

# Digital Transformations in Central Asia: Internet Stimulus on Trade

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**Abstract-** The main objective of this paper is to realize that how Internet affects the overall trade in Central Asia. It further discuss the effects of internet on production, unemployment, and industry. This research work perceives a quantitative panel data analysis method via secondary data for Central Asian countries because the assigned topic is studied in multiple countries for the period of 19 years (2000-2019). There is a special focus on discovering the relationship of internet with trade in Central Asia. We discovered that Internet has strong positive relationship with overall trade, industry, and production but a negative relationship with unemployment. To make it more clear, the results of this research work show that internet can increase trade, improve industry, and production but reduce the unemployment by great margin.

*Index Terms-* Trade, Unemployment, Industry, and Production

## I. INTRODUCTION

Central Asia Profile:

Central Asia is known as a single region, comprises of five culturally and ethnically miscellaneous countries and have a conjoint geography, historical legacy and common security concerns and interests that tracked both political and economic transformation alleyways in the past twenty five years since their independence from Soviet Union. Kazakhstan and Kyrgyzstan have made steps in market reforms in relative terms, while Turkmenistan and Uzbekistan still have not accomplished their conversions to a market economy and Tajikistan symbolizes an in-between circumstance so far. In many regards, the historic legacy of the 20th century and their sole topographical and geopolitical position have not assisted Central Asian countries in their exertions on the way to economic development and integration. The central Asian countries experienced more than decade of growth while still facing with collective challenges resulted from decreasing trade and lower remittances (Marek 2017).

The deficiency of economic compatibility and complementarity among the states created a push and full consequences that not only can accommodated labor migrants but also poverty, unemployment, security, health, and political softness. This nurtured competition instead, while each state observing at its capitals as independent and at its neighbors as opponents rather than partners in international marketplaces. Thus, economic relations and economic associations with countries outdoor the region are prioritized, leading to high trade dependency outside and small force intra-regional trade among the Central Asian countries that slowed down by policies of border controls, tariffs and regulations (Shahrbanou 2012).

The first internet service was launched in 1990 in Central Asia such that it became known to the people and only a few small companies had provided the internet services but now some famous communication monopolies provide the internet. Web resources are still in both Russian and English languages but now it is changing into local languages such as Kazakh, Kyrgyz, Tajik, and Uzbek. The people understood that internet could bring changes and play important role in their social lives. It has supported students, teachers, state authorities, administrations and employees in many ways especially in getting actual information. At first, internet was used in day-to-

day life as a source of information, and a means for communications. The internet was just used to create relationships and gain new experiences (Aitymov 2012).

#### Problem Statement:

Internet is a potent facilitator for innovation, economic development and social well-being and is the mainstay of the digital economy. Internet enabled people to look after more things online such as opening a business, generating new services or revolutionizing the provision of existing ones, voicing views, raising wealth, distributing knowledge and thoughts, doing research, interacting and improving skills. Limiting the use of internet will affect the benefits and innovation that pushes social, economic and cultural development. People can benefit from internet capacity to assist inventions, entrepreneurship, and international trade. Internet as a global interconnected nature which conveys effective and flexible strategies and observes for digital economy (OECD 2016). The internet provides numerous benefits globally for the people who have access to it. For example, sharing and collecting information, checking news, searching jobs, make advertisements, communicating, entertaining, getting online educations, buying or selling products, or other online services provided by the internet globally (Essect 2015).

The Central Asian countries experienced internet usage in the past 20 years and a lot of people understand that internet played an important role in their social lives, particularly for organizations, NGOs, teachers, students, and employees. It is worth mentioned that government authorities, and state administrations also benefited from internet especially for collecting information and sharing with others. Young generation use internet for making relationships and gaining new experiences. The impacts of internet on economy are not very obvious in Central Asia because it is just mentioned that economies are growing vastly due internet access (Nazarkulova 2019). There is limited research on the overall impacts of internet on many aspects and perspective of Central Asia.

Internet brought improvements in education of Central Asia but not as much as needed. There are arguments that internet improved learning via great amount of information and resources available in internet, smooth classroom environment, and created good relationships between students and teachers. There are also claims that internet poses problem rather than improving education in Central Asia. Sabine Henning discovered that internet supported learning in providing numerous resources of information, flexible classrooms, and good contact between teachers and students but claimed that lack of English language skills and lack of teachers' skills in web apps are the key problems in education (Sabine 2019). More than half of the population of Central Asia has access to internet but still very limited impacts on education and on other aspects are not well enough. According to Statista online website for statistics, shows that 43.85 million users have access to internet and the overall population is only 75.4 million of Central Asia. One can argue that there is a need for quality research to be conducted on the overall impacts of internet on general aspects of Central Asia (Statista 2021).

There is extensive research on the effects of internet on FDI conducted in many countries and discovered a positive relations between internet and FDI. For example, Amany Fakher discovered in his research that internet has positive relationship with FDI inflow in Egypt and claimed that the more the users in the country, the more FDI inflow to that country (Amany Fakher 2016). However, there is no such research on the effects of internet of FDI inflow conducted in Central Asia.

The impacts of internet are very obvious in many countries and especially in developing countries. There are plenty of research conducted on the internet effects on many aspects in these countries. For instance, Behzad Salmani discovered in his research in Iran that Internet has significant impacts on trade and got a positive relationship in between (Behzad 2013). One can argue that the effects of internet on trade could be different from country to country or different between rich and poor countries. In this regard, Caroline Freund found a different inferences in her study which found that the effects of internet are stronger in poor countries comparing to rich countries (Freund 2000). However, the question is what are the impacts of internet on trade in Central Asian countries? There is no good answer for this question because this issue is not researched or studied in Central Asia and that is why there is a need for such study to find out the relationship of internet with trade and also what kind of relationship exists, strong, weak, or even no relationship. Internet access in Central Asia has been a big change but why researchers are so silent about its impacts.

