of inflation will continue to be 5 percent. In such an economy, all contracts would build in the expected 5 percent inflation.

Borrowers and lenders would know and agree that the dollars in which a loan is repaid will be worth less than the dollars given up by the lender when making the loan. Nominal interest rates would be raised 5 percent to compensate for the inflation. Long-term labor contracts would increase wages at 5 percent per year to take account of the inflation. In short, any contracts in which the passage of time is involved would take the 5 percent inflation into consideration. The tax laws would also be indexed. This means the tax brackets would be increased at the rate of 5 percent per year.

The classical economists argued that, in a world in which the classical dichotomy holds, inflation has no effect on the real side of the economy, fully anticipated inflation should not affect your well-being (Mishkin, 2012).

2.3.2.2 Costs of Unanticipated Inflation

The idyllic scenario of full adjustment to inflation does not describe economies in the real world. Countries with long inflationary histories in their economy like Brazil and Israel have made tremendous adjustments to inflation through the use of indexing. Other countries in which inflation has not been episodic in their economy have not adopted indexation (Dornbusch and Fischer, 1994).

2.4 Empirical Literature

Different studies have been conducted on the determinants of inflation across country or economic unions and country specifics. In the following consecutive paragraphs different studies will be reviewed in order to give sight of the studies conducted on the determinants

of inflation starting for cross country studies covering different economies followed by studies conducted in Ethiopia.

According to the report of the Federal Reserve Bank of St.Louis (2011), rising food prices contribute more to inflation in developing countries because food is a much higher share of the consumption basket in emerging markets than in wealthier countries. The report also explains that significant pass-through from food prices to nonfood prices in developing countries compared with advanced countries, where there is almost none.

Vanteenkiste (2009) using a pooled probit analysis has assessed the factors trigger prolonged periods of inflation for a sample of 91 countries over the period 1960-2006. The study conclude food price inflation, the degree of trade openness, the level of past inflation, the ratio of external debt to GDP and the durability of the political regime are the factor that increases probability of an inflation to start in the developing countries. While, for advanced economies, these factors turn out to be statistically insignificant but instead a positive output gap, higher global inflation and a less democratic environment were seen to be detrimental for triggering inflation starts. Interestingly the analysis concludes that oil prices, M2 growth and government spending were never statistically significant.

According to Jaumotte and Morsy (2012) used a traditional backward looking Phillips curve equation and argued that, high employment protection, intermediate coordination of collective bargaining, and high union density increase the persistence of inflation in Euro zone. They have also explained that Oil and raw materials price shocks are also more likely to be accommodated by wage increases when the degree of coordination in collective bargaining is intermediate irrespective adoption of estimation methods, model specifications, and outliers.

A conducted by the African Development Bank (ABD) in 2012, the dynamics of inflation in selected East African countries: Ethiopian, Kenya, Tanzania and Uganda indicate that growth in money supply account for 40 percent and one third of short run inflation in Ethiopian and Uganda respectively (ABD, 2012). While oil price was the main driver of short run inflation accounting for one fifth and one quarter for Kenya and Tanzania respectively. However, even in those two countries, expansionary monetary policies do

play an important role. The study explains that the inflationary pressures in Ethiopia reflect monetization of the fiscal deficit while growth in private sector credit is the main source of broad money growth in Uganda and Kenya, resulting in an accumulated monetary expansion.

Loening et al (2008) used a parsimonious error correction model fitted with monthly observations, and found that increased money supply and the nominal exchange rate significantly affect inflation in the short run. Besides the increasing the money supply, Agricultural output shocks, proxied by a cereal-weighted agricultural production index, was the main source of inflation in Ethiopia. Loaning et al. (2008) explains that monetary policy through accommodative financial environment triggers price inertia, which has large and persistent effect.

According to Teshome (2011), between 2004 and 2008, the higher desires to spend and higher import price with slow growth of aggregate supply contributed to inflation in the country. The higher aggregate demand or desire for spending was influenced by private consumption spending which takes 91 percent of the total consumption spending. Further, the increase in import value also contributed to the rising of price in the country. During the study years (2004 and 2008), the value of the imported item increased by 29 percent as compared to a percent increased in the amount of imported items. These indicate that the sources of inflation in Ethiopia are both demand and supply side inflation.

Geda and Tafera (2011) also found out that an alarming rise in money supply/credit expansion was the main driving force of inflation in both the food and non-food sectors in the short run as well as in the long run analysis. They have also indicted that in addition to rise in money supply, a sharp rise in food demand, inflation expectation and international food price hike are the source of food inflation in long run. While money supply, interest rate and inflation expectations are the long run determinants of non-food inflation.

Ademe (2015) using Error Correction Model; found out that domestic inflation of Ethiopia is very responsive to each shock in the world level inflation and world oil price as depicted by the impulse response graphs. He conclude that in the long run co-integration model world oil price, household level and government expenditure of the country, world level

inflation and money supply growth of the country affect the domestic inflation positively as well as significantly. Given this, world oil price and government expenditure of the country affects the domestic inflation positively and in a significant level even in the short run.The mid-year of 2007 was also starting point for global food price hike and financial crisis of 2009 which was considered as Great Depression next to the Great Depression following the World War I in 1945 (Aiginger 2010).

2.5 Conceptual Framework

Theoretical literatures indicate that there are different sources of inflations in a given economy. The theories of inflation in general categorized into demand pull and cost push theories of inflations. According to the theory of demand pull of inflation the higher value of aggregate demand compared to that the value of aggregate supply at the full employment level, the inflationary gap arises. The larger the gap between aggregate demand and aggregate supply, the more rapid is the inflation. While the proponents of the cost-push theory of inflation attribute inflation to a host of non-monetary, supply-oriented influences that alter the unit cost and profit markup components of the prices of individual goods. However in most developing countries monetary expansion took the lion share for the inflationary pressure in an economy.

