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Why do high ability people also suffer from money illusion? Experimental evidence of behavioral contradiction

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Abstract. *Money illusion refers to the tendency of the individuals' decisions to be influenced by the nominal amount of money. It is a persistent phenomenon even for high ability people such as professional investors, and causes considerable aggregate nominal inertia. However, it has not been well discussed why they suffer from money illusion even though they are able to distinguish the nominal and real value.*
In this paper, we focus on numerical ability and investigate its relation to the tendency to suffer from money illusion. We show subjects two alternative funds (one fund has a higher nominal value and the other fund has a higher real value) and asked which one is preferable. Subsequently, they evaluated the attractiveness of each fund with a scale from 0 to 10.
Results show that high numeracy generally helps to distinguish the nominal and real value. However, when high numeracy individuals consider well-being, their decision is strongly affected by nominal value. Additionally, even though the high numeracy subjects were able to distinguish the nominal and real value, they evaluate the attractiveness of the fund with the high real value significantly lower than the fund with the high nominal value. Those behavioral tendencies prominently appeared when the nominal values are shown by the balance of assets.
The contradictory behaviors of high numeracy individuals may be largely involved in the integral emotions which accompanying with the nominal value.

Keywords: Money illusion; Numeracy; Decision-making; Emotional bias.

JEL Classification: C91; D81; D70; D91; G41.

1. Introduction

"Money illusion" occurs when the individuals' judgement is influenced by the nominal amount of money. For Fisher (1928, p. 4), who first coined the term and defined it as "*the failure to perceive that the dollar, or any other unit of money, expands or shrinks in value*", money illusion is a preventable phenomenon through recognizing the real value.

Conversely, Shafir, Diamond and Tversky (1997), that first advocated that money illusion is one of the "*cognitive bias*" and defined it as "*a tendency to think in terms of nominal rather than real monetary values*" (p. 341), emphasize the difficulty to remove money illusion from the decision-making even though the individuals could easily be aware of the difference between real and nominal values.

Money illusion is regarded as one of the psychosocial aspects (Animal Spirits) that leads people to irrational decision-making (Akerlof and Shiller, 2010). A myriad of empirical and experimental studies support that money illusion is an inevitable phenomenon even for professional investors with trillions of dollars at stake (Modigliani and Cohn, 1979; Campbell and Vuolteenaho, 2004; Chen et al., 2009; Cohen et al., 2005) and the few on individual-level money illusion cause considerable aggregate nominal inertia (Basak and Yan, 2010; Fehr and Tyran, 2001; Noussair et al., 2012). Also, any education such as economic or financial literacy is unable to counteract money illusion (Bakshi, 2009; Chytilova, 2017; Cipriani et al., 2008).

Our research motivation stems from a simple question, that is, why high ability individuals such as the professional investors also suffer from money illusion. Generally, money illusion is regarded as the cognitive bias caused by the confusion between the nominal and the real price (Akerlof and Shiller, 2010; Shafir et al., 1997; Modigliani and Cohn, 1979), but we suspect that money illusion is a much more complicated phenomenon and related to the physiological unconscious response.

In this paper, we showed that the individual's contradictory behavior in the financial decision-making; the individual changes the choice to the irrational one depends on the situation even after they found the rational one. As the result, they appear to suffer from money illusion. Any conventional theories of money illusion do not be able to explain this phenomenon. That is, we have to deviate somewhat from them.

In the following section, we will first show the past studies related to money illusion. Then, we will show the limitation of the conventional theories of money illusion. Third, we will propose our hypothesis of mechanism of money illusion. Finally, we demonstrate the case that individual inconsistently behavior between the different type of questions.

1.1. Interpretation of money illusion in the early days

Money is not something useful per se, but we can get satisfaction from what we purchased with money. In other words, not nominal monetary value but real monetary value should be important, because of its direct relationship with substantial purchasing power. Nevertheless, plenty of empirical and experimental evidence support that there is a tendency for people to decide their actions based on the nominal monetary amounts.

Irving Fisher, an American economist, first points the instability of the value of unit of money in his book *Money illusion* published in 1928. Around that time the United States was in the midst of the postwar prosperity, the so-called "Roaring Twenties"; it was a period of consecutive economic growth which established the distinctive cultures of the United States. As a symbol of the booming economy of that time, the Dow Jones grew six-fold within 10 years (from 993.19 points at January 1921 to 5449.37 points at August 1929). Whereas the US was enjoying an economic growth, the German economy was suffering from hyperinflation due to the reparation of World War I in the first half of 1920's.

In such a historical background, Irving Fisher claims the instability of value of any unit of money through the example of inflation in Germany; even though buying power had been changed with upheavals in prices, the general public overlook this problem because of *money illusion*. This term *money illusion* has first been coined and defined by Fisher as "*the failure to perceive ... unit of money, expands or shrinks in value*" (p. 4). In his book *Money illusion,* he describes the various examples in which the illusion of money is hidden to show the difficulty for lay persons to discern the differences between the real and nominal prices, in situations such as commercial transactions, the currency exchanges and dividend valuation.

The presence of money illusion has frequently drawn criticism from the scholars who support neutrality of money such as neoclassical economics (Patinkin and Steiger, 1989) and natural rate of unemployment (Friedman, 1968; Tobin, 1972). However, money illusion has been attracting attention through the growing body of empirical and experimental evidence in various domains, for instance, in housing markets (Brunnermeier and Julliard, 2008), in labor markets (Akerlof, 2007; Akerlof and Shiller, 2010; Fair, 1971), in consumption-saving decision (Miao and Xie, 2013; Thaler and Benartzi, 2004), or when the euro currency was introduced in Europe at 2000's (Gamble, 2006, 2007; Gamble et al., 2002; Cannon and Cipriani, 2006). Nowadays, money illusion is known as an ubiquitous phenomenon and is commonly used to explain the various irrationals behaviors in economics.

Money illusion began to receive remarkable attention in the financial market as the U.S. economy declined in 1970's. In the late 1960's, the postwar boom of World War II ended and it had been gradually apparent that the economic growth was slowing down. Subsequently in 1970's, the US economy, which had been depending on the heavy manufacturing industry, was diminished with the two oil crises and the increase in imports of manufacturing goods. At the same time, the inflation rate had remained high and the US economy had been in a slump (called "stagflation").

In this historic context, Modigliani and Cohn (1979) cast doubt on the commonly accepted theory at this period that the equity had been regarded as an ideal hedge against inflation. According to their analysis, the level of the S&P 500 stock index at the end of 1977 had fallen to half in real terms owing to inflation, even if it was the same as it was in the second half of the 1960's in nominal terms. They state that this fundamental mistake has been tied to investor's two kinds of error based on money illusion: first, the investors calculate equity earnings at a rate that parallels the nominal interest rate rather

than the real rate. Second, investors fail to allow for the gain accruing to stockholders from the nominal obligatory depreciation. Additionally, they emphasize the importance of money illusion in the actual economy as "*one must also be prepared to entertain the likelihood that lending institutions and business managers are subject to similar illusions, with real consequences for the behavior of firms and adverse effects on their profitability*" (Modigliani and Cohn, 1979, p. 36).

The findings of Modigliani and Cohn (1979) have deeply impacted subsequent studies and been cited as the evidence of the negative relation between the stock value and the inflation (called "Modigliani-Cohn hypothesis"). Campbell and Vuolteenaho (2004) break down the dividend yield into three components and identify that some dividend yield is accrued from the mispricing attributed to the market's irrational forecast. In addition, they find that the level of inflation explains almost 80% of the time-series variation in stock market mispricing by formalizing the Modigliani-Cohn hypothesis with "Gordon growth model"(1) and "Fed model"(2). Subsequently, Chen et al. (2009) examine the reason of stock mispricing by formalizing the investors' irrationality into money illusion and the resale option hypothesis (Scheinkman and Xiong, 2003). As a result, it is shown that money illusion explains partially the stock mispricing in the US market.

Cohen et al. (2005) enter into a discussion from basic questions such as whether the stock market investors with trillions of dollars at stake make the same mistake a pedestrian would. At the beginning, they claim that the small number of wealthy and rational arbitrageurs may be very conservative in accommodating supply and demand due to money illusion. By simultaneously examining the future returns of Treasury bills, safe stocks, and risky stocks, they find the evidence supported by the Modigliani-Cohn hypothesis; when inflation is high, irrespective of the riskiness of the particular stock, a stock provides higher than justified future returns relative to short-term bonds.

The relation between inflation and stock returns has been verified for various periods and countries. Similarly, to the Modigliani and Cohn (1979), a negative relation has been reported in the post-war data of the US and other countries (e.g., Bodie, 1976; Fama and Schwert, 1977; Gultekin, 1983; Jaffe and Mandelker, 1976, Lee, 2010; Lintner, 1975; Nelson and Schwert, 1977; Svedsäter, Gamble and Gärling, 2007). Conversely with Modigliani and Cohn (1979), a positive relation between inflation and stock returns has also been reported in the pre-war period (Kaul and Seyhun, 1990; Hess and Lee, 1999; Lee, 2010). Following those empirical studies, Lee (2010) point that the stock return-inflation relation is time depending and those relations is not necessarily constant through the whole period and countries.

Not only the empirical studies but also the experimental studies conducted in laboratory also support that money illusion affects the market pricing at the aggregate level, and furthermore, those well-designed experiment have revealed some characteristics of money illusion. Fehr and Tyran (2001) define money illusion as the situation where "*people behave differently when the same objective situation is represented in nominal or in real terms*" (1997, p. 1), and design a pricing game implementing an anticipated monetary shock at the half of the game to observe the adjustment process of prices in nominal as well as in real value.

As a result, they point out that part of the subjects suffered from money illusion, which caused a considerable aggregate nominal inertia. This result has been supported by Noussair et al. (2012) by way of experimental study and Basak and Yan (2010), which analyses the asset price and investor behaviour under the presence of money illusion. Furthermore, Fehr and Tyran (2001) states the lack of coherence about subjects' behaviour depending on the way of payoff presentation and the nature of nominal shocks. In particular, when the payoff information is presented to subjects in nominal terms, the nominal inertia has been observed much more noticeably than when payoff information is presented in real terms. In addition, while the nominal inertia is quite substantial and long lasting after a negative shock, it is rather small after a positive shock.

Whereas most researches on money illusion in financial markets are mainly concerned with its influences to the aggregate market under inflation (or deflation) situation, Svedsäter et al. (2007) points out that money illusion may also happen depending on the way of the nominal representation of stocks even though under no inflation (or deflation) situation. They investigated using a survey questionnaire whether the investors' reaction following the company's earnings announcement would change depending on the nominal value of stocks. According to their result, when the nominal share prices show high values, the investors expect less change in share prices than when the nominal prices are presented in low. It is also important whether prices are given in euros or Swedish crowns (approximately equal to 0.1 euro). Numbers of nominal value are higher in Swedish crowns, and, consistent with previous results, when the nominal share prices are presented in Swedish crowns, the investors expect less change in share prices than when the nominal prices are presented in euros.

From those results, they conclude that, the investors relate the nominal share prices to the performance of the company (Low stock prices are related to poor performance of the company, and high stock prices to good performance), therefore the investors tend to expect that share prices showing low nominal value is more affected by the fundamentals effects than the high nominal value of share. Finally, they investigate whether changes in nominal prices affect participants' trading following a split or a reverse split of share prices. The results show that both buyers and sellers are more willing to trade when the stock is presented with lower nominal price following a stock split than when the stock is presented with higher nominal price following a reverse stock split. They state that it is maybe because of the inexpensiveness of the stock, buyers and sellers are more willing to trade but the reason for this increase/decrease is not clear.

It also has been discussed whether we could alleviate money illusion with individual ability. Firstly, economic and financial literacy[3] has attracted attention as an ability to alleviate money illusion. Several studies tried to verify the impact of the economic and financial education on money illusion at an individual level (Bakshi, 2009; Chytilova, 2017; Cipriani, Lubian and Zago, 2008), however, those are failed to find any conclusive evidence.

1.2. Emotion as biases in decision-making

In the 1960's the cognitive psychologists began to adapt their cognitive models of decision-making under risk and uncertainty to economics. This new field called "behavioral economics" has explained various irrational behaviors that could not be explained under the models of rational economics. Under such circumstances, money illusion has been highlighted as an example of irrational behavior.

Shafir et al. (1997), first adopted cognitive psychology to money illusion and defined it as "a tendency to think in terms of nominal rather than real monetary values" (p. 341). They highlighted the saliency of the nominal value in the transaction at a single point in time or over a short period, and point out that the tendency of people to think in the nominal amount of money even though they aware the differences between real and nominal money.

Their innovative interpretation of money illusion as a cognitive bias broke the mainstream thought that money illusion is a preventable phenomenon through recognizing the real value. Nowadays, Shafir et al. (1997) has been widely accepted among scholars who study money illusion and it has constituted the bedrock of the concept of money illusion. (e.g., Basak and Yan, 2010; Miao and Xie, 2013; Raghubir and Srivastava, 2002; Svedsäter et al. 2007).

However, the cognitive bias is not able to explain the mechanism of money illusion for professional investors. According to a psychological theory called "dual process theory"[(4)], complex decisions, such as investment decision-making are processed in the reasoning processes, not in the belief-based processes. For instance, the instantaneous decisions that govern most of our lives (e.g., choosing which meals to eat or what to wear at morning) are linked to System 1. In comparison with daily small continuous decision-making, the complex decisions, such as deciding which house to buy, whether to change careers or investment decision-making are linked to System 2. Even if people would have some gut feelings about each option, most of the people would likely try to collect as much information about each option as possible and try to decide rationally (Kahneman and Egan, 2011).