Many researchers believe that internet provide more new opportunities for unemployed people and is a good tool for job searching and job matching. There are arguments that internet created more jobs for people who want to work from home. However, this might not be true in each country. Many people also argue that internet replace traditional jobs and many people become unemployed because internet replaced people with machines. For instance, before the internet, a company could hire 100 employees but accessing to internet, they would reduce the number of employee. There are different arguments in this regard. Lorenzo Pupillo discovered that internet produced

many new jobs but also claimed that a large number of job have been destroyed in the transition process. Moreover, lessons suggested that routinization, job market divergence and new labor market disparities have appeared in recent years (Pupillo 2018). But still, we do not know how internet affected the employment in Central Asian countries either positive or negative. There is a big gap due to very less number of studies on the assigned issue.

In addition to those, industry is also the hot topic for many researchers to discover that how internet affects the overall industry in the world. There are similar agreements and arguments that industry is positively affected by the internet meaning that increasing internet will increase industry in same geography. Enough reasons and claims are presented in this regards. For instance, innovation, easiness, communication, reduces transaction cost, and information are conducted due to the existence of internet. Sendil Ethiraj found out in his research study conducted in New Zealand that the new technology, especially internet generated new entrepreneurship opportunities by converting the “value chain, disintermediation, reintermediation, and reconfiguration”. Thus, one can argue that internet provides more information, give hints in creating new ideas, and brings innovation which as a result increase industry in the world (Ethiraj 2013). The researchers and writers are silent on this issue to cover it in Central Asia and yet it is not clear that how internet affected or affects the industry in central Asia. Maybe the inferences of internet on industry will be different in Central Asia comparing to other countries and one reason could be traditional way of doing business and traditional interest in product design.

The problem is that many researchers, state policy applicators, and business companies do not feel that internet could affect the trade, education, employment, industry and production at great percentage which maybe they are right or not. However, people do understand that internet is their first choice for communication. Many new businesses still do not invest money in digital technology because they do not feel their impacts on many aspects, especially on trade. If one can argue that digital technology especially internet can have good impact in other Asian countries, why not in Central Asia. But we should say that if something has impacts in one country, does not mean to have the same impact in Central Asia.

The internet offered new models for buyers and sellers, and provided customer service in new ways. Significant changes took place, for instance new methods of production, distribution, and search, advertising and new markets for the trade. Countries who adopted to such changes received greater impacts on international trade comparing to those who did not adopted to those changes. Reliable evidence showed that internet has affected investment and education in Central Asia but a research has not been conducted on the internet effects on international trade yet.

Internet has been a huge change in Central Asia in the past 20 years and its impacts should be wide and wise. Some people may understand that internet provided many benefits for them in many aspects but this might be true only in practice, not in theory. In order to know that internet could have great benefits for business, trade, education, industry, and production, an extensive and quality research is needed which will make a roadmap for policy applicators to know the benefits of internet an invest more in digital technology.

#### Purpose of the Study:

The main objective of this research study is to explore the effects of internet on trade through empirically and non- empirically analysis. To acknowledge that how internet mainly affects the trade, education, industry, employment, and production in Central Asia. Besides, how existed internet and technology dealt and managed with trade in Central Asia. Furthermore, where it provides specific benefits and find out the specific inferences to trade in Central Asian countries.

#### Hypothesis and Research Objectives:

H<sub>0</sub>: Internet does not affect trade, industry, employment, and production in Central Asian countries

H<sub>1</sub>: Internet does affect trade, education, industry, employment, and production in Central Asian countries

#### Research Questions:

1. How internet relates with trade in Central Asia?
2. What are the significances of internet for trade in Central Asia?
3. How internet comeback to trade in Central Asia
4. What are the specific benefits of internet for many other aspects?

#### State of Art:

Before touching the main topic and it is very important to know that what has been studied, who studied it and where it has been studied. There are many researches and studies about the effects of internet on many aspects in different countries of the world. However, their effects in different countries are very different and some countries even did not feel such effects. In this regards, a number of research papers on this are summarized here for the purpose of knowing the different, strong and weak impacts of internet on trade, unemployment, industry, and production which will lead us to focus on key variable that they would also covered in this research in Central Asia.

In 2011, Seyed Reza Miraskari researched on the effects of internet on trade inflows in developing countries via panel data analysis for period of 2001-2008 and discovered very meaningful inferences regarding this issue. He argued that internet has positive relationship with trade inflow and the relation significant at 5% level. He added that internet provided great support to trade in these developing countries. If the number of internet users is increasing, the trade is also increasing. Consequences of this research, hypothetically and empirically, show that Internet is effective, and is inspiration to policy makers for formulating basis and setups of Internet, because, it could upsurge export and society wellbeing (Miraskari 2004). One can argue that internet can speed transaction process, make ease border management, and helps in finding more buyers and sellers.

In 2002, James J. Choi conducted an empirical study on the title of: How Does the Internet Affect Trading? Evidence from Investor Behavior in 401(k) Plans. The data was 401 k plans from a number of online firms which is a retirement saving in the United States. The researcher came up w a different understanding. The results of his research says that internet had less impacts on trading and claim that there is no connection in between. The results of this research is different comparing to other research inferences because many researches showed that trade has a significant relationship with trade in many countries (J Choi 2002). Now we can argue the effects on internet on trading are not the same in every country and there is a need that each country should research this issue regarding their country.

Next, it is important to find out that how internet affect the business environment in other countries. In 2014, Elena-Iulia conducted research study on the effects of internet on business environment in developing countries and came up with acceptable inferences. She discovered that internet provided great opportunities and challenges for new and old businesses and had direct relationships with them. It is added that a few intermediaries emerged and achieved competitive advantage and good income but some replaced due to the existence of internet. Internet also developed good consumer behavior, relationships, and created loyalty. Besides, new markets, products, and new competitors emerged. Via the Internet, the associations can shape or develop competitive advantage, an advantage that should be based on real realities, that is different from entrants offer and also is important to impending customers. The Internet is efficient that offers status to a business, increase brand visibility and upsurge the confidence of possible customers in the company's offer. Recent research studies showed that the lack of online existence persuade clients the feeling that they are dealing with a small and poor company. An up-to-date business, regardless of size, is without an online presence either a limited business only, with no applied application at distance, either a simple implemented business, without much outlook in time and space (Lulia 2014).