While empirical studies conducted on the determinants of inflation in Ethiopia indicates that both demand pull and cost push sources of inflation as well as monetary expansion has contributed to the inflationary pressure in Ethiopian economy. However, the demand pull sources of inflation outweigh the cost push sources of inflation. On the other hand, as high and persistent inflation introduces uncertainties into the economy and may lead to slowdown of economic growth and increase poverty.

The impact of inflationary pressure influences economic growth through the following inter-related channels. First, high inflation increases consumptions expenditure resulting low saving which induce low investment and economic growth. Secondly, higher inflationary pressure decreases the purchasing power of constant real income which will also end up with low economic growth. On the other hand, higher inflation rate forces

economic agents to reallocate economic resources from the investment to consumption which decreases investment and slowdown economic growth.

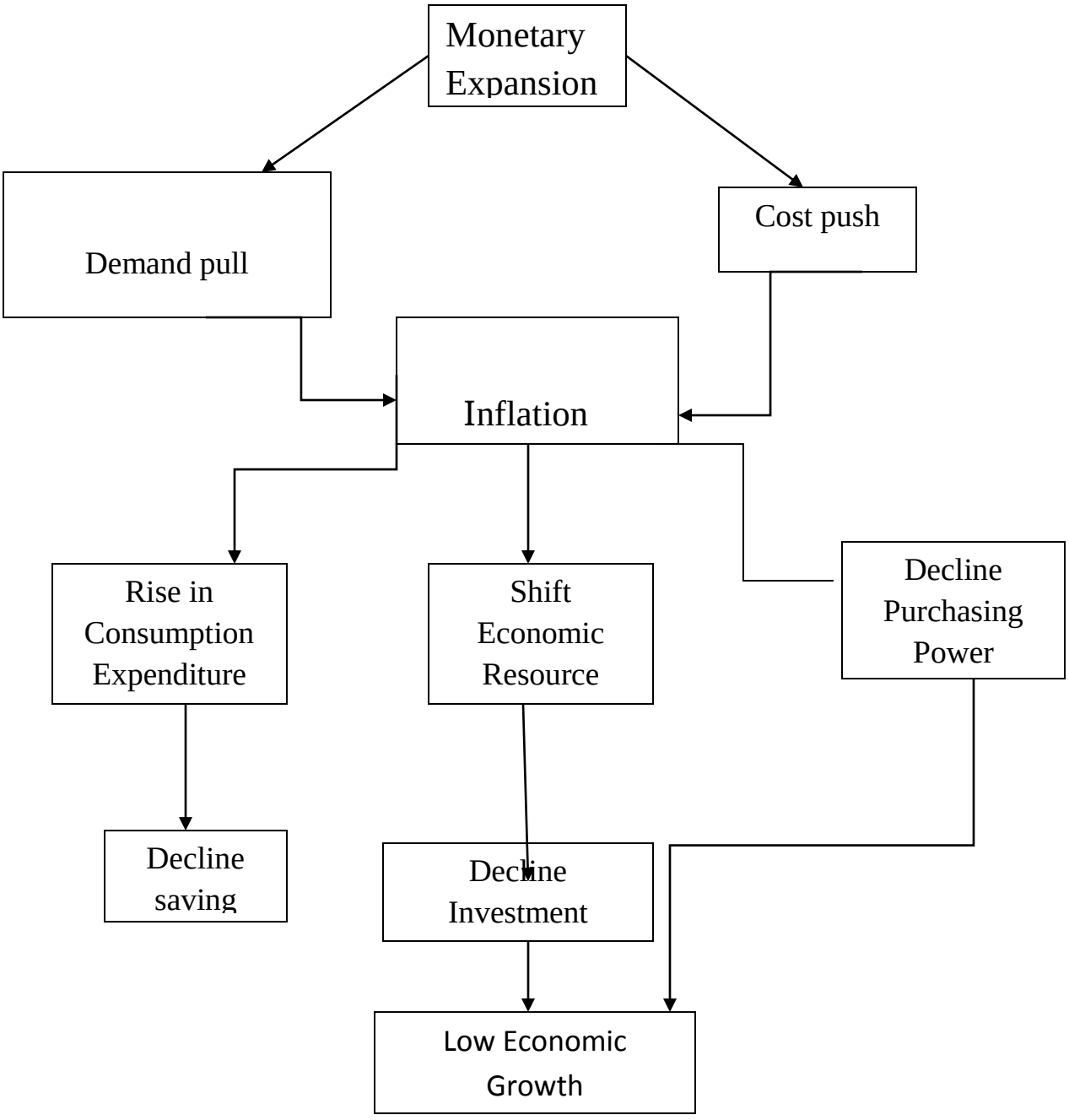

Figure 2.1 Conceptual Framework

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Research Approach and Research Design

In the study, to achieve the general objective of investigating the determinants of regional inflations in Ethiopia, quantitative research approach has adopted. System generalized method of momentum (System GMM) model as analysis tools with the help of OLS and fixed effect model to indicate the upper and lower boundary of estimates is employed.

A combination of descriptive and explanatory research design was adopted. This enables to incorporate and analyze the factors affecting regional inflations which were omitted in the econometric estimation due to difficulty getting those variables.

3.2. Data Source

In order to investigate the determinants of inflation in Ethiopia, secondary annual data over the sample period of 2002 to 2015 were used. Because of variation in the estimation and presentation of macroeconomic variables between national data sources such as MoFED and NBE, and international data sources such as the IMF and the World Bank, this study relied on national sources. Data were collected from three different governmental institutions namely National Bank of Ethiopia (NBE), Ethiopian Statistical Agency (CSA) and the Ministry of Trade.

