The Correlation of Government Expenditure on Information and Knowledge Systems with Unemployment

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Abstract. Most of today's automated systems have become completely dependent on the use of computer technology and its applications. It is very difficult, if not impossible, to measure how much a government spends on automation. But it is possible to find out about the part of government expenditure that is connected the most with automation, and that is government expenditure on information and knowledge systems. In this paper an article about the influence of banking automation on unemployment was chosen and analyzed as a case study. Analysis showed that there is a correlation between the government expenditure on information and knowledge systems with unemployment. The government expenditure on information and knowledge systems can be considered as a contributing factor to the unemployment rate, as the study showed that banking automation increased the disguised unemployment by 17%. It is possible to "estimate" how much government expenditure on information and knowledge systems increases the unemployment rate, but to do so larger and more reliable data is needed.

Keywords: Automation, Unemployment, Developing Countries.

1   Introduction

Unemployment has always been a problem in the economy of countries. In advanced countries population growth is at a very small rate, if not negative, and room for improvements and advancement is smaller comparing to developing countries; therefore unemployment is better controlled, and the growth rate is better balanced. This phenomenon is especially problematic in developing countries where the population is increasing rapidly, and there is a lot to improve.

It is very difficult for governments to maintain a good balance between the determinants of better and higher standards of living. Developing countries have a bigger battle to fight against unemployment, so it would be wise not to take actions that add to the existing unemployment problem that they are facing in the first place. Using modern technologies and systems leads to a better economic growth, however they must be used carefully so they wouldn't have unwanted negative outcomes such as unemployment.

For example, Iran's population has increased from approximately 32 million inhabitants in 1975 to about 79 million in 2015 [6], more than double in only 4 decades. The median age in Iran is currently 29.4 years old. [7] From these basic measures it is obvious that the labor force was increased significantly, and therefore many jobs must have been created (it does not necessary mean that they have) to avoid high levels of unemployment. In the other hand as Iran is considered among developing countries they have been investing a lot in the use of information and knowledge systems and automation. A question that asks itself here is that does automation contribute to the unemployment problem?

Not so far ago when we had to go to a bank, it was something unpleasant to do because banks were very crowded and we had to wait in a long queue for a very long time. This situation was because for every single bank operation we had to go to the bank and an employee had to help us with simple day to day operations like depositing and withdrawal of cash, paying bills, and many other services.

These days when we go to a bank, assuming that there is the need for it, we can easily see that there are not as many operators as before and similarly not many people waiting their turns. This is because banks automated a lot of their banking operations; thus, and many day to day operations could be done personally throw internet banking, where it uses information and knowledge systems. So, there is no need for employees for some of these operations, and as for some other more complicated operations a few employees are more than enough.

The aim of this paper is to review a study made in Syria about the measure of the influence banking automation has on the unemployment, in order to understand the case better, and to find out the relation between the use of information and knowledge systems with unemployment; and in a larger scale, to find out whether or not the government expenditures on information and knowledge systems is correlated with unemployment in general. Furthermore, to generalize this concept if possible.

2   Methodology and data

In this paper literature review, data analysis and synthesis, methods of description, comparison, and induction and deduction reasoning approaches are applied.

In social sciences one of the basic methods used for qualitative research is Case study. A case study is focused on capturing the complexity of the case to describe the relationships of the subject a whole by collecting and evaluating a large amount of data about one or a few cases. [2]

A case study is an empirical inquiry that explores a contemporary phenomenon deeply within its real world context, especially when there are no clear boundaries visible between the phenomenon and the context. Investigators prefer case studies as a research strategy when they are dealing with "Why" and "How" questions and have little or no control over events. [8]

The main goal of a case study is to understand the context of the whole case, and it is believed that by an accurate examination of a case, it would be possible to understand other similar cases. [2]

The most commonly used sources for collecting evidence for a case study are: documentation, interviews, archival records, direct observations, participant-observation, and physical artifacts. [8]

As one of the sources, an article was chosen be the case for this paper. This article was published in 2014, and it is about the influence of banking automation on unemployment.