Besides those, it is very vital to know about the relationship of internet with international trade. This might be true that impacts are different in different countries but one has to make it clear that there is a relationship or not between the internet and international trade. In this regard, Caroline Freund conducted a research study on the effects of internet on international trade in 2000, using panel data analysis for the period of 1995 -1999 in 56 countries. The results discovered in this research are very different from other research studies. It is found out that the effects of internet on international trade are different in each year. For example, in 1997, there is no evidence that internet would have effect on trade but there are effects in 1998 and 1999 (Freund 2000). One can draw conclusion that the effects of internet in each country and in different years are various. Thus we need a research about this topic in Central Asia as well.

In fact internet has got impacts on trade in many countries and in different years but there are countries who do not have evidence to proof that internet has impacts on trading. In order to fully understand that internet has also impacts on other aspects such as FDI and investment. In this regards, Tim Hockey summed a conclusions from a conference held on the impacts of internet on investing and investors which the results are very acceptable. Technology basically changes the investors' relationship with money and had great impact on how to spend and manage money and technology is merged into financial lives of many investors. It is added that technology provides controlling, certainty, and reliability which simplifies financial management for nearly half of the investors. They discovered that investors appreciated and wished technology in their lives forever because it made possible some of their favorite activities and made their lives easier as well. Investors are excited to try more new technology and wished that internet could manage their finances on the smartphone the same as online shopping (Hockey 2011).

More to the point, internet has got impacts on manufacturing as well and has a positive relationship in between. Stefan Boinec conducted research on the impacts of internet on manufacturing trade in OECD countries in 2009 and discovered same positive results. The empirical inferences suggested that internet encourages manufacturing exports such that the number of internet users is found to be significant in the importing countries. The sum of Internet users' increases information on the accessibility of manufacturing trade, decreases trade costs, improves competition, and inspires industrial exports. The upsurge in the number of Internet users has also alleviated the effect of space on manufacturing exports. The number of Internet users as an influence of industrial export development provides provision for a more thorough role of computer information systems in global manufacturing trade activities (Stefan 2009).

Dusko Tomic also researched the benefits and challenges with implementation of internet of things in manufacturing industry following all IBM employees in his survey and came up with same results. He discovered that internet of things increased the output and productivity of the companies while making the equipment smarter and interconnected by internet. A more responsive manufacture process will be shaped and a much deeper vision into plant data will be conceivable. Equipment effectiveness will increase which will directly decline the preservation costs. However, firms are still in the process of assessing these benefits and are examining the execution challenges their organizations might face which include, cyber-attacks, cultural conflict to technological changes and infrastructural issues (Tomic 2017). Now it is clear that internet has also impacts on production and productivity as well.

R Anita also conducted research study on effect of internet of things on manufacturing process and discovered same results. She found that internet of things supports in motivating operational productivity and success and also supports to enhance performance and productivities across your industrial devices, manufacture lines, and plant as a whole. She also added that using technologies will monitor and enhance equipment performance, without disrupting plant operation and function at peak effectiveness by drawing visions from data generated by connected equipment. It is also addressed that internet of things enhance effectiveness, improves processes, reduce waste in firms. Internet of things could help to serve better your customers, decrease fuel consumption, reduce maintenance costs, and improve customer experience (Anita 2017). So far we found that internet could impact on production in many countries the same but it is also important to find out these impacts in Central Asia.

Akinade Akindele on the other hand researched on the effects of internet technology on employment towards jobless society. He discovered that internet technology is a special cure for unemployment via reordering job landscape, upsurges productivity, enhance quality of life, promotes prosperity and investment in a country such that training and capacity buildings are vital by individuals. It is also addressed that internet technology cannot eradicate the demand for human skills in firms or organizations and no technology can completely replace humans. The rationale behind this is that with internet access, productivity, prosperity, and more investments are encouraged into countries and thus more new jobs are created (Akindele 2020). One can argue that internet technology can have a positive relationship with employment because increasing in internet access will increase employment but this might not be true in each country because there are plenty of research which showed that employment is decreased due to replacements in firms they have got access to internet or use internet in their plants. So each can country may feel different on the impacts of internet on employment, thus a research is much needed in Central Asia.

#### Research Gap:

Regarding this short literature review and the author best understanding of the Central Asia situation, there are notable research gaps in the study of impacts on internet on trade. The very first gap of this research is that this type of study work is less done and at the very best effort of author, he was not able to find such studies in Central Asian countries and hence it is a need to research and find a solution to this problem. Besides, many researchers conducted only time series analysis for very short periods of time which did not meet the requirement of time series analysis that is why this paper will use panel data analysis. Thus the inferences of panel data analysis will be different and accurate compared to time series analysis. Furthermore, many researchers found different relationships and results that some of them claimed that internet has positive relationship with trade, education, employment, production, industry, and investment but only few mentioned that internet has no effects on some of them . So this paper will find the correct relationship between internet and trade which will be positive. Finally, it is complicated problem that it must be researched, find a solution, and assign the appropriate polices implications.

#### Research Methodology:

In this research paper, a quantitative analysis method is applied which perceives the secondary data via panel data analysis for Central Asian countries because the assigned the topic is studied in multiple countries for the period of 19 years (2000-2019). To make it clear,

in quantitative method, a numerical data is collected for algebraic analysis that includes descriptive and analytical analysis. In qualitative method, non-numerical data is collected that would include idea, concepts and arguments to support the numerical analysis. There is a special focus on discovering the relationship of internet with trade in Central Asia. Besides, the relationships between internet with foreign direct investment, industry, production, and employment are added as control variables. In order to explore this relationship, a time series analysis for the period of 19 years is focused.