3.3. Model Specification

3.3.1 Introduction to panel dataset

A panel data set collected from seven regions have used in the analysis of the determinants of inflation in Ethiopia. A panel data (or longitudinal data) set consists of a time series for each cross sectional member in the data set. The key feature of panel data that distinguishes it from a pooled cross section is the fact that the same cross-sectional units (individuals, firms, or counties are followed over a given time period. There are several advantages of using panel data over cross-sectional or time series data. As quoted in Gujarati (2004) Baltagi lists the following advantages of panel data:

1. Since panel data relate to individuals, firms, states, countries, etc., over time, there is bound to be heterogeneity in these units. The techniques of panel data estimation can take such heterogeneity explicitly into account by allowing for individual-specific variables, as we shall show shortly. We use the term *individual* in a generic sense to include micro units such as individuals, firms, states, and countries.
2. By combining time series of cross-section observations, panel data give "more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency."
3. By studying the repeated cross section of observations, panel data are better suited to study the *dynamics of change.*
4. Panel data can better detect and measure effects that simply cannot be observed in pure cross-section or pure time series data.
5. Panel data enables us to study more complicated behavioral models. For example, phenomena such as economies of scale and technological change can be better handled by panel data than by pure cross-section or pure time series data.
6. By making data available for several thousand units, panel data can minimize the bias that might result if we aggregate individuals or firms into broad aggregates.

Generally, Panel data can better detect and measure effects that simply cannot be observed in pure cross-section or pure time series data. Panel data enables us to study more complicated behavioral models. By studying the repeated cross section of observations, panel data are better suited to study the dynamics of change. By the nature of the data, panel data relate to individuals, firms, states, countries, etc., over time, there is bound to be heterogeneity in these units. The techniques of panel data estimation can take such heterogeneity explicitly into account by allowing for individual-specific variables. And also by combining time series of cross-section observations, panel data give 'more informative data, more variability, less co-linearity among variables, more degrees of freedom and more efficiency.'

3.3.2Empirical Model

The model employed in this study was first introduced to Stata users by Roodman in 2003. As the author of the model discussed in the pedagogic paper of *'How to do xtabond2: An*

Introduction to Difference and System GMM in Stata' in 2006, the model was built on the model developed by the Arellano-Bond (1991) and Arellano-Bover (1995)/Blundell-Bond (1998) dynamic panel estimators in other word (Difference and System GMM). Unlike the Arellano-Bond (1991) and Arellano-Bover (1995)/Blundell-Bond (1998) dynamic panel estimators, System Generalized Method of Momentum (System GMM) were designed for the panel data of large time series and small cross sectional units.

As the model was built on Difference and System GMM estimators it is important to look at the basic assumptions about the data-generating process of Difference and System GMM. Roodman (2009) have described the following basic assumptions about the data-generating process of the Difference and System GMM

1. The process may be dynamic, with current realizations of the dependent variable influenced by past ones.
2. There may be arbitrarily distributed fixed individual effects. This argues against cross-section regressions, which must essentially assume fixed effects away, and in favor of a panel set-up, where variation over time can be used to identify parameters.
3. Some repressors' may be endogenous.
4. The idiosyncratic disturbances (those apart from the fixed effects) may have individual-specific patterns of heteroskedasticity and serial correlation.
5. The idiosyncratic disturbances are uncorrelated across individuals.

In addition, some secondary concerns shape the design:

6. Some regressors may be predetermined but not strictly exogenous: independent of current disturbances, they may be influenced by past ones. The lagged dependent variable is an example.
7. The number of time periods of available data, T, may be small. (The panel is "small T, large N.")

Finally, since the estimators are designed for general use, they do not assume that good instruments are available outside the immediate data set. In effect, it is assumed that:

8. The only available instruments are "internal"-based on lags of the instrumented variables. However, the estimators do allow inclusion of external instruments.

Roodman (2009) has specified the general model of the data-generating process as given in below:

$$y_{it} = \alpha y_{i,t-1} + x_{it}\beta + \varepsilon_{it} \quad (3.1)$$

$$\varepsilon_{it} = \mu_{it} + \nu_{it}$$

$$E[\mu_i] = E[\nu_{it}] = E[\mu_i \nu_{it}] = 0$$

Here the disturbance term has two orthogonal components: the fixed effects, μ_{it} and the idiosyncratic shocks, ν_{it}. Note that we can rewrite (3.1) as

$$\Delta y_{it} = (\alpha-1) y_{i,t-1} + x_{it}\beta + \varepsilon_{it} \quad (3.2)$$

So the model can equally be thought of as being for the level or increase of y. where β is a column vector of coefficients, y and ε are random variables, x = [x_1…… x_k]is a column vector independent variables, t represents year and i cross sectional unit regions.

Based on the general model specified above given a panel data set for seven regions over the period 2003/2015, inflation equation is specified as

$$RGINFL_{it} = \beta_1 RGINFL_{i,t-1} + \beta_2 \ln RGCE_{i,t} + \beta_3 \ln POP_{i,t} + B_3 RGREIN_{i,t} + \beta_4 EXCH_{i,t} + \beta_5 DISAA + \beta_6 \ln REGOIL + \upsilon_{it} \quad (3.3)$$

Where υ_{it} refers to the error term, and the parameters β_1, β_4 and β_6 are expected to have a positive sign which postulates a positive relationship of expectations of inflations, exchange rate and regional oil price. Whereas: β_2, β_3 and$\beta_5$are expected to negative sign which postulates an negative relationship of regional cereal productions, regional population size, regional real interest rate and distance from the Addis Ababa.

Estimating equation 3.3 using autoregressive Ordinary Least Squares (OLS) will result inefficient and inconsistent estimator. Mainly because the lagged dependent variable is correlated to state fixed effects. However, since the fixed effects are not modeled by equation 3.1, they are absorbed by the error term υ_{it}. The lagged variable will therefore be correlated to the error term violating one of the OLS assumptions. That is it violets the assumptions of E[X'E]=0

Thus, the estimates from OLS will however act as an upper bound to consistent estimations.

Now consider a Fixed Effects (FE) model in which υ_{it} is further decomposed to

$$\upsilon_{it} = \mu_{it} + \varepsilon_{it} \quad (3.4)$$

Where μ_i is the state fixed effect and ε_{it} is the error term. To eliminate the fixed effect from the model we need to transform by differencing. Thus

$$\Delta y_{i,t-1} = y_{i,t-1} - y_{i,t-2} \quad (3.5)$$

While the error term becomes

$$\Delta\varepsilon_{it} = \varepsilon_{it} - \varepsilon_{i,t-1} \quad (3.6)$$

However, the FE model is still inconsistent as $y_{i,t-1}$ from equation 3.5 is mathematical correlated with $\varepsilon_{i,t-1}$ of equation 3.6.So the dependent variable and error are still correlated after transformation. Thus resulting estimators does not have expectation zero and resulting inconsistent estimates of FE model (Nickell 1981; Bond 2002).

