LOCAL ECONOMIC IMPACT OF NIGDE UNIVERSITY: AN ESTIMATION UNDER TRUE INFLATION EFFECT[1]

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ABSTRACT

Local economic and employment impact of Niğde University was estimated for 2012-2013 fiscal year by using three methods: Keynesian Multiplier Method, Ryan Short Cut Method and Survey Method. University budget expenditures data, national statistical data resources, survey data were used in this study. Keynesian income multiplier was estimated to be 1.22. Marginal Propensity to Consume, a key factor in estimating economic impact, was estimated 0.70 in short run model via E-views. This paper shows economic importance of the University to locality by estimating total local income and employment, and finds that the University is a driving force for local economy. This paper provides a calculation including true inflation effect which gives a better estimate of local economic impact. It suggests that income multiplier be small under inflation effect in addition to other effects. Total local impact of the University was estimated by adding gross local outputs, by multiplying the sum of direct and indirect impacts by income multiplier and by multiplying direct impact by income multiplier, respectively. Local employment impact was estimated by multiplying local expenses related to the University by employment factor, and results were compared.

Keywords: Economic impact; university expenditure; inflation effect
JEL Codes: O18; O43; R11

NİĞDE ÜNİVERSİTESİNİN YEREL EKONOMİYE KATKISI: ENFLASYON ETKİSİ ALTINDA BİR HESAPLAMA

ÖZET

Niğde Üniversitesinin yerel ekonomik ve istihdam katkısı 2012-2013 mali yılı için Keynesyen Çarpım Yöntemi, Ryan Kısa Yol Yöntemi ve Anket Yöntemi kullanılarak hesaplanmıştır. Bu çalışmada üniversitenin bütçe harcamaları verileri, ulusal veri kaynakları, anket verileri kullanılmıştır. Keynesyen gelir çarpanı 1.22 hesaplanmıştır. Ekonomik katkının hesaplanmasında önemli bir etken olan marjinal tüketim eğilimi E-Views programı kullanılarak kısa dönem modelinde 0,70 hesaplanmıştır. Bu makale üniversitenin toplam yerel gelir ve istihdam kapasitesini hesaplayarak üniversitenin bulunduğu yer için ekonomik önemini gösterir ve üniversitenin yerel ekonomi için itici bir güç olduğu sonucuna varır. Bu makale yerel ekonomik katkıyı daha iyi hesaplamak için gerçek enflasyon etkisini içeren bir hesaplama yöntemi sağlar. Bu yöntem diğer etkilere ek olarak enflasyon etkisi altında gelir çarpanının küçük olduğunu gösterir. Üniversitenin toplam yerel katkısı sırasıyla gayrisafi yerel gelirlerin toplamı, doğrudan ve dolaylı katkıların toplamının gelir çarpanı ile çarpımı

ve doğrudan katkının gelir çarpanı ile çarpımı sonucunda hesaplanmıştır. Yerel istihdam, üniversiteye bağlı yerel harcamaların istihdam çarpanı ile çarpımı sonucu hesaplanmış ve sonuçlar karşılaştırılmıştır.

Anahtar Kelimeler: Ekonomik katkı; üniversite harcamaları; enflasyon etkisi

JEL Kodları: O18; O43; R11

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INTRODUCTION

The establishment of new state universities in small cities of Turkey since 1992 has brought new economic activities to local economy such as employment, construction of new departments and schools, private dorms and apartments, new banks, stores, restaurants, cafe shops, bookstores, gas stations and more. These continuing activities have increased the number of university personnel and students and therefore have increased university expenditure, personnel and student expenditure on goods and services in the locality and have generated more income to local economy. Therefore, it sparked an interest in studying over local economic impact of the University.

This paper estimates total local income together with local disposable income with respect to inflation effect and employment by Keynesian method, and total local economic and employment impact by Survey method and Ryan short cut method.

1. THEORY OF ECONOMIC IMPACT

Keynesian income multiplier was estimated by $1/[1 - wc(1 - t)(1 - i)(1 - r)]$ where w is proportion of personnel net income expenditure, c is marginal propensity to consume, t is direct tax, i is indirect tax and r is inflation effect.

Indirect tax rates for the University personnel (i_p) is estimated by using 2013 household expenditures data from TR Statistics Institute (TUIK) multiplied by tax rates for each expenditure: $i_p = \sum e_p \cdot t_p$ where e_p is expenditure rate for personnel and t_p is tax rate for personnel. Based on student survey the indirect tax rate (i_s) including VAT, ET, SCT for mean expenditure rates was estimated by $i_s = \sum e_s \cdot t_s$ where e_s is students expenditure proportion and t_s is students tax rate. Weighted mean of indirect tax rates of students and personnel expenditures was estimated to be $i = (n_s * i_s + n_p * i_p)/(n_s + n_p)$ where n_s is the number of students and n_p is the number of personnel.

Direct tax (t) share in total tax revenues in February 2012 was determined according to the statement of Minister of Finance.

Inflation effect r was calculated by subtracting official inflation rate from true inflation rate: $r = [(\sum_k \pi_k \cdot h_k) \div \sum_k h_k] - g$ where k is the number of expenditure groups, π_k is true inflation rate for k^{th} group expenditure, h_k is the proportion in household

expenditures, g is government (official, tune-up) inflation rate and $(\sum_k \pi_k \cdot h_k) \div \sum_k h_k$ is true inflation rate. True inflation rate for most consumed food items from period t_0 to t_1 is estimated by $\pi_1 = \dfrac{\sum \pi_{t_1} - \sum \pi_{t_0}}{\sum \pi_{t_0}}$ where $\sum \pi_{t_0}$ is the sum of prices at period t_0 and $\sum \pi_{t_1}$ is the sum of prices at period t_1. True inflation rate for other items is estimated by $\pi_k = \dfrac{\pi_{t_1} - \pi_{t_0}}{\pi_{t_0}}$ where k is the number of expenditure groups, π_{t_0} is the price at period t_0 and π_{t_1} is the price at period t_1.

First injection taken as base expenditure into expenditure chain is the sum of personnel income and expenditure of the University on goods and services. For every round, formulas to estimate gross local output (GLO) and local disposable income (LDI) are given below.