It is worth mentioned that panel data analysis contains “i” that stands for identity such as country and individuals and “t” for time period such that these make panel data analysis different from time series analysis. On the other hand, time series includes only “t” for time periods in the featured model and not “i” because there exists only one country or individual.

Quantitative Method: the data for the assigned variables such as internet, trade, FDI, production, industry, and employment are taken from World Bank Data bank. The dependent variable is internet and the independent variables are trade, FDI, production, industry, and employment.

#### Multiple Regression Model (Panel Data Analysis):

This study work follows a multiple regression model for studying the relationship of a single dependent variable with multiple independent variables. First, this model expresses the relationship of internet with final trade through multiple regression model. Second, additional control variables are added such as FDI, production, industry, and employment for discovering the best inferences.

$$\text{Plain Form: } Y_j = \beta_0 + \beta_1 X_{1j} + \beta_2 X_{2j} + \dots + \beta_n X_{nj} + e \dots\dots\dots 2$$

$$\text{Featured Form: } \text{Internet}_{it} = \beta_0 + \beta_1(\text{Trade})_{it} + \beta_3(\text{Prod})_{it} + \beta_4(\text{Indus})_{it} + \beta_5(\text{Emp})_{it} + \mu_i + U_{it} \dots\dots 3$$

$i$ : 1, 2, .....,  $N$  (5)  
 $t$ : 1, 2, .....,  $T$  (19)

Where

$\beta_0$ : The intercept or constant amount

$\beta_1$ -  $\beta_4$ : The coefficients of the assigned regressors

Internet: Internet users are individuals who have used the Internet (from any location) in the last 3 months. The Internet can be used via a computer, mobile phone, personal digital (World Bank)

Trade: Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product (World Bank).

Prod: Manufacturing refers to industries belonging to ISIC divisions 15-37. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3. Note: For VAB countries, gross value added at factor cost is used as the denominator (World Bank).

Indus: Industry corresponds to ISIC divisions 10-45 and includes manufacturing (ISIC divisions 15-37). It comprises value added in mining, manufacturing (also reported as a separate subgroup), construction, electricity, water, and gas. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3. Note: For VAB countries, gross value added at factor cost is used as the denominator (World Bank).

Emp: Unemployment refers to the share of the labor force that is without work but available for and seeking employment (World Bank).

$U_t$  is the country specific error in the model.  
 $\mu_i$ : The unobserved effect error

#### Assigned Hypothesis

$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$   
 $H_1$ : at least one  $\beta_i \neq 0$

#### Diagnostics and Estimation Analysis

The main objective of diagnostics tests is to find out the miss-specification in the regression model which creates severe adversative effects on the properties of both estimators and tests that have implications on the predictions. The complications that come from miss-specification are Multicollinearity, specification error, autocorrelation, heteroskedasticity, unit root, and Cointegration. The rationale behind using these tests is to make ensure that the model is valid for this linear regression model with acceptable inferences for the estimates of the coefficients (Linda 1996).

#### Summary Statistics:

It is an over-all summarization of the data such as mean, median, and variability which is the first impression for a researcher to figure out the data used in a research paper. It is a descriptive statistics that show all the data for each variable is clearly summarized. It gives the writer and the readers a good understanding of the data used in a research paper such as the mean of a specific variable and its variability.

#### Multicollinearity:

Correlation matrix test is always used to find out the connection among variables such that there is always a relationship between variables but depends how much. Correlation produces the problem of Multicollinearity which in this case the results of a regression are not biased but of course ineffective. If a variable has a correlation close to 1; there is a high correlation and needs to be removed. On the other hand, sometimes the coefficients of independent variable go opposite as they are not expected which this is also a sign of collinearity. In this paper, VIF test is used for this purpose (German 2010).

#### Heteroskedasticity:

Heteroskedasticity can be well-defined that the variances of error terms are not continuous and it is actually the violation of homoscedasticity which is the key assumption of the Classical linear regression model (CLRM). Heteroskedasticity will not result in biased parameter estimates, however, OLS estimates will no longer be best linear unbiased estimator (BLUE). There are several ways to notice heteroscedasticity such as graphical method, Park Test, Breusch-Pagan and Cook-Weisberg but for curative it is important to use the robust standard error method (Williams 2018).

#### Unit Root Test:

Mostly, researchers face the problem of stationary and non-stationary which create a series of problems in the analysis. A stationary process is one which statistical properties do not alter over time and mean and the variance of a "stochastic" practice is not determined by  $t$  and hence they are constant. The first condition merely declares that the estimated value of the time series should be constant and fixed. If the data is non-stationary, then there is a serious problem in the regression system. One of the possible problems is that R-squares and t-ratios incline to be overestimated and OLS regressions are likely to create incorrect inferences and justifications (Lyocsa 2009). Although, there are several ways to test the stationary and non-stationary data but IM Perasa Shin (IPS) is commonly used (Aminu 2013). In case, there exists non-stationary variables, they can be stationarized by using first difference method.

Ordinary Least square Estimation (OLS):

The initial method used for estimation in this paper is ordinary least squared estimation (OLS). The least squared is a classical estimation method broadly used in “geophysical” data study, developed by Gauss (1795), Legendre (1805) and Adrain (1808) which was issued in the initial era of 19<sup>th</sup> century. Simple ordinary least square estimation is the first method to find out about unknown parameters. In this method, it is important to see how your applied model looks like, are independent variables significant, is there any biases and inconsistency and are all variables exogenous. Besides, what are the signs of the coefficients of independent variables, are the signs match which were expected, is there endogeneity problem, is there a serial correlation and is there Multicollinearity problem (Agnew 2008).