Nevertheless, the inconsistent estimates from the FE model will serve as a lower bound for consistent estimations. Any good estimates of the parameters will lie in or near the range between the OLS and FE estimates (Bond 2002 and Windmeijer, 2005).

On the other hand, as cited by Roodman (2009) xtabond2 deals with the above two problems of OLS and the fixed effect model that is endogeneity problem by using the lags already presented in the model as instruments. However too many instruments variables can cause several problems in finite samples. First, since the number of elements in the estimated variance matrix of the moments is quadratic in the instrument count, it is quadratic in T. A finite sample may lack adequate information to estimate such a large matrix well. It is not uncommon for the matrix to become singular, forcing the use of a generalized inverse. And it can weaken the Hansen test to the point where it generates implausibly good p values of 1:000.

3.4. Definitions of Variables and Hypothesis

Regional annual inflation rate was computed by regional consumer price index (CPI) which measures the average change in the price paid by consumers for a fixed market basket of goods and services. It is usually based on household expenditure weights of the goods and services in the basket and their current market prices. CSA gathers market price data in 119 representative markets in different regions on large number of goods and services. These markets certainly cover the major urban markets, but they also cover peri-urban areas and even what are essentially rural towns with populations of less than 20,000 people.

Average distance of regions from Addis Ababa is an average distance of the market places that CSA has conducted a survey to gather market price data in a given region. As the distance of the region from Addis Ababa increases inflationary pressure tend to decline.
The average regional oil price is calculated based on the data collected from the Ministry of Trade. The regional oil prices were based on the retail price collected from different retail shops over selected 14 major cities of country. Those cities were selected based on the economic and political representativeness of the regions and distance of the cities from Addis Ababa.

Data on the demographic compositions are based on the second and third National Population and Housing Censuses conducted in October 1994 and between May and November 2007, respectively. Mainly, Section B of Statistical Abstract of CSA from 2004 to 2015 and Population Projections for Ethiopia 2007-2037 by CSA of 2012 were utilized. Demographic data for the year 2007 were calculated by taking the average value of 2006 and 2008 to keep the consistence of data. This is mainly necessary because there haven variation in the values of population estimation based National Population and Housing Censuses of 1994 and the population size counted in the 2007.

Market supply is computed as the volume of crop production for Meher Season agriculture in Ethiopia. Data in the volume of crop production is obtained from the Agricultural Sample Survey (AgSS) of CSA's from the 2002 to 2015. The report was based on private

peasant holdings in rural sedentary areas of the country and part of companion reports on the performance of agriculture in the country. In terms scope, the Agricultural Sample Survey (Meher Season) dealt with includes all cereals, pulses and oilseeds and the most commonly grown vegetables, root crops and permanent (perennial) crops. Holders growing at least one or more of these and/or other crops are enumerated and data on crop area and yield condition recorded, hence data on production of these crops acquired.

Real interest rate was calculated based on the minimum deposit rate set by the National Bank of Ethiopia. It is adjusted interest rate for the regional annual inflation rate of the regions over the period.

RINF = Regional annual inflation rate
ROIL = Regional oil price in Birr
RPOP = Regional population size
EXCH = Exchange rate expressed as units of Birr Per dollar
RREIN =Regional real interest rate
RCE = Regional Cereal production
DISAA = Average regional distance from the Addis Ababa

Research Hypothesis

The null hypothesis of there is no significant relationship between dependent variable and independent variables is tested against the alternative hypothesis of the presence of significant relation between dependent variable and independent variable.

HO; $\beta_1=\beta_2=\beta_3=\beta_4=\beta_5=\beta_6$
H1; $\beta_1\neq\beta_2\neq\beta_3\neq\beta_4\neq\beta_5\neq\beta_6$

CHAPTER FOUR: RESULT AND DISCUSSION

4.1 DESCRIPTIVE ANALYSIS

4.1.1 Inflation in Ethiopia

Historically Ethiopian has been one of the low inflation economies with average inflation rate of less than 5%. Since 2006 however Ethiopia has no longer been considered a low inflation country and in July 2008 all-time high inflation rate of 64% was recorded. The major causes were the high fuel and food prices shocks, weaker foreign exchange earnings, rising demand for imports depleted international reserves of the country. The highest prices increase was observed in food, housing, fuel and transport services, making the urban poor the most vulnerable to the impacts of inflation (UNDP, Country Economic Brief, 2014).

Figure 4.1 shows inflation in Ethiopia was dominated by food inflation rather than non-food inflation. This was mainly because of the consumption expenditure pattern of the population and low per-capital income level of the country. Thus, food accounts for 57 percent of total household consumption expenditure and cereal price inflation accounts the major share for the dominance of food inflation in Ethiopia and cereal price expenditure toke 23 percent of the total household expenditure. Beside this, food inflation in Ethiopia follows the same pattern that of general inflation.