LDI is estimated by
$$D_k = \begin{cases} (1-t)(1-r)(Y_1 - ihG) & k = 1 \\ (1-t)(1-i)(1-r)Y_k & k > 1 \end{cases}$$

and GLO is estimated by
$$Y_k = \begin{cases} L + S_1 + A + V_1 + dC + hG & k = 1 \\ vS_2 + V_2 + wcD_1 & k = 2 \\ wcD_{k-1} & k \geq 3 \end{cases}$$

LDI factor formula is $\dfrac{D_f}{D_1} = \dfrac{\sum D_k}{D_1} = 1 + \dfrac{D_2}{D_1}\left(\dfrac{1}{1 - wc(1-t)(1-i)(1-r)}\right) = 1 + \dfrac{D_2}{D_1} \cdot k$

where k is Keynesian Income Multiplier and $|wc(1-t)(1-i)(1-r)| < 1$

GLO multiplier formula is $\dfrac{Y_f}{Y_1} = \dfrac{\sum Y_k}{Y_1} = 1 + \dfrac{Y_2}{Y_1}\left(\dfrac{1}{1 - wc(1-t)(1-i)(1-r)}\right) = 1 + \dfrac{Y_2}{Y_1} \cdot k$

2. LITERATURE REVIEW

Most universities in the US have been using a multiplier created by US Bureau of Economic Analysis and it was applied to the direct expenditure to estimate total economic impact. In a full working economy in any state of the US expenditure multiplier is considered at most 2. Such a multiplier was not provided by Turkish National data resources.

Most universities around the world did not include the tax and inflation effects in expenditure multiplier formula in order to generate larger economic impacts and get more financial support from federal or state budget. None of the studies in Turkey included inflation effect assuming that national data used was already adjusted for inflation (at constant prices). But inflation rates explained by TUIK were just tune up rates and did not show true inflation rates.

A book by Erdinç Tutar (2005) whose title translated into English as "Impact of Universities to Local Economy: the Case of Niğde" covers Niğde's economy.

In 2004, Torun (2005) asked 304 residents who live in the city center whether they were better off with existence of Niğde University and if so from which perspective they were better off with the university there. 87% responded they were better off with the University. To the question of from which perspective they were better off, 43.4% responded "economic".

" "Better off" is usually defined as higher employment, per capita income or local tax revenue" (Siegfried, 2006: 5).

Short quotations from their own words of some respected residents, which summarizes the Niğde University's impacts to the city are given as follows. "increased the flow of hot cash into the city", "made investers stay in the region", "increased quality and the number of service sectors", "provided socio-economic improvement", "increased population", "provided urbanization" (Torun, 2005: 171).

On a survey conducted in 1995 by Objektif Magazine, Niğde residents were asked what they thought about university students being in Niğde. To Public-Student Communication questions, 67% responded that they saw students as customers, 15.5% responded that they saw students both as friend and customer. To "what benefits do you get from students" questions, 51.3% responded that students provide economic impact, 27.6% responded that students provide socio-economic benefit (Özbay, 2013: 23). About 80% of residents were better off economically with existence of students in Niğde. 50.5% of students, 51.8% of academic personnel, 57% of professors and 70% of lecturers stated that they were being seen as money-inducing persons by small business owners in the locality of the university. A 43-year old woman living in Ulukışla province described the students as a factory with no chimneys (Özbay, 2013: 44).

Garrido-Yserte and Gallo-Rivera (2007) used Ryan's short cut model to estimate direct and indirect impact of the University of Alcala upon the local economy. Direct economic impact was estimated to be 118 million euros and indirect economic impact was estimated to be 99 million euros. Total economic impact was estimated 217 million euros by using income multiplier 1.84. Number of full time jobs was estimated to be 3839.

Tavoletti (2007) estimated Keynesian income multiplier of 1.14, a total local income of £ 147 million in Cardiff and £ 153 million in South East Wales as a whole in the 2000-2001 period, a local disposable income of £ 80 million in Cardiff and £ 83 million in South East Wales, 652 indirect additional jobs in Cardiff and 59 in the rest of South East Wales generated by 2,962 direct employees.

Ohme (2003), based on regional I-O Modeling System (RIMS II), applied a multiplier of 1.8 created by US Bureau of Economic Analysis to the direct expenditure (student, faculty, staff and university expenditures) of the University of Delaware and total economic impact was estimated to be $735 million. According to the Bureau of Economic Analysis, approximately 20 jobs are generated for each additional $1 million of output. The estimated spending from students, faculty, staff, and the University therefore support approximately 8,170 jobs in the state of Delaware.

Sürmeli's (2008) project about the Effects of Anadolu University on Eskisehir and City's Sense of University estimated personnels' mean propensity to consume 0.9498. Direct effects were estimated to be 188 million TRY and direct employment effect was

4776 jobs, indirect effects 254 million TRY and indirect employment effect was 2162, and induced effects were 564 million TRY.

Görkemli (2009) "Economic Impacts of Selcuk University to the City of Konya" for the year 2003 estimated marginal propensity to consume to be 0.67 and expenditure multiplier 3.06 by using expenditure multiplier formula 1/(1- c). Direct effects were estimated 41million TRY and direct employment effect was 4205 jobs, indirect effects were 238 million and indirect employment effect was 9497 jobs, and induced effects were 853 million TRY and employment effect was 34085 jobs.

Tuğcu (2004) "University impact to the volume of local economic activity: Case of Nevsehir" used Keynesian Multiplier Model. Via Augmented Dickey-Fuller Test, marginal propensity to consume was estimated to be 0.668463, and expenditure multiplier was estimated to be 3.01 by expenditure multiplier formula 1/(1 – c).

Erkekoğlu (2000) on local economic impact of Sivas Cumhuriyet University for 1998-1999 term estimated direct economic impact to be 4.6 million TRY and direct employment impact 2171 jobs, and indirect economic impact 10.8 million TRY and indirect employment impact 2794 jobs.

Ceyhan and Güney (2011) "Impacts of Bartın University to Economic Development of the City of Bartın with the Projection of 20 years" estimated GLO to be 3.77, and LDI to be 3.50.

Sen (2011) "Local income and employment impact of universities: the case of Izmir University of Economics" estimated marginal propensity to consume to be 0.65 using ADF test and estimated expenditure multiplier to be 1.59.

3. METHODOLOGY

Three methods were applied to estimate total local economic impact: Expenditure Base Keynesian Method, Survey Method and Ryan Short-Cut Method. "The methodology used is based on the Keynesian multiplier theory: an injection of expenditure into a university leads to expenditure by that institution on personnel salaries, goods and services, which together with spending by students coming into the local area raises output and hence income in the area. These (first-round) increases in income in the region lead to subsequent rounds of spending by those benefiting from the expenditure. Therefore, any increase in expenditure feeds its way through a number of sequential rounds with each round declining in size to reflect deductions from income in the form of taxation, social security payments, indirect taxes, savings and spending on imports to the area. Usually, the smaller the region, the smaller the multiplier because the bigger the spending on imports". (Tavoletti, 2007: 11)

In expenditure base Keynesian method, university resources and national data were supported by survey data. Direct, indirect and induced impacts were estimated to find local economic impact and then local economic impact is multiplied by Keynesian factor to find total local economic impact. Direct impact was calculated from Niğde University 2012-2013 fiscal year budget expenditures. Student and personnel expenditure data from surveys were used to calculate indirect impact. Student and visitor expenditures were estimated based on a survey question "If NU had not existed, would you go to another university?". To calculate induced impact the sum of direct and indirect impact was

subtracted from total local income. Marginal propensity to consume was estimated from by using ADF test in E-Views program. GDP and Final Consumption Expenditure of Resident Households 1998Q1-2013Q1 data extracted from TR Statistics Institute Database was used to estimate marginal propensity to consume and to generate linear regression model. To estimate indirect employment from TUIK and DPT data, service production was divided by the number of employment in service sector.