Ultimately, the main argument of the "dual process theory" is that emotions should become detached from rational decision-making, processing in "System 2". As a matter of fact, emotions are extremely powerful for individual decision-making and have even influence evenly (Lerner et al., 2015). For instance, the type of emotion that is aroused by facing the choice or judgement at hand (i.e., integral emotion) strongly shape individuals' decision-making (Damasio[(5)], 1994, 1996; Greene and Haidt, 2002). Furthermore, the integral emotion associated with judgment target is difficult to detach (Rozin et al. 1986), and it affects strongly the individuals' behavior even though they realize the better alternative choices (Loewenstein, 1996).

Only the negative view of the role of emotions in decision-making tends to attract attention, but we are able to make decisions more efficiently and quickly with the aid of the emotion (Damasio, 1994). For instance, past studies found that the patients injured to the ventromedial prefrontal cortex (vmPFC), which is an important area of the brain for

integrating the emotion and cognition, tend to trapped by impulsive and immediate interests, and are unable to learn from failure (Bechara et al., 1994; Bechara et al. 1996). Interestingly, vmPFC activation increased with the nominal value, even though the subjects perfectly understand the real value is stable (Weber et al., 2009). It implies that the individual feels some emotional implications from the nominal value.

Moreover, the high ability does not necessarily help when the individuals suffer from the emotional biases. Peters et al. (2006) argues that high ability (in this case "numeracy"(6)) prevents rational decision-making in the question related to the evaluation of the choices: high numeracy individuals draw more emotional meaning from probabilities and numerical comparisons than lower numeracy individuals do, and consequently, they make a worse decision. The similar phenomenon is reported by Shafir et al. (1997) in the case of money illusion, people purposely chose the irrational choices even though they knew which choice was rational when they face the questions about happiness(7).

A series of studies imply the existence of emotions as a confounding factor between the perception of nominal value and money illusion. Nevertheless, past studies focused only on the relation between the perception of nominal value and money illusion, and no one discussed the existence of emotion as a cause of money illusion. Hence, we hypothesize that money illusion is not only the mistake or the cognitive biases but also caused by the emotions that are aroused by perceiving nominal quantities of money.

To investigate the role of emotion in money illusion, we conducted a survey experiment based on the Shafir et al. (1997). Subsequently, we hypothesized the results by formalizing the individuals' decision-making who suffer from money illusion. Generally, money illusion cannot be formalized by any theory premised on the accretion of utility that depends on the consumption of a product. Therefore, we formalized money illusion by incorporating the individuals' psychological utility into the individuals' utility function.

Analyzes showed that high numeracy generally helps to distinguish the nominal and real value. However, when high numeracy individuals consider well-being, their decision is strongly affected by nominal value. This behavioral tendency appeared prominently when the nominal values were shown by the balance of assets: the emotions accompanying the perception of the nominal value strongly affected the individuals' financial decision-making based on their well-being.

Furthermore, the evaluations of the bonds were basically given based on the nominal values. Especially the high numeracy individuals who perceived the nominal value with the balance of assets were strongly affected by the nominal value.

Our result showed the complexity of money illusion: it is caused not only by the confusion between the real and nominal value, but also by individuals making decisions by taking into consideration psychological aspects such as well-being.

2. Survey experiment

2.1. Method

The survey mainly consisted of 1) questionnaire of money illusion, 2) assessment of numeracy and 3) test about the ability to distinguish between the real and nominal value.

We conducted the survey after having asked the subjects' general information(8). The questionnaire of money illusion was conducted based on Shafir et al. (1997). At first, we showed the subjects the funds' performance during two different periods (period 1 of fund A and period 2 of fund B(9)) and asked four types of questions. First question only asked about the economic performance of two funds (hereinafter called "economical question"). The second question asked in which period you were happier (hereinafter called "well-being question"). Finally, they were asked to rate the attractiveness of each fund from 0 (not attractive) to 10 (very attractive).

Also, we set two conditions: one condition presented the nominal value as the total amount of the value of an asset ("total condition"). The other condition presented the nominal value as the investment balance ("gain/loss condition"). To even the degree of difficulty, the rate of asset growth in nominal values was shown in both conditions.

Subsequently, the subjects were tested on their numeracy, and finally, we set up a question to confirm whether the subjects properly understood the concepts of nominal and real value. We excluded the subjects who could not correctly answer this question from the samples. In order to avoid the subjects to be anchored in real value by this confirmation question, we asked it at the end of our survey.

We conducted the survey experiment via internet(10). We gathered data for 125 subjects, but eliminated the ineligible data(11), and as a result we used 77 individuals' data. The subjects were randomly assigned to one of the two conditions, and as a result the number of subjects in the gain/loss condition was 41, and 36 for the total asset condition. In both conditions, the majority of subjects were male (27 males in the gain/loss condition and 23 males in the total asset condition) in their 30's. Most of the subjects had a bachelor degree or higher (80% of subjects in the gain/loss condition and 83% of subjects in the total asset condition).

2.2. Decision models and hypotheses

In this chapter, we would like to simulate the situation that the individuals choose the irrational choice even though they know the rational one.

We first distinguished the individuals' decision-making process into two behaviors: 1) calculate the real value, and 2) choose from the options. The accuracy of calculation (p_i) depends on the individuals' numeracy. That is, p_i for the high numeracy individuals (p_i^h) is higher than for the low numeracy individuals (p_i^l). We suppose that when they face the economical question, the individuals' decision only depends on their calculations. Therefore, the high numeracy individuals distinguish the rational choices more easily than the low numeracy individuals.

Hypothesis 1:

When they face the economical question, the high numeracy individuals suffer less from money illusion than the low numeracy individuals.

Subsequently, we simulate the individuals' decision making in the well-being question. According to the result of Shafir et al. (1997), when the individuals face the question about their happiness, they tend to suffer from money illusion even if they know which choice is rational. We suspect that emotions play an important role in their decision-making.

In the question about well-being, the decision is made based on the evaluation of which option makes them happier. It means that the individuals consider the psychological utility which comes not only from the real value but also from the nominal value.

We defined the emotions which are aroused by perceiving the nominal amount of money as E, and also distinguished between the magnitude of high numeracy individuals' emotions (E^h) and the magnitude of low numeracy individuals' emotions (E^l). Peter et al. (2006) shows that the high numeracy individuals tend to draw strong emotional meaning from numerical information. Therefore,

$$E^h > E^l \geq 0. \quad (1)$$

When individuals face a question about well-being, they consider the magnitude of emotions that come from both the real value (E_r) and the nominal value (E_n). Their psychological utility depends on the magnitude of emotions for both.

$$U = u(E_r, E_n) \quad (2)$$

For instance, when the magnitude of the negative emotion accompanying the perception of the nominal losses surpasses the positive emotion which comes from the real gain ($|E_n| - |E_r| > 0$), the psychological utility increases with making the decision based on the nominal value.

Hypothesis 2:

The high numeracy individuals suffer from stronger money illusion in the well-being question than in the economical question.

Once again, we suspect that money illusion is caused by the emotions which are aroused by perceiving the nominal value, not by perceiving the nominal money. To verify our assumption, we set the two conditions in our experiment: one condition presented the nominal value as the total amount of the value of an asset ("*total condition*") and the other condition presented the nominal value as the investment balance ("*gain/loss condition*").

In the total condition, the individuals first perceive their wealth with positive numbers unless the suffer losses over their initially invested amount of money. Conversely, in the gain/loss condition, the individuals perceive directly the gain with the positive numbers and the losses with negative numbers. Directly perceiving the volatility of their wealth

may arouse a stronger emotion. Especially for the high numeracy individuals, this small perceptive difference may arouse big differences of level of the emotions.

The differences between those two conditions cannot be explained by any theory premised on utility maximization, such as prospect theory (Kahneman and Tversky, 1979) because both present the same degree of losses. That is, if the perception of the nominal value causes money illusion, there should be no behavioral difference between the two conditions. If behavioral differences are observed, the correctness of our theory will be proved.

Hypothesis 3:

High numeracy individuals suffer from stronger money illusion in the gain/loss condition than in the total condition.

3. Results

3.1. Economical and well-being question

Numeracy of the subjects was assessed with the scales developed by Lipkus, Samsa and Rimer (2001)[12]. The measure of numeracy consisted of 10 items, but 1 item required 2 answers therefore the maximum numeracy score was 11. The mean numeracy score was 8.75 (SD = 2.64, median 10) out of 11.

We divided the subjects into two groups according to the median numeracy score because the distribution was highly skewed (hereinafter called “high numeracy group” and “low numeracy group”). Thus, our analyses compared the participants who were most numerate (10, 11 items correct) with those who were less numerate (0–9 items correct). Since there were variations in the number of samples, we adopted Bayesian estimation[13] for the analysis in this section.

Table 1. *EAP of the mean performance rate of each questions and conditions*

			CI	
	EAP	SD	2.50%	97.50%
Economical question				
Low numeracy				
total	0.19	0.08	0.06	0.38
gain/loss	0.19	0.08	0.06	0.38
Higy numeracy				
total	0.47	0.11	0.26	0.70
gain/loss	0.42	0.23	0.61	0.37
Well-being question				
Low numeracy				
total	0.19	0.08	0.06	0.38
gain/loss	0.24	0.09	0.17	0.43
Higy numeracy				
total	0.31	0.13	0.24	0.53
gain/loss	0.12	0.07	0.03	0.28

Table 1 shows expected a posteriori mean performance ratings (MPR) of each question and condition. At the economical question, the MPR of the high numeracy group was significantly higher than for the low numeracy group in both conditions: odd-ratio was

5.24 (SD = 3.40, 95%CI = 1.58-13.70) and 4.08 (SD = 2.51, 95%CI = 1.24-10.37) in the total condition and in the gain/loss condition. However, in the well-being question, the significant differences between the high and low numeracy group disappeared both in the total condition (odd-ratio = 2.49, SD = 1.52, 95%CI = 0.73-6.43) and in the gain/loss condition (odd-ratio = 0.48, SD = 0.31, 95%CI = 0.12-1.29).

For the high numeracy group, the MPR was generally higher in the economical question than in the well-being question. The MPR was 0.44 (SD = 0.06, 95%CI = 0.33-0.55) in the economical question and 0.19 (SD = 0.04, 95%CI = 0.11-0.28) in the well-being question. Odd ratio was 3.68 (SD = 1.41, 95%CI = 1.69-6.96). This result exposed the behavioral tendency in the well-being question that the individuals in the high numeracy group choose the irrational choice, even though they could choose correctly in the economical question.

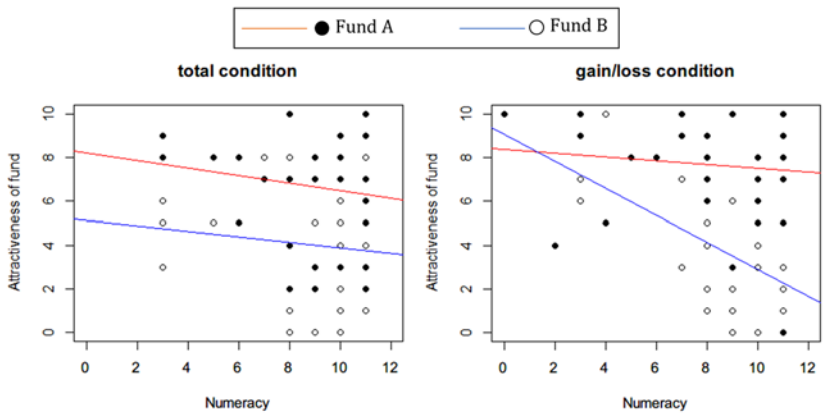
This behavioral tendency occurred particularly frequently in the gain/loss condition: the MPR was significantly higher in the economical question than in the well-being question (odd-ratio = 7.58; SD = 5.30; 95%CI = 2.06-22.58): more than 90% of the subjects who answered correctly in the economical question chose the irrational choice in the well-being question. However, in the total condition, difference of MPR was not significant between the economical question and the well-being question (odd-ratio = 1.91; SD = 0.89; 95%CI = 0.74-4.15): over the half of the subjects who answered correctly in the economical question could keep their rational choice also in the well-being question.

Hence, for the high numeracy group in the well-being question, the MPR was higher in the total condition than in the gain/loss condition (odd-ratio = 4.66; SD = 3.51; 95%CI = 1.27-13.30).

3.2. Attractiveness of each fund

In this section, we investigate whether the evaluation of each fund is different depending on the individuals' numeracy. Graph 1 shows the scatterplot with fitted regression line in each condition.

Graph 1. *Scatterplot with fitted regression line*



The regression line suggests that the attractiveness of fund A was generally higher than the attractiveness of fund B. From AIC comparison[14], we adopted the model that supposes that each single regression models (dependent variable: attractiveness of each fund in each condition, independent variable: numeracy) have perfectly different parameters.

Table 2 shows the parameters of each regression. The intercept coefficient was significant only for the fund B under the gain/loss condition ($F(1,39) = 26.74$, $p < .00$), with an R^2 of 0.407. Participants' predicted evaluation of fund B was equal to 9.071 + -.618 (numeracy) points when the fund attractiveness was assessed from 0 (not attractive) to 10 (very attractive). That is to say, only the evaluation of fund B in the gain/loss condition decreased along with the increase in numeracy, while in the other condition or for fund A in the same condition were the equivalent levels regardless of the numeracy.