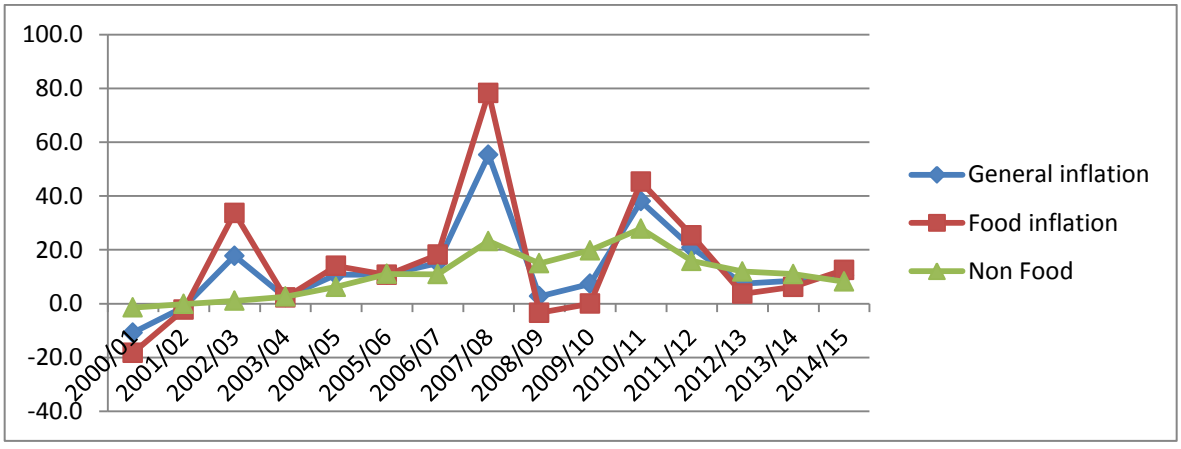

Figure 4.1 Trend in general, food and non-food inflation

Source: Own computation based NBE dataset

4.1.2 Regional Inflation

Beside inflation has become main challenge for the economy, the magnitude and the impact of inflation vary across regions. Table 4.1 shows the magnitude and variation of regional inflation rate from the regional average and national average inflation over the period 2002/03 to 201/15. As shown in the table, regions like SNNP, Oromia and Amhara have experienced higher rate that was above the average national rate of 14.7% per annual. On the other hand Benshangulg Gumuz and Somalia were regions with lowest inflation rate over the period. High variability of inflation as measured by the standard deviation from regional as well as national average inflation was observed in Benshangul Gumuz and Oromia regions. Whereas the two city administrations and regions like Somalia and Afar, inflation was relatively stable over the period.

Table 4.1 Variation in inflation rate from regional and national average inflation rate

Regions/Measurements	Maxim	Minim	Mean	St.D Region mean	St.D National mean
National	55.2	-1.2	14.7		15.1
Tigray	59.0	-4.2	13.6	15.6	15.1
Afar	36.3	-5.2	13.7	11.9	8.0
Amhara	49.4	-1.2	15.1	13.8	13.3
Oromia	61.0	-1.5	16.7	17.4	16.9
Somalia	27.0	1.4	12.2	8.6	13.1
Benshangul	57.3	-62.1	10.2	27.1	26.5
SNNP	90.0	-8.7	18.6	10.2	18.1
Gambela	52.1	-7.1	14.8	16.6	16.0
Harari	53.8	-2.2	14.0	14.8	14.2
D/daw	40.9	-3.9	13.5	10.8	10.5
AA	39.6	-2.1	13.3	10.4	10.2

Source: Own computation based NBE dataset

There have been different factors ascertained for the variation of inflation rate across regions. Those common factors are variation in the economic activity, agricultural productivity, population size and geographic location of the regions.

4.1.3 Trends in Economic Growth and Inflation Rate of Ethiopia

Figure 4.2 shows trend in GDP growth rate and annual inflation rate over the period 2000/01 to 2014/15. The figure shows during the period 2000/01 to 2002/03 there were inverse relationship between economic growth and inflation over the period. Beside the inverse relation relationship, average economic growth rate were above the average inflation rate. In this period Ethiopian economy grow on average by 2.3 % while inflation rate grow by 1.9%. The economic growth rate during the period was subject to high level of fluctuation where the standard deviation over the period was 3.2 units and the 14.5 unit of inflation rate

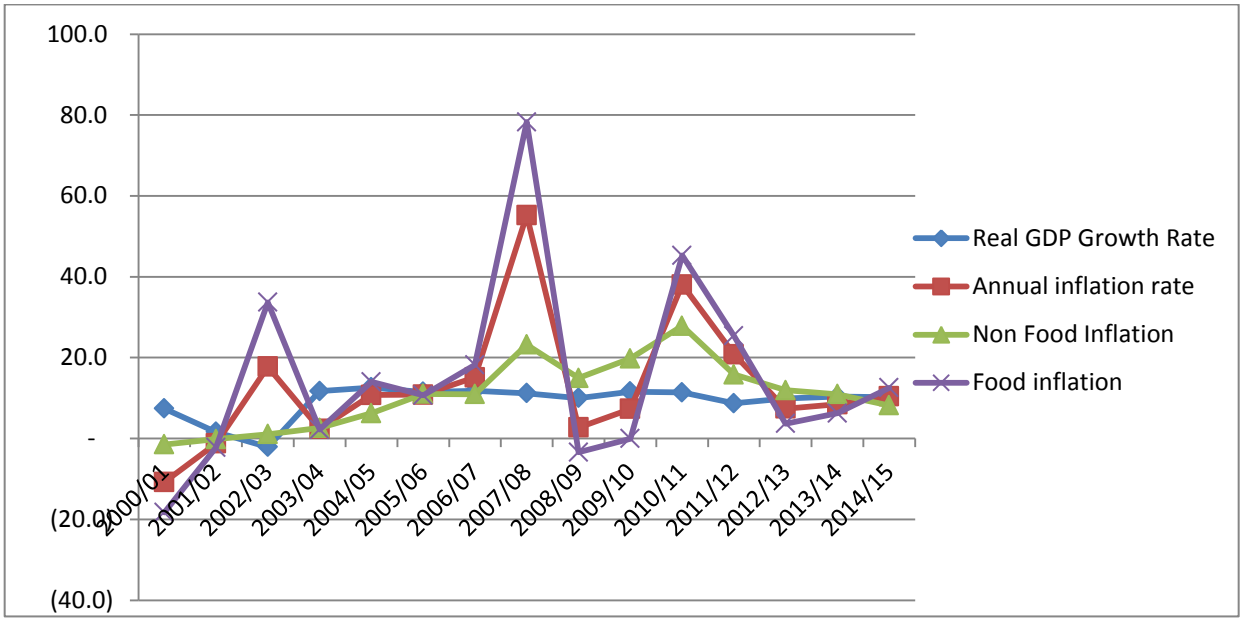

Figure 4.2 Trends in the growth rates of GDP and Annual inflation rate over the period 1999/00-2014/15.