In Ryan short-cut method no survey data was used. Data for student expenditures was extracted from the University's ECTS Information Package Cost of Living. Visitors data for Niğde was extracted from T.R. Ministry of Tourism and Culture. Personnel expenditure data was provided by Kadir Çal from Accounting Office in Niğde University Social Sciences Vocational School. To find indirect impact, the University related expenditure base direct economic impact is calculated and multiplied by income multiplier, and then it is subtracted from this product. To estimate direct economic impact of the University, data was extracted from Niğde University 2012-2013 Fiscal Year Budget Expenditures which was found in 2013 Institutional Financial Status and Expectations Report and 2012 Administration Activity Report posted by the University's Strategy Development Office on the University's web site.

To estimate indirect impact of the University, 2506 students and 126 university personnel were surveyed. A 27 question survey was handed out by ten surveyors to 2506 randomly selected students at randomly selected locations of the University. In the first part of the survey demographical questions and in the second part of the survey student income and expenditure questions were asked. Survey questions for expenditure were prepared in 6 classes for each question and class size for each question was selected carefully. All collected data was entered and analyzed in SPSS. When entering data for gender, female=0 and male=1, for cities where students come from plate numbers were assigned, e.g. Adana=01. Frequency distribution of surveyed students with respect to their schools was generated by SPSS statistical program. Cross-tabulating gender and age in SPSS we found that of 2506 surveyed students, 1306 (52.1%) were females and 1200 (47.9%) were males. 82% of students was in 17-22 age group, 16.8% was in 23-28 age group. 87.7% of females and 75.7% of males were in 17-22 age group.

Table1. Nigde University frequency distribution of surveyed students with respect to their schools

School	Frequency	School	Frequency
Science and Literature	241	Bor Halil Zöhre Ataman	47
Business, Economics, Accounting	252	Bor	143
Education	202	Social Sciences	896
Engineering	355	Ulukışla	75
Physical Training	39	Technical Sciences	105
Health	48	Health Services	103
Total			**2506**

Source: Own Elaboration**,** tabulated from SPSS outputs.

4. LOCAL AREA

In this study local or locality means Niğde University, Niğde city center, neighborhood of the city center, Bor and Ulukışla districts. University main campus is located on Niğde-Bor Road. Vocational School of Social Sciences is located in the city

center. Vocational School of Technical Sciences is located about 2 km west of city center. Bor Vocational Schools of Technical and Social Sciences is located in Bor, and Ulukışla Vocational School of Technical and Social Sciences is located in Ulukışla.

Table 2. Nigde University Number of Personnel and Students (2012-2013)

Nigde University Population	Number (n)	Percent (%)		Number (n)	Percent (%)
-Student	**18181**	**93.4**	*-Academic Personnel*	**757**	**3.9**
Associates	6657	34.2	Academician and Lecturer	205	1.05
Bachelors	10297	52.9	Professor	35	0.18
MS and PhD	1227	6.3	Associate Professor	78	0.4
-Nonacademic Personnel	**528**	**2.7**	Assistant Professor	218	1.1
Administrative	480	2.47	Research Assistant	211	1.1
Security	37	0.19	Professional	10	0.05
Contract 4/C	11	0.06			
Total				**19466**	**100**

Sources: http://www.nigde.edu.tr/oidb/page.php?page=24 and
http://www.nigde.edu.tr/personel/page.php?page=130 (Access date: 10.08.2013)

5.   ECONOMIC IMPACT OF NIGDE UNIVERSITY

According to TUIK, in 2012 GDP per capita in current prices was \$10497 and population of Turkey was 75627384. Niğde GDP share in 2012 total GDP was 0.4% which is \$ 3175442599. Niğde GDP per capita was estimated by dividing GDP of Niğde by total population of Niğde. 3175442599/340270 = \$9332. Since locality in this study was defined as university schools and their neighborhoods, city center and district centers of Bor and Ulukışla with a total population of 163990, GDP of locality was estimated by 9332*163990 = \$1530354680. GLO share in local GDP was estimated by GLO/Local GDP = 320479 / 1530354680 = 0.2094 or 20.94%. Total student expenditure share in local GDP was 146777 / 1530355 = 0.0959 or 9.6%. Employee expenditure share in local GDP was 28962 / 1530355 = 0.0189 or 1.9%.

5.1. KEYNESIAN METHOD

5.1.1 Direct Impact

Income of academic personnel and staff generates large portion of the University expenditures. It provides direct impact to local economy.

Table 3. Niğde University 2012-2013 Fiscal Year Budget Expenditures

Economic Code	July 2012 – June 2013 spent	Percent	2013 year end projected
Personnel Expenditure	44,556	49.9	53,351,000
Social Security Expenditures	7,223	8.1	8,656,722
Goods and Services Expenditures	10,969	12.3	12,398,000
Current Transfers	1,416	1.6	1,384,000
Capital Expenditures	24,977	28	21,985,000
Capital Transfers			0
Total	**89,141**	**100**	**97,774,722**

Source: T.R. NU Strategy Development Office, July 2013

In our estimation below, the fiscal year starting July 1, 2012 and ending Jun 30, 2013 budget expenditures from Table 1 were used. All estimations are in TRY 000.

The University personnel having largest portion of university expenditures mostly resides in the locality. However, only 65% of personnel expenditures was spent in the locality.

$$44,556 * 0.65 = 28,962 \tag{1}$$

40% of the expenditures of goods and services spent in the locality was $10,969*0.40 = 4,388$.

Analysis of construction expenditures which are included in capital expenditures showed that even though contractors were from other cities, construction materials were purchased in the locality. The proportion of construction expenses and major repair, alteration or improvement expenses to construction costs was about 80%. So 80% of construction costs was

$$17,000 * 0.80 = 13,600. \tag{2}$$

Subtracting 20% of construction costs from total capital expenditure gives $24977 - 17000 * 0.20 = 21577$ which was spent in the locality.