Table 2. *Dependent Variable: Evaluation of each funds*

	total condition				gain/loss condition				
Variable	A		B		A		B		
Numeracy	-0.175		-0.123		-0.085		-0.618		**
	(0.163)		(0.182)		(0.123)		(0.120)		
con	8.227	**	5.106	*	8.382	**	9.070		**
	(1.474)		(1.651)		(1.130)		(1.101)		
N	36		36		41		41		
R-sq	0.032		0.013		0.012		0.407		

**p<.001, *p<.05

4. Discussion

In this study, we investigated the role of emotions in money illusion. From our survey experiment, we found mainly four points: 1) the high numeracy group better overcame money illusion than the low numeracy group when they faced the economical question. However, 2) in the well-being question, the high numeracy individuals, who answered correctly in the economical question, tended to change their choice to the irrational option. This behavioural tendency appeared prominently in the gain/loss condition. 3) Moreover, the high numeracy group in the gain/loss condition suffered more from money illusion than in the total condition. Additionally, 4) the evaluations of attractiveness of funds were basically given based on the nominal value. Especially the high numeracy individuals who perceived the nominal value with the balance of assets were strongly affected by the nominal value.

The first point of the result was consistent with Peters et al. (2006) and supported our hypothesis 1. That is to say, numeracy is one of the components likely to decrease money illusion: numeracy helped the subjects understand numerical information in various forms, and as a result, their cognitive biases decreased.

The second point of the result partially supports our hypothesis 2, and is consistent with the results of Shafir et al. (1997) who argue that there is a case where the individuals suffer from money illusion even when they are able to distinguish between real and nominal value.

The third point of the result supported our hypothesis 3: in the well-being question, the high numeracy group suffered more from money illusion when they perceived the nominal losses as negative numbers rather than as positive numbers. That is, there is a possibility that the money illusion may be more strongly induced depend on which information the individuals focus on at first.

The fourth point of the result might be directly related to the mechanism of money illusion: attractiveness to funds leads to other cognitive bias (e.g., Normalcy bias, confirmation bias, Halo effect, etc.) in a chain reaction and consequently causes money illusion. Here we will illustrate one of the examples of money illusion in finance: the stock market tends to underestimate during inflation periods since the investors tend to calculate their dividend based on nominal value (Modigliani and Cohn, 1979; Campbell and Vuolteenaho, 2004). I would like to argue that this explanation does not fit the current era since investors calculate their profit by using financial theory coupled with high-spec computers. Rather we may have to focus on a different point between rational choices based on financial theory and the process followed by investors to build their portfolio.

In this context, the reasonable price is calculated with financial theory such as CAPM, which considers the risk of the fund as the volatility of the stock prices. As a matter of fact, investors take into account the risks are not only the volatility of the stock prices but also other types of risks that are involved by investment, such as bankruptcy risk.

In inflation, investors feel attracted to risk-free assets since the nominal value increase even though the real value decrease. Subsequently, their positive integral emotion for risk-free asset cause other cognitive biases. For example, investors may link the performance of stock prices with the risks other than the volatility (e.g., the risks of the bankruptcy of stemming from the shortage of cash). Consequently, they may avoid buying stocks and shift the position to more risk-free assets more than necessary.

5. Conclusion

In this paper, we investigated the mechanism of money illusion beyond the accepted notion, that money illusion is stem from confusion between the nominal and the real value. As a result, we found that the integral emotions caused by the nominal value are involved in the mechanism of the money illusion.

Our research would make a great contribution to the research of individual's decision-making because we clearly demonstrated that the high ability individuals also suffer from money illusion even though they were able to distinguish the real and nominal value.

In order to better understand money illusion in various field, we should bridge the gap between the economic theory and the actual decision-making process. Studying the role of the integral emotion that influence decision-making using the experimental method may be a good way. Eventually, it may lead us to know why people behavior sometimes seems to be irrational.

Notes

(1) Gordon Growth Model is a stock valuation method assuming a future series of dividends that grow at a constant rate, regardless of current market conditions (Gordon, 1962).

(2) Fed model is a theory of equity valuation about the relation between the forward earnings yield of the stock market and the 10-year Treasury bond yield to maturity (Campbell and Vuolteenaho, 2004).

(3) The terms “economic literacy” and “financial literacy” have been defined many times (e.g., De Rooy, 1995; Winick, 2006; Lusardi and Mitchell, 2014; OECD, 2011). However, some studies refer to the term “economic literacy”, some to the term “financial literacy”, or those terms are intermingled. On the whole, it means the ability to understand the information and the skills to choose the optimal choices when facing financial risks or opportunities.

(4) According to Kahneman (2003), that is one of the latest revised theories of the dual-process theory, people take on different cognitive systems depending on the situations: First, “Intuition” (or system 1) is activated automatically and processes information quickly. Usually this thinking process bonds with emotion. Second, “Reasoning” (or system 2) is activated by intention and processes information more slowly, but the reasoning is more speculative.

(5) Antonio Damasio formulated the “Somatic marker hypothesis”. He defines “Emotions” as a change in both body and brain states in response to stimuli (chapter 7), and argues that the individual experiences some gut feelings at the moment of perceiving stimuli (called ‘somatic markers’), and subsequently start the logical reasoning. This system improves the efficiency of our logical thinking by highlighting some options.

(6) They focused on the numerical ability (called ‘numeracy’), because it is the necessary ability to understand the numerical information (Schwartz et al., 1997; Black et al., 1995; OECD, 2013, 2016).

(7) Shafir et al. (1997) first present two persons' different financial situations for their subjects. One person gets a higher pay increase in the nominal value, but lower in the real value, than another person in the nominal value. After this presentation, the subjects were asked three types of questions. First one requires the subjects' rational evaluation for two alternative choices. The second one asked the well-being, and the third one asked about the attractiveness of the two choices. According to their result, most of the subject could answer correctly in the first question but not in the second and the third questions.

(8) General questions consist of gender, age, education level, and the assessment of loss aversion (Gächter, Johnson and Herrmann, 2007) and risk aversion (Holt and Laury, 2002).

(9) The value of fund A increased in nominal value but decreased in real value. Oppositely, the value of fund B decreased in nominal value but increased in real value.

(10) We recruited the subjects via Amazon Internet platform (Mechanical Turk; hereinafter called “MTurk”), on which the researchers can recruit participants with relatively low cost. The survey using MTurk is increasingly becoming the norm not only in consumer behaviour research (e.g., Smith et al., 2016; Goodman et al., 2013), but also in economics (e.g., Amir and Rand, 2012) and more recently in financial research (e.g., Bazley et al., 2017). Participant fee was $ 10.

(11) We eliminated the data of individual which answered for all items with same numbers, who did not answer for a required item, or who failed the question about financial knowledge.

(12) The validity of the numeracy scale is verified by Lipkus et al. (2001) (Cronbach's alpha (α) = 0.78).

(13) Mean performance ratings were calculated as expected *a posteriori* (EAP) by Bayesian statistical inference with Markov chain Monte Carlo (MCMC) using software R and RStan.

(14) We compare the three models: 1) the multiple regression model in which the dependent variable is the attractiveness of fund and the independent variables are numeracy and the type of fund. 2) The single regression models in which the dependent variable is the attractiveness of each fund and the independent variables are numeracy which have the perfectly different parameters. 3) The third model is almost the same as the second model, but those have the common residual variance.

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Appendix

1. Presentations of questionnaire

1) Gain/Loss condition presentation

Considering you invested in two different funds in two different years. One year, you invested $30,000 in Fund A. After a year, you got $600 (+2%) capital gain. During the year you invested in Fund A, there was no inflation. Another year you invested $30,000 in Fund B. After a year you invested in Fund B, you incurred a $-300 (-1%) capital loss. During the year you invested in Fund B, there was -4% deflation.

2) Total condition presentation

Considering you invested in two different funds in two different years. One year, you invested 30,000 USD in Fund A. After a year you invested in Fund A, your total holding in fund A was $ 30,600 (+2%). During a year you invested in Fund A, there was no inflation. Another year you invested $30,000 in Fund B. After a year you invested in Fund B, your total holdings in fund B were $29,700 (-1%). During a year you invested in Fund B, there was -4% deflation.

2. Questions (Common between the gain/loss condition and the total condition)

Q1. As you finished your two-year investment period, in which periods did you obtain the best economic performance? (*Economical question*)

Q2. As you received the reporting at the end of each year, in which year are you happier? (*Well-being question*)

Q3. Please rate the attractiveness of fund A (or fund B, range 0-10)

3. Question to understanding of nominal and real value

Suppose you have no savings or debt and you spend all of your monthly salary of 1600 dollar every month, but no more, that is to say, you cannot borrow money. Two scenarios are possible.

- Scenario A: There is 1% inflation and you get a 3% wage increase. Your salary goes from 1600 dollar to 1648 dollar.
- Scenario B: There is 4% inflation and you get a 5% wage increase. Your salary goes from 1600 dollar to 1680 dollar.

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Macroeconomic stability of new member states of the European Union: Fifth enlargement

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Abstract. *The historical context of globalization as an organized process, which influenced the majority of national economies linked via international institutional mediators, led to the so called regional economic integration phenomenon. It is interpreted as the efforts of underdeveloped and developing countries to speed up their economic growth and more significantly impact the entire macroeconomic stability by means of some form of regional integration. Nowadays, regional economic integration is one of the pillars for proper functioning of modern economic relations. Experience of developed countries serves as an example to point out that integration processes inevitably contribute to more favorable environment for developing business sector in the countries striving for integration. In the context of global integrations, more frequent forms of regional changes and the establishment of trade blocks come as the consequence but also the overall need for obtaining trade balance among national economies. Within this context, the European Union is seen as one of the most important regional integrations and an imperative in economic, political and cultural segment, as it is the territory with significant economic growth and the region with high living standards.*

Keywords: regional economic integrations, macroeconomic stability, economic development, macroeconomic aggregates.

JEL Classification: B21, F02, F41.

1. Introduction

The primary goal of this paper is to define the role and importance of integration processes in macroeconomic stability and faster economic growth of the countries striving to be a part of such processes. The key question arises as to whether economic integration processes contribute to macroeconomic stability of transition countries, which is observed on the example of the countries within the fifth enlargement of the European Union (EU) based on the examination of macroeconomic aggregates before and after their accession to the EU. Consequently, the paper seeks to interpret recommendations regarding the benefit of regional economic integration for the countries striving for integration process, from the aspect of using available resources through various sources of financing, aimed at decreasing unemployment as well as increasing per capita income, foreign direct investment, which would have the overall influence on the socio-economic status of these countries. The issue of regional economic integration is specific all over the world. Furthermore, this research intends to examine the basic characteristics of regional economic integration and its impact on macroeconomic stability of the countries within such integration.

One of the specific operational goals of the research is the analysis of the present scientific knowledge and contribution in the field of economic policy and convergence, which will describe present theoretical and empirical findings in the segment of regional economic integration. We intend to show that macroeconomic stability can be sustained primarily through stronger export activities and inclusion into regional and global economic integration as well as through faster growth of public revenue over public expenditure.

The paper also seeks to highlight the importance of regional economic integration for reducing trade barriers among the member states and discrimination of trade with non-member countries. This can be done by emphasizing the process of regional integration as the model of safer approach to bigger market, with the aim of increasing efficiency as regards better prospects, stronger competition, access to modern technologies, as well as the fear of staying aside in the time of increasingly present policy of regional integration.

Through a carefully planned approach, the authors seek to emphasize the importance of regional integration as a definite path for all accession countries, bearing in mind the main macroeconomic indicators. The results might serve for better understanding of how important economic integration is and contribute to the creation of strategic decisions in accession to regional economic integration. The research into this issue, aimed at testing the postulated hypothesis and achieving the research goals, includes the answers to numerous questions.

In order to effectively analyze the specified research problem and fulfill the aforementioned goals, a hypothesis can be postulated: Regional economic integration has an impact on a significant increase in the medium-term gross domestic product (GDP) and it directly contributes to a total macroeconomic stability of the new member states.

2. Theoretical framework

As a conceptually defined term, macroeconomic stability is the research subject for many authors active in macroeconomic theory. Begg (2010) defines it as the main economic goal of every country demonstrated by the achievement of basic goals determined by economic growth, price stability, high employment rate and positive international trade balance. Taking into account theoretical principles, (Hodžić, 2007) points out that it is important to highlight the role and significance of economic policy in achieving macroeconomic stability. While macroeconomic theory includes the scientific study of economic activity of the society as a whole, which needs to stand as the framework for practice, economic policy uses the so called discoveries of macroeconomic theory as the tools to achieve the desired goals. In other words, it gives the operating mechanism focused on specific economic practice and improvement of economic welfare of the society (production growth, GDP growth, price stability, etc.). Economic policy is the backbone for the development of any society. Praščević (2004) emphasizes that macroeconomic policy as well as economic policy have their main aims indicated by the realization of high and stable rates of economic growth and employment parallel with maintaining macroeconomic stability.

The premise is that macroeconomic stability is the basic economic goal of every country. It is manifested in the achievement of basic goals determined by economic growth (percentage of annual increase of real GNP or GDP per capita in the long run), price stability, high employment rate and positive international trade balance.