Source: Own computation based NBE dataset

On the other hand, from the fiscal year 2004/05 onwards, the relationship between economic growth and inflation follows some systematic pattern of inverse and positive relationship respectively over the period 2004/05 to 2014/15 expect that of 2008/09 and 2009/10. The inflation rate during 2008/09 and 2009/10 were influenced by the tight fiscal as well as monetary measurements taken by government to control the highest inflation rate of 55.2 percent of 2007/08. Over the period, average economic growth rate was below average annual inflation rate. During this period the economy were growing on average by 10.8% with inflation rate an average of 17% and the economy was growing on average with very low variation over period since the standard deviation of economic growth rate was only 1.1 where as that of inflation rate was 15.6 units.

Based on the above result we can conclude that, there is inverse relationship between economic growth and inflation rate when the economy was subject to high price instability. On the other hand during low level of inflation, there was systematic relationship between economic growth and inflation expects that of high episode of inflation in prior period. The systematic relationship starts with inverse relationship to positive one. In general, the relationship between inflation and economic growth depends on the variability of the economic growth over the period.

4.1.3.1 Agricultural sector and Inflation

In the analysis of relationship between economic growth and inflation, it is important to look at the relationship between the major economic growth and inflation. Such sectoral analysis enables to understand the relationship between the major sectors and determinants of inflation. It is general acceptable that the agricultural sector is the engine for the economic growth of Ethiopia over the period beside decline in percentage share of the GDP. And also the inflation in Ethiopia was closely related with the agricultural production especially that of cereal production since cereal price weights 23% percent of household consumption expenditure. This implies that there was inverse relationship in inflation rate and agricultural production, high inflation rate were subject to decline in the agricultural production because of drought and bad weather.

Figure 4.3 shows growth rate of agricultural, cereal production and inflation rate over the period 2000/01 to 2014/15. As shown in the figure, there was inverse relationship between agricultural growth rate and inflation in Ethiopian. However, the relationship between agricultural and food and non-food inflation varies over the period. Since food inflation follows the same pattern with the general one, it has negative relationship while positive with the non-food inflation. But there was variation on the degree of correlation between agriculture and inflation (general and food) and the correlation coefficient of agricultural growth and general inflation was lower than the agricultural growth and food inflation see table 4.2. This indicates that shock in the agricultural productivity as result of bad weather condition has immediate effect on the food inflation and gradually transit to the general. On the contrary to the food inflation, growth in agricultural production has a positive relation with non-food inflation.

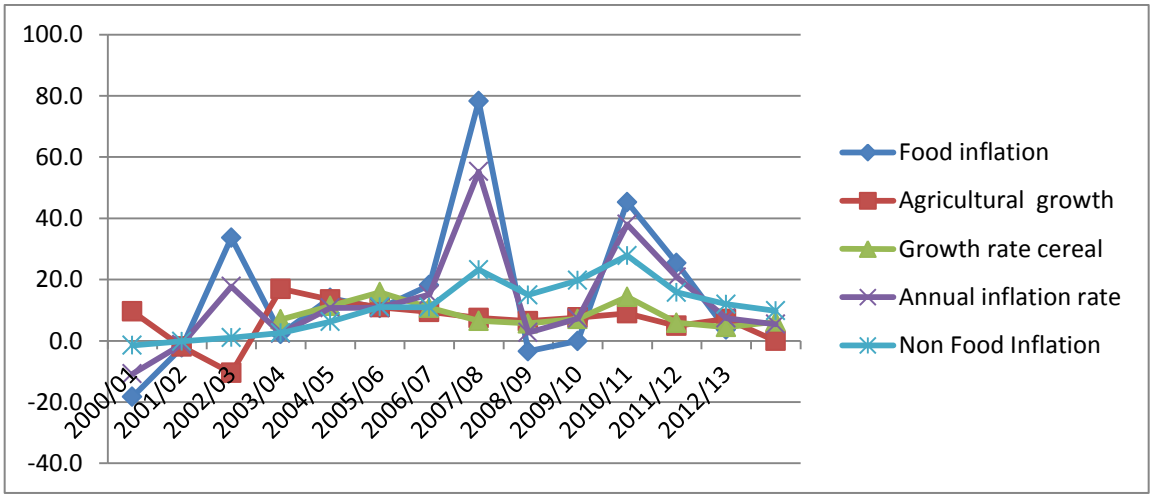

Figure 4.3 Trends in growth rate of agricultural growth, cereal production and inflation rate
Source: own estimation based on CSA and NBE (2015)

On the other hand, growth in cereal production has a negative relationship with general inflation and as well as on food particularly while it has positive relationship with the non-food inflation. The correlation coefficient between cereal production growth and general inflation and food inflation was almost the same see table 4.2. It indicates inflation tends to decline with increasing cereal production.

Export of cereal and increase in the use of the agricultural product as inputs for the industrial sector especially for the expanding beverage industries were ascertained for such pattern in the cereal production for the positive relationship between cereal production and the non food inflation. On the other hand even though productivity and production in the crop production have increased in very significant amount over the period, low level of market supply also main reason for such pattern.

Table 4.2 Spears man Correlation between sectoral growth, cereal production growth and inflation rate.

Sector Growth	General Inflation	Food Inflation	Non-food Inflation
Agricultural	-0.14 (0.65)	-0.23 (0.44)	0.14 (0.63)
Cereal	-0.18 (0.55)	-0.26 (0.38)	0.06 (0.85)
Industrial sector	-0.00 (0.1)	-0.10 (0.73)	0.3 (0.32)
Service sector	0.45** (0.1)	0.33 (0.26)	0.76* (0.00)

Note: Coefficient of standard error is given in parenthesis. Time (*) and (**) denote 5 % and 10% significance level.

