FINANCE, PRIVATE SECTOR DEVELOPMENT AND INEQUALITY

A DISSERTATION SUBMITTED TO THE DEPARTMENT OF MANAGEMENT, ECONOMICS AND QUANTITATIVE METHODS AND THE COMMITTEE ON GRADUATE STUDIES OF UNIVERSITY OF BERGAMO IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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Abstract

The first chapter seeks to reveal the long-run causal relationship among financial development, savings, openness and growth in Ethiopia using annual data from 1970 through 2010 in a VAR framework. I find no causal relationship between the series, to the dismay of the large "finance-openness-led growth" literature. The evidence, nevertheless, does not entail the impression that financial repression or trade restriction propels economic growth. The early 1990's and 2000's are identified as the periods when apparent regime shifts are observed in the economy of the country.

Identifying the economic sector that ensures maximum jobs creation remains the most challenging tasks for local and national governments. Chapter 2, explores the local multiplier effect of entry into the tradable sector on that of entry to the nontradable sector using a large panel dataset obtained from the South Africa's CIPC's databases on South African metropolitan cities. I find that new entry to tradable sector is significantly associated with entry to nontradable businesses. For each additional establishment of firms in the manufacturing sector in a given municipal unit, 15.26 firms are created in the nontradable sector in the same place.

There is an ongoing debate on inequality as a cause for a delay in recovery in the aftermath of recession. Using a simulation of U.S. household income and consumption, I show in Chapter 3 that it is possible to get significant differences in savings across income groups based on income-smoothing alone. I have statistically shown that the "rich" may appear to save a higher share of their income than the rest of the people even though the saving rate out of permanent income is the same for all individuals, by assumption. It is, however, less clear that the transitory income effect does, in fact, explain most of the saving rate differences across income groups.

Keywords: Causal Relationship, Cointegration, Ethiopia, Fixed Effect, Gamma, Growth, IV, Local Multiplier, Lognormal, Manufacturing, Nontradable, Openness, Private Credit, Saving Rate, Service, Structural Break, South Africa, Inequality, Tradable.

CHAPTER 1.

The Long-run Dynamic Interactions between the Development of Financial Intermediaries, Savings, Trade Openness and Economic Growth: Evidence from Ethiopia

The long-run causal feedback between the development of financial intermediaries, international trade and economic growth has been widely studied in the economic development literature. Yet, the issue has not been carefully explored for the particular case of Ethiopia. Chapter 1 seeks to reveal the long-run causal relationship among financial development, gross national savings, trade openness and economic growth in the Ethiopian context using annual data for the period ranging from 1970 through 2010 in a Vector Auto-Regression (VAR) framework. While unit root tests suggest that the series are difference stationary, the empirical investigation for possible cointegration among the variables finds no long-run stable equilibrium relationship among the series. The early 1990's and 2000's are identified as the periods when apparent regime shifts are observed in the economy of the country.

The standard Granger-causality test asserts the absence of any direct or inverse pair-wise and/or joint causal relationship between financial development, gross national savings, trade openness and/ or real per capita GDP in the country, to the dismay of the "finance-openness-led growth" literature. The evidence, nevertheless, does not entail the impression that financial repression or trade restriction propels economic growth in the country. The paper also calls for the need to collecting more extensive data and conducting further historical and critical investigation of the finance-openness-growth nexus in Ethiopia given the potential limitation of the econometric techniques and the relatively small time series observations employed in this particular paper.

1.1. Introduction

Shaping the financial system and liberalizing trade have remained to be today's most pressing and debatable policy issues among scholars and policy makers towards insuring sustainable growth in developing economies. The role of finance as a growth determinant has witnessed a remarkable growth in the literature since the seminal work of Joseph Schumpeter (1911), which opened the gate to the finance-growth nexus discussion. In the early 1990s, in particular, the dialogue gained more momentum once again after the empirical work of Mankiw (1992), which investigated the determinants of long-run economic growth in the neoclassical Solow framework. The discussion on the link between trade openness and growth is also as extensive as the finance-growth nexus dialog, at least, since the works of Krueger (1978), Dollar (1992) and Edwards (1993).

Despite the conceptual and methodological innovations in analyzing the finance-trade-growth nexus, unfortunately, no unanimity has yet reached among scholars even after decades of discussions. A bulk of theoretical and empirical evidence attest that finance has a direct and a positive effect on growth (see Levine, 2005 and the reference therein). The endogenous growth literature also argue that financial deepening leads to a more efficient allocation of savings to productive investment projects (Greenwood and Jovanovic, 1990, Bencivenga and Smith, 1991).[1] Subsequently, Levine (2005) concludes that a well-functioning financial system influences growth by easing information and transactions costs and thereby improving the acquisition of information about firms, corporate governance, risk management, resource mobilization, and the structure of financial exchanges.

A voluminous literature, on the other extreme, is skeptical about this assertion (see Garcia and Liu, 1999; Graff, 2001; Zhu et al., 2002; Rioja and Valev, 2004, among others). Moreover, the causality debate – does finance lead growth or the other way round? – has been also a bone of contention, at least since Patrick's (1966) bidirectional hypothesis. While most of the literature argue that a well-functioning financial system propels economic

[1] See Loayza and Rancière (2006) and the references therein for further information.

growth – the supply leading hypothesis (Goldsmith, 1969; Hicks, 1969; McKinnon, 1973; Gurley and Shaw, 1955; Miller, 1998; Levine et al., 1993a, 1993b, 1998, 2000, 2001, 2005), important researches refute this idea and claim that when the real economy grows, finance follows -- the demand-following perspective (Robinson, 1952; Lucas, 1988; Demetriades and Hussein, 1996).

A third strand of the debate, though less established, takes a middle position by positing that finance and growth have no apparent causal relationship. Graff (2001), for example, mentions that while modern economic growth is governed by real sector, the financial development is rooted in the history of financial institutions. Garcia and Liu (1999) find a reciprocal relationship between financial development and economic growth. Aghion et al. (2005) also argue that financial development does not exert a direct effect on steady-state growth. Rousseau and Wachtel (2002) find that the positive impact of financial development on growth diminishes with higher rates of inflation. Likewise, the banking and currency crisis literature argue that monetary aggregates, such as domestic credit, are among the best predictors for crises (e.g., Demirguc-Kunt and Detragiache, 1998, 2000; Gourinchas, Valde and Landerretche, 2001; Kaminsky and Reinhart, 1999).

Differentiating countries in terms of their financial development: “low”, “intermediate” and “rich”, Rioja and Valev (2004) find that the relationship between financial development and growth is not uniform across the regions. They pinpoint that in the low region, financial development has an uncertain effect on growth whereas in the intermediate region, it has a large and positive effect on growth. In the case of the high region, they show that additional financial improvements have a positive, but smaller effect on growth. The debate also stretches its scope to the extent of scrutinizing the financial structure -- a bank-based or market-based financial system -- which matters most for the economic growth. (See Levine, 2005 and the references therein for further review on the topic.)

Likewise, the debate on the link between trade openness and growth has remained unsettled among scholars and policy makers. While technological changes in the neoclassical growth models developed by Solow (1956) and others appears independent of a country’s openness to world trade, the endogenous growth theories suggest that trade policy affects long-run growth through its impact on technological change (Harrison 1996). It is also documented in the literature that in an open economy, trade openness spurs economic growth through a number of channels such as technology transfers, scale economies, and comparative advantage (Grossman and Helpman, 1997; Frankel and Romer, 1999; Frankel, Romer, Cyrus, 1996). Growth, in turn, impacts trade (Harrison, 1996). More interestingly, Harrison (1996) finds greater openness associated with higher growth. An earlier study by Edwards (1992) also demonstrates a positive and statistically significant impact of openness on growth.

Referring to these empirical literature, major figures in development economics, such as Krueger (1998) and Stiglitz et al. (1998), advocate “outward-oriented” trade strategies. Similarly, Fischer (2000) insists in integration into the world economy as the best way for countries to grow. Multilateral institutions such as World Bank, the IMF, and the OECD have been also advocating trade openness as a response to underdevelopment. "Policies toward foreign trade are among the more important factors promoting economic growth and convergence in developing countries,” (IMF, 1997, p. 84). In a supportive statement, a report by the OECD (1998, p. 36) also states that "More open and outward-oriented economies consistently outperform countries with restrictive trade and (foreign) investment regimes."

Despite the growing body of the literature on the co-movement between trade openness and growth, there is a considerable size of literature skeptical about the growth multiplier effect of openness and pose concern on the over-emphasis given to it (see Yanikkaya, 2003 and Rodríguez and Rodrik, 2000, among others). Yanikkaya (2003), for example, using a large number of openness measures for a cross section of countries over the last three decades, shows that trade liberalization does not have a simple and straightforward relationship with growth. The study employs two groups of openness measures -- various measures of trade volumes and several measures of trade intensity – for the analyses. The paper reveals that trade barriers are positively and, in most specifications, significantly associated with growth, especially for developing countries. Rodríguez and Rodrik (2000), also find little evidence to support the claim that open trade policies--in the sense of lower tariff and non-tariff barriers to trade--are significantly associated with economic growth. They rather have a serious concern that "… the priority afforded to trade policy has generated expectations that are unlikely to be met, and it may have crowded out other institutional reforms with potentially greater payoffs," Rodríguez and Rodrik (2000, p.317).

Amid the absence of agreement among scholars on the long-run causal relationship between financial development, trade openness and economic growth, the issue has, recently, come into agenda between the Ethiopian government, which promotes state-led economic growth, and the country's development partners such as the IMF and the World Bank (WB), who encourage the private sector development and are critical of the government's macroeconomic management. The development partners claim that the government is highly involving in the economy, intensifying financial repression, discouraging savings, competitiveness and private investment, in general (IMF Country Report, October 2011; Ken, 2011; WB, 2009). The government, on the other hand, argues that the state intervenes in the economy to insure sustainable growth and address the pervasive market failures using a comprehensive set of instruments. These instruments may include, among others, allocation of investible resources (such as credit) in accordance with the country's development plan, and providing a differentiated trade support and protection to support infant industries (Zenawi, 2012; MOFED, 2010; Zenawi, 2006).

The debate, nevertheless, seems fall short of empirical evidence to back either of the claims. Despite the growing body of literature (with its all inconsistencies), there is no study that has its focus on Ethiopia.[2] The cross-country studies that involve Ethiopia are also ambiguous and fail to incorporate the different structural brakes witnessed in the economy.

A cross-country study by Levine and Zervos (1998), which Ethiopia is also a part, shows that banking development positively affects growth, capital accumulation, and productivity improvements, even after controlling for economic and political factors. Similarly, Ghirmay (2004) provides evidence on the existence of a long-run relationship between financial

[2] See Levine, 2005, Yanikkaya, 2003 and the references therein for a thorough discussion of finance-led growth and trade-led growth, respectively.

development and economic growth in almost all (12 out of 13) of the countries he discusses, including Ethiopia. While the study shows a causal role of growth on financial development, it fails to prove the reverse causal relationships in the Ethiopian case.

Gries, Kraft and Meierrieks (2009), on the other extreme, demonstrate that there is only limited support for the popular hypothesis of finance and openness led growth in 16 Sub-Sahara African (SSA) countries, including Ethiopia. They indicate that financial deepening and trade openness have had only marginal effects on economic development. The study also identified Ethiopia, together with some other countries, demonstrating no evidence of any significant causal linkages between finance and trade openness. Yanikkaya (2003), likewise, finds that trade liberalization does not have a simple and straightforward relationship with growth in a cross section of countries, of which Ethiopia is a part, over the last three decades.

Given the conflicting results in the literature and deviation between the Ethiopian government and other development partners in the choice of policy priorities, this paper seeks in providing empirical evidence on the long-run causal relationship among financial development, trade openness, savings and economic growth in the Ethiopian context in a vector autoregression (VAR) framework. In addition to providing empirical evidence to the dialog, this paper has also two folds of benefits. First, Ethiopia is a perfect test case to evaluate the policies of financial development and trade openness as growth determinants since the country has been through two polarized economic regimes – command-economy (1974 – 1990) and (semi) market-economy (1991 – present). The developments of the financial intermediaries, international trade, national savings and economic growth during the two distinct economic regimes have their own unique features. Second, unlike most African countries, Ethiopia is free of the colonial legacies, which laid the foundation for a particular economic structure tailored to the colonist economies. And, hence, the lump sum evidences provided by previous cross-country studies, which involved Ethiopia and other countries in the region are found to be unwarranted since they fall short of considering the unique economic anatomy of the country.

Unlike any other previous studies that considered Ethiopia, this paper takes the presence of possible structural breaks into consideration. Consequently, the empirical investigation reveals that, in contrast to the finance-openness-led growth literature, there is no such direct or inverse pair-wise and/or joint causal relationship among financial development, trade openness, gross national savings and economic growth in the Ethiopian case, making it difficult for a simple policy prescription from the existing literature.

The outline of the paper is as follows. The next section explores the methods and material employed in the study. Then, the structure of the Ethiopian economy will be examined followed by the empirical findings of the study. Finally, the study summarizes the key results and discusses policy implications.

1.2. The Ethiopian Economy

The Ethiopian economy is characterized as agrarian economy; agriculture accounting about 42 percent of the GDP, 80 percent of the employment and 85 percent of the country's export in 2010. Heavy dependence on the rainfall, fragmented and traditional farming practice have, nevertheless, remained to be the prominent feature of the sector resulting in low productivity, frequent drought and food insecurity for the past half of a century.

After years of depression, the economy, in general, has shown a sign of revitalization following the series of reforms in the real and financial sector put in place by the new government in the early 1990s through liberalization and the enhanced Structural Adjustment Programs (SAPs) under the support and guidance of the IMF and the World Bank. Most of the measures were, in fact, targeted toward short-term economic stabilization, although some of them were structural adjustment measures. The reforms include, among others: deregulation of domestic prices, liberalization of foreign trade, privatization of public enterprises, abolition of all export taxes and subsidies, devaluation of the exchange rate followed by the introduction of an inter-bank foreign currency market, and issuance of a new labor law (EBDSN, 2012; Alemayehu et. al 2005).

During the last two consecutive economic strategic plans, in particular, the economy is reported to propel at an average of 11 percent between 2004 and 2010.[3] By the end of 2010, the real income per capita has jumped by 71 percent from what it had been in 2000 and reached its all-time high -- Birr 1,628.34 (about USD 239.60). The agriculture, industry and manufacturing sector have, nevertheless, remained performing very weakly except the service sector, which shows a sharp turnaround in the early 1990s. At the end of 2010, the value added to the GDP by the service sector improved by 14 percent and reached 38 percent from 24 percent in 1992. Meanwhile, the industry and the manufacturing sectors contributed only 14 and 5 percent, respectively. (See Figure 1, Appendix I).

Critical of the government's macroeconomic management, which suffers from high inflation and low international reserve, among others, argue that the series of reforms made in the past two decades still fall short of insuring sustainable economic growth in the country. One of the main criticisms is that alike its predecessor—the socialist regime—the existing government also heavily engages in all economic endeavors intensifying financial repression, discouraging private investment and savings. Ken Ohashi (a former World Bank Country Director for Ethiopia and the Sudan) argues "aggressive public sector-led investment programs resulted in sharp increases in demand for both investment and consumption goods. But, without deeper structural reforms, the expected private investment—both domestic and foreign—did not materialize on a scale to keep pace with demand growth."[4]

The investment climate has also remained unfavorable to attract more private (domestic and foreign direct) investment and spur productivity and competitiveness (UNCTAD, 2002; Alemayehu and Befekadu, 2005; AEO, 2011; WEF, 2011; UNCTAD, 2011; UNCTAD, 2012). Under the command economic regime (1974-1991), in particular, private investment

[3] The economic strategic plans are known as Sustainable Development and Poverty Reduction Program (SDPRP, 2002/03-2004/05) and Plan for Accelerated and Sustained Development to End Poverty (PASDEP, 2006 -2010).

[4] The government favors the "Developmental State Economy" school of thought and believes and practices that the state has more independent, or autonomous, political power, as well as more control over the economy. (See Zenawi, 2012; Zenawi, 2006 and MOFED, 2010)

was highly discouraged and nearly all medium- and large-scale manufacturing industries were nationalized. The participation of the private sector was deliberately discouraged through imposition of capital ceilings (a Birr 500,000 or USD250,000), restriction on private investment number of business ventures and special treatment was made to public companies in the allocation of foreign exchange, market access, subsidies, etc (Mulat, Fantu, Tadele, 2006).

Following the reforms in the 1990s, the private investment witnessed a brief revival for few years until it was crowded-out by the public investment in the early 2000s. Figure 2 (Appendix I) depicts the determination of the state to lead in capital formation instead of focusing in improving the investment climate for the private sector.[5] The Foreign Direct Investment (FDI) has shrunk down to 0.97 percent of the GDP in 2010, after a pick of its all-time high 5.4 percent in 2003 according to the WB's WDI data. The World Bank's 2013 and 2012 Doing Business report also ranked the country 127th and 125th, respectively, among 185 countries considered in the surveys revealing how poor the investment climate is in the country.

A poorly performing judicial system that fails to address property rights and weak corporate governance, land ownership problems, an under-developed financial system, and a poor macroeconomic management poses serious challenge to the economy, in general, and the meager private sector, in particular (AEO, 2011).