Fixed effect estimation model:

This paper tends to use panel data econometric analysis method which will probably have an individual effect error problem. Individual effect error problem exists when the individual error term is correlated with one of the explanatory variables and hence creates endogeneity problem in the regression model which the results of regression model will be biased and the coefficients will be inconsistent. In order to remove individual effect error problem, the fixed effect estimation model is used. In other words, in fixed effect model, Allison states that when we use a panel data which means the similar topics measured at two or more points in time, some “characteristics that do not change across time whether they are measured or not such as sex, race, and ethnicity” and we get a problem that we can control by panel data. The fixed effect model controls the time changing variables but does not control for time in-varying variables and hence we should be no longer worried about the effects of those omitted time unchanging variables that go to the error term and affect one of the explanatory variables.

Summary:

Overall, this chapter highlighted the basic description of the model, methodology, diagnostic, and estimation tests. The assigned variables and data are explained deeply for the purpose of understanding its importance and inclusion in the model.

Findings

Introduction:

This chapter proceeds with a short summary of the sample and provides statistical explanation for understanding the data regularities. Furthermore, various diagnostic tests apply such as model specification, autocorrelation, heteroskedasticity, and unit root,. In order to find the regression results, simple ordinary least square estimation (OLS), fixed effects and random effect estimation tests are applied. Hausman test is used to choose between fixed effect and random effect estimation models.

Table 1: Summary

Variable	Obs	Mean	Std.Dev	Min	Max
Internet Access	90	16.33379	18.59135	.0485996	76.42675
Trade of GDP	90	85.47221	31.50643	29.74841	175.3512
Industry	90	31.65108	11.2	16.6823	66.57986
Manufacture	90	14.03732	3.828968	7.617665	20.45652
Unemployment	90	7.6236	2.833801	3.74	14.96

Source: Stata Worked out

The mean is the best measure of central tendency but still, there is no good or bad mean because it just shows the central point in the data set. However, very large and small numbers exaggerate the mean in the data set. The means of all variables are clearly placed in



table 1. The most important point in summary statistic is the standard deviation which the lowest is the best and the highest is the worst because the lowest states the data points are close to the means and the highest states that the data points are spread out from the means but still a researcher should not decide based on standard deviation only. In this summary, unemployment has the lowest standard deviation which is good but trade has the highest which not good but also not bad. Also, trade of GDP has the highest mean but manufacture has the lowest mean. Besides that, minimum and maximum also show the spread out of the data through their ranges. In this summary, internet access has the lowest minimum and trade has the highest minimum and similarly, Trade has the highest maximum but unemployment has the lowest maximum. The main objective of this summary is the see how spread the data is from the mean and also how the data misleads the overall findings. From this summary, we understand that the data set has some very big and small numbers but still we cannot imagine that it would definitely give us misleading inferences. We have more options to find out that how the data would give us either good or unacceptable results.

VIF Test:

The VIF points out that how much the projected variance of a variable coefficient is overstated in case R-Squared equals zero which is defined as  $1 / (1 - R_2)$ . Besides, it indicates the influence of Multicollinearity on the variance of a variable coefficient in linearity of other predictors. The range of numbers that indicates the degree of Multicollinearity is (1-10) which greater than “10” indicates high Multicollinearity problem in the model. Furthermore, the tolerance is defined as  $1 / VIF$  which detects the level of Multicollinearity such that 0.1 is similar to 10 of VIF (Robert 2007).

Table 2: VIF Test

VIF Test		
Variable	VIF	1/VIF
Trade	1.31	.744066
Unemployment	1.79	.557766
Industry	2.18	.459041
Manufacture	1.79	.557766

Source: Stata Worked Out

Following table 2, there are correlations between the variables either small or acceptable big but there are no such correlations that a variable should be removed such that it would take collinearity in the model. We should always be worried about the biggest number because they create collinearity in the model. For instance, the biggest 1/vif results is 0.74 for trade of GDP which is less than one and there is no fear of high Multicollinearity in the model. So this does not mean to remove any variable from the model.

Heteroskedasticity Test:

Heteroskedasticity as defined that the variances of error terms are not constant and it is actually the violation of homoscedasticity which is the key assumption of the Classical linear regression model (CLRM). Heteroskedasticity will not result in biased parameter estimates, however, OLS estimates will be no longer best linear unbiased estimator (BLUE). There are several ways to detect heteroskedasticity such as graphical method, Park Test, Breusch-Pagan and Cook-Weisberg but for remedial it is important to use the Method of Weighted Least Squares.<sup>1</sup> In this research paper, Cook-Weisberg test is used. The hypothesis is  $H_0$ : there is not

heteroskedasticiy in the model and  $H_1$ : there is heteroskedasticiy in the model. Decision rule is when the p-value is less than significance level (5%), reject but if it is greater than significance level, do not reject it.

Table 3: Heteroskedasticiy

Breusch-Pagan / Cook-Weisberg test for Heteroskedasticiy	
Ho:	Constant variance
chi2(1)	= 45.410
Prob>chi2	0.10

According the table 3, result showed that there is no heteroskedasticiy in the model because the p-value is greater than significance level (5%). So there is no the problem of heteroskedasticiy.

Unit root Test:

Furthermore, it is very vital to find out the stationary of time series which means that the means and variances of variables are constant and non-stationary when the means and variances are not constant. If a variable or variables are non-stationary, then there is a serious problem in the regression systems because it will lead to a spurious regression in case they are not cointegrated. One of the possible problems is that R-squares and t-ratios incline to be overestimated and standard OLS regressions are likely to create incorrect inferences, and justifications. In order to find out stationary and non-stationary, we need to use IM Perasa Shin (IPS) test. Regarding this test, the null and alternative hypotheses are  $H_0$ : non-stationary (unit root),  $H_1$ : Stationary (no unit root). The basic decision rule is when the value of t-statistics is greater than critical value or when the p-value is less than the significance level (5%), we reject the null hypothesis and can draw the conclusion that data is stationary and do not have unit roots.