Babić (2007) states that macroeconomic stability as a macroeconomic goal, seen through the prism of the relationship of the overall production, revenue, employment, prices and other variables, is significantly determined by various factors. Macroeconomic analysis examines the behavior of the entire economy and establishes the interdependence among its more important aggregates such as: national income, aggregate expenditure, savings, investment, export, import, etc. These aggregates are calculated by cumulating a large number of microeconomic variables whereby macroeconomic analysis is also called aggregate economic analysis. In this respect, Jakšić (2003) claims that macroeconomic aggregates are statistical data that show the current state of a country's economy depending on the specific field. As such, these aggregates constitute certain economic dimensions of a nation which are used to register its production capacities (total material and subjective resources) as well as its economic results. Hence, it is rather important to look at macroeconomic stability in modern processes of transition and deregulation.

Transition is essentially seen as a positive and desirable process of lowering country's violent interference into people's lives and increasing individual freedoms, prosperity, and welfare. As such, transition is determined by two basic components and includes political and economic dimensions. Political transition is the elimination of authoritative government and affirmation of democracy while economic dimension of transition is market liberation, meaning separation of economy and state. This dimension is decisive for the success of the entire transition from government control towards free society and it is a

sine qua non of long term stability. Political transition in the countries of Southeast Europe (SEE) has mainly been completed while economic transition has not been carried in the same way and has some negative characteristics. There are many critical views and discussions regarding economic and social consequences of transition.

According to (Mervar,2002), it is generally observed that successful transition countries that follow rapid and strait line strategy have already implemented far reaching changes at institutional levels and have been economically linked to EU markets. In their case, all further adjustment may be carried out faster and at lower cost than in the countries hesitant in implementing reforms. Within the theory of economic integration, Kenen (1975) sees institutional programming of economic stabilization as a commercial policy of discriminatory limitation or removal of trade barriers only for the countries that have been integrated due to mutual benefits. This is why a significant proportion of theoretical and empirical researches are focused on seeking answers to questions regarding economic integration. It needs to be mentioned that there is no unified definition of economic integration. However, in his flexible interpretation (Balassa, 1961) defines it as an infinite form of integration of different national economies through free flows of goods and production factors. With this definition, Balassa made significant theoretical contribution introducing a five steps concept of regional integration. Some authors claim that from the current perspective, Balassa's integration stages seem outdated but still important for the study of doctrinal, historical, economic and political views, reasons and motives for emergence of such large integrations.

According to Ibreljić (1994) political debates are nowadays particularly frequent in developed and underdeveloped countries and their intensity depends on numerous factors such as state's centralization and decentralization, its national structure of the population, level and dynamics of global development, etc. McCormick (2015) believes that the advantages of common policy are evident in two main fields. First, open economies grow faster than those with limited access. Trade opens new possibilities and new jobs, provides customers with a wider choice of goods and services at lower prices, increases competitiveness, creates pressure for the removal of regulatory flaws, and fosters efficiency and innovation. Prokopijević (2005) states that research methodology for studying economic effects of integration is a complicated task. He points out the lack of consistency regarding the measurement procedure, which is why the results of various measurements are controversial. In terms of the model used, the studies are generally divided into a priori and a posterior. The former are conducted based on the model, regardless of the actual results of integration while the latter are based on attempts to observe and measure the actual results.

3. Review of previous research

Trade flows may be defined as intraregional if carried out within regional integration and extraregional if carried out with third countries, nonmembers of specific regional integration. The first attempt of the promotion of intra-ASEAN trade through institutional

integration within regional trade preferences was registered at the summit in Bali in 1976 when the preferential trade agreement was accepted. Despite the initial promises and enthusiasm, (Bilas, 2005) states that the agreement had little effect on intraregional trade. The suggested decrease of tariffs was too low so as to have any effect on trade flows. In addition, the preferential trade agreement was not adequate in terms of nontariff barriers that proved to be larger obstacles to trade than tariffs. As (Menon,2005) states, intraregional trade (Si) is most frequently measured by the share of the total intraregional trade (import and export included) in region's total trade: Si = tii/ti, where *tii* is intraregional trade or region *i*, while *ti* is the total trade of region *i*. Menon further emphasizes that in 2008 the share of the total intraregional trade in the total ASEAN trade was 50.2%, with the largest share registered by Myanmar (56.8%) and Singapore (55.6%). However, if the total trade is divided into intraregional import and export, it is evident that the ASEN extraregional export amount as much as 74.1%. This means that the ASEAN members mainly export outside their regional integration, meaning to the rest of the world while they mainly import from the regional integration member stated. Laos seems to differ from the other members as it has high intraregional export and extraregional import.

Statistical reports indicate that unification of a market brings an expansion of EU domestic trade and increases its openness to the world. The value of domestic trade in goods and services is significantly above foreign trade, even though since the formation of a single market the EU has taken the role of world's first exporter from the USA. The openness of EU economy towards the world, when measured by the share of export of goods and services in GDP, increased from 10% to 12%, thus coming closer to the USA (13.5%) and exceeding Japan (9%). The goods marketed in the EU needs to be subjected to customs duties and to satisfy all other criteria specified by competitiveness.

Grgić and Bilas (2012) conceptually divide the effects of integration into static and dynamic. Static effects are those functioning in the short run and observed immediately after integration and include: trade creation and diversion, production allocation, consumption, and trade relations. Dynamic effects are manifested in increasing competition, reaching production optimum, investment effects, etc. and as such, they are usually evident in the long run.

In the EU context, static gains in welfare as a consequence of unifications amounted 1 to 2 percent GDP, while dynamic benefits were assessed as much higher. The responsibility for establishment and function of a single market lies with the EU Commission which annually reports to the European Parliament and The Council of Ministers. In recent years, the Commission has invested efforts to provide harmonization of business conditions for financial services, tax legislation, etc. The EU reached the status of common market at the beginning of 1993. According to Vojnić (1993), there are numerous potentially positive and negative effects of regional economic integration. However, under present conditions one of the most important options is to stay aside. Hence the main assumption of the paper is that in integration with larger and developed countries less developed countries can significantly prosper. In the context of the research problem, we need to point to potential negative effects as well. Deeper integration may turn less developed countries rich in

natural resources into an instrument of concession extraction, bearing in mind various forms of adjustment to the standards of large and developed countries. The essence of economic integration is the creation of more favorable terms of company's business activities within integration. These terms are mainly evident in the creation of common market in which member states perform their activities under different, more favorable conditions than non-member states.

4. Methodology of the Empirical Research and Discussion of the Results

4.1. Analysis of the effect of integration on GDP

The most frequently used macroeconomic aggregate in economic analyses of a particular economy as well as its comparison to other economies is GDP. The following part of the paper brings the GDP per capita for EU member states within the fifth enlargement, for the five-year period prior and after their accession. The table shows the descriptive-statistical parameters for the analyzed variable (GDP per capita) for ten EU member states that joined the EU during its fifth enlargement in 2004: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia. The data show the average GDP per capita after the accession compared to the average value during the five-year period prior to their accession.

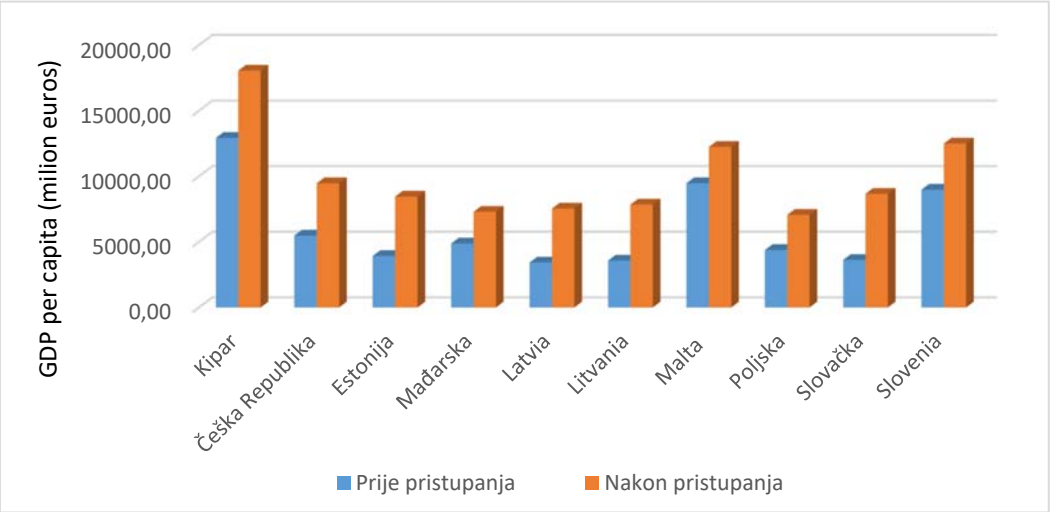
Table 1. *GDP per capita*

Ordinal number	EU member state	Before the accession (1999-2004)	After the accession (2005-2010)
		$\mu \pm \sigma$	$\mu \pm \sigma$
1	Cyprus	12,925.00 ± 846.07	18,050.00 ± 1,569.89
2	Czech Republic	5,475.00 ± 754.43	9,466.67 ± 1,428.50
3	Estonia	3,925.00 ± 556.03	8,450.00 ± 1,805.30
4	Hungary	4,875.00 ± 950.00	7,291.67 ± 433.71
5	Latvia	3,425.00 ± 350.00	7,541.67 ± 1,706.38
6	Lithuania	3,575.00 ± 427.20	7,841.67 ± 1,788.58
7	Malta	9,475.00 ± 250.00	12,233.33 ± 1,490.17
8	Poland	4,375.00 ± 330.40	7,058.33 ± 1,322.85
9	Slovakia	3,625.00 ± 512.35	8,666.67 ± 2,057.06
10	Slovenia	8,975.00 ± 607.59	12,491.67 ± 1,257.31

Source: available at http://ec.europa.eu/eurostat/statisticsexplained/index.php/Nationaonal_accounts_and_GDP/

It is evident that all the analyzed member states registered an increase in the average GDP per capita value when compared to the five-year period prior to their accession to the EU. The most significant increase after the accession was registered for Cyprus, Slovakia, the Czech Republic and Poland, Latvia and Lithuania, whose average GDP rates almost doubled in value (see the graphic presentation).

Chart 1. *GDP per capita*



The following Table 2. shows the results of testing the statistically significant difference in the average value of GDP per capita in the five-year period before joining the EU (1999-2004) and the average value of GDP per capita after joining the EU (2005-2010).

Table 2. *Results of testing the statistically significant difference*

Ordinal number	Accession	Before the accession	After the accession	P
		μ ± σ	μ ± σ	
1.	Fifth	4,460.00 ± 2,829.39	5,165.00 ± 1,178.88	0.000

Since $P < 0.05$ (5% significance or risk level), there is a statistically significant difference in the average value of GDP per capita before and after the accession for the ten countries that became members within the fifth enlargement. As previously showed, these member states registered a significant increase in GDP after their integration when compared to the period when they functioned as individual states in various bilateral and multilateral agreements. Economic development is usually expressed by means of GDP, which in the regional context may be used for measuring macroeconomic and growth and it may serve as the basis of comparison among regions. Hence, Cyprus, the Czech Republic and Slovenia registered a double GDP than before the accession while for Estonia, Latvia, Lithuania, Poland and Slovakia that growth was triple. It can therefore be stated that regional economic integration significantly influences the growth of GDP over the medium term and directly contribute to the profiling of macroeconomic stability.

4.2. Analysis of the effect of EU integration on unemployment rate

As Begg (2010) states, unemployment rate and its increase or decrease as a general indicator is seen as one of the most difficult consequences of any economic crisis. At times when production decreases there is less need for labor force. New unemployment does not occur, new workers are not hired but opposite tendencies appear and existing workers are fired. Okun's law shows precisely the key link between market output and labor market. It

describes the link between short term changes in real GDP and unemployment, whereby 1% increase in the unemployment rate, a country's GDP will be roughly an additional 2% lower than its potential GDP. Begg also states that unemployment is one of the key issues in modern economies. A high rate of unemployment with the tendency for further growth leads to resource dissipation, lower income and consequently general apathy and crisis. In order to understand country's economy, it is important to know the number of jobs opened or closed, the percentage of active labor force, and the number of persons that became unemployed.

Labor force is made of persons who have a job or are registered as job seekers, while unemployment rate is defined as the percentage of labor force that is unemployed, provided that they are registered as job seekers. Unemployment is the concept under which a part of working age population cannot find an appropriately paid job in accordance to their competences and qualification. This concept also includes all the society members that are partially employed but their labor force is not used to the full; they do not work full hours and their income is insufficient for a normal life. The following table shows the descriptive-statistical parameters for the analyzed variable (unemployment rate) compared to the working age population among ten EU members states that joined the EU during its fifth enlargement: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia.