Direct impact of the University to local economy was estimated to be

$$28,962 + 4,388 + 21,577 + 1,416 = 56,343 \tag{3}$$

5.1.2 Indirect Impact

Indirect impact is the sum of expenditures of students (S_2), visitors (V_2) and personnel income from outside the University (A). Total indirect impact $= S_2 + V_2 + A$

5.1.2.1 Student Expenditure

It was estimated that15606 students who came to Niğde from other cities stayed 9 months during 2012-2013 academic year, which includes Fall and Spring terms 16 weeks each, a total of 32 weeks, plus 4 weeks assumed for the 2012 summer term.

Table 4. Weighted mean monthly expenditures of 2506 surveyed students (TRY)

	Housing	Health	Transportation	Food	Clothing	Social Activity
Mean	209.16	22.96	115.26	179.91	23.39	45.83
	Energy	Communication	Books	Heating	Other	
Mean	69.59	40.63	13.47	73.04	67.03	

Source: Own Elaboration, calculated in SPSS

Surveyed students' mean monthly expenditure including housing was estimated to be 860.27 TRY and mean monthly expenditure not including housing 651.11 TRY.

To one of survey questions "If NU had not existed, would you go to another university?" out of 2506 surveyed students 93.5% responded yes, 4% responded no and 2.5% responded undecided. To the same question out of 376 students from Niğde 89% responded yes, 8% responded no and 3% responded undecided, and out of 2130 students from outside Niğde 94% responded yes, 3% responded no and 3% responded undecided.

The expenditures of 4% of responding no, and the expenditures of 89% of students responding yes (import substitution) who were from Niğde were included in the first round expenditures Y1. Expenditures of 94% of responding yes who were from outside Niğde were included in the second round expenditures Y2.

Economic impact of 2506 students surveyed in 2012-2013 academic year was estimated $(651.11*9+209.16*12)*2196 + 651.11*12*310 = 20,802$. Generalizing this estimation to a total of 18181students (NU office of student affairs) in 2012-2013 term, first round expenditures S1 and second round expenditures S2 were estimated as follows.

$$S_1 = (651.11*9 + 209.16*12)*18181*0.04 + 651.11*12*2575*0.89 = 23993 \quad (4)$$
$$S_2 = (651.11*9 + 209.16*12)*15606*0.94 = 122784 \quad (5)$$

Total student expenditure is $S = S_1 + S_2 = 23993 + 122784 = 146777$

Lets explain the above estimation in more detail. Expenditure of students who stay in dorms and rent were estimated for 9 months excluding housing and for 12 months including housing, so their economic impact was estimated by (mean monthly expenditure excluding housing * 9 months + mean monthly expenditure including housing * 12 months) *(the number of students staying at dorms and rent) * (percentage of students from outside Niğde who would go another university if NU had not existed). Economic impact of students who had no expenditure for housing and who reside in Niğde with their families or stays in family house or stays in a relative house or stay in their own houses was estimated by (mean monthly expenditure excluding housing) * (12 months) *(the number of students) * (percentage of students from Niğde).

To estimate the proportion of student spending which occurs in locality, from (Tavoletti, 2007: 16), $v = 1 - $ (spending outside the locality) $- $ (spending within the university) formula was used.

Student spending within the university occurs in dining hall, university cafeteria or canteen. Student expenditure for lunch and dinner within the university was estimated 899. Student canteen expenditure was estimated 6.5% of monthly spending which is $860.27(0.065) = 55.92$TRY a month. Canteen expenditure for 18181 students for 9 months $55.92(9)(18181) = 9150$ was estimated. Total expenditure within the university was $899 + 9150 = 10049$ which is 6.85% of total student spending. From student survey, student spending outside the locality was estimated 19.07%.

$$v = 1 - 0.0685 - 0.1907 = 0.7408 \quad (6)$$

5.1.2.2 Visitor Expenditure

Student visitor expenditures were estimated similar to estimations in formulas 4 and 5 based on the survey question "If the University had not existed, would you go to another university?"

Table 5. Mean number of student visitors per month, and number of days per visit in 2012-2013 term

Surveyed Students	Average number of visitors per month	Average number of days per visit
From Niğde	3,33	4,96
From Other Cities	2,76	2,73
All	2,98	3,34

Source: Own Elaboration, estimated in SPSS

The average number of student visitors from other cities was estimated 3.82 per month, 3.59 days stay per visit and average 50 TRY per day expenditure were estimated. Economic impact of visitors of students was estimated by the following formulas.

$$V_1 = 2,76*2,73*50*18181*9*0.04 + 3,33*4,96*50*2575*11*0.89 = 23285 \qquad (7)$$

$$V_2 = 2,76*2,73*50*15606*9*0.94 = 49740 \qquad (8)$$

Total student visitor expenditure $V_s = V_1 + V_2 = 23285 + 49740 = 73025$.

V_1 would be included in Y_1 for the first round expenditures and V_2 would be included in Y_2 for the second round expenditures. The mean number of visitors who attended graduation ceremony of students who were not from Niğde was 2, mean number of days visitors stayed in Niğde was 1 and mean expenditure per day was 100 TRY. Therefore economic impact of graduation ceremony was $V_g = 2*1*100*2150 = 430$. Also economic impact of visitors of the University personnel was estimated. Of 513 staff and 736 academic personnel, a total of 1285, mean monthly number of visitors was 3,54, mean number of days stayed was 4,85 per visit and mean daily expenditure was estimated to be 100 TRY. Therefore the economic impact of visitors of personnel was $V_p = 3,54*4,85*11*100*1285 = 24268$. Total economic impact of visitors was

$$V = V_s + V_g + V_p = 73025 + 430 + 24268 = 97723 \qquad (9)$$

Total indirect impact was estimated by student expenditures + visitor expenditures + personnel's income from outside the University. Total indirect impact was

$$S2 + V + A = 122784 + 97723 + (0.057)(44556) = 223047 \qquad (10)$$

5.1.3 Induced Impact

"A proportion of local sales to the University employee are paid out as wages to local employees and profits to local employers/business owners, and a proportion of this income is in turn re-spent on local goods and services". (Lantz et al.2002, p.11).

Base expenditure (E) is personnel (labor, employee) income (L) plus goods and services expenditure (G):

$$E = L + G = 44,556 + 10,969 = 55,525 \qquad (11)$$

First round gross local output Y_1 includes labor income (L), first round student expenditures (S_1), personnel income from outside the University (A), first round visitor expenditures (V_1), proportion of construction expenditures in the locality (dC), proportion of goods and services in the locality (hG):

$$Y_1 = L + S_1 + A + V_1 + dC + hG \qquad (12)$$

"What should be counted as new first-round economic activity is tuition, room and board, and other spending by students who alternatively would not have attended a local institution, and revenues from students from inside the area who, in contrast, would have instead attended a college elsewhere (import substitution). Non-student expenditures attracted to the area by the particular college or university" (Siegfried et al., 2006 p.14). In this study tuition was excluded from student expenses.