Table 4: Im-Pesaran-Shin unit-root test in levels and first difference

Variables	T- Statistic	P-value
Internet Access	-2.9587	0.0002
Trade	-2.9587	0.000
Industry	-2.012	0.0004
Unemployment	-1.8405	0.0045
Manufacture	0.7100	0.014

Regarding table 4 and the p-value approach, we do reject the null hypotheses for Internet Access, Trade, Industry, Unemployment, and Manufacture because p-values are less than alpha. Finally, it is concluded that all the variables are stationary and there is no unit root mostly in levels.

**Fixed Effect and Random Effect Estimations Results:**

The purpose of using fixed effect estimation in this paper is to remove the individual fixed effects (error) from the model which created endogeneity problem because individual effect error correlates with one of the explanatory variables and hence endogeneity takes place. Using fixed effect estimation ensures a researcher to be no longer worried about unknown omitted variable bias. Fixed effect model controls and even removes the effects of time-invariant variables such as gender, sex, and color but it could be a disadvantage if the model includes time-invariant variables. Fortunately, this data set does not have time-invariant variables.

This paper also used random effect estimation test for the purpose of having unbiased, consistent and efficient estimation results. It is clear that under the random effects assumptions, explanatory variables are exogenous so that simple OLS provides consistent estimates but errors are correlated over time for given t and there might be serial correlation which will be removed by using random effect estimation.

Table 5: Fixed and Random Effect Estimation Results						
R-Squared:						
Within: 0.3320						
Between: 0.2022						
Overall: 0.0197						
Variables	Fixed Effect			Random effect		
Internet Access	Coef.	Std. Err	P>/Z/	Coef.	Std. Err	P>/Z/
Trade	.0346993	.0165805	0.040	.0211326	.0152318	0.165
Manufacture	.1754649	.1200304	0.014	-.0284547	.1318588	0.829
Unemployment	-.775949	.1695493	0.000	-1.040105	.2270717	0.000
Industry	.0108301	.0551938	0.08	-.062813	.0454658	0.167

Applying fixed effect and random effect models results completely changed compared to OLS results because individual fixed effects are removed and hence no endogeneity exists. At the same time, results from fixed effect and random effect also differ in economic and statistical significance levels. Following the comparison results in table, the fixed effect provided logical and rationale results compared to random effects but one should not decide without using Hausman test for assurance to take correct decisions. The results after the correct choice of estimation such as fixed effect or random models are deeply discussed in discussion section after Hausman test.

**Hausman Test:**

Hausman test is used to find out the correct estimation model between fixed and random. In Hausman test, the null hypothesis is that random effect is appropriate and the alternative hypothesis is that fixed effect estimator is appropriate. So if we reject the null hypothesis by Hausman test, we should use fixed effect estimation but if we do not reject the null hypothesis, we will use random effect estimation.

Table 6: Hausman Test

Coefficients			
Variables	(b)	(B)	(b-B)
	Fixed	Random	Difference
Internet Access	.1925359	.1447721	.0477638
Trade	.0346993	.0211326	.0135667
Unemployment	-.775949	-1.040105	.2641558
Industry	.0108301	-.062813	.073643
Manufacture	.1754649	-.0284547	.2039195
b = consistent under Ho and Ha; obtained from xtreg			
B = inconsistent under Ha, efficient under Ho; obtained from xtreg			
Test: Ho: difference in coefficients not systematic			
Prob>chi2 = 0.001			

According to table, the Hausman test results showed that the fixed estimation is preferred because the p-value for Chi<sup>2</sup> is 0.001 which is less than 5% and the null hypothesis says that there is difference in coefficients which are not systematic. So the null hypothesis is rejected in favor of alternative hypothesis and that is why fixed effect estimation model is preferred as the best in this research paper.

Interpretation and Discussion:

1. Trade of GDP

According to the Fixed Effect Estimation, the Trade of GDP as the main dependent variable is significant at 4% significance level and hence it means that a 1% increase in Internet Access, will increase the Trade of GDP by 0.034% which is statistically feasible. They have both positive and direct relationship among each other. This make a good sense because one can argue that internet can improve productivity, export, and border management, reduce costs and speeds the transportation process. In this regard, Sayed Reza discovered similar understanding, added that internet has positive and significant impacts on trade volume both in exporter and importer countries. He claimed that the results from both theoretically and empirically, show that internet is so efficient, and a stimulator to trade because it can increase export and social welfare (Sayed Reza 2011). Besides that, Alberto and Shawn also found out that internet reduced the cost of export among 56 countries in its very short history and hence claimed that internet can boast the trade by a huge margin. It is also added that countries who have both enough internet access, have more trade compared to those countries who have no equal internet access (Alberto 2016). On the other hand, George R discovered a little different inferences. He claims that internet access can only increase trade from rich countries to poor countries and wrote that internet made it easier for fro firms to enter the new markets by reducing communication and research costs. His research findings are different because he addressed that effects of internet on trade are only applicable in developing countries. Regulating internet and communication policies will increase trade more in developing countries by increasing their exports (George R 2004). So the inferences of this research study is similar with Karim, Alberto and George research works and hence one can claim that internet access can increase the trade with a positive and significant correlation in Central Asia.

2. Manufacture

The inference by Fixed Effect also shows that Manufacture is also significant at .014% significance level and there is exists a positive relationship between them because the sign of the coefficient is +. It reads that a 1% increase in Internet Access will result in 0.17% increase Manufacture. A general thought would also suggest that Internet Access could improve the quality of products, reduce cost of products, helps in better designing, using of advanced tech, and improve labor experience. This finding is similar with Chen Yang

research study conducted regarding the effects of internet on manufacturing in 2016. The author discovered that internet improved and increase the degree of manufacturing because the all the manufacturing devices, equipment, processing, communication, data, and many more are powered by the internet. Today, it transformed the manufacturing industry by a lot after the internet application to manufacturing. She added that it is true because internet improved many portions in manufacturing such as architecture, cloud computing, business model, services composition, pervasive environment, energy management, maintenance, critical issues, risk, automation and efficiency, and supply chain management (Chen Yang 2016). More to the point, Hamid Morssi studied the effects of internet on supply chain performance, conducted in 9 companies based in Egypt via doing Simi structured interviews. He discovered that internet increased and improve the flow of supply chain performance in these companies and claimed that this also increases and improves the manufacture overall (Hamid Morssi 2020). Dusko Tomic studied the benefits and challenges of internet in manufacturing conducting a survey and came up with similar findings. It is showed that internet increased output and productivity of the companies because all the equipment are made smarter and interconnected by the internet and made it easy to manufacture. However, some firms are still in the process of measuring these benefits and are examining challenges that their organizations might face which include, cyber-attacks, cultural conflict to technological changes and infrastructural issues (Tomic 2017). Now it is clear that internet has also impacts on production and productivity as well.