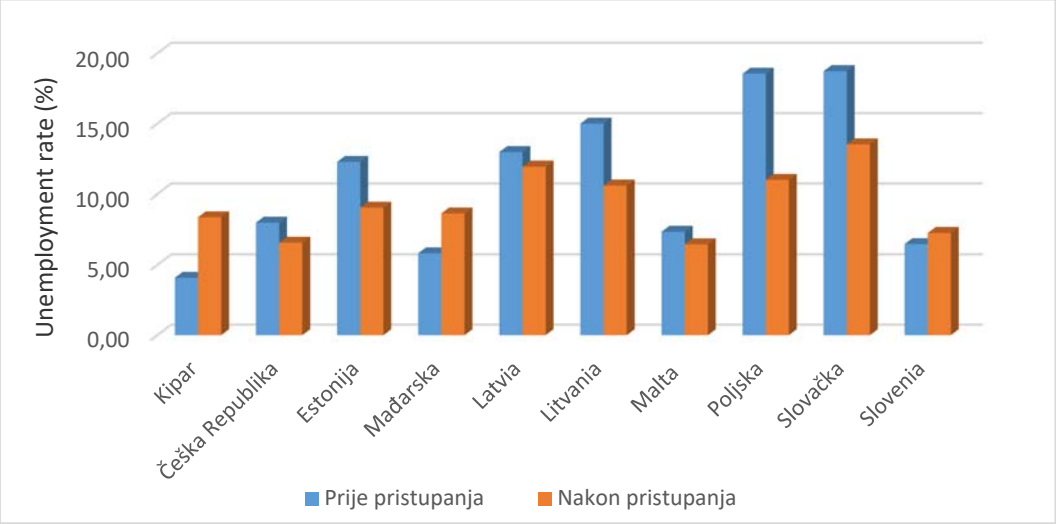
Table 3. *Unemployment rate in relation to working age population*

Ordinal number	EU member state	Before the accession (1999-2004)	After the accession (2005-2010)
		$\mu \pm \sigma$	$\mu \pm \sigma$
1	Cyprus	4.08 ± 0.54	8.38 ± 4.92
2	Czech Republic	8.00 ± 0.63	6.58 ± 1.16
3	Estonia	12.28 ± 1.91	9.07 ± 3.64
4	Hungary	5.83 ± 0.33	8.66 ± 1.87
5	Latvia	12.98 ± 1.18	11.94 ± 4.28
6	Lithuania	15.00 ± 2.30	10.59 ± 4.13
7	Malta	7.35 ± 0.45	6.46 ± 0.53
8	Poland	18.55 ± 1.80	11.00 ± 3.91
9	Slovakia	18.73 ± 0.75	13.53 ± 2.35
10	Slovenia	6.48 ± 0.26	7.27 ± 1.89

Source: available at http://ec.europa.eu/eurostat/statistics-explained/index.php/Employment_statistics/

The table shows that the majority of the analyzed EU member states registered increased unemployment rate in relation to working age population after they joined the EU. The highest drop in unemployment rate was registered in Slovakia while Malta saw the lowest drop in unemployment. Cyprus, Hungary and Slovenia did not register this decrease. The following graph shows the average unemployment rates before and after the accession per the ten EU member states within the fifth enlargement.

Chart 2. *Unemployment rate in relation to working age population*



The following Table 4 shows the results of testing the statistically significant difference in the average unemployment rate in the five-year period before joining the EU and the average unemployment rate after joining the EU.

Table 4. *Unemployment rate*

Ordinal number	Accession	Before the accession	After the accession	P
		μ ± σ	μ ± σ	
1	Fifth	11.29 ± 3.75	9.03 ± 3.50	0.042

Since $P < 0.05$ (5% significance or risk level), there is a statistically significant difference in the average value of unemployment before and after the accession for the ten countries that became members within the fifth enlargement. As previously showed, the majority of these member states registered a significant decrease in unemployment in relation to working age population after their integration when compared to the average unemployment rate in the accession period. The largest drop in unemployment was registered in Poland, Slovakia, Lithuania, Estonia and the Czech Republic while the lowest drop was registered in Malta. This means that regional economic integration had a significant impact on business activities in the EU due to the access to a much larger market. This access created the potential for utilizing market's positive values by means of using economies of scale, making higher profit, and opening new jobs, which manifests in a significant drop in unemployment over the medium term in the countries after the integration, which contributes to the entire macroeconomic stability.

4.3. Analysis of the effect of EU integration on foreign trade

(Paspalj,2016) states that the creation of common market and independent administration of equally represented member states was aimed at preventing national and other types of monopoly, enhancing unity, increasing stable economic growth, creating positive influence on standard of living and good economic basis for the development of integration process.

(Salvatore, 2014) also states that foreign trade or import coverage by exports is a very important indicator of company's competitiveness. For developing countries export creates opportunities for employment and income needed to pay numerous products they are not able to produce as well as advanced technology required. In the long run, states strive to keep import and export balanced and they see foreign trade as one of the most important forces of economic growth. Countries with developed foreign trade have the so called open economy that enables them to specialize in the production for which they have most favourable conditions. It would increase their productivity and consequently the standard of living of their population. Open economy freely established relations to other economies worldwide while the so called closed economy does not cooperate with other world economies.

As the main flows of goods in international economy are export, import and net export, the following part of the paper brings the comparison of export in millions of euros (millions of ECU) as one of macroeconomic indicators among the new EU members for the five-year period prior and after their accession. The following table shows the descriptive-statistical parameters for the analyzed variable (export value) for ten EU member states that joined the EU during its fifth enlargement in 2004: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia.

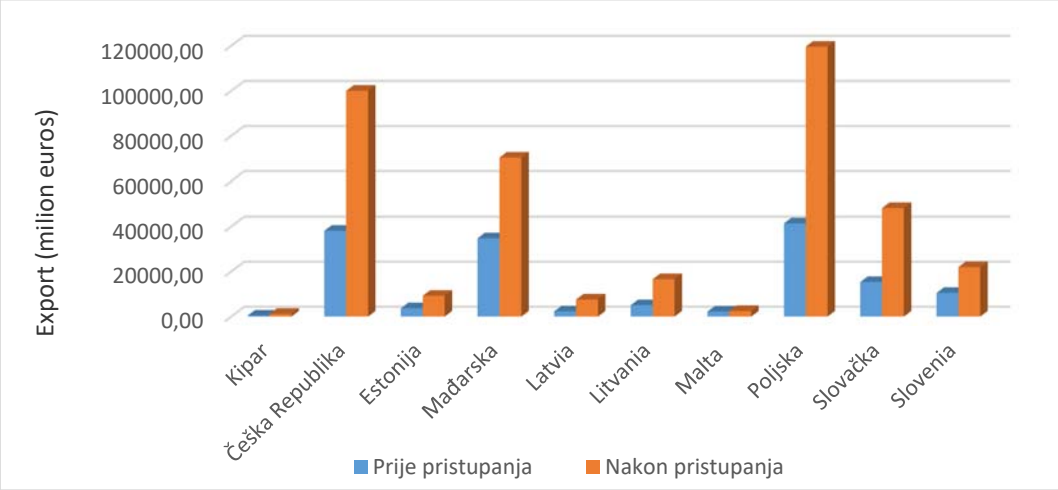
Table 5. *Export value*

Ordinal number	EU member state	Before the accession (1999-2004)	After the accession (2005-2010)
		$\mu \pm \sigma$	$\mu \pm \sigma$
1	Cyprus	447.75 ± 27.94	1,189.42 ± 257.58
2	Czech Republic	38,117.00 ± 5,022.11	100,015.58 ± 27,929.72
3	Estonia	3,696.00 ± 231.79	9,245.33 ± 2,745.34
4	Hungary	34,776.75 ± 3,301.76	70,330.08 ± 13,999.94
5	Latvia	2,307.75 ± 231.36	7,589.67 ± 2,911.97
6	Lithuania	5,082.75 ± 993.47	16,612.25 ± 6,191.01
7	Malta	2,206.25 ± 306.68	2,461.17 ± 439.55
8	Poland	41,398.25 ± 5,560.71	119,617.17 ± 37,247.99
9	Slovakia	15,354.25 ± 2,816.02	48,243.50 ± 15,788.89
10	Slovenia	10,522.25 ± 787.64	21,983.83 ± 4,861.44

Source: available at http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ext_It_intertrd&lang=en

The table shows that all the analyzed EU member states registered increased average value of export after they joined the EU when compared to the average value of export in the five-year period prior to their accession. The largest increase of export was registered in Poland (by EUR/ECU 78,218.92 million), the Czech Republic (by EUR/ECU 61,898.58 million), Hungary (by EUR/ECU 35,554.00 million), and Slovakia (by EUR/ECU 32,889.58 million). The graphic presentation is given below.

Chart 3. *Export value*



The following table shows the descriptive-statistical parameters for the analyzed variable (import) among ten EU member states that joined the EU during its fifth enlargement: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia.

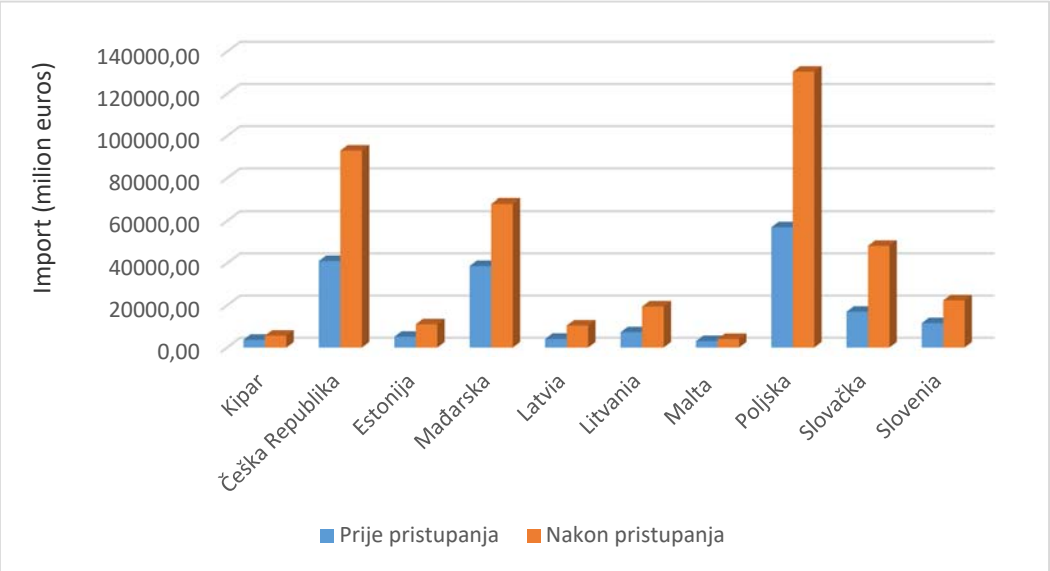
Table 6. *Import value*

Ordinal number	EU member state	Before the accession (1999-2004)	After the accession (2005-2010)
		μ ± σ	μ ± σ
1	Cyprus	3,653.50 ± 220.40	5,615.50 ± 814.47
2	Czech Republic	40,967.75 ± 4,735.29	93,045.42 ± 22,479.42
3	Estonia	5,052.50 ± 481.44	10,990.25 ± 2,621.67
4	Hungary	38,639.50 ± 3,188.35	67,994.50 ± 10,855.31
5	Latvia	4,071.75 ± 497.58	10,386.50 ± 2,772.76
6	Lithuania	7,233.75 ± 1,267.62	19,401.00 ± 5,774.72
7	Malta	3,043.50 ± 435.56	4,009.25 ± 867.68
8	Poland	56,988.25 ± 3,146.40	130,430.08 ± 33,774.46
9	Slovakia	16,937.00 ± 2,535.04	48,183.58 ± 14,011.75
10	Slovenia	11,536.00 ± 527.23	22,298.17 ± 4,130.42

Source: available at http://ec.europa.eu/eurostat/statistics-explained/index.php/Employment_statistics/

The table shows that all the analyzed EU member states registered increased average value of import after they joined the EU when compared to the average value of import in the five-year period prior to their accession. The largest increase of average import was registered in Poland (by EUR/ECU 73,441.83 million) and the Czech Republic (by EUR/ECU 52,077.67 million). The graphic presentation is given below.

Chart 4. *Import value*



The previous tables and graphs were used to present the results of the average values of export and import in millions of EUR/ECU in the five-year periods before and after the accessions. The paper now brings the average values of foreign trade for the EU member states that joined the EU during its fifth enlargement. The table shows the descriptive-statistical parameters for the analyzed variable (foreign trade value) among these countries.