1.2.1 The Ethiopian Financial System

The finance sector, including the regulatory and supervisory frameworks in Ethiopia is characterized as the least developed financial system in the region (AfDB, 2010; EEA, 2011). The sector has not been liberalized for the past four decades and it is less integrated with the external financial system. There are no secondary/capital markets, except for the very limited informal investing in shares of private companies. Absence of credit ratings, international financing reporting standards (IFRS), real time gross settlement (RTGS), and

[5] The public's Gross Fixed Capital Formation is computed as the difference of the Gross Fixed Capital Formation (% of GDP) and the Gross Fixed Capital Formation (% GDP) from the WDI database.

a subsidiary of at least one major foreign banking group in the country are certain features of the under-developed financial system. The strong (capital) exchange control in the country, which hinders the financial integration in the region (AfDB, 2010), is also part of the poor financial system.

Nevertheless, the 1994 proclamation, which liberalized the finance sector for Ethiopian citizens only, has shade a hope of light on the future prospect of the sector. Due to the high return of the sector, the reduced establishment requirements (such as capital), and the immense protection from external competition, a number of private financial intermediaries, especially banking and insurance companies, have been established. In the past eighteen years alone, 14 domestic private commercial banks and 12 domestic insurance corporations have joined the economy. The number of microfinance institutions has also surged from nonexistence to 31 in these two decades alone. Moreover, they have witnessed an outstanding performance, even compared to their peers in the region, at their infant stage (Tsegaye, 2009).

And yet, the state owned banks (two commercial and one development banks) and an insurance company still dominate the Ethiopian financial sector. At the end of September 2010, the share of deposits mobilized by the then 12 private commercial banks was only 38.2 percent and the share of their outstanding loans and advances was only 38.9 percent. Whereas, out of the total of 681 bank branches and 209 insurance branches network at the time, the share of the private sector was 60 and 81 percent, respectively. The ratios of bank and insurance branches to population were 117,474 and 386,473, respectively, making it the least bank-and-insurance-intensive country in the Sub Saharan Africa (SSA)[6]. About 39 percent of the banks' and 50 percent of the insurances' branches were concentrated in the capital Addis Ababa. The capital share of private banks was 40.2 percent while that of the private insurance was 65 percent (NBE, 2010).

[6] The banking and insurance business in Ethiopia is branch-based.

The share of credit to the private sector had also suffered persistent stagnation during the socialist DERG regime (1974 – 91) at an average of 16.2 percent of the country's GDP and then exhibited a marginal progress to reach an average of 18.8 percent in the current regime (1991-2010). (See Figure 4 and Table 1, Appendix I.) The newly established domestic private banks have contributed to this progress by pumping new capital to the private sector. At the end of 1998, the credit to the private sector registered its all-time high and reached 25 percent of the GDP. Nevertheless, following the monetary authority's interventions (such as through constraining private credit – credit-caps -- and increasing the reserve requirement of the financial firms) since early 2000s, with the aim of directing credit to priority public investments, credit channeled to the private sector has shrunk down to 13.5 percent at the end of 2010.[7] The intervention has, in effect, hampered the meager private sector and weakened the intermediation role of the financial sector (IMF, 2011; AEO, 2011).

1.2.2 The Ethiopian International Trade

In light of the balance of payment, the Ethiopian international trade is characterized by chronic trade deficit. Besides the volume, the product diversification of the export items has been limited to few primary agricultural products, mainly coffee, pulses, oilseeds, hides and skins, and gold mineral ore, whereas, the imports of the country ranges from capital goods to primary consumption goods. Recently, flower has joined the main pool of export items constituting 5.5 percent of the total share of exports in the late half of 2000s according to the data obtained from the National Bank of Ethiopia.

The highly protective tariffs, the bias towards state run export companies -- despite their inefficiencies, the strategy to discourage the role of the private capital in trade, the attempt to closely monitor the price, quantity and distribution of goods, and the attempt to shift the export destination of goods (from developed capitalist countries towards socialist countries) during the period 1974-91 had a deterring impact on the international trade of the country

[7] Recently (in 2011), the National Bank of Ethiopia (NBE) has put a requirement of 27 percent of private banks' loan disbursement to purchase treasury Bills.

(Alemayehu et al., 2005; Kagnew, 2008). The reforms made in the late ages of the DERG regime, i.e. the introduction of the export subsidy scheme in 1983/84 and the ban on the export of raw hides and skins in 1989/90, were not also as fruitful as anticipated. The average share of trade (import and export) to GDP during the last decade of the regime (1982 to 1991) was only about 16.9 percent. On the other hand, the government was able to keep the import-export gap better than its successor – the current regime – at an average export to import ratio of 55.34 percent.

Following the regime change in 1991, the country has exerted enormous effort to restrain internal and external imbalances of the economy. Among the various policy and institutional measures the government took in the 1990s to enhance the international trade performance of the country, (a) liberalization of the exchange rate market, (b) simplification of the licensing procedure, (c) supportive services to private exporters in areas of transport, package training, overseas market research etc, and (d) a simplified tariff structure and foreign exchange retention scheme can be mentioned (Alemayehu et al., 2005). All export taxes are abolished and the weighted mean of applied tariffs has progressively declined from around 18.15 percent in 1995 to 10.45 percent in 2010, according to the data obtained from the World Bank's World Development Indicators. The country has been also negotiating for World Trade Organization (WTO) membership since January 2003 although it has not yet become a full member.

The international trade has, consequently, made a sharp turnaround in 1992 and has been galloping at an average annual growth rate of ten percent in the last two decades. (See Figure 4 or Table 1, Appendix I.) By the end of 2010, it accounted 46.6 percent of the GDP. The country's export destination has also diversified to Asian, particularly China, and other neighboring African countries in the last ten years although Europe remains the main export recipient. In 2009/10, for example, while 41 percent of the country's merchandise was shipped to Europe, 31.2 percent was exported to Asian markets, particularly China (10.6 percent), and 23 percent to neighboring African countries. Ten years before, the situation was quite different. The export of Ethiopian merchandise to China was only 0.22 percent or less. (See Figure 3, Appendix I.)

The trade deficit, nevertheless, remains exasperated because of the uncompetitive products of the country. The export to import ratio has been continuously declining and reached its all-time low (37 percent) in 2009. The country's export unfriendly macroeconomic policy mix, high costs of trade, under-developed private sector, inefficient producer services, and thick borders are known to be the main sources of the weak export performance of the country (Ciuriak, 2010).

1.2.3 Gross National Savings

In creating (fixed) capital, and hence insuring sustainable growth, the role of savings comes to the forefront. Countries resort to external sources of finances such as loan, aid and foreign direct investment, when their savings fall short of filling their investment gapes. And hence, evaluating the co-movement of the growth of the country and its national savings is instructive while assessing whether the economic growth of the country is laid on a strong bases or not.

After years of stagnation, the Ethiopian gross national savings (GNS) has shown a gradual improvement in the past few years. (See Figure 4 and Table 1, Appendix I.) At the end of 2010, it reached 20.72 percent as a share of the GDP growing by 0.4 percent on average for the past one decade. And yet, the savings of the country has not reached to the level it can fairly support the private or the state investments, consequently, subjecting important investments vulnerable to financing constraints (IFAD, 2009; Ken, 2011; IMF, 2012). External debt, which hit 146% of the GDP in 1994, and foreign aid have seem to step forward to bridge the saving-investment gap. While the external debt stock falls sharply since late 1990s following the debt reliefs and cancellation by creditors, the foreign aid increases continuously to reach at 12 percent of the GDP in 2010. (See Figure 5, Appendix I.)

1.3.Method and Material

This study tries to provide empirical evidence to the debate raised in the outset -- whether there is or not a long-run causal relationship among financial development, openness, saving and growth in the Ethiopian context -- under a VAR framework, as follows:

Let $Y_t = v + A_1 Y_{t-1} + A_2 Y_{t-2} + ... + A_p Y_{t-p} + \varepsilon_t$, (1)

where Y_t is a *K* × *1* vector of variables, v is a *K* × *1* vector of parameters, A_1 to A_p are *K* × *K* matrices of parameters, and ε_t is a *K* × *1* vector of disturbances.

The VAR(*p*) model can also be expressed in a vector error correction (VECM) representation:

$$\Delta Y_t = v + \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t \quad (2)$$

where $\Pi = \sum_{j=1}^{j=p} A_j - \mathrm{I}_k$ and $\Gamma_i = -\sum_{j=i+1}^{j=p} A_j$.

Engle and Granger (1987) demonstrate that if the variables Y_t are $\mathrm{I}(1)$, the matrix Π in (2) has rank $0 \leq r < K$, where *r* is the number of linearly independent cointegrating vectors. If the variables cointegrate, $0 < r < K$ and (2) shows that a VAR in first differences is misspecified because it omits the lagged level term ΠY_{t-1}. In this case, Π can be expressed as $\Pi = \alpha\beta'$ and $\beta' Y$ is stationary, where α (the adjustment coefficients) and β (the cointegrating vectors) are both *K* × *r* matrices of rank *r*. The existence of cointegration implies that Granger causality[8] must exit in at least one direction between the variables of the system.

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[8] Granger (1969) causality: Partition the data vector Y_t into (y_t, z_t) such that $\mathbf{F}_{1t} = (y_t, y_{t-1}, y_{t-2}, ...)$ and $\mathbf{F}_{2t} = (y_t, z_t, y_{t-1}, z_{t-1}, y_{t-2}, z_{t-2}, ...)$. We say that z_t does not Granger-cause y_t if $\mathrm{E}(y_t \mid \mathbf{F}_{1,t-1}) = \mathrm{E}(y_t \mid \mathbf{F}_{2,t-1})$.

On the other hand, if the variables in Y_t are $\mathrm{I}(1)$ but not cointegrated, which is the case in this particular study, Π is a matrix of zeros and thus has rank 0. Consequently, the unrestricted VAR(*p*) in (2) reduces to a first difference VAR form, maintaining the usual asymptotic distribution theory:

$$\Delta Y_t = \nu + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t \,. \qquad (3)$$

Then, the Wald χ^2 statistics can be used to test the joint significance (or Granger-causality) of each of the other lagged endogenous variables in that equation.

1.3. 1 Lee and Strazicich Unit Root Test Allowing for Structural Change

It is well established that non-stationary series in standard OLS regression can lead to spurious regression (Granger and Newbold, 1974). Testing for the presence of unit-roots in the series, and hence, precedes the test for Granger causality to ensure that the Wald χ^2 statistics is valid.

Despite the presence of a number of unit root tests, the regime change in 1991 and the independence of Eretria from Ethiopia in 1994 trigger the use of the Lee and Strazicich's (2004) minimum Lagrange Multiplier (LM) unit root test allowing for a structural break to detect the presence of unit root in the macroeconomic time series considered in this paper, unlike any other previous similar studies that involved Ethiopia. The Lee and Strazicich's (2004) procedure has advantages in power and size properties over other similar endogenous (data-dependent) methods, such as Zivot and Andrews (1992), Banerjee, Lumisdaine and Stock (1992), Perron and Vogelsang (1992), Perron (1997) and Lumsdaine and Papell (1997), among others.

Lee and Strazicich (2004) consider the following data generating process (DGP) based on the unobserved components model to describe the properties of their minimum LM unit root test in the presence of a structural break:

$$y_t = \delta Z_t + X_t,\ X_t = \beta X_{t-1} + \varepsilon_t \quad (4)$$

where Z_t contains exogenous variables. The unit root null hypothesis is described by $\beta = 1$. If $Z_t = [1, t]'$, then the DGP is the same as that shown in the no break LM unit root test of Schmidt and Phillips (1992). Lee and Strazicich (2004) consider two models of structural change. "Model A" is known as the "Crash" model, and allows for a one-time change in intercept under the alternative hypothesis. It can be described by $Z_t = [1, t, D_t]'$, where $D_t = 1$ for $t \geq T_B + 1$, and zero otherwise, T_B is the time period of the structural break, and $\delta' = (\delta_1, \delta_2, \delta_3)$.[9] "Model C" allows for a shift in intercept and change in trend slope under the alternative hypothesis and can be described by $Z_t = [1, t, D_t, DT_t]'$, where $DT_t = t - T_B$ for $t \geq T_B + 1$, and zero otherwise.

The LM unit root test statistics, subsequently, can be obtained by regression, following the LM (score) principle, as follows:

$$\Delta y_t = \delta' \Delta Z_t + \phi \widetilde{S}_{t-1} + u_t, \quad (5)$$

where $\widetilde{S}_t = y_t - \widetilde{\psi}_x - Z_t \widetilde{\delta}$, t=2,…,T; $\widetilde{\delta}$ are the coefficients in the regression of Δy_t on ΔZ_t; and $\widetilde{\psi}_x$ is the restricted maximum likelihood estimation (MLE) of $\psi_x (\equiv \psi + X_0)$ given by $y_1 - Z_1 \widetilde{\delta}$.

They also noted that since the testing regression (5) involves ΔZ_t instead of Z_t, ΔZ_t is, therefore, described by $[1, B_t]'$ in Model A and by $[1, B_t, D_t]'$ in Model C, where $B_t = \Delta D_t$ and $D_t = \Delta DT_t$. Thus, B_t and D_t correspond to a change in intercept and trend under the alternative, and to a one period jump and (permanent) change in drift under the null

[9] When Zt = [1, t, DTt*]', the model becomes the "changing growth" Model B, where DTt* = t for t ≥ TB+1 and zero otherwise. Nevertheless, Lee and Strazicich (2004) do not consider Model B as most economic time series can be adequately described by Model A or C (see, for example, Table VII in Perron, 1989).

hypothesis, respectively. The unit root null hypothesis is described by $\phi = 0$ and the LM t-test statistic is given by:

$\tilde{\tau}$ = t-statistic testing the null hypothesis $\phi = 0$. (6)

Lee and Strazicich (2004) include augmented terms $\Delta\tilde{S}_{t-1}$, j = 1,..., k in (5) to correct for autocorrelated errors as in the standard ADF test. Following the Ng and Perron's (1995) a general to specific procedure to determine the optimal number of k augmented terms, Lee and Strazicich (2004) determine the location of the break (T_B) by searching all possible break points for the minimum (i.e., the most negative) unit root t-test statistic as follows:

, where $\lambda = T_B / T$. (7)

Finally, the results obtained from the Lee and Strazicich's test are contrasted with that of Zivot-Andrews (1992) approach in this study.

1.3. 2 Gregory-Hansen Cointegration Test with Structural Break

It is apparent that whilst two nonstationary time series are cointegrated, the traditional tests for Granger causality are misspecified, potentially leading to erroneous and misleading inferences regarding the direction of causality, i.e., detection of causality where it does not exist or failure to detect causality where it exists (Engle and Granger 1987; MacDonald and Kearney 1987). Investigating the presence of cointegration between the variables of our interest, to this end, has become a prerequisite to testing for causality.

Pertaining to the reasons that deemed us to the use of the Lee and Strazicich (2004) minimum LM unit root test with a structural break, this study prefers to employ the residual-based Gregory and Hansen's (1996a, b) test for cointegration with structural break for its power and identification of the break points advantages over the other tests of cointegration such as the residual-based Engle-Granger two step approach (1987), the Full Information

Maximum Likelihood Multivariate Johansen (1988), Johansen and Juselius (1990). (See Campos et al., 1996 and Gregory and Hansen, 1996a.) While Gregory and Hansen (1996a) consider three alternative models ((i) level shift, (ii) level shift with trend, and (iii) regime shift, both level shift and slope coefficients can change), the extended Gregory and Hansen (1996b) procedure provides a more general model that permits a trend shift as well as a regime shift and provides critical values appropriate for testing this alternative.

Consequently, the structural change tests for cointegration, among the variables, that holds over some (fairly long) period of time, but then shifts to a new 'long-run' relationship at some unknown time, can be modeled in the sense of Gregory and Hansen (1996a,b) as follows:

Model 1: Level Shift (C) or Change in Intercept, also known as "the Crash Model"

$$y_{1t} = \mu_1 + \mu_2 \varphi_{t\tau} + \alpha' y_{2t} + e_t, \qquad t = 1, \ldots, n. \qquad (8)$$

Model 2: Level shift with trend (C/T), also known as "Changing Growth Model"

$$y_{1t} = \mu_1 + \mu_2 \varphi_{t\tau} + \beta t + \alpha' y_{2t} + e_t, \qquad t = 1, \ldots, n. \qquad (9)$$

Model 3: Regime shift (C/S) where intercept and slope coefficients change

$$y_{1t} = \mu_1 + \mu_2 \varphi_{t\tau} + \alpha_1' y_{2t} + \alpha_2' y_{2t} \varphi_{t\tau} + e_t, \qquad t = 1, \ldots, n. \qquad (10)$$

Model 4: Regime Shift where intercept, slope coefficients and trend change

$$y_{1t} = \mu_1 + \mu_2 \varphi_{t\tau} + \beta_1 t + \beta_2 t \varphi_{t\tau} + \alpha_1' y_{2t} + \alpha_2' y_{2t} \varphi_{t\tau} + e_t, \quad t = 1, \ldots, n, \qquad (11)$$

where $y_t = (y_{1t}, y_{2t})$ are the observed data, y_{1t} is real-valued, y_{2t} is an m-valued and *I(1)*, and e_t is *I(0)*. $\varphi_{t\tau} = \begin{cases} 0, & if\ t \le [n\tau] \\ 1, & if > [n\tau] \end{cases}$, where the unknown parameter $\tau \in (0,\ 1)$ denotes the (relative) timing of the change point (for computation purpose $\tau \in (0.15,\ 0.85)$) and [ ] denotes integer part.

In cases of "Model 1" to "Model 3", μ_1 and μ_2 are the respective intercept coefficients before and after the level shift model, α_1 denotes the cointegrating slope coefficients before the regime shift, and α_2 denotes the change in the slope coefficients. In Model 4, μ_1, α_1 and β_1 are the intercept, slop and trend coefficients respectively before the regime shift and μ_2, α_2 and β_2 are the corresponding changes after the break.