As a state university NU has been fully supported by the government budget which is from outside the locality. Therefore, the budget expenditure of the University can be considered

to be new to the locality except social security expenditures which is paid back to the government. This can be compared to federal support to a US state university for construction costs. Since federal support to any US state university for construction is from out of state, we can also consider government budget support to NU as from out of city. Capital expenditure of the University is a portion of the University budget. Construction expenses are included in and takes large portion of capital expenditures. Proportion of construction costs in the locality was13,600 from (2). Proportions applied to S_1 in (4) was also applied to V_1 in (6). $S_1 = 25427$ from (4). According to the University resources, the proportion of goods and services expenditures in the locality is hG = 0.40*10969 = 4388. Additional income rate of the University personnel was estimated from personnel survey to be 0.057 or 5.7%. We substitute all of the above values in the first round GLO formula (12) as follows.

$Y_1 = 44556 + 23993 + (0.057)(44556) + 23285 + 0.80(17000) + 0.40(10969) = 112361$

5.1.3.1 Direct and Indirect Tax Effect

How direct tax (t) and indirect tax (i) are taken affects Keynesian multiplier and therefore total economic impact to be estimated. Highest indirect tax rates are ET(Excise Duty) 130%, Special Communication Tax (SCT) 25% and VAT (Value Added Tax) %18. Special communication tax share in total tax revenue was 1.4%. According to Revenue Administration, in 2012 some commonly consumed products which excise duty tax rates applied are cigarettes and tobacco 65%, beer 63.3%, rakı 81%, wine and vodka 86%, whiskey 107%, cola soda pops 25%, mobile phones 20%. Excise duty tax share in total tax revenues is 27%. Indirect tax charged to a household electricity bill was 45%, to a cell phone subscription bill was 48%. According to Minister of Finance, in February 2012 indirect tax share in total tax revenues was 47.7% and direct tax share in total tax revenue was 32.3%, so t=0.32 was used for direct tax in our estimation.

Based on student survey, for mean spending percentages on housing, health, travel, food and drink, clothing, social activities, energy, communication, books, heating and personal spendings, the indirect tax rate (i) including VAT, ET, SCT was estimated as follows.

$i = 0.263(0.15)+0.026(0.08)+0.132(0.18)+0.207[(0.65+0.633+0.81+0.86+1.07+0.18+0.08)/7] + 0.027(0.08) + 0.119(0.08) + 0.08(0.45) + 0.047(0.48) + 0.015[(0.08+0.18)/2] + 0.084(0.18) + 0.077[(0.18+0.20)/2] = 0.2939$

Based on personnel survey, indirect tax rate paid for fuel by the University personnel was $0.069[0.31(0.624)+0.31(0.668)+0.38(0.79)] = 0.069(0.70) = 0.048$ or 4.8%. Using the data on consumption expenditure of resident households extracted from TR Statistics Institute (TUIK) 2013, the weighted mean of indirect tax rates was estimated to be $i_p = 0.048 + 0.154 + 0.092 + 0.079 + 0.008 + 0.016 + 0.01 + 0.004 + 0.003 + 0.003 + 0.001 = 0.418$

Table 6. Indirect Tax Rates Paid by the University Personnel in 2012-2013 academic year

Expenditure Items	Mean Indirect Tax Rates
Food Drink and Tobacco	0.154
House, water, electricity, gas and other fuel	0.092
Transportation	0.048
Communication	0.079
Goods and Services Expenditures	0.008
Furniture and house appliances	0.016
Restaurant and hotel expenditures	0.010
Clothing and Shoes	0.004
Entertainment and Culture	0.003
Health	0.003
Education	0.001
Total	**0.418**

Source: Own Elaboration, estimated in SPSS

From (6), 74.08% of student spending occurs in the locality. 74.08% of 18181 students is n_s= 18181*0.7408 = 13468. From personnel survey 67.5% of personnel spendings occur in the locality. 67.5% of 1285 personnel is n_p =1285*0.675 = 867. Weighted mean of indirect tax rates of students and personnel expenditures was estimated by $i = (n_s * i_s + n_p * i_p)/(n_s + n_p)$ = [13468(0.2939) + 867(0.418)]/14335 = 0.301 and 0.30 was used in the following rounds of income.

5.1.3.2 Inflation Effect

In 2012-2013 academic term, income increase of the university personnel was determined by the negotiations between government representatives and personnel representative labor union ''Memur-Sen''. Both parties agreed on 3% income increase for July – Dec 2012 and Jan– Jun 2013. The inflation rate explained by TUIK for July – Dec 2012 and Jan – Jun 2013 terms is 8.02%. This 8% tune-up inflation rate was about three times less than actual inflation rate estimated for the same period. Actual inflation rate was estimated from weighted mean price increase in most common consumptions. Most consumed 24 food items selected from two actual receipts taken from the same market at specific days and price increase was found 32%. Price increase in tap water price not including tax was 9%, in electricity 1 kWh fee not including VAT and service fee was 8%, in house propane price (12 kg) was 17%, in natural gas price was 49%, rent 7%, which gives average annual price increase of 18%. Cell phone talk fee went up 11%, home phone fixed charge 27%, internet 55%, taxi 10%, airplane ticket 9%, bus fare 7% which gives average annual price increase of 20%. Education prices went up 10%, clothing and shoe prices 9%, restaurant 9%. According to TUIK, for the same term shares in household expenditures are food 24%, transportation and communication 23% and housing, water, gas, electricity 19%, restaurant 5%, clothing and shoes 5%, education 2%. Weighted mean price increase (true inflation rate) can be calculated by (0.24*0.32 + 0.23*0.20 + 0.19*0.18 + 0.05*0.09 + 0.05*0.09 + 0.02*0.10) / 0.78 = 0.22 or 22%. True Inflation effect is r = True inflation rate – tune up inflation rate = 22% – 8% = 14%. Moreover, according to TR Statistical Institute, cpi increase in 2012 for Niğde was 10.12 % whereas increase for Turkey was 8.89%. This brought an additional difference of 1.13% in inflation rate which is to be added to 14%, previously estimated inflation effect. Therefore, total estimated inflation effect is 15.13% and this inflation effect was included in the marginal propensity to consume and therefore in Keynesian expenditure cycle formulas.

First round local disposable income (LDI) was estimated by $D_1 = (1 − t)(1 − r)(Y_1 − ihG)$ where t: direct tax rate, r: true inflation effect, i: indirect tax rate, hG: proportion of goods and services expenditure in locality.