In relation to the topic of this paper the following research questions were formulated:

- Does the application of information and knowledge systems cost jobs?
- Could the government expenditure on information and knowledge systems considered as a contributing factor to the unemployment rate?
- And if yes, is it possible to calculate this affect?

Finding answers to these questions satisfies the goal of the research, which is to analyze the case and to generalize conclusions made in the case.

Using the mentioned methods, it is important to clarify a few issues. First of all, unemployment is a broad topic and generally there are many factors contributing to the unemployment rate of a country. Secondly, the unemployment rate is not an exact measurement. In the other hand, there is no way to measure how much a government spends on automation. But we can settle for the next best thing, the part of government expenditure that is connected the most with automation, and that is government expenditure on information and knowledge systems. Nevertheless, the focus of this paper is mainly to understand the context of the case as whole to find the possibility to generalize the acquired knowledge.

Sources used for this paper were selected from publicly available books and articles, as unfortunately some much appreciated data and information we needed were not available.

3 Theoretical background

3.1 Economics

Unemployment is one of obvious determinants of the country's standard of living. People who cannot find jobs or lost their jobs are not contributing to the country's production of goods and services. When a country keeps its workers as fully employed as possible, it would have a higher GDP and growth rate. [4]

The economy of a country is a very large and complex system, with millions of firms and workers, so some degree of unemployment is inevitable. That's why politicians campaigning for office address unemployment and their proposed policies to help create jobs and reducing the unemployment rate. Unemployment is considered in short-run and in long run and have a few different forms, types and reasons, but first let's see how it is measured.

The labor force is the total number of workers in the country, categorized as employed and unemployed. People who have jobs, are called employed and those

who don't, unemployed. But of course, there are other people in the country, which don't fit neither one of the categories mentioned above (for example homemakers, retirees, and full-time students), these are considered as Not in the labor force. Unemployment rate is the percentage of the labor force that is unemployed. So, measuring the unemployment rate is basically the number of unemployed over the labor force multiplied by 100. [4]

Natural rate of unemployment is the normal rate where the unemployment rate fluctuates around, and cyclical unemployment is the deviation between unemployment from its natural form. It is hard to measure unemployment for a few reasons. One reason is that it is sometimes hard to distinguish between someone who is unemployed and someone who is not in the labor force. Another reason is that many of unemployed people are young and just entered the labor force, looking for their first job. Furthermore, there are those people in the labor force that call themselves unemployed to get financial assists from the government, where in fact they are working and getting paid under the table to avoid paying taxes. Another case is those people who are reported as out of the labor force but the want to work, they actually tried to find a job but finally gave up due to unsuccessful search, they are called discouraged workers. [4]

The rate of unemployment never falls to zero but it actually fluctuates around the natural rate of unemployment. One reason behind this is that it actually takes time for workers to find a suitable job. The type of unemployment that is caused from the process of matching workers and jobs is called frictional unemployment and its effect is mostly in the short run. In the long run, in most of cases the unemployment is as a result of insufficient number of jobs in the labor market for everyone who is in the labor force and wants to have a job, in other words, the quantity of labor supplied is more than the quantity demanded. This type of unemployment is called structural unemployment and often explains the longer spells of unemployment. [4]

Other reasons why there is always some unemployment in the economy are the minimum-wage law, market power of the unions, and the theory of efficiency wages. What these three have in common is the fact that they try to push the wage of workers above the equilibrium level and this leads to a surplus of labor and consequently, unemployment. [4]

There are two other terms, which we need to understand as well, underemployment and disguised unemployment.