Table 7. *Foreign trade value*

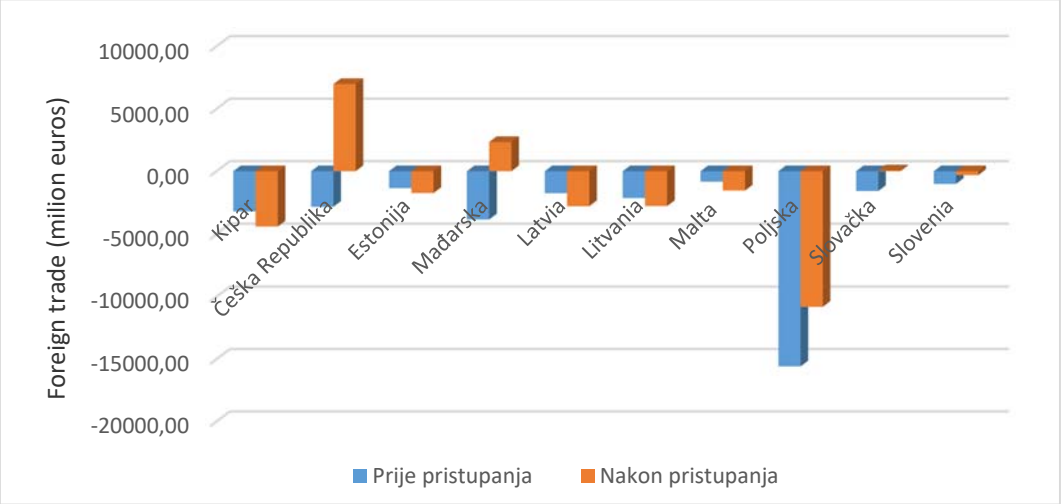
EU member state	Before the accession 1999-2004	After the accession 2005-2010
	μ ± σ	μ ± σ
Cyprus	-3,205.75 ± 207.93	-4,426.00 ± 894.59
Czech Republic	-2,850.75 ± 461.38	6,970.17 ± 5,945.09
Estonia	-1,356.50 ± 277.88	-1,745.00 ± 899.88
Hungary	-3,862.75 ± 439.65	2,335.33 ± 4,099.11
Latvia	-1,764.00 ± 266.56	-2,796.83 ± 1,113.85
Lithuania	-2,151.25 ± 290.06	-2,788.83 ± 1,356.31
Malta	-837.00 ± 160.57	-1,548.33 ± 703.88
Poland	-15,589.75 ± 2.436.40	-10,812.75 ± 7,927.12
Slovakia	-1,582.75 ± 901.68	59.92 ± 2,137.79
Slovenia	-1,013.75 ± 361.93	-314.25 ± 1,177.89

Source: available at http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do

What is evident is that the EU member states such as the Czech Republic, Hungary, Poland, Slovakia, and Slovenia saw improvement of foreign trade or reduced imbalance between import and export. The highest improvement of foreign trade was registered in the Czech Republic (by EUR/ECU 9,820.92 million) and Hungary (by EUR/ECU 6,198.08 million). The research results lead us to conclude that the member states such as Cyprus, Estonia,

Latvia, Lithuania and Malta saw a decline in foreign trade and consequently increased imbalance between import and export. The most serious decline in foreign trade was registered in Cyprus (by EUR/ECU 1,220.25 million) and Latvia (by EUR/ECU 1,032.83 million).

Chart 5. *Foreign trade value*



5. Conclusions and recommendations

The experiences of the analyzed countries show that joining the EU is not only a foreign policy priority and goal alone. The basic macroeconomic aggregates, observed in the five-year period before and after their accession, indicate that the process of European integration (which should certainly be a common strategic goal) is important for macroeconomic stability as a whole. Macroeconomic stability within the framework of regional economic integration needs to be an imperative and a real chance for faster overcoming present limitation. It should be observed as a significant advancement in achieving country's interests and expected benefits evident in inevitable reshaping and modernization of economy, mobility and retraining of labor force from less competitive industry towards those able to equally participate in market competition. In addition, it allows for the access to common market, which opens the possibilities for placement of products and services, as well as the access to a wider market of capital, equipment and developed technological and innovative solutions. The profiling of macroeconomic stability is primarily the recommendation for the countries striving for regional integration. In that way they could reach improvement of other fields that need to go hand in hand with economic reforms such as harmonizing legislation through promotion of the rule of law, building democratic institutions, reforming public administration, and supporting regional cooperation. This guarantees the overall stability and trust as the prerequisite for capital transfer.

The examination of macroeconomic aggregates before and after joining the EU, as one of the most important regional integrations, allowed for the interpretation of recommendations regarding the benefit of regional economic integration for the countries striving for such process from the aspect of using available resources through various sources of financing, aimed at decreasing unemployment as well as increasing per capita income, foreign direct investment, which would have the overall influence on the socio-economic status of these countries. It can be concluded that the research hypothesis that by joining the EU new member states that constitute part of the fifth enlargement profile and achieve their macroeconomic stability has been confirmed.

The EU as a political, cultural, and economic area has clear goals of preserving and increasing economic advancement and growth based on free market for the welfare of all its citizens and strengthening and improving social security and welfare. As such, it imposes the process of European integration as a wide adaptation of policies, institutional framework and legal system aimed at reaching European standards in all fields.

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The global context of economic crises and cohesion funds in the EU

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Abstract. *The currently finalized financial crisis, which began in the US then spread to Europe, has become global at some point. Even the emerging markets and the less developed countries that have managed their economy well, have resisted unfavorable lending practices, kept high levels of foreign exchange reserves, bought no toxic mortgages, and did not allow banks to engage in excessive risk through financial derivatives so they get involved and suffer as a consequence. Any global solution – short-term measures to stabilize the current situation and long-term measures to make another less likely reappearance – must pay due attention to the effects on these countries. Without doing so, global economic stability cannot be restored, and economic growth as well as global poverty reduction will be threatened.*

Keywords: global context, economic crisis, Gresham's law, deviation, recession.

JEL Classification: G01, H11.

Introduction

East Asian countries came out of their crisis more than a decade ago, relatively quickly, because they could head to export markets, so their outbreak was the export itself. Last year, the only source of economic power in the US was exports. A global crisis requires a global response, but so far our responses are national and unional (EU case). Each country has focused on its own compromises, the incentive it derives from spending on costs in increasing national indebtedness, for example. The benefits of other countries from rising costs are externalities, which they will not take into account, unless there is coordinated action. Worse, each country will be tempted to maximize its multiplier demanding that its neighbor policies endorse or empower its internal stimulus package. Although there has been a relief when additional language has been introduced with regard to the suspension of this provision, to the extent that it has violated international agreements, this has been strangely made by providing to a certain extent, plurilateral agreements public procurement with other advanced industrial countries but not with most developing countries. In short, there will be discrimination against poor developing countries that need the help of developed countries and more.

If each country focuses solely on its own interests, some countries will be tempted to be free pilots. The size of the global stimulus will be lower than necessary and the overall impact will be lower, each trying to find those expenditures that have the most internal multipliers, regardless of global multipliers. There is an enormous difference between domestic and global multipliers and an effective global response must focus on global multipliers.

Global context

America has a special obligation to behave responsibly. This crisis has a clear “Made in the USA” label. Toxic mortgages were created and then exported – about half of them to countries like Iceland. Once again, we have benefited from globalization: if it were not exported so much, the US would have had a deeper crisis. Banks would have had even more serious problems. The deregulation philosophy was exported, which meant that many elsewhere did not implement guarantees that would have prevented them from buying these toxic products.

Governments have intervened in the markets in an almost unprecedented way – and even if some governments are calling for greater transparency, we have to recognize that much of what has been done has been extremely unobtrusive. With the expense of this scale and the lack of transparency of this scope, enormous possibilities of corruption and inappropriate redistribution are opening up. I was moving on an endless territory.

The distortions created in the market economy will have a long duration. There can be no level playing field, with governments in some developed countries offering their businesses billions of dollars worth of subsidies that poor countries cannot offer. Even symmetrical policies can have asymmetric effects: a government guarantee for a US bank deposit has more credibility than one in a poor developing country.

Problems are even worse in financial markets, as firms in some developed countries receive hundreds of billions of dollars of assistance, well above the GDP of poorer countries. Even knowing that failure can be met with a rescue plan changes availability and the ability to take risks.

The global economic landscape has undoubtedly changed. We cannot return to the world before September 15, 2008. The question is: what kind of world will be over years and years? In the past, the global financial system has often been at the disadvantage of developing countries. Banks in developed countries, for example, have been encouraged to lend short-term loans to developing countries; while it provided greater liquidity to the premium, led to greater instability in the latter case. For years, the liberalization of the financial market and the capital market could have given additional funds to developing countries. Procyclical monetary and fiscal policies have often been adopted in developing countries, while developed countries have followed counter-cyclical policies.

These asymmetries mean that there is a higher risk in developing countries, forcing them to pay a higher cost of capital. In combination with last resort guarantees and rescues, these asymmetries are also partly the abnormal situation in which money flows from developing countries back to the US, where global problems arose.

It is understandable that each country focuses primarily on its own citizens and on its own economy, but it would be a mistake not to recognize the consequences of the actions of developed countries. At the very least, we may need compensation payments to compensate for the damages that we have countries like the US have done it to others. It is not the time to reduce foreign assistance; this is the time to grow it.

The rest of the world will watch closely what the US is doing during Donald Trump 's first term. The way the US responds will have much to do not only as fast and robust as the world gets out of this crisis but also on the nature of the global economy in the post-crisis world. Will there be closer economic integration? Or will it be a retreat from globalization?

A diagnostic approach to recession causes

The neoclassical business cycle model suggests diagnostic procedures to assess the role of productivity and other possible sources and mechanisms that drive the current recession. These procedures diagnose potential sources of economic fluctuations by building a neoclassical business cycle model, feeding data from cyclical episodes, and then measuring deviations in equations that characterize model balance in the absence of shocks. In this section, I describe how this procedure works and summarize the results.

I start with a neoclassical business cycle model using model parameters that are standard for this approach. The production function is the Cobb-Douglas production, with one-third of capital factor income and two thirds of labor for income. Family preferences for consumption and recreation are logarithmic. A leisure time parameter generates the feature that steady-state hours are equal to about one-third of the time spent in the household.

Reducing domestic work in the future generates a real interest rate of 4%. Capital is depreciated at an annual rate of 7% and exogenous technological growth generates a steady growth rate of production, consumption and investment of 2%. These parameters are selected or calibrated so that the model matches the long-term path of the US economy.

A combination of maximization means that the model of the neoclassical business cycle requires four theoretical standard relationships between production, labor, consumption and investment: first, the production function, which requires a relationship between inputs and outputs; secondly, a decision to allocate the household time between time spent on the market and leisure time, which is equivalent to the marginal rate of substitution between consumption and recreation with the salary received by the household, which in the basic version of this model is equal to the marginal product of labor; third, a consumption/investment allocation decision between consumption and investment, where the current consumer price in terms of consumer consumption tomorrow is the real saving rate or the real interest rate. Therefore, this decision equates to the marginal intertemporal rate of substitution between current consumption and consumption in the future for returning to the investment in physical capital, which in the basic version of the model is equal to the marginal product of the net depreciation capital. Fourthly, a resource constraint shows the allocation of expenditure between the final requirements of consumers, firms and government and net exports.

The analysis of this component is based on quarterly data after the Second World War for the United States and six other high-income countries. For each quarter, we analyze actual production, consumption, labor and investment data in these four theoretical model relationships described above. With some algebraic manipulations, these data provide measurements of all the terms in these four theoretical relationships. For example, capital, labor and production data are linked to the production function so that production is equal to its production function value. In the household allocation decision, a numerical value for the marginal rate of substitution between consumption and rest can be derived from the household utility function, while the marginal product of labor can be derived from the production function so that the marginal rate substitution between consumption and leisure are equal to the marginal product of labor. Similarly, in the consumption/investment allocation decision, a numerical value for the marginal intertemporal substitution rate between today's and future consumption derives from the utility function and the marginal product of the capital can be derived from the production function so that the rate marginal intertemporal substitution is equal to return on investment in physical capital.

However, when the numerical values in the quarterly economic data are introduced into the model in this way, the four theoretical relationships will not be met. Instead, there will be errors or deviations between the components of these equality. When looking at the relationship of the production function, for example, there will be a deviation between the output generated by the production function and the actual production of the economy. This deviation, which measures the difference between real output and output component that can be calculated by measuring labor and capital inflows, forms the basis of the Solow production function (1957).

When analyzing the decision to allocate household time between work and leisure, there will be a deviation between the numerical value derived for the marginal substitution rate and the derived value for the marginal product of labor. Note that this deviation in the household time allocation equation is equivalent to a labor income tax, since this labor deviation is a slope between the marginal household substitution rate and the marginal labor product, just as a labor income tax determines a slope between the marginal substitution rate and the marginal product.

In addition, when considering the consumption/investment allocation decision between consumption and economy, there will be a deviation between the numerical value derived for the marginal intertemporal substitution rate and the derived value for the marginal product of the capital. We note that this deviation in the household consumption/investment equation is equivalent to a capital income tax, as this deviation generates a slope between the marginal intertemporal substitution rate for households and the marginal product of capital, just like a capital income the tax drives a slope between these two measures.

Deviations that appear in the first three theoretical relationships provide a diagnostic tool to look at the underlying causes of the recession. We refer to these as the productivity deviation (the deviation that occurs in the numerical estimates of each part of the production function), the deviation of the labor force (the deviation that occurs in the numerical estimates of each part of the household allocation decision), and the deviation of capital (the deviation that occurs in the numerical estimates of each part of the consumption/investment allocation decision between consumption and investment).

The tax interpretations of labor and capital deviations are useful in identifying sources of recession. More specifically, it can be shown that hours worked during the 2007-2009 recession are far too low compared to the marginal product of labor. Thus, the key to understanding this recession is to find a factor that works as a high increase in labor income tax, which reduces labor depreciation relative to the observed marginal product of labor.

Table 1 provides information on these three deviations, which can be used to compare the US experience during the 2007-2009 recession with the average of other post-World recession recessions, and to compare the US experience in the recession 2007-2009 to parallel recessions in other High Income Countries: Canada, France, Germany, Italy, Japan and the United Kingdom. Each deviation is built by first linking the production function, the work decision and the consumption/investment allocation decision to the actual data, then taking the ratio of the left-right sides of each of these three conditions and then subtracting one of each of these reports. We will look for negative deviations in these three conditions to shed some light on the recession 2007-2009. In particular, a negative productivity deviation means that output is below the level generated by labor capital and input and production function; a negative deviation of the workforce means that employment is below the level compatible with the marginal product of work; and a negative capital deviation means that consumption growth is below the level that is in line with the marginal product of capital.