Source: Own computation based on CSA and MoFED

4.1.3.2 Industrial sector and Inflation

Even though the contribution of the industrial sector to GDP growth was small and were growing at a slower rate than anticipated by the policy makers, the registering growth in the industrial sector have strong impact on the inflation level. Industrial development has negative relationship with the inflation in general and food inflation in particular. But its has positive relationship with the non-food inflation see table 4.2. However the correlation coefficients of the variable are statistically insignificant. The correlation coefficient between industrial growth rate and non-food inflation was much higher than that of food inflation. This is mainly because industrial output constitutes non-food items of the

consumer price index and the price level of the sector was subject to high level of fluctuation. However the correlation coefficients of the variable are statistically insignificant.

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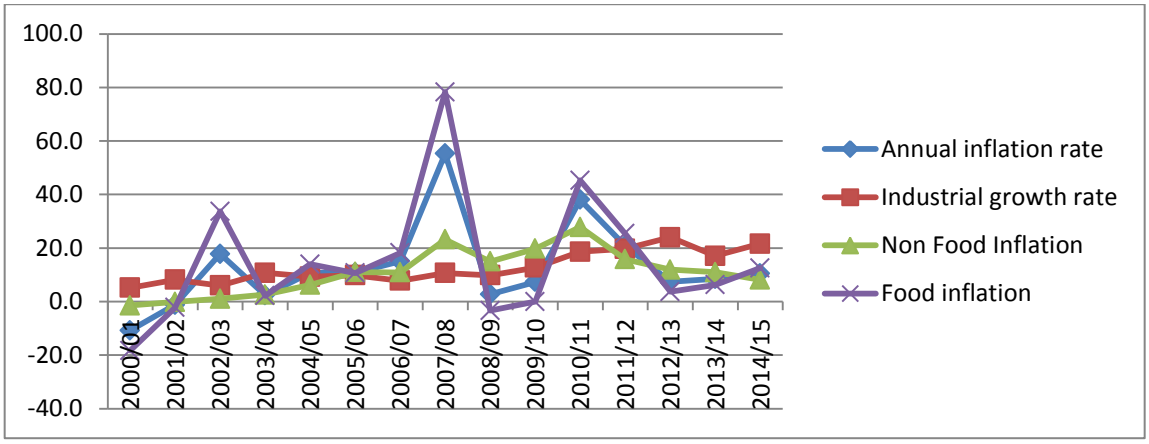

Figure 4.4 Trends in industrial growth and inflation.

Source: Own computation based on CSA and MoFED dataset

4.1.3.3 Service sector and Inflation

The correlation coefficient between growth rates of service sector and inflation rate indicates, the service sector have become most determinant of inflation in Ethiopia particularly that of no-food inflation. The correlation coefficient was 66 % and 84 % for the general and non-food inflation respectively. Beside the sector has become the largest contributor of GDP, Positive and high level of correlation between the sector and inflation indicates the sector have became the major determinant of inflation. This is indicates that, the growth in the service sector has increased the number of mouth and resulted from the sectoral transformation of important factor of production from the agricultural sector to the service.

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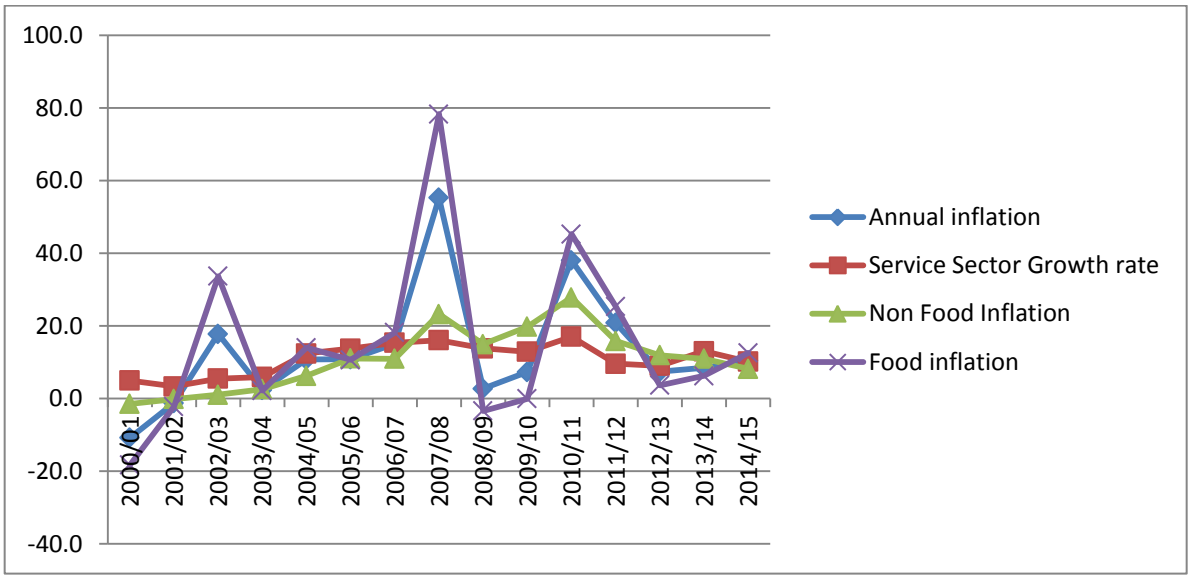

Figure 4.5 Trend in service sector growth and inflation.

Source: Own computation based on CSA and MoFEDdatadet

4.2Estimation of System Generalized Method of Momentum (System GMM) and Interpretation of Results

The estimation of the system generalized method of momentum (System GMM) is initially started with the estimation of the OLS and the fixed effect estimation. Table 4.3 presents summary of estimations of System GMM. As the table 4.3 shows, estimates of the System GMM model lies between the OLS and fixed effect model which satisfies the basic assumptions.