Finally, after estimating the cointegration equations for all four possible break points, ADF-, Z_α -, and Z_t,-type test statistics are computed to test the null of no cointegration against the alternative of cointegration in the presence of a possible regime shift. A point is chosen given that the test statistic value is the least, i.e. the absolute value of the ADF-, Z_α -, or Z_t, test statistic is at its highest. The smaller the values of the test statistics, the higher the chance of rejecting the null hypothesis of no cointegration with a structural break. These test statistics are given as:[10]

$$Z_\alpha^* = \inf_{\tau \in T} Z_\alpha(\tau);$$

$$Z_t^* = \inf_{\tau \in T} Z_\tau(\tau); \text{ and,}$$

$$ADF^* = \inf_{\tau \in T} ADF(\tau).$$

Even though this paper aims in making use of the benefits of Gregory and Hansen's test, it also present the results from the trace tests for cointegration developed by Johansen (1988, 1991, and 1995) for the sake of comparison.

[10] See Gregory and Hansen (1996a, b) for the detail derivation of the test-statistics.

1.3. 3 Material (Data and Description of Variables)

Measuring financial development or trade openness is not straightforward. There is no single indicator that measures the development of the financial intermediaries or international trade to a full extent. Different researchers, consequently, use different proxies to measure a spectrum of financial development and international trade depending on their particular research objectives. Levine (2005) and Yanikkaya (2003) discuss the different possible measures of financial intermediaries and international trade, respectively, with their pros and cones.

Following Levine (2005) and the bulk of literature on the topic, this study, nevertheless, employs private credit by deposit money banks and other financial institutions as a share of gross domestic product (GDP) (hereafter *PC*), to measure the role of financial intermediaries in the Ethiopian economy. This indicator has an advantage of closely measuring the functions of finance in: (i) easing the exchange of goods and services, (ii) mobilizing and pooling savings from a large number of investors, (iii) allocating society's savings to its most productive use, and (iv) diversifying and reducing liquidity and intertemporal risk (Levine, Loayza and Beck, 2000; Beck, Levine, and Loayza, 2000; Beck and Levine, 2004; Levine, 2005).

The data is obtained from the IMF's (January 2012) International Financial Statistics (IFS) database by taking the ratio of the sum of "CLAIMS ON PRIVATE SECTOR, 64422D..ZF..." and "CLAIMS ON PRIVATE SECTOR, 64442D..ZF..." to "GROSS DOMESTIC PRODUCT (GDP), 64499B..ZF..." following Beck et al. (2000) but without any deflation or adjustment.

For similar reasons – wide acceptance in the growth literature— the sum of imports and exports as a share of GDP (hereafter *TO*) is used in this study to measure "trade openness."[11] The data is obtained from the IMF's (January 2012) WEO database by taking the ratio of the

[11] See Halit Yanikkaya (2003) for a more complete discussion of this subject.

sum of “Imports of goods & services (W644NM)” and “Exports of goods & services (W644NX)” to “Gross domestic product (W644NGDP)”. Likewise, Gross National Savings (hereafter *GNS*) is measured as (the natural logs) of the ratio of gross national savings (W644NGS) to GDP. All the variables from which the ratios are computed are in current prices. Last, economic growth is captured through real GDP per capita (W644NGDPRPC, hereafter EG) from the same source -- the IMF’s (January 2012) WEO database.[12]

Table 1 and Figure 4 (Appendix I) depict that all of the macroeconomic indicators have witness a substantial growth since 1992 despite the volatility observed. Credit to the private sector and national savings have started to shrink down since 2003 when the economy began enjoying miraculous growth accompanied by the galloping international trade, dominantly, import. It can be also noted that the economy was in general smaller prior to the regime change in 1991. The evidence also shows that, except for the trade openness and economic growth, there is apparent irregularity among the variables, especially during the post-DERG period (1992-2010), suggesting the absence of stable co-movement among the variables.

1.4.Empirical Results

1.4.1 Unit Root Test Allowing for Structural Break

Table 2 and 3 (Appendix I) report the Zivot-Andrews’ (1992) and the Lee-Strazicich’s (2004) unit root test results for the four macroeconomic indicators considered in this paper. The Zivot and Andrews (1992) test identifies a unit root in all the series in any of the three model settings -- intercept, trend and both. The order of integration, however, varies across the series. At 5% level, the test identifies that all the variables, except real per capita GDP, are difference stationary, suggesting that they are *I(1)*. At a 1% level, however, it is only private credit found to be *I(1)*.

[12] Other variables and data sources have been also used to complement the study and to capture information not found in the IFS, WEO and the WB’s WDI databases.

The Lee-Strazicich's (2004) minimum LM unit root test allowing for structural breaks at the intercept and trend (Model C) identifies that all series are difference stationary at 1% critical value. The test also pinpoint that except GNS all the remaining variables are difference stationary at 5% level. In the case of the Crash Model – ignoring the trend shift, the Lee-Strazicich (2004) test suggests the presence of unit roots in the real per capita GDP, gross domestic savings and the trade openness at 1% level of significance. Relaxing the level to 5% also result in the same findings except that GNS appears to be level stationary.

The Lee and Strazicich's (2004) test also identifies the early 1990s and 2000s as periods when major structural breaks are observed in the Ethiopian economy. This is, in fact, consistent with the visual examination of the time series plots of the macroeconomic indicators and a close look at the recent socio-economic developments in the country. The years 1991 and 2002 are, in particular, important years in contemporary Ethiopian economic development following the regime change in 1991 and the adoption of the very influential economic strategic plans in 2002.

In summary, the unit root test results obtained from the Lee-Strazicich's (2004) minimum LM unit root test allowing for structural breaks at the intercept and trend slope under the alternative hypothesis (Model C) are more reliable and conclusive than the results obtained from the intercept model (Model A) and that of the Zivote-Andrew's unit root test procedures. While the Lee-Strazicich's (2004) unit root test allowing for shifts in both intercept and trend slope is more general than the test with only a shift at the intercept, it is also more powerful and accurate in estimating the exact break points than the Zivot-Andrews' (1992) procedure as pinpointed in Section (1.3.1). The variables are not mean reverting but they are after first differencing, suggesting that the effects of some shocks will not die out over time in the Ethiopian context. As a result, the series qualify for further cointegraiton analyses since they exhibit the fundamental time series feature of unit root – integrated of order one, *I(1)* -- particularly when allowance is made for shifts in intercept and trend slope.

1.4.2 Testing for Cointegration

The results from the residual-based Gregory-Hansen's (1996a, b) cointegration test allowing for a structural break at the null are presented in Table 4, Appendix I. The Johansen's (1988, 1991, 1995) cointegration test results in a vector autoregression (VAR) framework are also annexed in the table for the benefit of comparison. The Gregory and Hansen (1996a, b) tests, in anyone of the four model settings with a structural break, fail to reject the null of no cointegration. The result suggests that there is no a long-run stable equilibrium relationship among real per capita GDP, private credit, gross national saving and trade openness in the Ethiopian context. The test, in particular, identified 1991 as the year when a regime shift is observed in the economy. It also suggests a significant level shift with trend since 2006. These periods appear to be consistent with the major events occurred in the country as discussed in the previous sections.

In contrast to the Gregory and Hansen (1996a, b) test, the maximum likelihood tests for cointegration developed by Johansen (1988, 1991, 1995), after referring to the optimal order (3) of the underlying VAR, suggests that there is a weak cointegration among the variables. However, the results are not robust since they fail to meet the specification requirements. The results from this procedure suffer as well from inconsistency for marginal changes in number of lags[13], trend[14] specification or level of significance.

To sum up, from the descriptive statistical and econometric analyses, there is no strong evidence to support the claim that there is a long-run and stable equilibrium relationship among level of real per capita GDP, financial development, international trade and national savings in the Ethiopian context.

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[13] While the final prediction error (FPE), Akaike's information criterion (AIC) and the likelihood-ratio test statistics suggest optimal lag of 3, the Schwarz's Bayesian information criterion (SBIC) and the Hannan - Quinn information criterion (HQIC) suggest lag of order 1.

[14] . Since the time trends in the data appear to be nonlinear and irregular, it is ambiguous whether to specify a constant trend or not. Consequently, the various empirical analyses with different trend specifications come up with mixed results.

1.4.3 Granger-causality Test

The absence of cointegration among the four macroeconomic variables discussed warrants the use of traditional causality tests, i.e., the Wald test in the first difference VAR framework. Table 5 (Appendix I) presents the results for pair-wise and joint Granger-causality tests for the system specified in (3). Prior stability and misspecification tests of the VAR models with optimal lags of 3 (selected as per the selection criteria indicated in Table 4, Appendix I) prove that the VAR models are well behaved and qualify for further analysis of Granger-causality.[15]

From Table 5 (Appendix I), it can be learned that the coefficients on the three lags of the first differenced natural logs of private credit, gross national saving and/or trade openness that appear in the equation for real per capita GDP are independently or jointly zero as measured by the Wald's test. This warrants the assertion that the null hypothesis that the *PC*, *GNS* and/or *TO* does not Granger-cause *EG* cannot be rejected. Similar non-causality results, in any possible direction, are also identified with the other three model specifications.

Most of the results are also shared by Yanikkaya (2003) and Gries, Kraft and Meierrieks (2009), in particular, related to the absence of a direct causal relationship between international trade and growth in Ethiopia. On the other hand, while the lack of evidence for a causal role of financial development on growth is shared by Ghirmay (2004), this study deviates from Ghirmay (2004) and Levine and Zervos (1998) by evidencing that there is neither reverse causality in the Ethiopian case. This deviation may attribute to the difference on the sample size and methodology between the studies. The present study employs a relatively large sample size and econometric techniques, which consider regime shifts, to address the unique economic environment of Ethiopia.

[15] A small-sample adjustment – divisor of $1/(T-\overline{m})$, where $\overline{m}$ is the average number of parameters included in each of the four equations – has been made while estimating the variance-covariance matrix instead of the maximum likelihood (ML) divisor $1/T$. Specifying small-sample adjustment will not change the computed lag-order statistics, but it will change the estimated variance–covariance matrix. (See StataCorp, 2009.)

1.5.Conclusion

This paper, unlike any other study before, seeks to reveal the long-run causal relationship between financial development, national savings, trade openness and real per capita GDP in Ethiopia over the period 1970 through 2010 in a vector auto-regression (VAR) framework. While both Zivot-Andrews (1992) and Lee-Strazicich's (2004) unit root tests allowing for structural changes suggest the series are difference stationary, the later procedure, in particular, identifies the early 1990s and 2000s as the periods where structural breaks are observed in the series.

The Gregory and Hansen (1996a, b) test for cointegration, on the other hand, fails to reject the null of no cointegration among the series. The test rather reveals the absence of such a long-run and stable equilibrium relationship among real per capita GDP, private credit, gross national savings and trade openness in the Ethiopian context. The test also identifies the year 1991 as the time when a regime shift is observed in the economy, which is consistent with the government/ regime change in the country. It also suggests a presence of significant level shift with trend since 2006. The multivariate maximum likelihood tests for cointegration developed by Johansen (1988, 1991, 1995), in contrast, suggests the existence of a weaker cointegration among the variables although the results are not robust as they fail to meet the specification requirements.

To the dismay of the voluminous "finance-openness-led-growth" literature, the Granger-causality test asserts that there is no apparent direct or inverse pair-wise and/or joint causal relationship between financial development, gross national savings, trade openness and growth in the case of Ethiopia. This could be attributed to the failure of the econometric technique, which may be related to the sample size used, or may stem from the fact that fundamentally there is no such a link between growth and the other factors as a number of empirical and theoretical studies attest. The evidence, nevertheless, does not entail the impression that financial repression or trade restriction propels growth in the country. Finally, the paper calls for further historical and critical investigation of the issue by collecting more extensive primary and secondary datasets given the limitation of the econometric techniques.

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APPENDIX I

Table 1 Private Credit, Trade Openness, National Savings and Economic Growth during the Derg and the Current Regimes

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
1970 – 1991 (DERG Regime)					
Real GDP per Capita (EG)	22	1043.941	71.92172	870.7626	1131.16
Private Credit	22	15.5%	2.4%	11.6%	20.7%
Trade Openness	22	16.4%	2.3%	12.8%	20.8%
Gross National Savings	22	6.3%	1.5%	3.7%	10.3%
1991 – 2010 (Current Regime)					
Real GDP per Capita (EG)	19	1063.838	250.48	766.6511	1628.339
Private Credit	19	18.8%	4.7%	8.6%	24.9%
Trade Openness	19	35.3%	11.2%	10.5%	50.6%
Gross National Savings	19	15.4%	5.5%	6.6%	24.6%
1970 – 2010					
Real GDP per Capita (EG)	41	1053.162	176.2092	766.6511	1628.339
Private Credit	41	17.0%	4.0%	8.6%	24.9%
Trade Openness	41	25.1%	12.2%	10.5%	50.6%
Gross National Savings	41	10.5%	6.0%	3.7%	24.6%

Source: WDI, WEO and personal computation.

Table 2: Zivot and Andrews (1992) Endogenous Unit Root Test Allowing for Single Structural Break.

		Levels					Difference				
				Critical Values		Break-Year			Critical Values		Break-Year
Variable	Break in:	K[a]	Minimum t-statistic	1%	5%		K	Minimum t-statistic	1%	5%	
LY	Intercept	2	-1.1	-5.43	-4.8	2004	2	-3.919	-5.43	-4.8	2004
	Trend	2	-2.44	-4.93	-4.42	2001	2	-3.887	-4.93	-4.42	1992
	Both (trend & intercept)	2	-2.433	-5.57	-5.08	2002	2	-4.08	-5.57	-5.08	1991
LPC	Intercept	2	-4.065	-5.43	-4.8	1998	2	-4.954**	-5.43	-4.8	1995
	Trend	2	-2.444	-4.93	-4.42	2001	2	-4.469**	-4.93	-4.42	2006
	Both (trend & intercept)	2	-4.701	-5.57	-5.08	1999	2	-5.336**	-5.57	-5.08	1995
LGNS	Intercept	0	-4.975	-5.43	-4.8	1975	0	-9.104*	-5.43	-4.8	1979
	Trend	0	-5.331	-4.93	-4.42	1979	0	-8.929*	-4.93	-4.42	2002
	Both (trend & intercept)	0	-5.237	-5.57	-5.08	1977	0	-9.376*	-5.57	-5.08	1979
LTO	Intercept	2	-3.293	-5.43	-4.8	1997	0	-11.762*	-5.43	-4.8	1993
	Trend	2	-3.431	-4.93	-4.42	1991	0	-7.061*	-4.93	-4.42	1999
	Both (trend & intercept)	2	-3.5	-5.57	-5.08	1997	0	-12.225*	-5.57	-5.08	1993

** (**) denotes statistical significance at 5% (1%).*
a The number of lags is selected in such a way that the last included lag has a marginal significance level less than the cutoff 1%.

Table 3: Lee and Strazicich (2004) minimum LM unit root test allowing for structural breaks.

Series	Model		T_B	k	S[t-1] (Min. test-Stat)	1 (t-stat)	B1[t] (t-stat)	D1[t] (t-stat)
LY	Intercept	Level	1984	3	-0.13(-1.92)	-0.02(-0.87)	-0.12(-2.16)	
		Difference	1998	3	-0.98(-3.56)*	-21.21(-2.01)	53.96(1.04)	
	Intercept & Trend	Level	1998	3	-0.53(-3.53)	0.002(0.22)	0.006(0.12)	0.02(0.77)
		Difference	1990	1	-1.25(-5.96)**	-17.05(-1.43)	-167.92(-3.21)	79.61(4.01)
LPC	Intercept	Level	2006	2	-0.65(-4.49)**	0.13(3.64)	-0.23(-1.63)	
		Difference	1998	0	-0.94(-5.62)**	0.002(0.47)	-0.02(-0.76)	
	Intercept & Trend	Level	2004	2	-0.67(-4.46)	0.07(2.63)	0.297(1.98)	-0.15(-2.27)
		Difference	1998	0	-0.94(-5.58)**	-0.01(-1.81)	-0.06(-1.31)	0.01(0.97)
LGNS	Intercept	Level	1994	0	-0.53(-3.66)*	'-0.08(-1.75)	0.40(1.70)	
		Difference	1991	0	-1.29(-8.10)**	-0.001(-0.38)	0.03(0.96)	
	Intercept & Trend	Level	1993	0	-0.74(-4.62)*	-0.07(-1.48)	0.07(0.28)	0.22(2.67)
		Difference	1990	0	-1.29(-7.96)**	0.01(1.02)	-0.03(-0.92)	0.01(1.03)
LTO	Intercept	Level	1989	0	-0.27(-2.41)	0.04(1.44)	-1.14(-6.55)	
		Difference	1991	2	-0.69(-3.25)*	-0.02(-2.23)	-0.02(-0.69)	
	Intercept & Trend	Level	1994	5	-0.73(-3.29)	0.28(2.62)	0.68(1.67)	-0.38(-2.33)
		Difference	2004	2	-1.11(-4.79)*	-0.02(-2.97)	0.05(1.59)	-0.05(-2.78)

Notes:

T_B is the break date, k is the optimal lag length, S_{t-1} is the coefficient on the unit root parameter, 1 is the constant, B_t is the coefficient on the break in the intercept and D_t is the coefficient on the change in trend slope. Critical values for the LM unit root test statistic, for Model C, are presented below, sourced from Lee and Strazicich (2004). * (**) denote statistical significance at 5% and 1%, respectively.