### 3. Unemployment

The unemployment is mostly effected by the internet access but it may depend in different countries. In this research study, Internet Access negatively affects the unemployment which means if one increases, the other decreases. The unemployment is statistically significant at 0.000 significance level and it is feasible too. It states that 1% increase in Internet Access can result in 0.77% decrease in the number. Meaning that if Internet increases, unemployment decreases. A decrease in unemployment also takes place when people who can do online job get more jobs by the increase of internet. So it is different in each labor section. Betsey conducted a quality research on how the internet brought changes in labor markets since the usage of internet raised by a great amount. He found out that internet dramatically changed the labor market to positive outcomes because it made more efficient the job search, awareness and matching the positions, however this change is only for those who use internet not only for job search but also for working by internet. The internet also speeds the hiring process and the employer can easily the right matching candidate for their positions (Betsey 2006). But one can also argue that internet brought more positive changes in manufacturing and economy as a whole that itself creates more jobs and this internet could be the greater determinant of the job flow. Anne Green and her research team conducted a research study on correlation between internet and Job in in 2012 and came up with strong positive arguments. They simply claimed that internet increased jobs and hence reduced the unemployment by a greater level. They found out that technology change is now accounted as an important for changing the occupation structure along with global economy structure which its results are felt in most sectors and professions because it provides the labor market information and played a vital role in job education, training, and job options based on their skills. It is better in speed than traditional of job search. The internet reduced the unemployment because it provided the opportunity for international jobs which was not easily possible in tradition way of search. It also provided the environment for both online and in person jobs which let people get more various job cultures (Anne Green 2012).

### 4. Industry

The Fixed Effect Estimation shows that Internet Access stimulates the overall industry in a country, meaning that the increase in Internet Access, can increase the overall industry in its quantity. This is significant at 0.08% significance level and statistically feasible. 1% increase in Internet Access can increase the overall industry by 0.010% which is applicable. If one guess that industry is very in its nature and there plenty of industry that would be affected by the internet in many aspects but pricing, costumer behavior, costs, data transfer and many more aspects of industry are impacted the by the internet. In this regard, Sandra Sieber conducted relevant research and discovered that internet affects market structure overall and created comparative advantages for dot com companies. Computer willingness to pay and reducing costs of products, services, transaction, and coordination costs. It also creates new entry possibilities, increase market transparency, and new products and services. The value creation is another good illustration of internet effect on industry. She concluded that internet can effect both the supply and demand sides of the industry (Sandra 2002).

### Conclusion and Policy Implications:

This paper studies that the digital transformations in Central Asia, mainly that Internet encourages trade to a better position as well as a few other influencers. This research work perceives a quantitative panel data analysis method via secondary data for Central Asian

countries because the assigned the topic is studied in multiple countries for the period of 19 years (2000-2019). There is a special focus on discovering the relationship of internet with trade in Central Asia. Besides, the relationships between internet with production, industry, and employment are added as control variables. Running Fixed Effect and Random Effects estimation tests in multiple regression, we discovered that Internet has strong positive relationship with overall trade, industry, and production but a negative relationship with unemployment which are true based on original expert theories regarding internet effects. We found that they are statistically significant and are feasible if there takes place an increase in internet access in Central Asia. To make it more clear, the results of this research work show that internet can increase trade, improve industry, and production but reduce the unemployment by great margin. This paper suggest the following policy implication for a better change in trade, industry, unemployment, and production.

Increase internet in trade, production, and industry and train well their users in various sectors will be a must job for Central Asian states to enhance further these sectors. We believe that internet is still an issue in rural areas in these countries. The first important effects of internet in Central Asia are that it increase trade, employment, improve industry and increase production as they were highlighted in this research study inferences. Besides those, internet can bring marketing benefits because it builds trust between the business and the costumers. Internet improves and speeds productivity in many aspects, for example, machines and equipment are run by internet and do not make more mistakes and errors in production and it also speeds the production process compared to traditional one. Internet can be the 24/7 doors of business because nowadays, businesses are run 24/7. Social media any other platforms will be the used for customer support and it is only internet that can provide this facility for the businesses. Remote staffing, outsourcing, online employee training and development, online banking, business growth, costumer relationship, online accounting services, online meeting and assigning tasks are other important benefits of internet. So finally, one can argue that internet can applied in each business sectors and well trained internet users will make a good use of Internet. So finally this research paper suggests that an increase in Internet by Central Asian businesses and administrations will grant them a better trade, reduced unemployment, improved industry, and quality production.