Disguised unemployment is when a part of the labor force is left without work or is working in such manner that the productivity of the worker is basically zero. Disguised unemployment is very common in the developing countries because they have a surplus in their labor force due to their large and fast growing populations. Disguised or hidden unemployment can refer to any part of a country's population that is not employed at the full capacity, in other words, people working below their capabilities whose work positions contribute less value in terms of productivity, and those groups who are able to perform valuable work but they are not looking for work. [1]

Underemployment is a form of disguised unemployment where a worker works part-time job when he/she is able and willing to have a full-time job. It also includes those workers who accepted employment that is below their set of skills. [1]

3.2   Automation

Automation evolves from the Greek word "automatos", which means: acting by itself, or spontaneously. Automation is generally acting, operating, or self-regulating with no human intervention. [5] Automation could be defined as the cancellation of human intervention partially or entirely in the implementation of industrial, administrative, scientific, or household tasks. [1] It could be as simple as regulating the temperature in an oven, or as complex as management of automated banking institution. The word automation has been used since 1930s to express all the processes that human could exploit mechanical machines to replace to the work of human force. [1]

Generally before 1950s the most common form of automation was mechanization. Advantages and distinctions of automation became clear later on in the 1950s when modern automation was introduced by adding automatic control to mechanization as an intelligence feature. [5] The use of automation expanded to the point where it reflected on all production processes which require the use of theories and arbitrary sophisticated methods without direct human intervention for its completion such as Chemical, petrochemical, medical, and other engineering purposes. The spread and evolution of automation accelerated because of the invention of the computer and the development of electronic technology to the point where most of today's automated systems have become completely dependent on the use of computer technology and its applications. [1]

There are two fields in automation: Process automation and Manufacturing automation. The field of process automation is based on mostly analogue devices, for example hydraulic or electric devices. Recently these devices are very dominating, particularly in information processing, because of their change from analogue to digital. In manufacturing automation, devices were mostly electrical and digital since the beginning. [3]

4   Results and discussion

An analytical study on Syrian banks was conducted in 2014 to measure the influence of banking automation on unemployment. More specifically, to find out if banking automation has any effects on the size of disguised unemployment and structural disguised unemployment in Syrian banks. The study was conducted using data from the questionnaires distributed to 191 bank employees. From this number, 154 people were employees of state owned banks and 37 people were employees of privet banks. For their study they had the following hypothesis:

- Automation in the banking business would have no impact on the disguised unemployment.

- There would be no significant difference in the amount of disguised employment between banks in the public sector and banks in the private sector, in Syria.
- Automation in the banking business would have no impact on the structural disguised unemployment.
- There would not be significant differences in the amount of average employee training between banks in the public and private sectors. [1]

They reached the following conclusions:

- There is an effect of banking automation in Syria on disguised unemployment apparently, increasing this kind of unemployment as much as about 17% of full time clocks.
- There were significant differences in the size of disguised unemployment due to the sector's type that the bank belongs to, and this size of disguised unemployment was larger in the public sector banks.
- There is an effect of banking automation in Syria as structural disguised unemployment being at the rate of 12%. In Syrian Banks, most of the officials never had convenient qualification to deal with automating systems; just about 45% of them have rather convenient qualification to deal with this kind of systems. Therefore, they found that the unemployment is partially "technological disguised unemployment" in Syrian banks due to those unqualified officials.
- There was a significant difference in the amount of average employee training between the sector's type that the bank belongs to, and this amount was larger in the private banks. [1]

Table 1 illustrates a part of the results they have collected from their questionnaire, participants had to answer how proportionate is the amount of work with the number of employees before and after using computers.

Table 1 – partial results of the questionnaire. [1, own elaboration]

The ratio between the number of employees and the volume of work in the bank	Before using computers	After using computers
Less proportionate	59 (30.9%)	19 (9.9%)
Proportionate	66 (34.6%)	99 (51.8%)
More proportionate	35 (18.3%)	64 (33.5%)
The question does not apply to the respondent	29 (15.2%)	0 (0%)
No answer	2 (1%)	9 (4.7%)

As we can see in table 1, before using computers, 59 (30.9%) participants believed that the amount of work is less proportionate with the number of employees, in other words, not enough employees for the amount of work. 66 (34.6%) participants believed that the amount of work is proportionate, and 35 (18.3%) participants believed that the amount of work is more proportionate, meaning the number of employees exceeds the amount of work. After using computers we can see that the number of participants who believed there is not enough employees for the amount of

work, decreased to 19 (9.9%); Number of participants who believed that the amount of work is proportionate to the number of employees increased to 99 (51.8%), and number of participants who believed that the number of employees exceeds the amount of work increased to 64 (33.5%). From these numbers it is evident that there is underemployment in the Syrian banks caused by the use of information technologies.