λ	0.1	0.2	0.3	0.4	0.5
1%	-5.11	-5.07	-5.15	-5.05	-5.11
5%	-4.5	-4.47	-4.45	-4.5	-4.51
10%	-4.21	-4.2	-4.18	-4.18	-4.17

Table 4: Gregory-Hansen (1996) and Johansen (1988, 1991, 1995) Test for Cointegration

Model							
Gregory and Hansen (1996a, b), with a break in: (lags in parenthesis†, breakpoint below)	ADF*	Z(t)	Z(a)				Are there Cointegrating Vectors (1%, 5% levels)?
Level shift	-3.12 (1) 2003	-3.07 2005	-14.71 2005				No, No
Level shift with trend	-4.72(0) 2006	-4.93 2006	-32.16 2006				No, No
Regime shift	-3.75 (1) 2001	-3.34 1991	-18.75 1991				No, No
Regime and trend shifts	-6.27(1) 2000	-5.62 1997	-36.33 1997				No, No
Johansen (1988, 1991, 1995)	Trace statistics			Maximum eigenvalues			
	r = 0	r ≤ 1	r ≤ 2	r = 0	r ≤ 1	r ≤ 2	
unrestricted constant in model	68.0575**	38.9333**	13.4966	29.1242*	25.4367*	10.6257	Yes, Yes
a linear trend in the cointegrating equations and a quadratic trend in the undifferenced data	61.2059*	33.2628		27.9432			No, Yes
no trend or constant	52.3569**	26.3628*	9.8652	25.994*	16.4977		Yes, Yes

** and * indicate statistical significance at 1% and 5% level of significance, respectively.

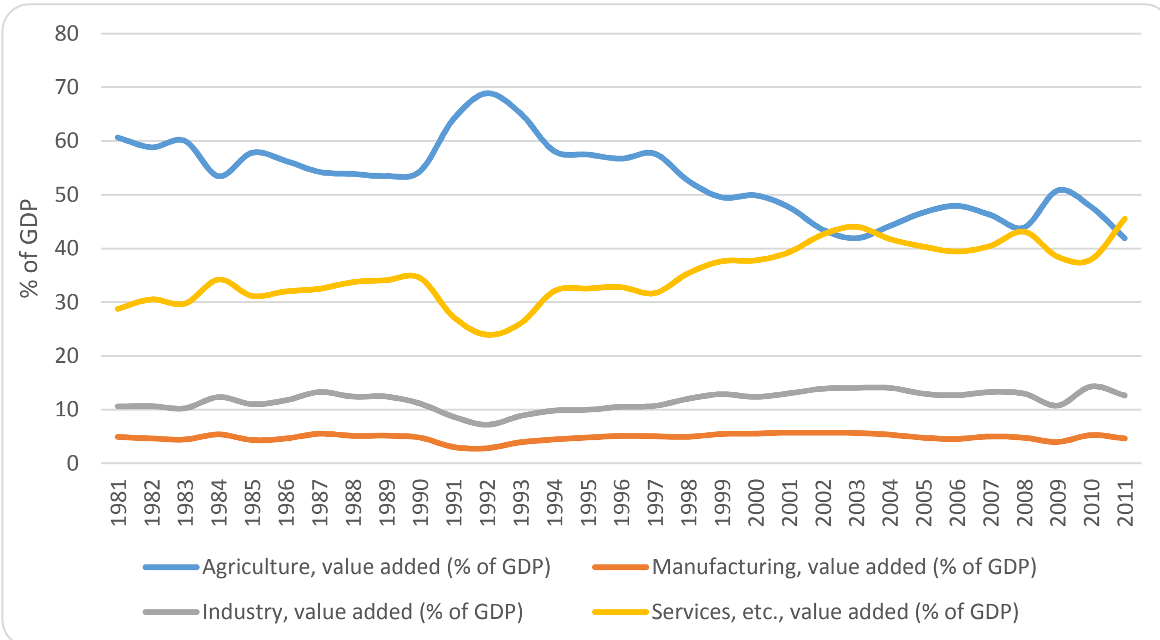
†Lag-length (in parenthesis) is chosen by downward t-statistics (the last significant lag according to its t-statistic, starting from a maximum number of lags). Break points are indicated below each test.

Table 5: VAR Granger-causality between ΔLEG, ΔLPC, ΔLGNS and ΔLTO

Dependent Variable	Endogenous Variable	F-Statistic	prob > F
ΔLEG	*ΔLPC*	1.049	0.389
	ΔLGNS	0.81683	0.4972
	ΔLTO	2.0733	0.1304
	All	1.3947	0.245
ΔLPC	*ΔLEG*	1.0006	0.4096
	ΔLGNS	0.96961	0.4233
	ΔLTO	2.1232	0.1237
	All	2.3285	0.0476
ΔLGNS	*ΔLEG*	1.5972	0.2162
	ΔLPC	2.8461	0.0588
	ΔLTO	0.96916	0.4235
	All	1.8073	0.1191
ΔLTO	*ΔLEG*	0.77902	0.5172
	ΔLPC	0.24232	0.8659
	ΔLGNS	0.68761	0.5684
	All	0.60879	0.7774

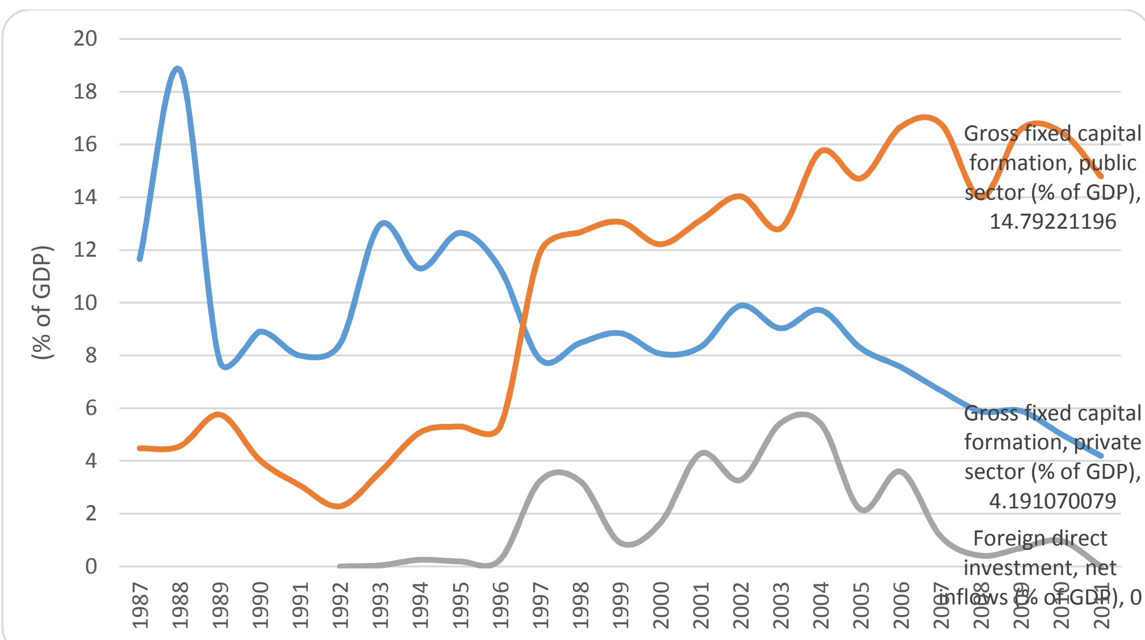
** and * indicate statistical significance at 1% and 5% level of significance, respectively.

Figure 1: Structure of the Ethiopian Economy, Value Added, Ethiopia



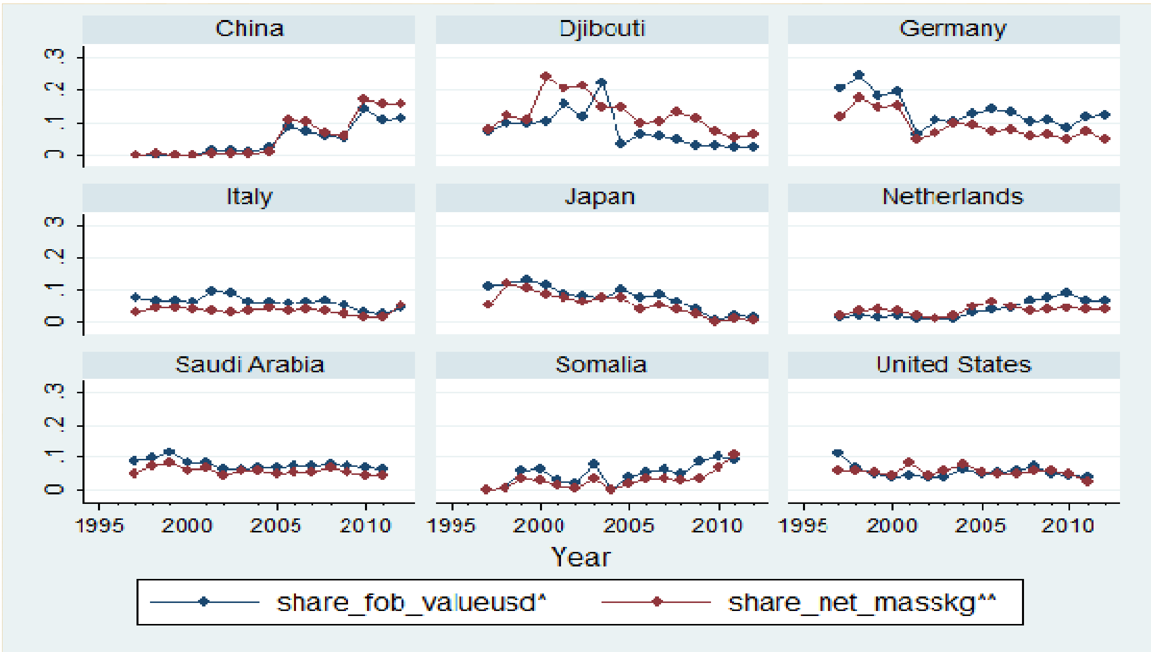
Source: WDI database.

Figure 2: Capital Formation and FDI, Ethiopia



Source: World Bank's WDI database and author's computation.

Figure 3: The Major Export Destinations of Ethiopian Merchandises, % Share



*Source: Ethiopian Revenues & Customs Authority, and author's computation. * Percent share of FOB value in USD; ** percent share of net mass exported, in kg.*

Figure 4: Evolution of Private Credit, Openness, Saving and Economic Growth, Ethiopia

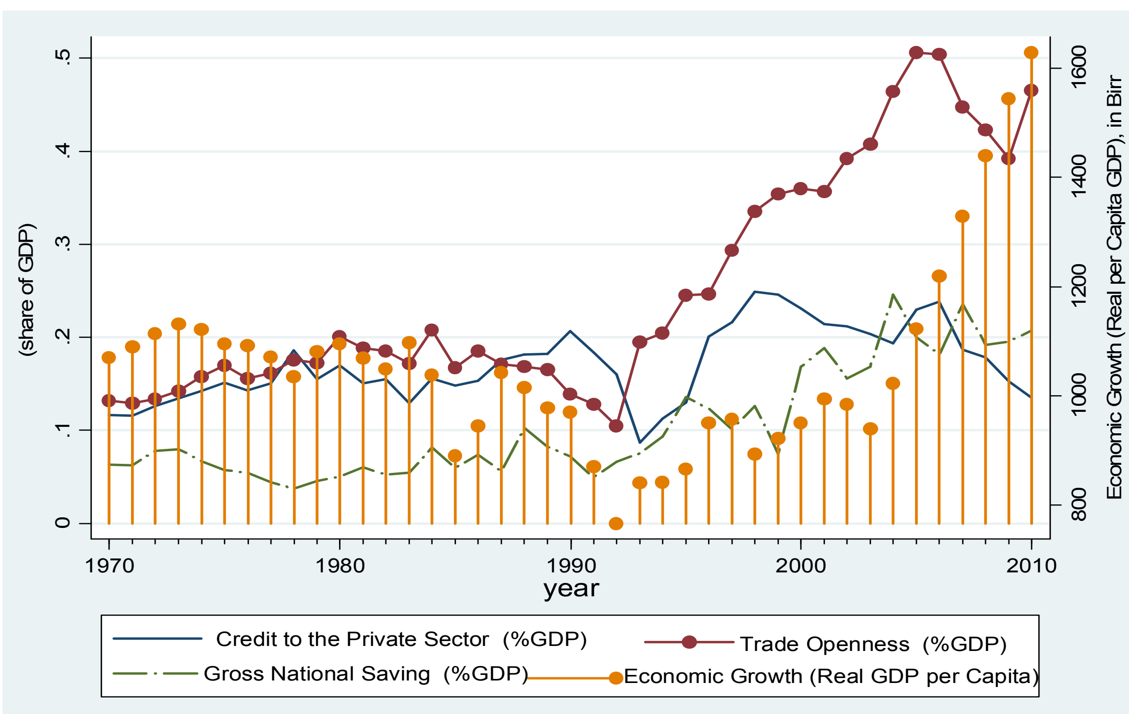
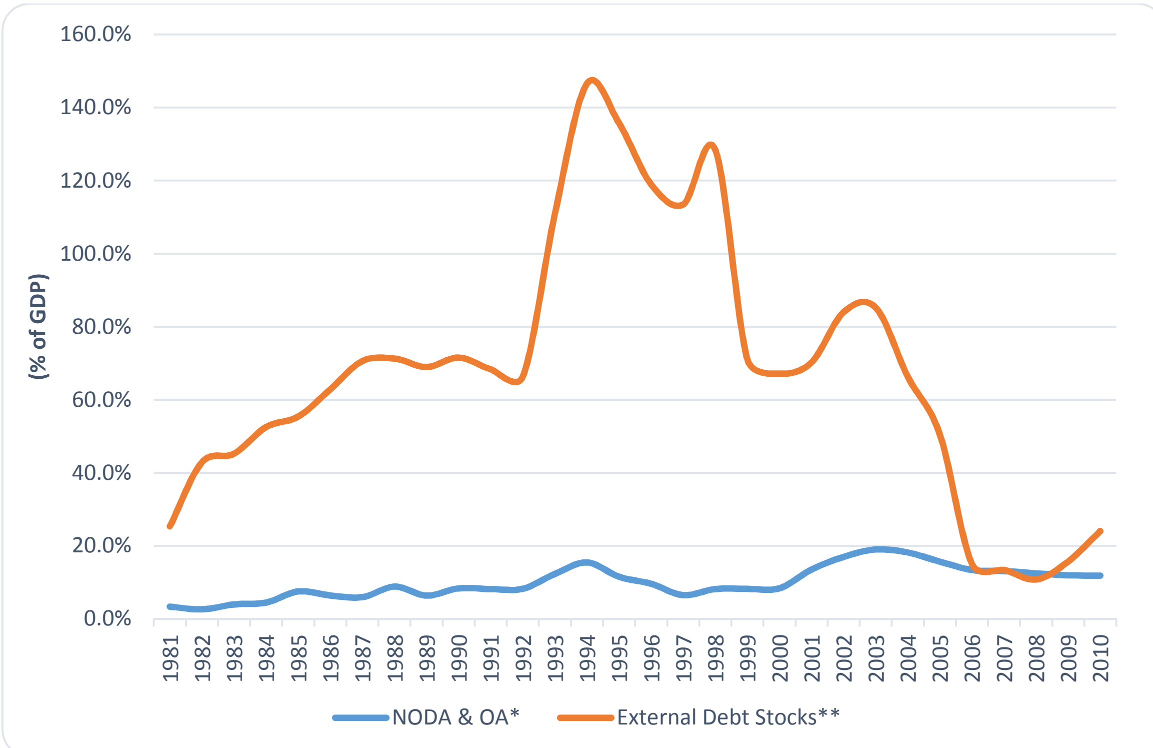


Figure 5: External Debt Stocks & Aid, Ethiopia



Source: The WB's WDI database and author's computaion. Net official development assistance and official aid received; **External debt stocks, total.*

CHAPTER 2

Local Multiplier Effect of Entry to Tradable Sector: Evidence from South African Metropolitan Cities

Ease of new firm entry to the market at local jurisdiction level has broader economic implication not only on the attractiveness of local business environments but also on the soundness of the national investment climate and commitments of governments towards creating job opportunities in their respective jurisdictions. Identifying the economic sector, which ensures maximum creation of job opportunities in a particular area and worth spending tax-payers resources, remains the most challenging tasks of local and national governments. Chapter 2, to this end, explores the local multiplier effect of new entry of firms into the tradable sector on that of entry to the nontradable sector using a large panel dataset obtained from the South Africa's Companies and Intellectual Property Commission (CIPC) databases on South African metropolitan cities.

Using different panel data estimation techniques, including fixed effects and instrumental variables based on a "shift-share" instruments of national levels of entry of firms into the tradable (manufacturing) sector, I found that new entry of firms into tradable sectors in the South African metropolitan areas are positively and significantly associated with entry of new nontradable (service) businesses in those specific areas. The time fixed effect estimate, controlling for different local socio-economic factors, in particular, reveals that a 10 percent additional entry to the tradable (manufacturing) sector is associated with a 5.92 percent increase in non-tradable (service) sector. That is, for each additional formation of business in the manufacturing sector in a given municipal unit (MU), 15.26 firms are created in the nontradable sector in the same place. I also find that wage and fixed investment in the financial development (including: finance, insurance, real estate and business services) have determinant roles in the new entry of firms into the nontradable sector. Different tests for Granger causality also reveals inverse and two-way causalities although it varies from city to city.