$D_1 = (1 − 0.32)(1 − 0.15)(112361 − 0.30*0.40*10969) = 64184$

5.1.3.3 Marginal Propensity To Consume (c)

For this study, we estimated c = 0.70 using ADF test in E-Views program for which statistical analysis is given in Appendix B. This number makes sense given that it is a few percent more than marginal propensity to consume (c) estimated in other studies. Consumption expenditures have been increasing in Turkey in recent years and Turkey's 3% growth rate for the first quarter of 2013 mainly comes from consumer expenditures.

Second round gross local output (GLO) was estimated by $Y_2 = vS_2 + V_2 + wcD_1$ where S_2 is second round student expenditure from (5), v is proportion of student expenditures in the locality (74%), w is proportion of personnel net income expenditure in the locality(65%), V_2 is expenditures of visitors of 94% of students from Niğde who would go another university had not university existed.

2nd round GLO: $Y_2 = 0.74*122784 + 49740 + 0.65*0.70*64184 = 169804$

2nd round LDI: $D_2 = (1 − t)(1 − i)(1− r)Y_2 = (1 − 0.32)(1 − 0.30)(1 − 0.15)(169804) = 68703$

3rd round GLO: $Y_3 = wcD_2 = 0.65*0.70*68703= 31260$

3rd round LDI: $D_3 = (1 − t)(1 − i)(1− r)Y_3 = (1 − 0.32)*(1 − 0.30)*(1 − 0.15)*(31260) = 12648$

4th round GLO: $Y_4 = wcD_3 = 0.65*0.70*12648 = 5755$

4th round LDI: $D_4 = (1 − t)(1 − i)(1− r)Y_4 = (1 − 0.32)(1 − 0.30)(1 − 0.15)(5755) = 2328$

5th round GLO: $Y_5 = wcD_4 = 0.65*0.70*2328= 1059$

5th round LDI: $D_5 = (1 − t)(1 − i)(1− r)Y_5 = (1 − 0.32)(1 − 0.30)(1 − 0.15)(1059)= 428$

6th round GLO: $Y_6 = wcD_5 = 0.65*0.70*428 = 195$

6th round LDI: $D_6 = (1 − t)(1 − i)(1− r)Y_6 = (1 − 0.32)(1 − 0.30)(1 − 0.15)(195) = 79$

7th round GLO: $Y_7 = wcD_6 = 0.65*0.70*79= 36$

7th round LDI: $D_7 = (1 − t)(1 − i)(1− r)Y_7 = (1 − 0.32)(1 − 0.30)(1 − 0.15)(36) = 15$

8th round GLO: $Y_8 = wcD_7 = 0.65*0.70*15 = 7$

8th round LDI: $D_8 = (1 − t)(1 − i)(1− r)Y_8 = (1 − 0.32)(1 − 0.30)(1 − 0.15)(7) = 3$

9th round GLO: $Y_9 = wcD_8 = 0.65*0.70*3 = 1$

9th round LDI: $D_9 = (1 − t)(1 − i)(1− r)Y_9 = (1 − 0.32)(1 − 0.30)(1 − 0.15)(1) = 0$

Table 7. Gross Local Output and Local Disposable Income Estimated for Niğde in 2012-2013 Fiscal Year (TRY 000)

Rounds	1	2	3	4	5	6	7	8	9	Total
Y_i	112361	169804	31260	5755	1059	195	36	7	1	320478
D_i	64184	68703	12648	2328	428	79	15	3	0	149388

Total Gross Local Output (GLO): The sum of all gross local outputs from round 1 to round 9 gives the total gross local output generated by Niğde University in 2012-2013 fiscal year: $\Sigma Y_i = Y_1 + Y_2 + Y_3 + \ldots + Y_9 = Y_f$. Niğde University with its administration, staff, students and visitor expenditures in the locality would generate a total local income of 320 million TRY.

Total Local Disposable Income (LDI): The sum of all local disposable incomes from round 1 to round 9 gives the total local disposable income generated by Niğde University in 2012-2013 fiscal year: $\Sigma D_i = D_1 + D_2 + D_3 + \ldots + D_9 = D_f$. The university has the effect of generating TRY 149 million LDI in city center, around the center, Bor and Ulukışla.

Keynesian Factor for Gross Local Output: Full factor for GLO can be calculated by

$$\frac{Y_f}{Y_1} = 1 + \frac{169804}{112361}\left(\frac{1}{1 - 0.65(0.7)(1 - 0.32)(1 - 0.30)(1 - 0.15)}\right) = 1 + 1.51*1.22 = 2.84$$

Keynesian Factor for Local Disposable Income:

$$\frac{D_f}{D_1} = 1 + \frac{68703}{64184}\left(\frac{1}{1 - 0.65(0.7)(1 - 0.32)(1 - 0.30)(1 - 0.15)}\right) = 1 + (68703/64184)*1.22 = 2.31$$

"After literature review of estimated expenditure multipliers related to US and UK universities, GLO multiplier was observed to be changing between 1.5 and 3.5 and LDI multiplier between 1.15 and 3.15." (Sürmeli, 2008: 76).

Gross Local Output Expenditure Base Factor: $Y_f / E = 320478/55525 = 5.77$

Local Disposable Income Expenditure Base Factor: $D_f / E = 149388/55525 = 2.69$

Keynesian Income Factor: $k = 1/[1 - wc(1 - t)(1 - i)(1 - r)]$

$= 1/[1 - 0.65(0.70)(1 - 0.323)(1 - 0.301)(1 - 0.1513)] = 1.22$

For every 1 TRY spent in local economy, 1.22 TRY more gross income would be generated.

Direct impact is the sum of the proportion of personnel expenditure occurs in locality and the proportion of goods, services, capital and transfer expenditures which occurs in locality.

Total direct impact = 28,962 + 4,388 + 21,577 + 1,416 = 56,343

From student and personnel surveys student expenditure Y_2 was estimated to be 122784, personnel additional income was estimated to be 5.7% of personnel income which is 0.057(44556) = 2540 and total visitor expenditure was estimated to be 97723. Indirect impact is the sum of student expenditures, personnel additional income and visitor expenditures.

Total Indirect impact = 122784 + 97723 + (0.057)(44556) = 223047

Induced impact equals to the sum of direct and indirect impacts subtracted from total impact. Total Induced impact = 320478 – (56343 + 223047) = 41088. Total impact is the total gross local output (Y_f).

Table 8. University Related Expenditure Based Direct, Indirect and Induced Impact on Local Economy (TRY 000)

Direct Impact	**56343**
Personnel Expenditure	28962
Goods, Services, Capital and Transfer Expenditures	27381
Indirect Impact	**223047**
Personnel Additional Income	2540
Student Expenditure	146777
Visitor Expenditure	97723
Induced Impact	**41088**
Total Impact	320478

5.2 SURVEY METHOD

Only survey data was used to estimate local impact by Survey Method. In this method, total local impact was estimated by multiplying the sum of personnel, student and visitor expenditures in the locality by income multiplier. Induced impact is estimated by subtracting the sum of personnel, student and visitor expenditures from total local impact.