Table 1. *Deviation from recession, 2007-2009*

	Deviation of work	Deviation of capital	Productivity Deviation
A: USA			
Post World War II Recession	-2.4	1.8	-2.2
Dates 2007-2009	-12.9	0.3	-0.1
B: USA vs. other high income countries, 2007-2009			
US	-12.9	0.3	-0.1
Canada	-0.9	0.7	-7.0
France	1.7	1.3	-6.1
Germany	4.8	-1.1	-7.0
Italy	-0.8	0.3	-7.2
Japan	2.9	-0.4	-7.1
UK	-2.3	0.0	-8.2
Average high income countries	0.9	0.1	-7.1

Source: author interpretation according to OECD and World Bank databases, 2018.

The first column in Table 1 refers to "deviation of work". Again, the theoretical relationship in the household allocation decision tells us that the marginal rate of substitution between consumption and leisure will be equal to the marginal product of labor. However, the first row of the table shows that during the recession after World War II the deviation is -2.4%, which means that the marginal product exceeds the marginal substitution rate by an average of 2.4%. This typical US model of marginal product growth relative to the marginal rate of substitution is equivalent to an increase in the income tax rate of the same proportion as the theory otherwise states that the occupation should have been higher.

Labor productivity gaps in the 2007-2009 recession in the United States also stand out against the other six high-income countries. Panel B shows that all of these countries have made much smaller changes in labor deviation, with an average change of only 0.9%. In fact, there are considerable positive deviations in France, Germany and Japan, which means that employment in these countries is actually higher than the level consistent with the marginal product of labor. Until mid-2008, the labor market deviation for the United States was very different from the one in the other six countries, and this gap between the US and foreign labor deviation continued to increase.

The second column in Table 1 is the capital deviation. It results from bringing the quarterly economic data to the consumption/investment allocation decision, the theoretical condition that equates to the marginal intertemporal substitution rate in consumption and the net return on investment. When the actual data is applied to relationships in the base model, a deviation occurs between these values.

The capital deviation shows that the net return on investment was about 1.8% higher in the recession after the Second World War compared to the expansion. This is not just a small deviation, but when it is discussed as a tax on capital income as described above, it is equivalent to a small tax cut rather than an increase in taxes that would affect economic activity. Note that there was almost a capital deviation in the US recession in 2007-2009.

Indeed, a more detailed analysis shows that each recession analyzed here – that is, all post-war recessions during the Second World War and the recession 2007-2009 in all seven economies – has either a large deviation from the labor force, or a high productivity

deviation. But there are no large and negative capital distortions during these recessions, including the 2007-2009 recession in any of these countries.

The third column in Table 1 shows the "productivity deviation", which is based on the production function. In a standard business cycle analysis such as Kydland and Prescott (1982), the deviation between output and inputs from the production function is just the famous Solow residue, which can be seen as a measure of productivity change. However, the Solow residue takes over all the output changes that cannot be accounted for by the measured inputs, and not just the modification of the technology. Thus, productivity deviation will raise all the factors that change the relationship between measured labor and capital and measured output.

All recessions in non-US economies show substantial productivity reductions of 6% and more. In US experience, some post-World War II recessions show a substantial productivity gap, including the large recessions of 1973-1974 and 1981-1982. Total factor productivity declined by more than 2 percent during the recession after World War II, but there is almost no overall factor productivity deviation in the US recession from 2007-2009. Other productivity measures show little change, including real hourly production and real hourly production. As in the case of labor deviation, the productivity deviation in the US is considerably lower than in the other six countries since mid-2008 and continues to remain lower afterwards.

The fact that there is essentially a decline in productivity suggests that the sources and mechanisms of the US recession in 2007-2009 differed substantially from the post-war recessions in the United States and the parallel recessions in 2007-2009 in other high-income economies. In contrast, the US recession in 2007-2009 seems to be almost exclusively linked to a factor that significantly affects the labor market by changing the relationship between the marginal substitution rate and the marginal labor product.

In order to further understand the relative importance of labor deviation for the 2007-2009 recession, we are simulating what would happen in the US economy if this deviation was the only one that took place, as in Mulligan (2010b). We have found that labor deviation can practically represent the entire US recession in 2007-2009, with simulated output, employment and investment shifts, which roughly fit with what has happened. Otherwise, in the absence of this labor force gap, the labor force contribution during this recession was about 10% below the level that should have prevailed, given the marginal product of labor. However, in all other post-war recessions, labor deviations are large enough to account for one-fifth of the full decline in real output and about half of the drop in workforce.

These findings suggest that understanding the US recession in 2007-2009 requires a labor market theory where employment is well below its normal level. While the US recession in 2007-2009 is unique compared to all other post-World War II recessions, it is qualitatively very similar to the Great Depression. During the 1930s, the number of hours worked per capita and production remained well below the normal levels, indicating a very high labor force deviation. Like the recession from 2007-2009, the 1930s deviation

reflected a marginal labor product that substantially exceeded the marginal rate of substitution between consumption and leisure. Specifically, the average labor force gap between 1930-1939, calculated in the same way as in the post-war recession, is about -26%, about twice as high as the 12-year labor force, 9% in the third quarter of 2009.

Lessons of economics

We continue to discuss a part of the lessons from the economic crisis of 2007. Great Depression has transformed the current economy. Even when the economy plunged into depression, most of the economic profession argued that nothing should be done, because government intervention would only make things worse. As the depression disappeared in distant memory, the economic profession lost sight of these lessons. The dogmas and doctrines that claimed that the markets were performing well and that they had self-corrected once again became predominant. This time, theories were more sophisticated, but the underlying assumptions were equally irrelevant. These ideas helped shape the intellectual media that gave rise to flawed policies that in turn gave rise to the crisis and, to some extent, they are shaping policies today as we try to respond to the crisis.

Perfect market advocates in all their versions say that syncope or crises are rare events – though they are happening with increasing frequency, changing rules to reflect beliefs in perfect markets. We could argue that economists, like doctors, have much to learn from pathology: we see more clearly in these unusual events how the economy really works.

Following the Great Depression, a special doctrine, called neo-classical synthesis, was accepted. He argued that once the markets were restored to full-time employment, neo-classical principles would apply – the economy would be efficient. It should be clear: it was not a theorem but rather a belief. The idea has always been suspicious – why should market failures only occur in high doses? Rather, the recession can be seen as the tip of the iceberg; below these are many smaller market failures, leading to aggregation to enormous inefficiencies – illustrated by a multitude of tax paradoxes.

We must also remember that, while large failures were rare in the US on a global scale, failures were, in fact, frequent. This is just the biggest and the most recent financial crisis – and rescue. Beyond the 2007 American disaster, there are situations in other countries (Mexico, Brazil, Korea, Indonesia, Argentina, Thailand, Russia, etc.) that were really in need of saving Western creditors and the result of inappropriate credit assessment. The main difference between these crises and the current one is that there were consequences in the "periphery" – and the rescue costs were largely borne out of the periphery.

The irony, of course, was that other components of modern economic theory, including the theory of imperfect information, simultaneously explained why markets often do not work so well. Greenwald and Stiglitz, for example, showed that the invisible reason of Adam Smith's hand was often invisible because it was not really there: market equilibrium was not constrained Pareto efficiently whenever there were imperfections and asymmetries of information and markets imperfect risk. At the same time, the countries of East Asia, which

had the greatest success in terms of economic growth and poverty reduction, pursued policies with the active involvement of the government. It would have been thought that this powerful combination of theory and evidence could have mitigated the enthusiasm for free and sub-regulated markets. But obviously he did not. We understand the unusual enthusiasm of special interests that have found the arguments for increasing deregulation profits.

There were also arguments that risk is the price we have to pay for innovation, and the financial markets of North America have been tremendously innovative. However, financial markets have not created risk products that would have allowed individuals to manage the risks they faced – simple ownership of the dwelling. Rather, innovations consisted mainly of fiscal, regulatory and accounting arbitrage. Their financial alchemy – the conversion of F rated mortgages into financial products that could be held by fiduciaries – had a private (but not necessarily social) remuneration. Such repackaging, which we know from Modigliani Miller's theorem, should have a limited maximum value. Meanwhile, many in the financial sector have in fact withstood the innovations that would have made markets work better – innovations such as GDP and inflation-linked bonds, Danish mortgage bonds and better bids of treasury bonds.

Models that have predominated in macroeconomics, which assume representative agents with rational expectations, are particularly disturbing, as we are now discussing some examples of irrationality in the economy, namely:

1. Markets believed real estate prices could continue to grow – a belief needed for toxic mortgages that should not explode – and yet the real incomes of most of the population in developed countries have fallen.
2. Markets seemed to systematically ignore the possibility of strongly correlated house price movements, even if these prices were affected by national interest rates and the general business cycle, and markets seemed to ignore the possibility of contagion related to the interconnectivity of the economy, and expectations.
3. “Once in a lifetime” are the events that actually took place every 10 years. It would have had to use simple econometric distributions rather than log-normal distributions. There have been several cases of failures in the use of these models – obviously, the financial markets have not learned.
4. Markets have offered 100% or more non-recurring mortgages. He should have acknowledged that (at least with rational buyers) these were an option with positive value: they were giving money. It is not the standard model of banks to give money – at least to those with low incomes. Both investors and regulators should have admitted that something was wrong.
5. Supporters of the new products have argued that they are transforming the economy – only such fundamental transformation could justify the high salaries they have received. However, in modeling, they used the previous data, which implicitly supposed that nothing has changed. However, something has changed – new information asymmetries have been created, which investors have not fully appreciated and did not consider their modeling. Mortgage loans with much higher default rates were granted.

6. The system was full of perverse incentives – from rating agencies, from mortgage-makers, from securitization and from banks. There have been conflicts of interest, incentives to provide distorted information and incentives to engage in short-term and excessively risky behavior. But in a way, investors – the other side of each of these transactions – have irrationally assumed that these perverse incentives have had no adverse effects.
7. Banks were allowed to become too big to fail but did not take into account the effects they would have on their behavior. Derivatives have played an important role in amplifying the crisis. Large banks have failed to withdraw derivative positions. Obviously, they have failed to recognize the importance of counterparty risk, even if they bet on counterparties' failures – another example of intellectual incoherence.

Cohesion policy

Cohesion policy is the EU's main investment policy. This policy is addressed to all regions and cities in the European Union. It complements other EU policies such as education, employment, energy, the environment, the single market, research and innovation. In particular, the Cohesion Policy provides the framework and the investment strategy needed to meet the agreed growth targets.

Cohesion policy is a catalyst for additional funding from public and private funds, as this requires Member States to co-finance from the national budget and also confers investor confidence. Cohesion policy objectives are achieved through three main funds:

1. The European Regional Development Fund (ERDF) aims to strengthen economic and social cohesion at regional level by investing in growth-enhancing sectors in order to generate jobs. At the same time, the ERDF finances cross-border cooperation projects.
2. The European Social Fund (ESF): invests in people, focusing on improving opportunities for employment and education. It also aims to support disadvantaged people who face the risk of poverty or social exclusion.
3. The Cohesion Fund: invests in green growth and sustainable development and improves interconnection in Member States with a GDP below 90% of the EU-27 average.

These consist of the European Agricultural Fund for Rural Development (EAFRD) and the European Fund for Fisheries and Maritime Affairs (EMFF), European Structural Funds and European Investment Funds.

By 2020, the EU is pursuing five concrete objectives – employment, innovation, education, social inclusion and climate/energy. Each Member State has adopted its own national targets in these areas.

In 2014-2020, € 351.8 billion – about one third of the total EU budget – was allocated to cohesion policy to meet these objectives and meet the diverse needs of all EU regions. The most much of the funds available to cohesion policy are geared towards less developed European countries and regions to support them in order to recover and reduce further economic, social and territorial disparities across the EU.

The level of investment reflects the development needs of the Member States. Regions are classified according to their gross domestic product (GDP) in more developed, transition or less developed regions. According to this classification, funds provide between 50% and 85% of the total funding of a project. The remaining funding needs may come from public (national or regional) sources or private sources. The overall policy objective is to boost the competitiveness of Europe's regions and cities by encouraging growth and job creation.

Absorption of European funds on operational programs

Acquiring the European Union (EU) membership has brought Romania a number of benefits and opportunities for development. The most important of these is the structural funds available to the Member States to help create a thriving, stable and homogeneous economic system in the Member States of the European Union and their regions.

Structural Funds are the most important economic policy measure adopted by the European Commission (EC) to influence (positively) the economic development of the states that are part of the large European 'family'. The primary goal pursued by the EU by providing these funds is to harmonize levels of economic development between states in order to stop the economic downturn of Europe and reduce existing gaps between developed and less developed regions.

The way these funds are managed is the responsibility of the Member States, which have the task both of determining where these resources will be allocated (based on identified needs) and of attracting and actually spending that money.

Union-level communities have structural funds covering a wide range of areas where interventions can be made to develop and modernize them. These projects focus on financing infrastructure projects, the professional redeployment of the unemployed, and the technological improvement of agricultural machinery.

The Structural Funds are “financial instruments through which the EU acts to eliminate economic and social disparities between regions in order to achieve economic and social cohesion” (Balogh and Negrea, 2009). For the period 2007-2013, there are three financial instruments, called Structural Funds: the European Regional Development Fund (ERDF or ERDF), the European Social Fund (ESF) and the Cohesion Fund (FC).

For Romania, Structural Funds are a basic tool in terms of economic recovery, continuation of change and acceleration of the reform process, to reach the level of other European economies. With EU accession, national economic activity is steadily moving towards the outside. At present, the economy of a state is of interest to both the state and the other Member States, which chose to join the big European economies. The economic decline of a country also affects other European contributors, and once an economic problem arises in a state, it becomes a common problem for the whole of the Union (for example, Greece's economic problems).