2.1. Introduction

The effort of local and national governments in creating jobs in their jurisdiction mainly depends on their effort to create conducive business environment for the existing firms and newly establishing ones. Nevertheless, the administrative organs most often fail to identify the most critical economic sector where they should spend their budget and resources to ensure maximum job opportunity in their respective jurisdiction. Moretti (2010), for example, argues that the magnitude of local multipliers is important for regional economic development policies, and for shaping the direction of subsidies by local and national governments. Using data from the 1980, 1990, and 2000 U.S. Census of Population he finds that jobs in the tradable (manufacturing) sector have local multiplier effects on nontradable (service) sector as large as 1.6 folds.

The government of South Africa (SA) is currently intensively working in creating jobs in the country, especially in less developed and highly populated areas, together with many development partners including the World Bank.[16] Two complementary instruments have been considered to integrate marginalized communities to the mainstream economy in the country: "taking people to jobs," which the government has been doing until recently, and "creating jobs where people live," instead of moving the labor to cities where there are high concentration of industries and services. Although creating jobs where there are unemployed but potentially capable workers has become the most preferred solution, especially in areas where there is a potential for growth, the question of what types of business activities should be created and what kinds of policy instruments should be installed to improve the business environment, remains a puzzle for government, policy makers and development partners. This paper, to this end, seeks to provide empirical evidence to the question raised above by analyzing the local multiplier effect of entry into the tradable (manufacturing) sector on the nontradable (service) sector in South African metropolitan areas. Unlike Moretti (2010) and Moretti and Thulin (2012), this paper focuses in the entry of new firms in the tradable and

[16] A forthcoming World Bank's policy paper by Mengstea, T., Bastos, P., Edwards, L., Assayew, T., entitle "Sector Growth in Less Developed Regions in South Africa: An Assessment of Potential and Constraints" explores the issue more thoroughly.

nontradable sectors -- instead of counting the number of new jobs -- in one of the emerging economies (South Africa), which has a dual economic nature of developing and developed economies, employing a large panel data of new firm registrations.

In particular, this paper tries to answer the following three important questions:

i. How does entry of new firms to the tradable (manufacturing) sector affect the entries of new firms in non-tradable (service) sector?

ii. Is there a causal relationship between entry to the tradable and entry to the non-tradable sectors?

iii. What other factors might affect entry to the non-tradable sector, besides the entry to the tradable sector?

The structure of the paper is as follows. Section 2.2 presents a brief overview of the economic and administrative background of South African metropolitan cities (Municipal Units, referred as MUs, henceforth). Then, Section 2.3 follows by setting up the methodological framework, which highlights the estimation method and the data employed. Section 2.4 presents the empirical analyses while Section 2.5 concludes and suggests important future research problems.

2.2. Administrative and Economic Background of South African MUs

Following the 1994 end of apartheid in SA, a new administrative units of the state – the local, district and provincial governments - were laid out by the new government systematically integrating areas that apartheid had separated (Makgetla, 2010). The country is divided into nine provinces: the Eastern Cape, the Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, North West, the Northern Cape and the Western Cape. Each province is disaggregated into districts making up a total of 52 districts. These districts are also divided into local or metropolitan Municipal Units (MUs), governed by municipal councils elected every five years. There are a total of six[17] metropolitan, also known as "Category A," municipalities (City of Cape Town, Nelson Mandela Bay (or Port Elizabeth), eThekwini (or Durban), Ekurhuleni, City of Johannesburg, and City of Tshwane (or Pretoria)) and 46 district municipalities comprising 231 local municipalities. While the metropolitan municipalities, also known as Unicities, have exclusive municipal executive and legislative authority in their areas, the district local municipalities have individual local councils which share their municipal authority with the district council under which they fall.

The country's Constitution, section 155.1.a, defines "Category A" municipalities. In the Municipal Structures Act, it is laid out that this type of local government is to be used for conurbations, center(s) of economic activity, areas for which integrated development planning is desirable, and areas with strong interdependent social and economic linkages.

The metropolitan (or category A) municipalities, which are the center of this paper, are characterized by densely populated urbanized regions that encompass multiple cities. As Table 6 (Appendix II) depicts, based on the information obtained from 1996 and 2001 censuses, the population of the metro areas constituted 31 and 33 percent of the total population of the country, respectively, witnessing a 17 percent growth in the five years alone. The population density of the metro areas, which were 44.0 and 47.4 times higher than the non-metro areas, in 1996 and 2001, respectively, had also witnessed a surge of 17 percent during the two census periods.

Table 6 (Appendix II) also depicts that the median nominal income per capita of the metro MUs (5,400 and 5,700 South African Rand in 1996 and 2001, respectively,) were 73 and 32 percent higher than the non-metro MUs in 1996 and 2001, respectively. Nevertheless, the

[17] Concurrently with the 2011 municipal election, two additional metropolitan municipalities (the Mangaung Metropolitan Municipality surrounding the metropolitan area of Bloemfontein and Buffalo City Metropolitan Municipality around East London) were recently-created making the total metropolitan municipalities eight. This paper, nevertheless, considered the former classification (six metropolitan municipalities) as the data was mainly organized according to the 2001 census and the Quantec database, which both rely on the former classification.

share of the median income per capita of the metro areas out of the national share decreased by 15 percent from 1996 through 2001 despite the nominal 5 percent increment in the metro areas. On the other hand, the relative share of the unemployment rate in the metro areas increased by 7 percent as compared to the national average. The difference between the metro and non-metro area unemployment rate grew from 2 percent to 4 percent in the two periods. The evidence, in general, suggests the growing economic uneasiness in the metro areas.

Figure 6 (Appendix II) contrasts the positioning of each municipal unit across the nation versus those only found in the metro areas relative to the measure of national median income and average national population density to help visualize the development status of the MUs in SA. Based on these two key measures of socioeconomics indicators (income per capita and population density), we can easily categorize the MUs into four courts: High Income – High Population (HI-HP or Cohort I), High Income – Low Population (HI-LP or Cohort II), Low Income – Low Population (LI-LP or Cohort III) and Low Income – High Population (LI-HP or Cohort IV). Low-income municipal units are located below the horizontal line and units with high population density are located to the right of the vertical line. Among the universe of 497 municipal units considered, 110 (22.3%) fall in the group with low per capita income and high population density (LI-HP or Cohort IV). When we restrict the units only to those found in the metro areas alone, we find that 108 (43.9% of the metro MUs) are in this group. That is, 98.2 percent of the MUs found in the national LI-HP or Cohort IV group are metro area MUs. This confirms the need for exclusive study of the metro areas in order to curve the prevailing development gap in the country. This study, to this end, focuses only on the metropolitan municipalities at the level of municipal units.

Table 7 (Appendix II) presents the population density, income per capita and unemployment rate of the top ten highly populated MUs in 1996 and 2001. While Soweto and Johannesburg (both in the City of Johannesburg Metropolitan Municipality) and Cape Town (in the City of Cape Town Municipality) constitute the top three MUs hosting a large number of dwellers across the metropolitan areas, Tembisa (in Ekurhuleni Metropolitan Municipality), Umlazi (in eThekwini Metropolitan Municipality) and Soweto ranked from first to third as the top three highly concentrated MUs in the country with a population density of 8,000 to more than 10,000 dwellers per sq. meter. Pretoria (in City of Tshwane Metropolitan Municipality), Johannesburg and Durban (in eThekwini) are the most three rich MUs with an average income per capita of R17,194 and R23,594 in 1996 and 2001, respectively. On the other hand, Tembisa, Katlehong (in Ekurhuleni), Umlazi and Soweto are found to be the top four MUs where the is high prevalence of unemployment rates across those top 10 populated MUs with an average unemployment rates of 21.3% and 27.0%, in 1996 and 2001, respectively. Tembisa and Umlazi, in particular, suffer not only from high concentration of population but also from growing unemployment. In the two periods, the unemployment rates in the two cities grew by 5.9 and 5.8 percent although they are preceded by Mitchell's Plain (in Cape Town) and Soweto with a 7.0 and 6.1 percent growth rate of unemployment, respectively.

2.3. Methodological Framework

2.3.1 Empirical Estimation Method

Building on Moretti's (2010) "Local Multiplier" conceptual framework, this paper tries to provide empirical evidence on the local multiplier effect of tradable sector on nontradable sectors in South African metro areas, where there is high concentration of unemployed labor and potential for development. Unlike Moretti (2010), this paper employs data on entry of new firms into the service and the manufacturing sectors, instead of employment data, since the capacity of a local administration in attracting new firms to its jurisdiction has further policy implication on the business environment of the location.

The empirical model posited in this paper uses data for a number of cities in the six metro areas in SA (subscript k) and years (subscript t), and takes the form:

$$\ln(E_{kt}^{NT}) = \beta \ln(E_{kt}^{T}) + \alpha \cdot X_{kt} + \Lambda_t + \varepsilon_{kt} \quad (1)$$

$$\varepsilon_{kt} = \mu_k + \nu_{kt}$$

where E_{kt}^{NT} is entry to the non-tradable (service) sector in location k at time t; E_{kt}^{T} is entry to the tradable (manufacturing) sector in location k at time t; X_{kt} are other exogenous variables that explain certain location attributes (such as local GDP, local investment on fixed assets, local investment on infrastructure and financial developments, etc.). I also control for changes in local population dynamics (total population and population density) but the exclusion of these variable does not affect the main results in the paper. Λ_t are year dummies, which capture local economic variables. The error term ε_{kt} is assumed to consist of unobservable location-specific fixed effects, represented by μ_k, and a truly random component, ν_{kt}. The specification in (1) implies that the entry multiplier is given by β.

2.3.2 Data

I employ a large series of panel data of firm establishments in South Africa obtained from a Business Register database that contains information on the enterprise name, a unique enterprise registration number, company status (e.g. in business, deregistered, dissolved, etc.), physical and postal address including postal code, and registration date. This database was obtained from the South Africa's Companies and Intellectual Property Commission (CIPC) during the first quarter of 2012 and reflects the most up-to-date information on the enterprise at the time of download. The database provide a rich set of information of business entities in South Africa containing data for over 3 million enterprises and registration dates going as far back as the year 1801. I, nevertheless, focus on firms registered since 1940, as the data is more stable since then, at highly disaggregated MU-level, which is the geographical unit of the analysis. MUs are economically self-contained urban region where most resident both live and work.

It has demanded a huge effort to map the postal code areas in the South African Postal Code System to the Census based spatial units. Some of the difficulties encountered in mapping the postal code areas in the South African Postal Code System to the Census based spatial units includes, among others:[18]

- Postal codes often overlap different provincial and municipal boundaries as defined by the Municipal Demarcation Board;
- Postal codes can cover multiple areas (or main places) that are not necessarily contiguous. The main places in the Census spatial units may also cover geographical areas that are not contiguous;
- There is no clear hierarchy for postal codes. Different postal codes can cover combinations of main places that partly overlap with each other. For example, postal code 3610 covers the main places of Pinetown, Hillcrest, Kloof and New Germany in the eThekwini Metropolitan municipality. Postal code 3624 overlaps and covers Kloof, Bothas hill and Assegay. In these cases, it was necessary to aggregate these main places into a single spatial unit;
- Each Metropolitan municipality in the 497 Census based classification contains a residual category (e.g. P1D01M01C07: City of Cape Town [Part of P1D01M01]). These are not contiguous areas and it is not possible to create a consistent map between these areas and the postal codes.

While out of the 3.6 million businesses registered in the CIPC database, 6% (21 thousand) of them could not be mapped with any of the MUs in SA and 156 MUs were found to have no firms registered in their jurisdictions at all in the past two centuries. After limiting the geographical regions only to those (246) metropolitan MUs, which are the focus of this paper, and further cleaning of the data, from 19 to 82 MUs were found to attract new firms each year between 1940 through 2012, making the total number of MUs considered in this study reach up to 82 per year. That is, one of the data used in this study for the main evaluation of the link between tradable and non-tradable sectors incorporates an unbalanced

[18] Detail explanation of the mapping of the postal code areas in the South African Postal Code System to the Census based spatial units can be obtained from the forthcoming World Bank's report on the Private Sector Growth in Less Developed Regions in South Africa.

data of businesses registered in 19 to 82 MUs from 1940 to 2012 in the South African metro areas.

Figure 7 and Table 8 (Appendix II) presents the evolution of the total number of registered firms and those registered in the service and the manufacturing sectors. The data reveals that the businesses environment in the South African metro areas has witnessed a sharp turnaround since the mid of 1980s and attracted a growing number of new businesses, predominantly into the service rendering activities. As can be also seen on Figure 8 (Appendix II), while the average share of the new entry to the service sector was 59 percent between 1940s and 1960s, it surges to an average of 89 percent in the following three decades. Recently, in the 2000s, new entry to the service sector constitutes even higher shares -- about 96 percent -- on the average. On the other hand, new entry to the manufacturing sector witnessed a marginal increment over the past seven decades. While the share of entry to the manufacturing was only about 4 percent in the 1940s through 1960s, it has entertained a modest increase since then and reach to an average of 7 percent in the following three decades. Recently, in the past one decade, new entry to the manufacturing sector, however, has stagnated at an average of 2.6 percent.

Taking the ratio of new firm entry into the service sector to that of the manufacturing sector (Table 8, Appendix II), the data reveals that, on average, for a single entry into the manufacturing sector, there are 26 new entries into the service rendering businesses in a given MU at a particular year. The data also reveals that the between MUs variation is smaller than the within a MU variations in terms of new entry/firm establishment in South African metro areas across all sectors. That is, the variation of entry of firms over time in a given locations is larger than the variation of entry of firms across locations (municipal units). The within variation of firm entries in the service sector, in particular, and hence in all sectors, in general -- since total entry to all sectors is predominantly influenced by the entry to the service sector -- is 30 times higher than the manufacturing sectors. While the overall entry of firms into the service sector varies from 113 to 165,371 per year across MUs, entry to the manufacturing sector ranges only between zero to 4,119 per year per location.

A closer look at the trend of firm establishments in certain industrial locations reveals that cities such as Pretoria and Johannesburg have succeeded in attracting more firms – more than 10,000 firms per year -- since the mid of 1990s; the trend curves down in the late 2000s, and distinctly so since 2008.[19] Moreover, Johannesburg, Pretoria, Roodepoort (Cape Town) and Sandton (Durban) have attracted a large number of businesses -- more than 200 firms per year -- in the manufacturing sector since the mid of the 1980s. Johannesburg, followed by Pretoria, in particular, were able to attract more than 600 new local and international investments per year into the manufacturing sector. Table 9 (Appendix II) presents the top twenty MUs attracting large number of businesses in the service and manufacturing sector since 2000.

The paper has also benefitted from the detailed timeseries socio-economic indicators obtained from Quantec's database at MU-level. Quantec Research Ltd[20] has constructed a spatially disaggregated database (the Standardized Regional Database) containing information on employment, output, wage remuneration, capital formation for 23 industries in 497 municipal units (covering main places in metropolitan municipalities and local municipalities). It also provides data for these 497 municipal units on population, household income and expenditure, and various development indicators (education, access to municipal services, poverty lines, dependency rates, etc.). The paper has made use of these local socio-economic indicators, in particular: wage, employment, capital, GDP, fixed investment, fixed investment in the infrastructure (water, gas, electricity), fixed investment in the manufacturing sector, and fixed investment in financial development, since 1995, as the data are available only since then, to control for location specific effects while estimating the link between entry to the tradable (manufacturing) and non-tradable (service) sector.[21] (See Table 10, Appendix II.)

[19] The decline in firm entry since 2008 could be attributed to both the global financial crisis and the change in the firm registration system in South Africa.
[20] Quantec Research Ltd is a South African based consultancy. It compiles economic and financial data, among others, at MU-level in SA.
[21] A severe drawback of this data is that the municipal level unit entries of the industry based data are based on projections of national level aggregate estimates to the lower spatial units. The data are not based on direct statistical inferences from survey results for these spatial units.

2.4. Empirical Result

2.4.1 Basic Estimation

In order to exploit the rich long time series business register dataset obtained from the CIPC's database of newly registered firms, disaggregated by industry of Standard Industrial Classification (SIC) level 1, I first estimate different specification of the model presented in (1) using data on entry to the manufacturing and service sector from 1940 through 2012.[22] It is customary to start the estimation using OLS method, to get baseline estimates. Table 6 (Appendix II), Column 1, shows the OLS estimate of the elasticity of new entry to the tradable sector on non-tradable sector, where the robust standard errors are also indicated in square brackets. The result suggests that an additional 10 percent entry to the tradable (manufacturing) sector in a given MU is associated with a 12.66 percent increase in non-tradable (service) sector. Nevertheless, further investigations reveal that there is significant differences across MUs suggesting the baseline OLS estimate is inconsistent and suffers from omitted variables bias.

Consequently, I resorted to considering a fixed or random effects specifications. But the Hausman test for fixed versus random effect test suggest the use of the former one over the latter. Table 11, column 2 (Appendix II), shows the results obtained from the fixed effect estimation. It indicates that a 10 percent additional entry to the tradable sector in a given MU is associated with a 12.29 percent increase in non-tradable sector, which is very close to the baseline OLS result. But the Wald test for testing the need for time fixed effects rejects the null that all years coefficients are jointly equal to zero, therefore, confirming that time fixed effects are needed. When we consider time fixed effect estimation by including time dummy variables, nevertheless, a 10 percent additional new entry to the tradable sector is only associated with a 4.83 increase in non-tradable (service) sector (column 3). The R-square

[22] In Section 2.4.3, estimation of the impact of new entry to the tradable (Manufacturing) sector on the non-tradable (Service) is presented controlling for different socio-economic factors, which are typical to each location, for the period from 1995 through 2012, for which we have data for most MUs in South Africa.

also improves by 20 and 28 percent compared to the OLS and the FE estimates without time effect, respectively, showing that the model explains 91.5 percent of the variation in the data. The result has important economic significance. Since there are almost twenty-six entry of firms in to the nontradable business for each entry of tradable firm, the time fixed effect estimate implies that for each additional formation of business in the manufacturing sector in a given city, 12.45 firms are created in the nontradable sector in the same MU.