Table 9. Weighted mean monthly expenditures of 112 surveyed personnel calculated in SPSS (TRY)

Rent	Transportation	Food	Clothing	Social Activity	Energy	Communication
454	194.5	471	229	190	242	136.5

Education	Heating	Furn.	Cigarette	Hotel-Restaurant	Other	
155	240	148	195	196	217[*]	

Source: Own Elaboration   [*]includes goods and services

50% of personnel were at rent and the other half owned a house or a flat. Therefore personnel rent monthly expenditure for 12 months was 454*0.5*1285*12=3500340. Rate of smoking personnel was 38.5% and monthly expenditure was 195*0.385*1285*11 = 1061185. Adding these to the sum of the other personnel monthly expenditures in Table 9 gives 3500340 + 1061185 + 1285*11*(194.5 + 471 + 190 + 136.5 + 196 + 217) + 1285*12*(229 + 242 + 155 + 240 + 148) = 4561525 + 19859675 + 15635880 = 40057080. Since 67.5% of personnel expenditures was spent in the locality, 0.675*40057080 = 27038529

Table 10. University Related Expenditures and Impacts by Survey Method (TRY 000)

Direct Impact (a+b+c)		68079
a. Personnel Expenditure	(0.675*40057)	27039
b. Student Expenditure S_1 from (4)	(0.74*23993)	17755
c.Visitor Expenditure V_1 from (7)		23285
Indirect Impact (d+e+f)		167581
d.Student Expenditure S_2 from (5)	(0.74*122784)	90860
e.Visitor Expenditure $V_2 + V_g + V_p$ from (8) and (9)		74438
f. Personnel Additional Income	0.057*40057	2283
g.Income Multiplier		1.22
h.**Total Impact** (a+b+c+d+e+f)*g	235660*1.22	**287505**
Induced Impact h - (a+b+c+d+e+f)		51845

| Employment Related to University | 235660*0.00001388 | 3271 |
| Employment Factor | | 0.00001388 |

Source: Own elaboration

5.3 RYAN SHORT CUT METHOD

"The economic impact model known as the "Ryan Short-Cut Model" is an adaptation of the ACE method created by G.J. Ryan in 1981 and later refined by the creator himself in 1992. This model enormously reduces the complexity of the different sub models developed by Caffrey and Isaacs and simplifies the process of collecting data; using existing information from local, regional and national sources instead of surveying university students and employees. Ryan has proved that the results obtained by using this simplified model are comparable to those obtained from Caffrey's and Isaacs more general model and their different adaptations" (Garrido-Yserte and Gallo-Rivera, 2007: 11).

Only university and national data resources were used for Ryan Short-Cut method. Data for student expenditures was extracted from the University's ECTS Information Package Cost of Living[6]. Total student expenditure was $S = S_d + S_r + S_f = (312.41*9 + 187.5*12)*6061 + (312.41*9 + 375*12)*9545 + 312.41*12*2575 = 110122$ where S_d is expenditure of students living at the dorms, S_r is house or flat rent expenditure of students and S_f is expenditure of students who are from Niğde.

Visitors data for Niğde was extracted from T.R. Ministry of Tourism and Culture as for each person 2 visits per month and 2 days stay per visit. This was applied to students and personnel visitors. 50 TRY expenditure per visit per night stay was assumed. Total student visitor expenditure was $18181*2*2*9*50 = 32726$. The number of students graduated in 2012-2013 academic year was 2150. 100 TRY per person was assumed, so total graduation visitor expenditure was $2150*2*2*100 = 860$. 100 TRY per person per visit was assumed. Then personnel visitor expenditure was $1249*2*2*100*11 = 5,496$. Total estimated visitor expenditure was $32,726 + 860 + 5,496 = 39,082$

Via this method to estimate local economic impact of the University, expenditures less personnel expenditures, personnel expenditure, student expenditures and visitor expenditures were added to get total direct economic impact. $27381 + 28962 + 110,122 + 39,082 = 205,547$

To get total estimated economic impact, total direct economic impact was multiplied by the income multiplier. Total estimated economic impact = $205,547 * 1.22 = 250767$

The difference between total estimated economic impact and total direct economic impact would give indirect economic impact = $250767 - 205547 = 45520$.

To find the number of employment related to the University, total direct economic impact was multiplied by the employment factor (multiplier). The number of employment related to the University = $205547 * 0,00001388 = 2853$ jobs.

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[6] http://www.nigde.edu.tr/ects/page.php?page=14&ln=en (Access Date: 26.02.2014)

Table 11. Expenditures and Impacts by Ryan Short Cut Method (TRY 000)

Personnel Expenditure	Student Expenditure	Visitor Expenditure	Total Direct Expenditure	Income Multiplier	Total Economic Impact
28962	110122	39082	205547	1.22	250767
Indirect Economic Impact	Employment Related to University		Employment Factor		
45520	2853		0.00001388		

6. EMPLOYMENT IMPACT

Total employment impact was estimated from the sum of direct and indirect employment impact.

6.1 DIRECT EMPLOYMENT IMPACT

The University has provided 1285 full time jobs for personnel and staff in 2012-2013 academic year.

6.2 INDIRECT EMPLOYMENT

According to TR Statistics Institute (TUIK), as of end of first quarter of 2013, GDP at current prices was $200319 million of which 58.3% was services. According to State Planning Department (DPT), end of 2013 GDP was projected to be 1571 billion TRY. According to TUIK, as of end of March 2013 employment in services sector was 12711766 persons. This number was 50.9% of the total employment which is 24766000. According to these numbers service production per person was 915893 billion/12711766 = 72050.81TRY or 1/72050.81 = 0.0000138 jobs for every directly spent 1 TRY or 13.8 jobs for every million TRY spent.

To estimate the number of jobs generated by the University, local expenses related to the University was multiplied by the number of jobs generated by every 1 TRY spent in the locality and added to the number of university personnel. The total number of staff and academic personnel at NU was 1285 in 2012-2013 academic year, the number of jobs generated by every 1 TRY spent in the locality was 0.00001388 and local expenses related to the University was 56343 + 223047 = 279390. Therefore, the number of jobs the University has the effect of generating would be 1285 + 279390 * 0.00001388 = 1285 + 3878 = 5163 jobs directly or indirectly as a result of university activities.