Based on the results and conclusions mad by the before mentioned case, it is safe to say that applying automation to the banking system increases the unemployment rate. As mentioned in the literature review, automation is currently almost completely dependent on the use of computer technologies and their applications, in other words information and knowledge systems. So, using information and knowledge systems can increase the unemployment rate it terms of underemployment, disguised unemployment, and technological disguised unemployment.

Another interesting detail in the article was the fact that most of the people (154 of 191) who participated in their research were employees of state owed banks. Hence, the cost of upgrading and applying automation in these banks could be considered to be government expenditure, and particularly, government expenditure on information and knowledge systems. We can say the same thing about all the government subordinates (for example all the ministries, organizations, and government projects), that are upgrading their technologies and applying automation. Therefore, there is a correlation between the government expenditure on information and knowledge systems with unemployment.

To measure the correlation between the government expenditure on information and knowledge systems with unemployment, some statistical methods and tools such as test of correlation could be used, but in order to do so larger amount of data is needed with a higher quality.

5   Conclusions

Before 1950s automation was in the form of mechanization, but later on it evolved into the modern type by adding automatic control as an intelligence feature. Nowadays automation is significantly dependent on the information technologies and the use of information and knowledge systems.

Using information and knowledge systems and subsequently automation increases the productivity and profitability of companies and firms, decreases their costs, saves them a lot of time and energy, and in the case of dangerous and hazardous jobs, could save some lives. Nevertheless, automation could potentially cause unemployment.

By the application of the information and knowledge system and automatizing some of bank's everyday operations and processes, which were done by the bank employees, we witnessed that the disguised unemployment was increased, and perhaps some of the bank employees lost their jobs. Now the bank case is just an example, but there are many other fields that are the same, all letting some employees go and subsequently increasing the unemployment.

Even in the best cases, if those people who lost their jobs would be able to find another job shortly after, the economy of the country still would be affected as an increase in the frictional unemployment.

In macroeconomic level, it's true that unemployment has many factors contributing to it significantly, but it looks like that automation could be considered as a factor as well. This affects the economy system of a country as a whole. Unemployment is a very important part of the economy of a country that must be kept as low as possible. This would be a larger problem in developing countries where unemployment is often high due to large and growing population.

Increased level of unemployment causes a lot of negative and counterproductive social, economical, and political effects. When the rate of unemployment is high, the economy of the country is not working with its full potential, which means lower GDP. Socially, in better cases it causes a lower standard o living, anxiety about the future, and a lower self-esteem, and in the worse cases it could increase and promote crime.

Learning from the bank case and some other similar cases we generalize and state that the use of information and knowledge systems could be a contributing factor to the unemployment of a country and could have unwanted consequences, of course these negative consequences would be in a larger scale in the developing countries.

To measure the extent of that the use of such systems and automation could influence the unemployment is not an easy task as the measures of unemployment are considered to be imperfect in the first place.

However, the effect of information and knowledge systems on unemployment could be estimated and interpreted by the use of multi regression models and analysis, by assuming the government expenditure on information and knowledge systems as an individual independent variable among other independent variables in the regression analysis, and the unemployment as the dependent value. Multi regression analysis also shows to which degree an independent variable could affect the dependent value assuming the other independent variables would be constant. This could be especially be helpful in the decision making of policy makers to provide them have a better idea of what could happen to the unemployment rate by counting expenditure on information and knowledge systems as a factor.

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