2.4.2 Shift-share Instruments

To take care of the endogeneity problems, I consider exogenous changes in the number of entry in to manufacturing by suitably instrumenting the explanatory variable of interest through three instruments: shift-share instrument, one period lagged values of entry to the manufacturing sector and both as instruments. I construct the shift-share instrument building on the stylized fact that manufacturing firms in the same industry tend to cluster in particular regions because of agglomeration effects (Head et. al., 1994).[23] Taking the analogy from Card (2002), Saiz (2003 and 2006), I construct the 'predicted' change in the number of manufacturing firms in each MU during the observed periods. The predicted change is based on the actual shares of manufacturing businesses in each MU at the beginning of the period, and the total establishment of manufacturing businesses in South African metro areas during the whole period. By construction the 'predicted' change does not depend on any area-specific shock during the observed period.

The shift-share instrument is, therefore, generated as follows:

$$\widehat{E_{k,t}^{T}} = \phi_{k,1940} \cdot E_{SA,t}^{T}$$

where $\widehat{E_{k,t}^{T}}$ is the predicted number of new entry to the manufacturing sector in MU k and year t , $E_{SA,t}^{T}$ is the total entrants to the manufacturing sector in South Africa in year t , and $\phi_{k,1940}$ is the share of entrants to the manufacturing sector in MU k in 1940, the first year of

[23] Head, Ries and Swenson (1995) show, by examining the location choices of 751 Japanese manufacturing plants built in the U.S. since 1980, that industry-level agglomeration benefits play an important role in location decisions.

the dataset that I employed. This prediction is independent of location and time-specific shocks.

Two basic identification assumptions are made. First, I assume that entry to the manufacturing sector in 1940 is not driven by omitted variables that will affect entry to the service sector in the future. In other words, entrants to the manufacturing sector in 1940 did not predict the future evolution of entry to the service sector better than the participants in the local economy and the business environment. The second identifying assumption is the exogeneity of the national entry to manufacturing sector to the entry of firms to the service sector in each MU.

Table 12 (Appendix II) shows the results obtained from considering each instrument separately and both of them together. While the robust regression F test fails to reject the null that entry to the manufacturing is exogenous in the case of the shift-share instrument (column 1), the test rejects the null when one period lag of entry to the manufacturing sector is used as an instrument (column 2). The test also reject the null when both variables are considered as instruments suggesting that entry to manufacturing has to be treated as endogenous (column 3). However, further investigation of over identifying restrictions reveals that either one or more of the instruments are invalid. On the other hand, the test for the strength of each instrument suggests that they are strong instruments, when considered independently.

In case the location and time effects have a play on the mixed results obtained with the different specification of the instruments shown on Table 12 (Appendix II), I estimated the models controlling for time and location interaction effects – shown on Table 13 (Appendix II). Nevertheless, the diagnostic tests exactly replicate the results obtained with the previous specification (when time and location interaction effects are not considered). The R-squares in the latter specifications have, however, shown considerable improvements over the previous estimates suggesting further analyses of the results worth consideration.

Taking the most conservative IV estimate shown on Table 13, column 1, Appendix II, where shift-share instrument is employed, it shows that an additional 10 percent entry to the tradable (manufacturing) sector in a given MU is associated with an 8.42 percent increase in non-tradable (service) sector in the same MU. Given the fact that there are on average almost twenty-six new entry of firms in to the nontradable business for every entry to the tradable sector, the IV estimate implies that for each additional formation of business in the manufacturing sector in a given MU, 21.9 firms are created in the nontradable sector in the same place.

2.4.3 Controlling for Socio-Economic Attributes of MUs

The South African economy has witness significant changes in the past two decades. Analyzing the data from the 1940s to present at a lump sum could be potentially misleading given the fundamental and structural changes witnessed in the political and socio-economic environment in the country, in particular, and the globe, in general. The 1994 transition of the country to democracy, especially, is a landmark phenomenon in the contemporary economy of the nation. The current administrative units – the local, district and provincial governments – that the country has also laid out in the aftermath of the end of apartheid in 1994, has also a significant implication on the rural and urban economy of the country. To this end, evaluating the evolution of the tradable and non-tradable sectors in the country since 1994 deserves its own treatment. The existence of detail social-economic indicators at MU level from the Quantec database also encourages and contributes to the meaningful analyses and interpretation of the link between new entry to the tradable and nontradable sectors in the metro areas of the country.

Table 14 (Appendix II), Column 1, presents the OLS estimate of the link between entry to the tradable (Manufacturing) and non-tradable (service) sector controlling for different local socio-economic factors: wage, employment, capital, GDP, aggregate fixed Investment, fixed investment in the infrastructure (water, gas, electricity), fixed investment in the manufacturing sector, and fixed investment in financial development. The result suggests that a 10 percent increase in entry to the tradable (manufacturing) sector is associated with an 11.6 percent increase in non-tradable (service) sector. But the result may be flawed by unobserved heterogeneity and endogeneity of manufacturing entry.

Table 14, Column 2, Appendix II, presents the fixed effect estimate controlling for different local socio-economic factors. The result indicates that a 10 percent additional entry to the tradable (manufacturing) sector is associated with a 6.80 percent increase in non-tradable (service) sector. But when we consider time fixed effect estimation by including time dummy variables, it is associated only with a 5.92 increase in non-tradable (service) sector (column 3). This means, based on the fact that there are on average almost twenty-six new entry of firms in to the nontradable business for every entry to the tradable sector, for each additional formation of business in the manufacturing sector in a given MU, 15.26 firms are created in the nontradable sector in the same place. The time fixed effect estimate has also reveals that wages and fixed investment in the financial development play a determinant role in the formation of new businesses in the service sector. A 10 percent increase in wages and fixed investment in the financial development increase entry to the service sector by 47.69 and 12.69 percent, respectively.

Table 15 (Appendix II) depicts the IV estimates isolating the exogenous changes in the number of entry to manufacturing through shift-share (Columns 1 and 3) and one period lagged values of entry to the manufacturing sector (Columns 2 and 4) as instruments. Since using both of the instruments together (at a time) fail to meet the over identifying restrictions, i.e. either one or more of the instruments are found to be invalid, the results obtained with these specification are not discussed here. On the other hand, the test for the strength of each instrument suggests that, except in the case of use of the shift-share instrument, when time and location interaction effects are considered (Column 3), they are found to be strong instruments.

As shown on Table 15 (Appendix II), Column 1, where the shift-share instrument is employed, an additional 10 percent entry to the tradable (manufacturing) sector in a given MU is equivalent to creating 10 percent new businesses in non-tradable (service) sector in the same MU. But when the lagged value of entry to the manufacturing sector is used as instrument (Column 2), the result improves by 2.3 percent (to 12.38 percent). Nevertheless, if we control for location and time interaction effects (Column 3 and 4), the results show marginal declines compared to the corresponding estimates without controlling time and location interaction effects. For example, the elasticity (β) of entry to the manufacturing sector is 0.944 (Column 3) holding constant all the other determinants of entry to the nontradable sector when a shift-share instrument is employed. Whereas the lag variable is used as instrument, the elasticity improves to 1.18. Taking the most conservative IV estimate shown on Column 3 and the fact that there are on average almost twenty-six new entry of firms in to the nontradable business for every entry to the tradable sector, into account, the IV estimate implies that for each additional formation of business in the manufacturing sector in a given MU, 24.34 firms are created in the nontradable sector in the same MU.

The subsequent natural question to follow the observed significant relation between entry to the tradable and nontradable sectors in the South African metro areas is whether there is reverse causal relationship between the two series across the MUs. That is, does entry to the service sector feeds back to entry to the manufacturing sector, and vise-versa? I carry out several Granger (-like) tests to support the evidence obtained from the fixed effect systems diagnostics. First, I fit a model with natural log of entry to the service sector as a dependent variable with the first four lags of the natural log of entry to the service and entry to the manufacturing businesses as regressors. The fixed effect estimation rejects the null restricting the coefficients of the lags of manufacturing to zero ($F(4, 80) = 83.16$; *Prob.* $> F = 0.0000$) implying that entry to manufacturing sector granger causes entry to the service sector. Employing similar procedure to test the inverse causality, i.e. making entry to the manufacturing sector as a dependent variable, reveals that entry to the service sector also granger causes entry to the manufacturing sector by rejecting the null of zero coefficients of the lags of service sector ($F(4, 80) = 35.32$; *Prob.* $> F = 0.0000$).

Further evidence comes from Granger causality models fitted to each of the 71 (out of the total 94) MUs series, where there is sufficient data to run Granger causality test, restricting the number of lags to 4.[24] The result (see Table 16, Appendix II) indicates that entry to service sector does Granger causes entry to the manufacturing sector in 20 the MUs. On the other hand, out of 71 MUs with sufficient data, in 48 MUs direct Granger causality was

[24] Employing Stata's gcause2 command.

noticed running from entry to manufacturing to entry to the service sector. Whilst two-way Granger causality is observed in 13 of the MUs, no direct or reverse causality is observed in 39 of them.

2.5.Conclusion and Future (Unsolved) Research Problems

This chapter seeks to provide empirical evidence to the effort of local governments in the South African metropolitan areas in creating jobs in their jurisdiction using panel data of new firms registration obtained from the South Africa's Companies and Intellectual Property Commission (CIPC) databases. The paper provides answer to the local multiplier effect of new entry into the tradable sector on the nontradable sector in the context of South African metropolitan areas employing different techniques of estimations. The time fixed effect estimate, controlling for different local socio-economic factors, in particular, reveals that a 10 percent additional entry to the tradable (manufacturing) sector is associated with a 5.92 percent increase in non-tradable (service) sector. That is, for each additional formation of business in the manufacturing sector in a given MU, 15.26 firms are created in the nontradable sector in the same place. I also find that wage and fixed investment in the financial development (including: finance, insurance, real estate and business services) have determinant roles in the new entry of firms into the nontradable sector. Test for granger causality also reveals inverse and two-way causalities although it varies from city to city.

The results this paper provides also triggers some important questions that future researches should address. Some of the unanswered questions includes, but not limited to:

1. What is the odds of entry to the tradable sector in a certain MU in SA? Does it differ from one metropolitan location to the other?
2. What policy and administrative tools should be installed promote new establishment of firms?
3. How does the growth in the tradable sector impact on income inequality and poverty in the country?

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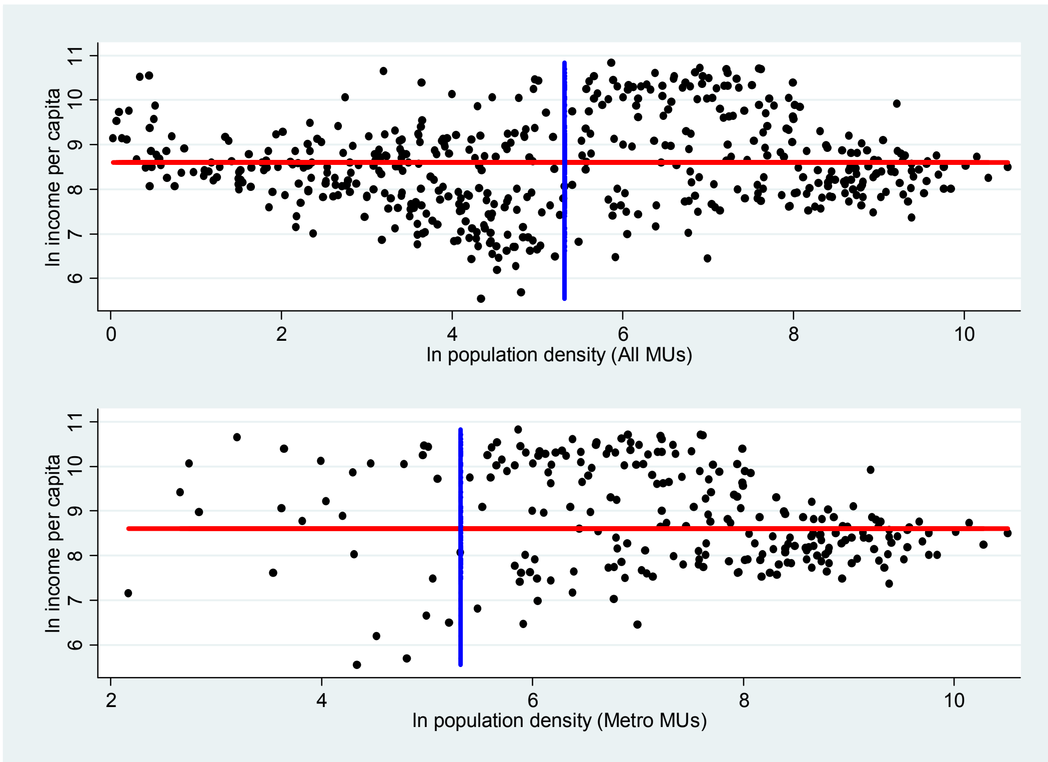
Appendix II

Figure 6 (CHAPTER 2): Comparison of Distribution of MUs Across the Nation Versus Only in Metro Areas as Seen Through the Perspectives of Median National Income per Capita and Average Population Density Perspective



Source: Author's computation based on census 2001 information. MUs with zero income or population are excluded. While the red line is the national median income per capita, the blue line represents the median population across MUs in South Africa.

Table 6: Comparison of Metro and Non-Metro Municipalities, SA

	Indicator	1996	2001	Growth Rate/Change
Non-Metro MUs	Total Population	27,800,000	30,100,000	8%
	Population Density	23	25	8%
	Median Income per Capita	3,149.09	4,304.63	37%
	Unemployment Rate	11.0%	13.8%	26%
Metro MUs	Total Population	12,600,000	14,700,000	17%

	Population Density	1,011	1,180	17%
	Median Income per Capita	5,434.77	5,691.78	5%
	Unemployment Rate	13%	18%	39%
Total	Total Population	40,400,000	44,800,000	11%
	Population Density	33	37	11%
	Median Income per Capita	4,100.72	4,838.69	18%
	Unemployment Rate	11.6%	15.2%	31%
Share of Metro Area Out of Total	Total Population	0.31	0.33	0.02*
	Population Density	30.57	32.16	1.59*
	Median Income per Capita	1.33	1.18	-0.15*
	Unemployment Rate	1.11	1.18	0.07*
Ratio of Metro to Non-Metro Areas	Total Population	0.45	0.49	0.04*
	Population Density	43.97	47.38	3.41*
	Median Income per Capita	1.73	1.32	-0.40*
	Unemployment Rate	0.02**	0.04**	0.02*

Source: Author's computation based on 1996 and 2001 censuses. The data represents only MUs considered in the study based on the Quantec classification of local MUs.
**=Difference between 2001 and 1996; **=Difference between metro and non-metro MUs*

Table 7: Top Ten Populated MUs in Metro Areas (1996 and 2001), SA

1996						2001					
Metropolitan	MU	Population	Popl. Density	Income per Capita	Unemployed	Metropolitan	MU	Population	Popl. Density	Income per Capita	Unemployed
Cape Town	Cape Town	861,868	1,735	12,539	5.8%	Johannesburg	Johannesburg	1,000,000	1,980	19,822	15.2%
Johannesburg	Soweto	812,170	7,615	4,803	20.3%	Johannesburg	Soweto	858,648	8,051	5,650	26.4%
Johannesburg	Johannesburg	803,292	1,576	14,729	9.3%	Cape Town	Cape Town	827,216	1,665	17,457	8.0%
eThekwini	Durban	512,260	2,259	14,428	8.7%	eThekwini	Durban	536,646	2,367	19,375	11.5%
Tshwane	Pretoria	487,797	947	22,426	2.6%	Tshwane	Pretoria	525,386	1,020	31,585	4.8%
eThekwini	Umlazi	341,663	7,330	4,136	20.4%	Cape Town	Mitchell's Plain	398,648	4,366	8,000	16.6%
Cape Town	Mitchell's Plain	314,002	3,439	6,562	9.6%	eThekwini	Umlazi	388,690	8,339	4,445	26.2%
Ekurhuleni	Katlehong	278,984	4,534	4,578	22.1%	Ekurhuleni	Katlehong	349,864	5,686	4,556	27.2%
Ekurhuleni	Tembisa	270,799	8,327	5,009	22.4%	Ekurhuleni	Tembisa	348,685	10,722	5,704	28.3%
Tshwane	Soshanguve Part 1	257,139	2,188	4,758	15.9%	Cape Town	Khayelitsha	329,007	7,560	3,910	24.8%

Figure 7 (CHAPTER 2): Total Number of Firms Registered and Those Registered in Service and Manufacturing Sector in SA's Metro Areas.