#### REFERENCES

- [1]: AKINADE AKINDELE, "THE EFFECT OF INTERNET TECHNOLOGY ON EMPLOYMENT TOWARDS A JOBLESS SOCIETY", INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH · JULY 2020: 1-6
- [2]: ALBERTO, SHAWN, "DISAGGREGATING THE IMPACT OF THE INTERNET ON INTERNATIONAL TRADE," WORLD BANK, 2016: 1-19
- [3]: Amany Fakher, "The Impact of Investment in ICT Sector on Foreign Direct Investment: Applied Study on Egypt", Review of Integrative Business and Economics Research, Vol. 5, no. 2, April 2016: 1-15
- [4]: Aminu, Aminu Bashir, "The Determinants of Bank's Profitability in Nigeria" Eastern Mediterranean University January, 2013: 36
- [5]: Anne Green, Maria de Hoyos, and Yuxin Li, " Employment and The Internet," Institute for Employment Research, University of Warwick, 2012:1-15
- [6]: Behzad Salman, "The effect of the Internet on international trade in services: Developing countries' case study", Conference Paper, 2013: 1-9
- [7]: Betsey Stevenson, "The Impact of the Internet on Worker Flows," *The Wharton School, University of Pennsylvania*, 2006: 1-24
- [8]: Caroline Freund and Diana Weinhold, "On the Effect of the Internet on International Trade". International Finance Discussion Papers, 2000: 1-13
- [9]: Chen Yang, Xianbin Wang and Weiming Shen, "Applications of Internet of Things in Manufacturing," The University of Western Ontario and National Research Council of Canada, 2016: 1-8
- [10]: D.C. Agnew, "Chapter 7: Least Squares Estimation" (2008): 1
- [11]: Dr. R.Anita and Bodla. Abhinav, "Internet of Things (IoT)– Its Impact on Manufacturing Process", International Journal of Engineering Technology Science and Research 2017: 1-7

- [12]: Dusko Tomic, "The Benefits and Challenges with Implementation of Internet of Things (IoT) in Manufacturing Industry", STOCKHOLM, SWEDEN 2017: 1-40
- [13]: Elena-Iuli, "The Impact of Internet on Business Environment," *Procedia Economics and Finance*, University of Tîrgu Mures, 2014: 1-8
- [14]: Elena-Iulia Apvloaie, "The impact of the Internet on the business environment", *Procedia Economics and Finance* 15 2014: 1-8
- [15]: Essect, "Advantage and Disadvantages of Internet", *Essect* 2015: 1-12
- [16]: Ezequiel Uriel, "The simple regression model: estimation and properties", University of Valencia, 2013: 21-23,
- [17]: George R. G. Clarke and Scott J. Wallsten, "Has the Internet Increased Trade? Evidence from Industrial and Developing Countries", *World Bank Policy Research Working Paper* 3215, February 2004: 1-20
- [18]: German, "Correlation matrix" *Stata Premir*, 2010: 1-2
- [19]: Hennig, S. and Nazarkulova, A., "Benefits and Challenges of eLearning in Central Asia", *International Journal of Geoinformatics*, 2019: 1-10
- [20]: Hennig, Sabine, "The Benefits and Challenges of ELearning in Central Asia," University of Salzburg, 2021: 1-10
- [21]: James J Choi, David Laibson, Andrew Metrick, "How does the Internet affect trading? Evidence from investor behavior in 401(k) plans," *Journal of Financial Economics*, 2002: 1-15
- [22]: James J. Choi, David Laibson and Andrew Metrick, "How Does the Internet Affect Trading? Evidence from Investor Behavior in 401(k) Plans", *Wharton School* 2002: 1-20
- [23]: Linda F. De Benedictis and David E. A. Giles, "Diagnostic Testing in Econometrics: Variable Addition, RESET, and Fourier Approximations" *Department of Economics, University of Victoria, Victoria, B.C., CANADA*, October 1996: 2-4
- [24]: Lorenzo Pupillo, Eli Noam and Leonard Waverman, "The Internet and Jobs Opportunities and ambiguous trends", *CEPS • Place du Congrès*, 2018: 1-16
- [25]: Ly'ocsa, Eduard Baum'ohl and S'tefan, "stationary of time series and the problem of spurious regression" *Munich Personal RePEc Archive, Faculty of Business Economics in Ko'sice, University of Economics in Bratislava*. 2009: 1-6
- [26]Maha Abdel Hamid Morssi, Hussein Magdy Elhousseiny and Dina Adel Hammad, "The Impact of Internet of Things on Supply Chain Performance," *College of International Transport and Logistics*, 2020: 1-9
- [27]: OECD, "Internet Openness and Innovation", *OECD Ministerial Meeting, Cancun Mexico* 2016: 1-4
- [28]: Robert M. O'Brien, "A Caution Regarding Rules of Thumb for Variance Inflation Factors", *Quality & Quantity* (2007) 41, *Department of Sociology, University of Oregon, Eugene* (2007): 673-690
- [29]: Sandra Sieber, "Impact of the Internet on market structure," *Universidad de Navarra*, 2002: 1-22
- [30]: SENDIL ETHIRAJ and ISIN GULER, "The impact of Internet and electronic technologies on firms and its implications for competitive advantage", *Huntsman Center for Global Competition and Innovation*, 2013: 1-35

- [31]: Seyed Reza Miraskari, Noorollah Salehi Asfiji, Seyed Abdolkarim Siadat and Seyed Ali Mirasgari, “The Effect Of The Internet On Trade Flows”, Economics and Finance Review Vol. 1(6) pp. 100 – 106, August, 2011: 1-7
- [32]: Shahrbanou Tadjbakhsh, “Central Asia and Afghanistan: Insulation on the Silk Road, Between Eurasia and the Heart of Asia”, Peace Research Institute Oslo PRIO, 2017: 1-15
- [33]: Stefan Bojnec, “Impact of the internet on manufacturing trade”, Journal of Computer Information Systems · September 2009: 1-10
- [34]: Statista, Internet access User in Central Asia,” 2020: 1
- [35]: Tim Hockey, “The Tech Effect: How the Digital Age Is Changing Investing”, TD Ameritrade 2015: 1-30
- [36]: Uuriintuya Batsaikhan and Marek Dabrowski, “Central Asia at 25”, Policy Contribution, Issue n°13, 2017: 1-5
- [37]: Williams, Richard, “Heteroskedasticity” University of Notre Dame, And January 30, 2015: 1-8
- [38]: Zhandos Aitymov, “Internet history and it’s perspectives in central Asia – internet for social and political development: community building”, Karaganda State University, Kazakhstan, 2012: 1-2

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