CONCLUSION

Total local income generated by Niğde University in the locality was estimated 21.4% of local GDP. This shows that the University is a driving force for economic activity in the locality. Estimations from expenditure based Keynesian method, survey method and Ryan short cut method resulted in different numbers. Total economic impacts with respect to these methods were estimated to be 320479, 287505 and 250767 respectively and number of additional jobs the University has the effect of generating directly or indirectly as a result of university activities were 3878, 3271 and 2853, respectively. Among these

methods Ryan Short Cut method was easiest to apply since no survey data was needed, but not most reliable one. By this method weighted mean student expenditure excluding housing which was estimated from data extracted from the University's ECTS Information Package Cost of Living was a low 312 TRY since data was provided for very basic expenses only. Since student expenditures make largest portion of total economic impact, in this study survey method is more reliable than Ryan Short Cut method. By survey method proportion of personnel expenditures in the locality was estimated 0.675*40057=27039 vs. 0.65*44,556 = 28961 which was estimated by Keynesian method. In this study, Keynesian method was the most reliable method since actual data was supported by survey data.

Table 12. Total economic and employment impacts related to the University (000 TRY)

Method	Data	Total Economic Impact	Total Employment
Keynesian	University and national data supported by	320479	5163
Survey	Only surveys	287505	4556
Ryan Short Cut	Only university resources and national	250767	4138

Dynamic impact of the University would not be estimated in this study since graduates tracking system was very new. For future studies, knowledge based dynamic impact can be estimated.

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APPENDIX A

Linear regression model is $X_t = b + cY_t$ where $X_t = EX_t$ = Final Consumption Expenditure of Resident Households, $Y_t = GDP_t$ = Real Gross Domestic Product, c = Marginal Propensity to Consume, b = Autonom Consumption Expenditure.

Seasonally adjusted data in regression model and short run model both was taken quarterly in number of periods between 2002Q4 and 2012Q3.

Because of seasonal variations in GDP and EX it might not be easy to detect a trend. Census X12 ARIMA in E-Views was used to deseasonalize (seasonally adjust) GDP and Final Consumption Expenditure of Resident Households (EX). To validate the automodel choice by X12 ARIMA, Ljung-Box(LB) statistics was conducted on the residuals. There was no significant autocorrelation among the residuals.

Gross Local Output (GDP) and Final Consumption Expenditure of Resident Households (EX) both increases as time increases. Time series EX and GDP do not have a constant mean and variance. Therefore, EX and GDP are not stationary, but they have a constant and trend. Before ADF test is applied to make them stationary, it is important to read the graphs for the assumptions. The same can be discussed for EXSA and GDPSA.

In our study to test the hypothesis whether EXSA and GDPSA have a unit root or not, ADF test is applied to both EXSA and GDPSA series at level. Results given on Table A1 shows at level ADF test values are greater than McKinnon critical values. Therefore, H_0 hypothesis could not be rejected which implies both EXSA and GDPSA series were not stationary at level. To make EXSA and GDPSA stationary first difference was taken for each and ADF test values were found to be less than McKinnon critical values. Therefore, the first differenced series both DEXSA and DGDPSA became stationary.

Table A1. ADF test t-statistics, ( ):McKinnon 5% critical values

Series	Level	1st Difference
EXSA	1.254127 (-2.910860)	-6.760135 (-2.912631)
GDPSA	1.719017 (-2.912631)	-6.179232 (-2.912631)

So EXSA~ I(1) and GDPSA ~ I(1). This means that variables EXSA and GDPSA both are integrated of order 1. Since they were integrated of the same order, we could run Johansen Cointegration test with lag 1 to check for the number of cointegrating equations using Trace Statistic and Maximum Eigenvalue Statistic. Table A2 shows that both statistics indicated 1 cointegrating equation at the 5% level. The two variables EXSA and GDPSA were cointegrated and this suggested that they had a long run relationship.

Table A2. Johansen Cointegration Test Lag 1 Results at 5%

Hypothesis	Statistic	5% critical values	# of CE* equations	p-value
	Trace			
H_0: No CE* rejected	22.94809	15.49471	1	0.0031
H_0: At Most 1 CE* not rejected	1.87760	3.84147		0.1706
H_0: No CE* rejected	Max-Eigen			
H_0: At Most 1 CE* not rejected	21.07049	14.26460	1	0.0036
	1.877601	3.84147		0.1706

*CE means Cointegration Equation

The linear regression model was used to generate the residual series and then residuals were tested for stationarity using ADF test and residuals were stationary at level. Results are given on Table A3 below.

Table A3. ADF Residual Test Results at 5%

None	Hypothesis	t-statistic	McKinnon Critical Value
Level	H_0: Residual is not stationary (rejected)	-7.815368	-1.946654

Since residuals were stationary we could conclude that the variables in regression model had long run relationship and they were cointegrated. Regression model was estimated by OLS method and corrected to remove serial correlation (autocorrelation).

Regression Model: $X_t = 1646 + 0.70Y_t + 0.36AR(1)$ $X_t = EXSA_t$ and $Y_t = GDPSA_t$

Constant coefficient was not significant. Long run coefficient of GDPSA, marginal propensity to consume, was highly significant. ADF results of the regression model are given below. Residuals of the regression model were not serially correlated (had no autocorrelation) by Breusch-Godfrey Serial Correlation LM Test, monoskedastic by Breusch-Pagan-Godfrey Heteroskedasticity Test and normally distributed by Jarque-Bera probability test. All implies that the regression model $X_t = 1646 + 0.70Y_t + 0.36AR(1)$ is a good model.

Table A4. ADF Results of the Regression Model

Variable	Coefficient	p-value		
C	1646.42	0.3744	R^2	0.998221
GDPSA	0.702092	0.0000	Durbin-Watson	1.986084
AR(1)	0.361712	0.0248	Akaike	18.38016
F-statistic		0.0000		

SHORT RUN MODEL

Correlogram and LB statistics were also used to check for autocorrelation. DEXSA and DGDPSA had no autocorrelation. Null Hypothesis H_0: DGDPSA is stationary was accepted. Since the two variables were cointegrated, using E-Views we could run Error Correction Model (ECM) to estimate marginal propensity to consume (c).

ECM model: $\Delta X_t = b + c\Delta Y_t + d*u_{t-1}$

From Table 5 below, ECM short run model is $\Delta X_t = 335 + 0.70\Delta Y_t - 0.64*u_{t-1}$

Since the coefficient of error correction term u_{t-1} was negative ($-1 < u_{t-1} < 0$) and significant, it validated long run equilibrium relationship between X_t and Y_t in our linear regression model. In the ECM model constant coefficient was not significant, but short run coefficient of ΔY_t which is marginal propensity to consume was highly significant. Marginal propensity to consume was estimated 0.702157 and approximated to be 0.70 in our study.

Table A5. Short Run Model

Variable	Coefficient	p-value		
C	335.2745	0.6037	R^2	0.655178
DGDPSA	0.702157	0.0000	Durbin-Watson	1.951602
U(-1)	-0.638101	0.0006	Akaike	18.42431
F-statistic		0.0000		