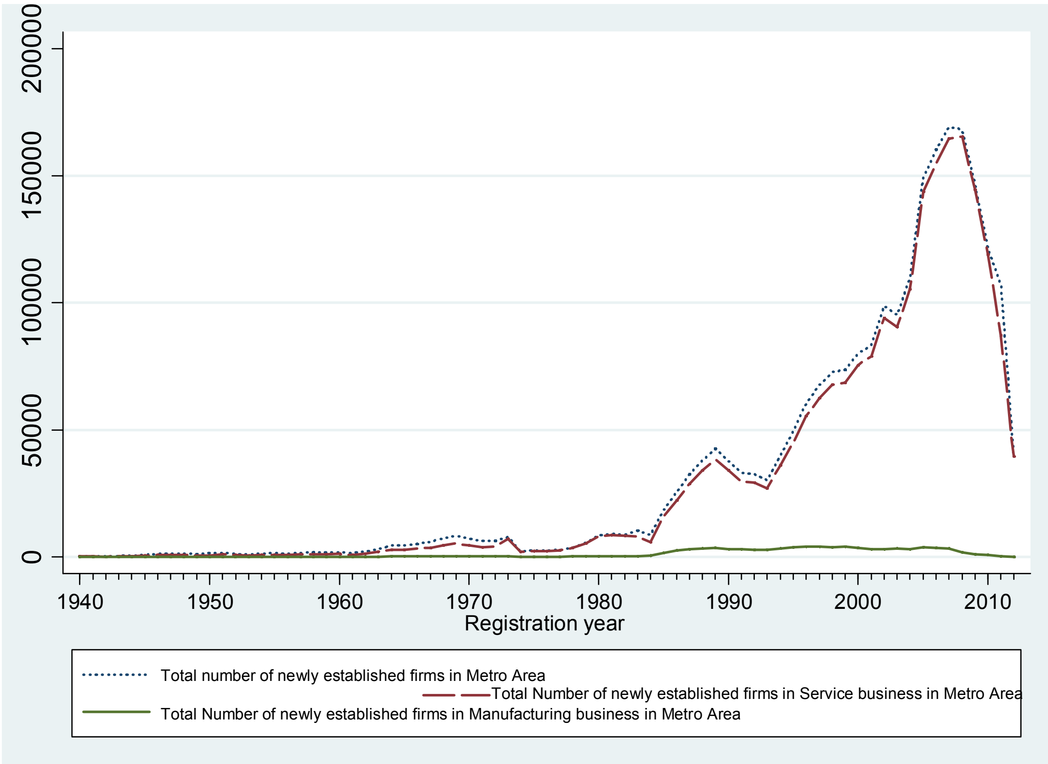


Figure 8 (CHAPTER 2): Share of New Entry of Firms to the Service and Manufacturing Sectors.

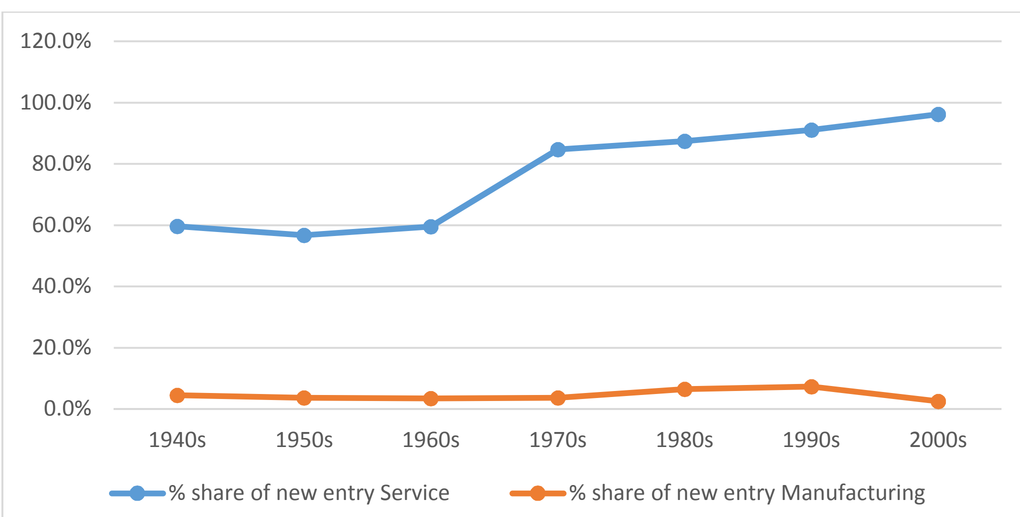


Table 8: New Entry to the Service and Manufacturing Sectors in Metro Areas (1940 and 2012), SA

Sector		Mean	Std. Dev.	Min	Max	Observations	
Total Entry	overall	32053.6	46376.4	183	169240	N =	6862
	between		3.66E-12	32053.6	32053.6	n =	94
	within		46376.4	183	169240	T =	73
Entry to Service Sector	overall	29756.3	44809.1	113	165371	N =	6862
	between		3.66E-12	29756.3	29756.3	n =	94
	within		44809.1	113	165371	T =	73
Entry to Manufacturing Sector	overall	1154.07	1476.74	0	4119	N =	6862
	between		0	1154.07	1154.07	n =	94
	within		1476.74	0	4119	T =	73

N: total number of observations; n: number of MUs; T: time periods (years of observations).

Table 9: Top 20 MUs Attracting Large Number of Service and Manufacturing Businesses Since 2000

	Total Number of Entry (since 2000) to:		Service to Manufacturing Ratio
Municipal Unit	Service	Manufacturing	
Pretoria	330,726	4,668	70.8
Johannesburg	261,486	5,750	45.5
Cape Town	95,236	2,416	39.4
Durban	73,413	2,408	30.5
Soweto	41,694	579	72.0
Roodepoort	36,488	844	43.2
Sandton	35,816	791	45.3
Luganda	31,219	989	31.6
Pinetown	31,116	674	46.2
Port Elizabeth	28,922	879	32.9
Midrand (Johannesburg)	25,629	468	54.8
Milnerton	24,431	596	41.0
Kempton Park	23,362	471	49.6
Benoni	21,437	636	33.7
Bellville	20,613	549	37.5
Randburg	20,329	450	45.2
Tembisa	18,250	248	73.6

Germiston	17,537	489	35.9

Table 10: Descriptive Statistics of Local Attributes of MUs (1995 – 2012):

Variable		Mean	Std. Dev.	Min	Max	Observations
Population Density	overall	4061.454	4359.572	52	22368	N = 1128
	between		4351.142	66	19721	n = 94
	within		508.1499	214	7356	T = 12
Population	overall	141949.7	197678.8	213	1256708	N = 1128
	between		197946.9	334	1138243	n = 94
	within		16625.54	11409	287625	T = 12
Wages	overall	3412.843	5891.129	1	42852	N = 1504
	between		5872.449	4	34911	n = 94
	within		750.9388	-4023	11354	T = 16
Employment	overall	49536.43	104053.1	232	790164	N = 1222
	between		104243.3	256	684621	n = 94
	within		8195.433	-71094	155079	T = 13
Capital	overall	20062.72	35779.57	0	326331	N = 1275
	between		33950.98	12	194157	n = 85
	within		11839.57	-62539	152237	T = 15
GDP	overall	6428.692	11135.15	1	91167	N = 1504
	between		10938.55	6	66833	n = 94
	within		2352.397	-14512	30763	T = 16
Total Fixed Investment	overall	1211.236	2117.342	0	19250	N = 1275
	between		1983.095	1	11557	n = 85
	within		770.5126	-3601	8905	T = 15
Fixed Investment in Infrastructure (water, electricity, road)	overall	75.67573	143.0952	0	2136	N = 1275
	between		110.0849	0	668	n = 85
	within		92.14514	-319	1544	T = 15
Fixed Investment in Manufacturing	overall	278.4421	372.374	0	3305	N = 1275
	between		357.447	0	2053	n = 85
	within		110.8968	-343	1530	T = 15
Fixed Investment in Financial Development	overall	327.1336	689.484	0	6268	N = 1275
	between		658.8649	0	4004	n = 85
	within		214.6058	-1374	2590	T = 15

Source: Quantec Research Ltd.

Table 11: Local Multipliers of Entry into Tradable sector on entry to Nontradable sector, data from 1940-2012

VARIABLES	Elasticity of OLS (1)	Elasticity FE (2)	Elasticity time FE (3)
Ln (Manufacturing)	1.26626***	1.22901***	0.48289***
	[0.025]	[0.036]	[0.036]
Constant	1.97826***	2.03044***	-0.13136
	[0.061]	[0.051]	[0.143]
Observations	3,865	3,865	3,865
R-squared	0.717	0.635	0.915
Number of MUs		94	94

*Robust standard errors clustered by MUs in brackets. *** p<0.01, ** p<0.05, * p<0.1.*

Table 12: Estimation of Local Multipliers of Entry into Tradable Sector on Entry to Nontradable Sector, Using IVs (1940-2012)

Variable	IV (Shift-share IV) (1)	IV (Lag of Manufacturing IV) (2)	IV (both IV) (3)
Ln (Manufacturing)	1.09119***	1.34230***	1.20659***
	[0.026]	[0.035]	[0.029]
Constant	2.42145***	1.97037***	2.19447***
	[0.105]	[0.068]	[0.097]
Observations	1,376	3,482	1,320
R-squared	0.787	0.698	0.781

*Robust standard errors clustered by MUs in brackets. *** p<0.01, ** p<0.05, * p<0.1.*

Table 13: Estimation Using IVs and Time and Location Interaction Effects (1940-2012)

Variable	IV (Shift-share) (1)	IV (Lag of Manufacturing) (2)	IV (both) (3)
Ln (Manufacturing)	0.84242***	1.20902***	0.98581***
	[0.058]	[0.030]	[0.049]
year	0.00138***	0.00100***	0.00128***

	[0.000]	[0.000]	[0.000]
MU	-1.28561***	-0.96812***	-0.97286***
	[0.118]	[0.123]	[0.119]
Manufacturing*MU	0.00065***	0.00049***	0.00049***
	[0.000]	[0.000]	[0.000]
Constant	(omitted)	(omitted)	(omitted)
	[0.000]	[0.000]	[0.000]
Observations	1,376	3,482	1,320
R-squared	0.849	0.765	0.845

*Robust standard errors clustered by MUs in brackets. *** p<0.01, ** p<0.05, * p<0.1.*

<u>Table 14: Estimation of Local Multipliers of Entry in to Tradable Sector on Entry to Nontradable Sector, Controlling for socio-economic Factors, (1995-2012)</u>

VARIABLES	Elasticity of OLS (1)	Elasticity FE (2)	Elasticity of time FE (3)
Ln (Manufacturing)	1.15996***	0.67998***	0.59179***
	[0.060]	[0.064]	[0.057]
Ln (wages)	-2.05438**	-3.91030***	4.76922**
	[0.882]	[1.125]	[1.882]
Ln (employment)	-0.26218*	-1.52670*	-1.96549***
	[0.142]	[0.777]	[0.735]
Ln (capital)	-0.50744	0.92334	0.21943
	[0.530]	[0.891]	[0.580]
Ln (GDP)	1.93761	2.13185	-4.31351*
	[1.670]	[1.936]	[2.482]
Ln (Total Fixed Investment)	1.23419*	-0.04569	-2.30986**
	[0.658]	[0.820]	[1.075]
Ln (Fixed Inv. in Infrastructure)	-0.15708*	-0.44250***	0.2698
	[0.087]	[0.110]	[0.270]
Ln (Fixed Inv. In Manufacturing)	-0.10596	-0.20688	0.54231
	[0.228]	[0.549]	[0.524]
Ln (Fixed Inv. in Financial Dep't.)	-0.05249	1.89738***	1.26921**
	[0.244]	[0.494]	[0.545]

Constant	2.92648***	16.45240**	24.25643***
	[0.908]	[7.291]	[6.905]
Observations	908	908	908
R-squared	0.879	0.766	0.815
Number of geounitcode_2		80	80

*Robust standard errors clustered by MUs in brackets. *** p<0.01, ** p<0.05, * p<0.1.*

Table 15: IV Estimation of Local Multipliers of Entry to Tradable sector on entry to Nontradable Sector Controlling for Location Attributes (1995-2012).

VARIABLES	IV Estimates without Time & Location Interaction Effects		IV Estimates with Time & Location Interaction Effects	
	Shift-share (1)	Lag of Manufacturing (2)	Shift-share (3)	Lag of Manufacturing (4)
	1.00680***	1.23850***	0.94383***	1.18430***
Ln(Manufacturing)	[0.135]	[0.067]	[0.120]	[0.062]
	-2.18463**	-2.67064***	-0.81667	-1.65460**
Ln (wages)	[0.936]	[0.738]	[0.974]	[0.761]
	-0.21822	-0.44457***	-0.0563	-0.33621***
Ln (employment)	[0.278]	[0.152]	[0.258]	[0.111]
	-0.5795	-1.00798**	-0.10054	-0.62898
Ln (capital)	[0.615]	[0.471]	[0.626]	[0.452]
	1.8452	3.39484**	0.69013	2.67901**
Ln (GDP)	[1.986]	[1.439]	[1.912]	[1.348]
Ln (Total Fixed	1.90539***	1.30927**	0.63544	0.18105
Investment)	[0.701]	[0.607]	[0.554]	[0.605]
Ln (Fixed Inv. in	-0.15603*	-0.12133	-0.09732	-0.08156
Infrastructure)	[0.088]	[0.087]	[0.097]	[0.089]
Ln (Fixed Inv. In	-0.32387	-0.22641	-0.27154	-0.17538
Manufacturing)	[0.233]	[0.211]	[0.232]	[0.208]
Ln (Fixed Inv. in	-0.15957	-0.26945	0.13346	-0.029
Financial Dvp't.)	[0.285]	[0.213]	[0.274]	[0.187]
			0.00089*	0.00111***
year			[0.000]	[0.000]
			-3.32677***	-2.84575***
MU			[0.530]	[0.531]
			0.00167***	0.00142***
Year*MU			[0.000]	[0.000]

	2.63921**	3.07340***	0	0
Constant	[1.028]	[0.833]	[0.000]	[0.000]
Observations			859	805
R-squared	859	805	0.899	0.893
Number of MU	0.877	0.874		

*Robust standard errors clustered by MUs in brackets. *** p<0.01, ** p<0.05, * p<0.1.*

Table 16: Count of Individual Granger Causality Test Results across MUs.

Granger causality	Number of MUs where		
	Manufacturing G-causes Service	Service G-causes Manufacturing	two-way causality
Yes	48	20	13
No	23	51	39
Insufficient data	23	23	23
Total	94	94	

CHAPTER 3

Income Shocks, Inequality, and Household Saving Rates

There is an ongoing debate on inequality as a cause for a delay in recovery in the aftermath of recession. Using a simulation of U.S. household income and consumption, I found out that it is possible to get significant differences in saving rates across income groups based on income-smoothing alone. I have statistically shown that the "rich" may appear to save a higher share of their income than the rest of the people even though the saving rate out of permanent income is the same for all individuals, by assumption. The difference between the "high" (say the top 5%) and the "low" (bottom 95%) income groups' saving rates could reach up to more than 16 percent as the transitory component of income becomes larger.

It is less clear, however, that the transitory income effect does in fact explain most of the saving rate differences across income groups. The key issue is to calibrate the variance of the transitory shock. Even with a shape parameter for the transitory shock gamma distribution of 100, the standard deviation of the transitory component is 0.10. This implies that a 10 percentage point shock to permanent income is rather common on an annual basis.

My simulation, with A 10 percentage point shock to permanent income, which is a large enough shock to income, does not give a difference in the saving rates between income groups that is as large as witnessed in the empirical evidence. The effect of transitory income shocks on saving rates across income groups is probably not trivial. But there are likely other forces driving the difference between saving behavior across households.

Keywords: Gamma, Lognormal, Saving Rate, Inequality.

3.1.Background

It has been almost four years since the Business Cycle Dating Committee at the National Bureau of Economic Research determined that a trough in business activity occurred in the U.S. economy in June 2009. Even though the committee did not conclude that the economy had returned to operating at normal capacity, it was claimed that the recession ended and a recovery began in that month. Nevertheless, after the official declaration of the end of the Great Recession, the recovery has remained sluggish to date. Despite a wide range of possible reasons put forward by scholars, such as an uncontrollable market forces like globalization, trade liberalization, the technological revolution and the "rise of the rest", some economists argue that the rise in inequality observed across the U.S. households over the past four decades is an important factor that explains the slow recovery.

Joseph Stiglitz on his NY Times blog claims that "Inequality stifles, restrains and holds back growth through (i) weakening the middle class, which support the consumer spending that has historically driven the US economic growth; (ii) disabling the middle class to invest in their future, by educating themselves and their children and by starting or improving businesses; (iii) holding back tax receipts; and (iv) exacerbating economic instability."[25]

Evidence from Cynamon and Fazzari (2013) also sheds light on the fact that the demand drag of rising inequality in the US economy could be one explanation for the stagnant recovery. They show that, during the past three decades, while income inequality widened across US households, demand drag did not occur because the spending share of the bottom 95 percent of income earners rose, accompanied by a historic increase in borrowing. Their approach also discusses the possibility that the rich save a higher share of their income than the rest of the people, so rising inequality will (eventually) lead to lower spending.

On the other extreme, there is skepticism about inequality as a cause for the delay in recovery in the aftermath of the recession. In a blog[26] debate with Joseph Stiglitz, Paul Krugman, in

[25] http://opinionator.blogs.nytimes.com/2013/01/19/inequality-is-holding-back-the-recovery/, January 19, 2013.

[26] http://krugman.blogs.nytimes.com/2013/01/20/inequality-and-recovery/http://krugman.blogs.nytimes.com/2013/01/21/more-on-inequality/

particular, dismisses the importance of rising inequality for the drag in aggregate demand on statistical grounds. His logic goes back to an old idea of Milton Friedman's (1957) *A Theory of the Consumption Function*. At any point in time, we might observe that high-income people have higher savings rates than lower income people. He argues, however, that this outcome could be just a statistical illusion with no structural economic implications since a cross-sectional sample of people with high (low) incomes will disproportionately include people who are having an unusually good (bad) year and will therefore be saving a lot (little) if their consumption is determined by their stable "permanent" income.