However, the estimates of the System GMM model has larger number of instruments more than the number of the cross sectional units of the study. As argued Roodman (2009), this situation may result in lack of adequate information to estimate variance matrix of the moments which is quadratic in the instrument count, which it is not uncommon for the matrix to become singular, forcing the use of a generalized inverse. But such number of instruments does not compromise consistency (again, any choice of a give a consistent estimator), but does dramatize the distance of FEGMM from the asymptotic ideal. And it can weaken the Hansen test to the point where it generates implausibly good p values of 1:000 (Anderson and Renson 1996;Bowsher 2002).

In addition, a large instrument collection can over fit endogenous variables. For intuition, consider that in2SLS, if the number of instruments equals the number of observations, the R^2's of the first-stage regressions are 1 and the second-stage results match those of (biased) OLS. This bias is present in all instrumental variables regression and becomes more pronounced as the instrument count rises. Unfortunately, there appears to be little guidance from the literature on how many instruments is *'too many'* (Ruud 2000, p. 515), in part because the bias is present to some extent even when instruments are few (Roodman, 2009).

In general, the estimates of system GMM with larger number of instruments than the cross sectional unit will produce consistence estimator and may not be efficient estimates of the parameters.

On the other hand, the Sargan and/ Hansen test of over identifications indicate that the model has over identified. However the Sargan and /Hansen test should not be relied upon too faithfully, as it is prone to weakness (Roodman, 2009). Intuitively speaking, while applying it after GMM, first stage is to drive 1N Z0^E close to 0, then testing whether it is close to 0. Counter intuitively, however, the test actually grows weaker the more moment conditions there are and, seemingly, the harder it should be to come close to satisfying them all.

Table 4.3 Estimation results of system GMM model.

Variables	System GMM Estimations	
		P value
Constant	478.77 (3657.78)	0.9
L.RINF	0.53 (0.19)	0.10
lnRCE	-2.34 (45.66)	0.96
lnRPOP	-91.31 (199.53)	0.66
RREIN	-54 (0.18)	0.02**
EXCH	47.64 (11.03)	0.00*
DISAA	-284.84 (1506.82)	0.86
LnROIL	55.28 (41.96)	0.23

Note: dependent variable is regional inflation. Coefficient of standard error is given in parenthesis. Time dummies are included in the regressions. (*) and (**) denote 1 % and 5% significance level.

As shown in the above table, the result revealed that all variables have the expected sign of relationship with inflation expect the lagged of regional inflations which is expectations of inflation. Exchange and real regional interest rate are variables statistically significant variables to determine regional inflations in Ethiopia. As can been seen from the system GMM estimation, regional real interest rate is inversely related with regional inflation in Ethiopia. One percent increases in the real regional interest rate causes a decline in regional inflation rate by 54.1 percent. The impact of regional real interest on regional inflation can be viewed from two points of view. First a rise in real interest lowers demand for real money resulting in increment in the net capital formation in terms of increased deposit mobilization. This increment in the capital formation will increase the capacity to produce goods and service of the economy since the Ethiopian economy was far away for full employment. This in general increases the supply of goods and service while forcing

price level to decline in the economy. On the other hand a decline in real interest rate will increase the demand for real asset, resulting in scramble to acquire assets in real terms. This is supported by empirical observation seen in the capital city in terms of the scramble to acquire a plot of land for construction.

The result also indicates that, exchange rate has a positive relationship with the regional inflation rate. The impact of exchange rate is stronger than the impact of real interest rate. Thus, keeping other things constant, one unit increment in the exchange rate is estimated to increase inflation by 47.6 units. Depreciation of Birr against Dollar increase the price of imported goods, which we are currently witness in Ethiopia. Especially from the fiscal year 2007/08 onwards for various reasons such as to be competitive at internationally market, to promote the export sector, to minimize the gap between balance of payment of and increase the reserve ratio of the country, Ethiopian currency depreciated more and more. On the other side price of imported goods and service have been continuously increasing in parallel with the deprecation of Ethiopian Birr. The government action against the recommendation of the World Bank and IMF for further deprecation of Ethiopian is Birr found to be supported by the estimation result of the system GMM model in this study.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

A panel data set of different seven regions between the period 2002 and 2015 is collected to conduct system GMM estimation of determinants of regional inflation in Ethiopia. The result revealed that real regional interest rate and exchange rate were the main determinants of regional inflation rate. In addition to this, variation in cereal production, population size, regional average distance from Addis Ababa and regional oil price were also the contributed for the variation of inflation across regions in Ethiopia.

The study also indicates real regional interest rate has inverse relationship with regional inflation rate over the period. This indicates real interest rate is effective mechanism of controlling the upward going inflation. Besides helping to control inflation, change in real interest rate has also strong influence on the economy by increasing productivity and production as well as in achieving full employment. This argument is also supported by the positive relationship between population size and regional inflations.

The most important determinant of regional inflation rate is found to de deprecations of Ethiopian Birr against US dollars. Unlike real interest rate, exchange has positive relationship with regional inflation rate. The study also indicated that the impact of exchange rate was stronger than the real interest rate. Continuous deprecation of Birr against US dollars was the major driving force of inflation in Ethiopia. In addition to being the major source of inflation, deprecation of Ethiopian Birr does not have helped to be international competitive, promote the export sector or maintain positive balance of payment of the country.

The study is limited by lack of availability of region specific time series data of most important variables which are not included in this study. I recommend further studies to be conducted on the topic by including other important variables not included in this study. For example regional money supply, government expenditure and variables that can increase market integration which is largely missing and perhaps a limitation of the study.

5.2 Recommendations

Based on the result of this empirical study, the following policy recommendations are drown:

- Policy interventions through further devaluation of Ethiopian Birr against Dollar aiming to tackle the problem of international competitiveness, BOP or to promote export sector will end up with persistent and redundant inflation in the economy. This indicates that exchange rate is poor policy intervention instrument to tackle inflation rate and improve the international competitiveness and promote the export sector.
- Regional real interest rate has found to be the best policy instrument to control inflationary pressure and variation of inflation across regions. Beside real interest rate helps to control inflation, it can also help to increase the domestic resource mobilization activity of the country. Which in turn increase the production and productivity of the economy producing strength to be competitive at the international and export.

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