Higher permanent inequality will not reduced aggregate demand if the propensity to consume out of permanent income is the same across income groups. And Krugman's point is that this may be the case *even though we might measure higher saving rates for the rich* at any point in time. There is no doubt that this argument is correct as a matter of logic. The key empirical question is whether the purely statistical story for why saving rates differ across income groups is sufficiently large to dismiss concerns about inequality and demand drag. This is the issue we consider in this paper.

3.2. Conceptual Framework/Methodology

We take a first step toward answering the question posed in the introduction by calibrating a very simple model of permanent and transitory income. The basic idea is to start with a model in which, by construction, all households follow the permanent income consumption rule. For such households, transitory shocks to income will have no effect at all on consumption. But positive transitory income shocks will push some households with low permanent income into higher income groups which inflates their measured saving rate. Symmetrically, negative income shocks will temporarily push some households with high permanent income into lower income groups. Because the spending of these households depends solely on their (higher) permanent income, their observed saving rate will be lower than their saving rate out of permanent income. The implication is that for any arbitrary income threshold that divides "rich" from "non-rich," measured saving rates for the two groups as a whole will suggest that the rich save a larger share of their income. This is true even though we know by construction that there is no difference in the permanent saving and consumption propensities across households. To measure the size of this phenomenon, we begin by constructing empirically reasonable distributions for both permanent income and transitory income.

Following the literature (Aitchison and Brown, 1957; Salem and Mount, 1974; Dagum, 1977b), we employ widely used probability distributions to model the permanent and transitory components of income, the lognormal for permanent income and the gamma distribution for the proportional transitory shock to income. These distributions have advantages over other possible income distribution estimation models because their parameters have clear economic interpretations. In addition, these distributions fit the whole range of income groups, unlike the Pareto model, for e.g., which best describes the high income groups. Aitchison and Brown (1957) show that the scale (σ^2) parameter of the lognormal distribution can be used as a measure of inequality demonstrating that the larger the σ^2, the larger the inequality measure. The shape parameter (α) of the gamma distribution, on the other hand, is directly associated with measure of skewness (inequality). As the value of α increases the population in the left tail decreases and thus the inequality decreases. Whereas, the second parameter (θ) of the gamma distribution is the scale parameter.

We first set up an artificial economy consisting of N (=10,000) households. We, then, calibrate a lognormal distribution to approximately reproduce the distribution of permanent household income in the U.S using simulation of hypothetical households. Then, we employ a gamma distribution to determine the transitory income component such that actual income is the product of permanent income and a proportional shock to the permanent income – the transitory income – as follows:

$$Y_{jt} = P_j * X_{jt}, \qquad (1)$$

where, $P_j \sim logN(\mu, \sigma^2)$; with μ and σ^2 log-scale and shape parameters, respectively;

$X_{jt} \sim Gamma(\alpha, \beta)$; with α and θ(=$1/\beta$) are shape and scale (β=rate) parameters, respectively;

The subscript $j(= 1,2,3, \dots, N)$ indexes individual households and $t(= 1,2,3, \dots, T)$ indexes time. P_j is the permanent income component for each individual household (HH) j and it is time-invariant. Its probability distribution function (pdf) is represented as:

$$f_{P_j}(p; \mu, \sigma) = \frac{1}{p\sigma\sqrt{2\pi}} e^{-\frac{(lnp-\mu)^2}{2\sigma^2}}, p > 0 \tag{2}$$

Whereas, X_{jt} is the transitory component of income with a Gamma distribution following a pdf of the form:

$$f(x; \alpha, \beta) = \frac{\beta^{\alpha} x^{\alpha-1} e^{-\beta\alpha}}{\Gamma(\alpha)} for\ x \geq 0\ and\ \alpha, \beta > 0. \tag{3}$$

We specify the mean of the gamma distribution to be a unit such that the shape parameter (α) equals the rate parameter (β) or equals the inverse of the scale parameter ($\theta = \beta^{-1}$). This assumption restricts the mean of the multiplicative transitory component of income to one. Therefore, because the permanent and transitory components are statistically independent:

$$E(Y_{jt}) = E(P_j) * \mathrm{E}(X_{jt}) = E(P_j), \tag{4}$$

because the mean of the transitory component is one by assumption. The bigger is α, the smaller the skewness ($\frac{2}{\sqrt{\alpha}}$), and variance ($\alpha\theta^2 = \alpha^{-1}$) of the transitory component. That is, as the shape parameter increases, the scale parameter decreases and the inequality (skeweness) decreases in effect.

Assuming that households follow the permanent income hypothesis (Friedman, 1957), we determine consumption for each household as a constant share of permanent income. Based on Cynamon and Fazzari (2013) who find that the benchmark saving rate for US households was 7.37 percent of the permanent income during 1979–84, when household financial circumstances were stable, we fix consumption to be 93% of the permanent income in our simulation. Therefore, by construction, the saving rate would be 7 percent for all households if there were no transitory shocks to income. When we add transitory shocks, however, the saving rate will be higher than 7 percent for households that receive a multiplicative shock greater than one and less than 7 percent for households that have a transitory shock below one.

We look at the difference between the saving rates for the "high" and "low" income groups' in our simulation for different disaggregated groups such as the bottom 50% and top 50%, 90%-10%, and 95%-5%. The groups with higher income will have somewhat higher saving rates since any definition of "high group" will include some households/families with positive income shocks who are (temporarily) consuming a smaller share of the their actual income. The opposite is true for the bottom income group since the cross-sectional sample of the "lower group" will include some high income households/families with a bad year (unusually negative income shocks) who nevertheless consume a large share of the their actual income.

Cynamon and Fazzari (2013) have shown that the difference between the actual saving rates of the U.S. 95% and 5% income groups is between 6 and 7 percentage points for the years 1989 through 2010. One explanation for this difference comes from the theory summarized above. The difference may not be due to some fundamental difference between the income groups' behaviors. Rather, it could come from transitory income shocks. But the question, how large the difference could be remains unanswered. It is, therefore, instructive, at this point, to answer the two important questions that may follow on the size of this effect: (1) Is it large enough to account for a meaningful difference between the disaggregated high and low income groups', such as the top 5% and bottom 95% income groups' saving rates, as found in Cynamon and Fazzari (2013)? (2) How does the answer to this question depend on the variance of the transitory component of income? Does the claim "temporary earnings shocks have only a modest contribution to decreasing the savings rate at low incomes and increasing the savings rate at high incomes" by Huggett and Ventura (1995) still hold?

To this end, we consider four different parameterizations (α=10,θ=0.1; α=20,θ=0.05; α=50,θ=0.02; and α=100,θ=0.01) of the gamma distribution to evaluate how big the difference between the high and low income groups' saving rates could be as the variance of the shock (transitory income component) changes. Our expectation is that for lower α values of the gamma distribution we will see bigger differences in the saving rates between the lower and upper parts of the income distribution.

3.3. Results (Simulation of Saving Rates for Different Cohorts of Households)

We tried to be as realistic in setting the parameters of the permanent income component. According to the U.S. Census Bureau, the 2011 family income distribution percentiles (20th, 40th, 60th, 80th and 95th percentiles) were \$27,000, \$49,000, \$75,000, \$116,000 and \$205,000. Based on these information, we estimated a lognormal distribution that approximates these values for the P_j component yielding a mean of \$83,400 ($\mu = 4.07 \approx 4.1$) and variance \$84,390 ($\sigma^2 = 0.75$). (See Appendix III, A.) The same procedure also estimates a median and mode income of \$58,636 and \$28,975, respectively.

Cynamon and Fazzari (2013) show that the benchmark saving rate for US households was 7.37 percent of the permanent income during 1979–84 when household financial circumstances were stable. Consequently, we imposed a 93 percent constant - propensity to consume out of permanent income across all households in our simulation and computed the measured saving rates for different disaggregation of income groups when everything is constant. (See Table 17, Appendix III.)

We found out that, in general, the aggregate saving rates remain close to the benchmark (ranging between 7.1 percent and 7.3 percent) across the four parameterizations of the gamma distributions used to estimate the transitory income shocks. However, across the different disaggregation of income groups (50%-50%, 90%-10%, and 95%-5%), the saving rates of the bottom income groups is found to be lower than that of the corresponding upper income groups, and even the benchmark, consistent with our expectation. Moreover, as the shape parameter increases, we found out that the difference in saving rates between any lower and upper disaggregation of income groups shrinks considerably, consistent with the theory. For example, in the case of the transitory shock following a gamma distribution of 10 and 0.1 shape and scale parameters, respectively, the difference of the saving rates between the lower and upper 50% income groups is found to be 0.2133 (21.33%). Whereas, the difference drops to 0.0241 (2.41%) when we consider a transitory shock of shape 100 and scale 0.01 values.

The saving rates converge to the benchmark saving rate (7%) as the shape parameter of the gamma distribution for the transitory shock increases and the disaggregation of the income groups become more stringent, i.e. when we move from the less drastic 50% - 50% divide to the conservative 95%-5% divide. While the saving rates of the lower income groups converge to the benchmark saving rate from bellow, the upper income groups' saving rates converge to the benchmark from above. (See Figure 9, Appendix III.)

It is also noteworthy the fact that the difference between the saving rates of the bottom 50% (under the median) and upper 50% (above the median) income groups could reach more than 21% (specifically speaking, 21.33%) as can be seen from our result when we fix the shape and scale parameters of the gamma distribution to 10 and 0.1, respectively. In the case of the 95%-5% divide, the largest difference in saving rates hits 16.66 percent demonstrating the fact that it is possible to have a meaningful difference between the disaggregated high and low income groups' saving rates as found in Cynamon and Fazzari (2013). But the difference declines to 1.97% by reducing the variance of the transitory shock.

3.4. Conclusion

Using a simulation of U.S. household income and consumption, we found out that it is possible to get significant differences in saving rates across income groups based on income-smoothing alone. We have statistically shown that the “rich” may appear to save a higher share of their income than the rest of the people even though the saving rate out of permanent income is the same for all individuals, by assumption. The difference between the “high” (say the top 5%) and the “low” (bottom 95%) income groups' saving rates could reach up to more than 16 percent as the transitory component of income becomes larger. That is, it is possible to get significant differences in saving rates across income groups based on income-smoothing alone. This result suggests that Krugman's explanation for differences in consumption and saving rates across income groups is at least possible.

It is less clear, however, that the transitory income effect does in fact explain most of the saving rate differences across income groups. The key issue is to calibrate the variance of the transitory shock. Even with a shape parameter for the transitory shock gamma distribution of 100, the standard deviation of the transitory component is 0.10. This implies that a 10 percentage point shock to permanent income is rather common on an annual basis. This size of variance already seems large and the simulation with this parameter does not give a difference in the saving rates between income groups that is as large as the empirical evidence. Another feature to keep in mind is that the difference between the saving of the bottom 95% and top 5% changes significantly after 2001 according to the data presented by Cynamon and Fazzari (2013). There is no obvious reason that the transitory variance would have jumped in the early 2000s.

Our overall conclusion, therefore, is that the effect of transitory income shocks on saving rates across income groups is probably not trivial. But there are likely other forces driving the difference between saving behavior across households. Cynamon and Fazzari (2013) propose some explanations for this effect.

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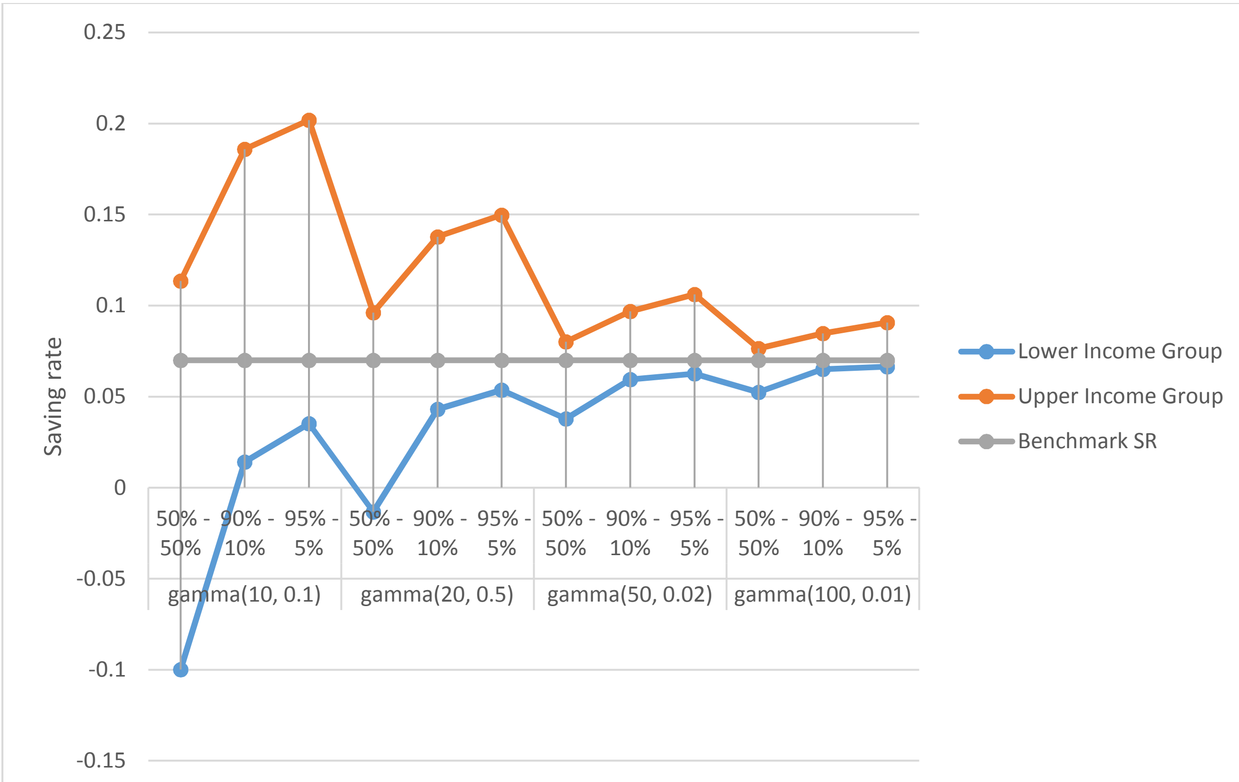
Appendix III

Table 17: Simulated Estimates of Saving Rates (SR) for Different Income Groups

Gamma parameters (Shape , scale) for the transitory income component	Disaggregation of Income Groups	Saving Rates		Difference between Upper & Lower Income Groups' SRs
		Lower Income Group	Upper Income Group	
(10, 0.1)	Aggr. SR	0.0726		
	50% - 50%	-0.0998	0.1134	0.2133
	90% - 10%	0.0141	0.1859	0.1718
	95% - 5%	0.0352	0.2018	0.1666
(20, 0.05)	Aggr. SR	0.0723		
	50% - 50%	-0.0133	0.0961	0.1094
	90% - 10%	0.0430	0.1377	0.0947
	95% - 5%	0.0537	0.1496	0.0960
(50, 0.02)	Aggr. SR	0.0706		
	50% - 50%	0.0379	0.0801	0.0422
	90% - 10%	0.0594	0.0969	0.0375
	95% - 5%	0.0625	0.1062	0.0436
(100, 0.01)	Aggr. SR	0.0710		
	50% - 50%	0.0523	0.0764	0.0241
	90% - 10%	0.0651	0.0848	0.0197
	95% - 5%	0.0665	0.0907	0.0241

Aggr. SR = Aggregate saving rate (the ratio of the aggregate saving to the aggregate income).
Source: Authors simulation.

Figure 9 (CHAPTER 3): Comparison of SRs for different income groups across different parameterization of Gamma distributions for the transitory shock



Appendix III, A.

Estimating the two (shape and scale) parameters of the lognormal distribution from the given fifth percentiles (20th, 40th, 60th, 80th and 95th percentiles) leads us to solving non-linear system of equations of the form:

$$q_{0.20} = f(0.20, \theta)$$

$$q_{0.40} = f(0.40, \theta)$$

$$q_{0.60} = f(0.60, \theta)$$

$$q_{0.80} = f(0.80, \theta)$$

$$q_{0.95} = f(0.95, \theta)$$

where f is the percentile function with parameter vector θ and q are the percentiles.

Nevertheless, for our 2-parameters lognormal distribution, this system is overdetermined, so there are no exact solutions. And yet, we can search for a set of parameters which minimizes the discrepancy:

$$(q_{0.20} - f(0.20, \theta)^2 + (q_{0.40} - f(0.40, \theta)^2 + (q_{0.60} - f(0.60, \theta)^2 + (q_{0.80} - f(0.80, \theta)^2 +$$

$$(q_{0.95} - f(0.95, \theta)^2$$

(One can use any other function besides the quadratic function shown here.)

We, nevertheless, employed the "get.lnorm.par" function from "rriskDistributions" package in R and estimated the parameters nicely. (See Fig. 10.) The "get.lnorm.par" returns the parameters of a lognormal distribution where the pth percentiles match with the quantiles q. As a result, we found out that the mean-log (M) and the sd-log (S) to be 4.0712906 and 0.8395617, respectively. Given the two parameters, we easily computed the mean (μ) and sd (σ) of the associated normal distribution as follows:

$\mu = e^{M+S^2/2}$ (= 83.4097, in thousands) and

$\sigma^2 = (e^{S^2} - 1)(e^{2\mu + S^2})$ (= 84.3923, in thousands.)

Doing further adjustments, we employed 4.07 and 0.75 as the log-mean and log-standard deviation, respectively, in our subsequent analyses.

Fig. 10: Fitting the U.S. 2011 Household Incomes