Absorption capacity is “a variable that manifests itself differently in the Member States”, which determines the need to identify individual solutions, tailored to and tailored to the

specific needs of each country in terms of eliminating obstacles and difficulties absorption of European money. The absorption capacity is of two types, namely – absorption capacity on the part of the offer (of funds) – consists in the creation of the institutional system by a state, necessary to manage the European funds; and – absorption capacity on demand (funds) – refers to the ability of beneficiaries to absorb the funds that are addressed to them. Absorption capacity on the supply side is influenced by three factors (Transparency International Romania, 2011): Macroeconomic absorption capacity – presented and explained in line with GDP; in this respect, Council Regulation no. No 1260/1999 shows that the annual amount allocated to a Member State from the Structural and Cohesion Funds should not exceed 4% of GDP; at the same time, the macroeconomic absorption capacity also implies the need to increase budgetary expenditures as a result of accession but also the absorption capacity of the additional expenditures to be made – the financial absorption capacity – lies in the ability of a state to provide co-financing for programs and projects benefit from EU support, the capacity to plan and guarantee these contributions from the national budget and the capacity to collect contributions from partners involved in different actions, projects or programs, and – administrative capacity – consists of the capability and competence of central and local public administration to prepare projects and programs in a timely manner, to finance and monitor them during implementation, to comply with administrative and reporting requirements, to avoid certain irregularities, and to ensure effective coordination with partners involved (Transparency International Romania, 2011).

Conclusion

Even today, irrational and mistaken thinking continues. We are inclined to encourage mergers between large banks that make them even bigger. We are talking about a close regulation of systemically significant institutions, failing to mention that there may be systemic effects of correlated behavior on the part of individual institutions, even if each of them is not systemically significant.

Models of representative agents ignore the rich diversity of the global economy – a diversity that is at the heart of some of the problems they face. A single- person economy does not have creditors and debtors, there are no asymmetric information problems (unless they are subject to schizophrenia), no banks are needed, no creditworthiness – in short, everything is important. Remarkably, much of the economist profession has focused on models that have little to say about the crisis we are facing.

There were other directions of thought. Minsky has returned to fashion at the academic level. Greenwald and Stiglitz (2003) have developed formal deflation models and a monetary policy theory focusing on the role of credit. With Gallegati and other co-authors (2008), we explored the credit interconnections that have played such an important role in this crisis. These models explore the possibility of bankruptcy cascades. This explains how global financial integration can serve not only to share risk but also to facilitate contagion because a failure in a part of the economic system – in this case, the US – is spreading

throughout the world. Neo-classical models have argued that globalization has inevitably led to greater stability. Just before this crisis, there is more and more contradictory evidence.

There are other arguments against inflation targeting – especially in developing countries. Those countries that have tried to mitigate this imported inflation distorted their economy; nothing could affect the prices of oil or food. In some cases, only 25% of prices were directly affected by high interest rates – in order to reduce the average inflation, a huge price was imposed for those sectors at that time. However, high interest rates have led to higher rates of exchange, which have now fallen, subjecting the real sector to huge volatility. An attempt to stabilize inflation has served to destabilize the global economy.

The unfavorable financial markets are not working and current regulations and regulatory institutions have failed – partly because it is unlikely to get effective regulation when regulatory authorities do not believe in regulation. Markets do not self-regulate, at least within the relevant timeframe.

Generally, Darwinian natural selection may not work. Rather, like Gresham's law – claiming bad money is conducting good business-wrong firms forced firms more conservative to follow similar, reckless investment strategies. More prudent businesses could have done better in the long run but could not have survived to take advantage of the long term.

Our financial system has failed in its core missions – capital allocation and risk management – with disastrous economic and social consequences, not only on the mismanaged capital in the past, but also on the enormous disparity between the potential and the current GDP in the years to come, in the amount of trillions of dollars. Unfortunately, the wrong economic theories have helped and urged both the public sector and the private sector to pursue policies that almost inevitably led to the current calamities.

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Is real depreciation or more government deficit expansionary? The case of Macedonia

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Abstract. *The paper finds that real depreciation of the denar reduces real GDP and that more government deficit spending as a percent of GDP raises real GDP. In addition, a lower world real interest rate, a higher lagged world real income, a lower real oil price or a lower expected inflation would increase real GDP. It suggests that the negative impact of real depreciation such as higher import costs and domestic inflation and less international capital inflows dominates the positive impact of real depreciation such as more exports.*

Keywords: currency depreciation; government deficits; world interest rates; world income; oil prices; IS-MP-AS model.

JEL Classification: F41, E62.

1. Introduction

Macedonia's economy exhibits both progress and concerns. According to the International Monetary Fund (2017), Macedonia showed some encouraging economic statistics as evidenced by an inflation rate of -0.239%, a government-debt-GDP ratio of 38.980%, and a government borrowing-to-GDP ratio of -2.641% in 2016. The annual growth rate of real GDP of 2.406% in 2016 was slightly lower than those in 2014 and 2015. The unemployment rate of 23.55% in 2016 was much higher than most other emerging economies, though it had declined from a high of 37.25% in 2005. The current account continued to show improvements as the deficit declined from a high of 12.802% of GDP in 2008 to 3.076% of GDP in 2016. The government spending as a percent of GDP declined from a high of 38.192% in 2002 to 30.459% in 2016. The government revenue as a percent of GDP also declined from a high of 35.928% in 2003 to 27.818% in 2016. The value of the denar versus the US dollar declined as much as 43.11% from 39.2 denar per US dollar in 2008.Q2 to 56.1 denar per US dollar in 2017.Q2.

This paper attempts to examine whether exchange rate movements or government deficits would affect aggregate output in Macedonia based on an extended IS-MP-AS model (Romer, 2000). Several previous studies employ the traditional IS-LM model to examine the effect of real depreciation on aggregate output and include the money supply in the estimated equation (Bahmani-Oskooee, 1998; Bahmani-Oskooee, Chomsisengphet and Kandil, 2002; Kim and Ying, 2007; Ratha, 2010; An, Kim and Ren, 2014; Kim, An and Kim, 2015). Because the National Bank of the Republic of Macedonia gave up the targeting of the money supply in 1995, the IS-MP-AS model incorporating the monetary policy function may be more appropriate.

2. Literature survey

Several recent studies have examined macroeconomic policy, the exchange rate, and its effect on aggregate output and other relevant variables in Macedonia and related countries.

Besimi (2004) reviews exchange rate policy of the National Bank of the Republic of Macedonia. He indicates that a flexible exchange rate regime should be pursued with great caution with relatively narrow bands due to a high degree of currency substitution (euroization), strong exchange rate pass-through and the Balassa-Samuelson effect.

De Grauwe and Schnabl (2008) show that more exchange rate stability reduced inflation and increased economic growth in the South Central Eastern and Central European countries during 1994-2004. Hence, membership in the EMU would increase exchange rate stability, reduce inflation and increase growth.

Jovanovic (2009) estimates the impacts of exchange rate movements on exports and imports for Macedonia. For exports, the negative coefficient of the real effective exchange rate is insignificant whereas the coefficients of foreign demand, metal prices and industrial

production are significant. For imports, the coefficients of the real effective exchange rate, real GDP, private consumption, exports and investment spending are significant. Because devaluation of the denar would not improve the current account much and because the cost of devaluation is relatively high, he does not recommend the devaluation of the denar.

Fetai and Zeqiri (2010) find that the money supply is not an effective instrument in the monetary policy transmission mechanism because the link between the money supply and real GDP is weak. They maintain that a stable exchange rate pegged to the euro would work better for a small open economy like Macedonia because denar depreciation causes manufacturing and retail prices to rise sharply and does not affect real GDP significantly. Hence, exchange rate stability leads to macroeconomic stability.

Koczan (2015) reviews fiscal deficit and public debt in six Western Balkan countries including Macedonia after 15 years of economic transition. He indicates that after the global financial crisis, these countries received less capital inflows and experienced lower economic growth. During and after the global financial crisis, the Macedonian government cut spending in 2009 in order to meet revenue shortfalls and froze wages in 2010-2011. Macedonia also partially changed the original universal pension system into the selective contributive system. The second tier currently substitutes part of the first-tier social security pension. The third-tier voluntary private pension plays a minor role.

According to Petrevski, Bogoev and Tevdovski (2016), a higher money market rate causes the inflation rate to decline. A positive fiscal shock results in more output, and fiscal policy is countercyclical, suggesting that more budget deficit will be used to stimulate a sluggish economy. Fiscal and monetary policies are strategic substitutes, suggesting that fiscal tightening will be matched with monetary loosening, and vice versa.

Selimi (2017) investigates the effect of exchange rate changes and other related variables on real GDP for Macedonia. Other variables include M2, degree of openness, CPI, the real interest rate, the current account balance and a dummy variable for the recent global financial crisis. The positive coefficients of the real exchange rate, M2 and the degree of openness are statistically significant. The negative coefficient of the dummy variable is statistically significant. The coefficients of the CPI, the real interest rate and the current account balance are statistically insignificant. The positive significant coefficient of the real exchange rate suggests that real depreciation would increase real GDP.

3. The model

Suppose that in the IS function, aggregate spending is determined by real income, government revenue, government spending, the real lending rate, the real exchange rate and the world income, that in the monetary policy function, the key interest rate is influenced by the inflation gap, the output gap, the world real interest rate and the real exchange rate, that in the aggregate supply function, the inflation rate is affected by the expected inflation rate, the output gap, the real exchange rate and the real oil price, and that

the real lending rate is a function of the real key interest rate. We can express an extended IS-MP-AS model as:

$$Y = f(Y, G, T, L, E, Y^w) \quad (1)$$

$$R = g(\pi - \bar{\pi}, Y - \bar{Y}, R^w, E) \quad (2)$$

$$\pi = h(\pi^e, Y - \bar{Y}, E, O) \quad (3)$$

$$L = w(R) \quad (4)$$

where:
Y = real GDP in Macedonia;
G = government spending;
T = government tax revenue;
L = the real lending rate;
E = the real exchange rate (an increase means real depreciation of the denar);
Y^w = world real income;
R = the key interest rate of the central bank;
π = the inflation rate;
$\bar{\pi}$ = the inflation target;
$\bar{Y}$ = potential real GDP;
R^w = the world real interest rate;
π^e = the expected inflation rate, and
O = the real oil price.

Assuming that the inflation target and potential real GDP are constants in the short run, we can solve for the three endogenous variables and express equilibrium real GDP as:

$$Y^* = x(E, G - T, R^w, Y^w, O, \pi^e) \quad (5)$$

An analysis of the sample data indicates that real GDP exhibited seasonal patterns. Therefore, three binary variables, Q2, Q3 and Q4, are added to the estimated equation:

$$Y^* = x(E, G - T, R^w, Y^w, O, \pi^e, Q2, Q3, Q4) \quad (6)$$

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The sign beneath each independent variable represents the impact of a change in the independent variable on equilibrium real GDP.

Real depreciation tends to increase exports, reduce imports, reduce international capital inflows, and increase import costs and domestic inflation (Fetai, 2013; Coricelli et al., 2004). Hence, aggregate demand would shift to the right due to increased net exports and shift to the left due to decreased international capital inflows, and aggregate supply would shift to the left due to rising costs. Previous findings are inconclusive (De Grauwe and Schnabl, 2008; Jovanovic, 2009; Fetai and Zeqiri, 2010; Selimi, 2017).

More government deficit spending tends to shift aggregate demand to the right. On the other hand, government borrowing by selling government bonds tends to push the real interest rate higher, reduce private spending, and shift aggregate demand to the left. Thus,

the net effect is uncertain. Barro (1974, 1989) suggests that the deficit- or debt-financed government spending has a neutral effect in the long run. Cebula (1997, 2014a, 2014b) shows that more government deficits tend to raise the real interest rate and crowd out private spending.

The National Bank of the Republic of Macedonia is expected to respond to a change in the world real interest rate. Hence, an increase in the world real interest rate causes the real lending rate in Macedonia to rise, which reduce private spending and aggregate demand. A higher real oil price or expected inflation rate is likely to shift aggregate supply to the left and reduce real GDP.

4. Empirical results

The data were obtained from IMF's International Financial Statistics and the National Bank of the Republic of Macedonia. Real GDP is measured in million denar. The real exchange rate is measured as the units of the denar per euro times the relative prices in the euro area and Macedonia. Hence, an increase means real depreciation of the denar, and vice versa. The choice of the real denar/euro exchange rate is because it has a higher correlation coefficient than the real denar/USD exchange rate or the real effective exchange rate. The government deficit is expressed as a percent of GDP. The world real interest rate is represented by the lending rate in the euro area minus the inflation rate in the euro area. World real income is represented by the real GDP in Germany. A lagged real GDP in Germany is used due to an information lag. A simple lagged inflation rate is chosen to represent the expected inflation rate (Romer, 2000). Except for the world real interest rate and the expected inflation rate with negative values before or after log transformation, other variables are measured on the log scale. The sample runs from 2005.Q1 to 2017.Q2 and has a total of 50 observations. The data for the government deficit before 2005.Q1 are not available.

To test whether these time series variables have a long-term stable relationship, the ADF test on the regression residual is performed. The value of the test statistic is estimated to be -4.999, which is greater than the critical value of -4.000 in absolute values at the 1% level. Therefore, these variables are cointegrated.

Figure 1 shows the scatter diagram between real GDP and the real exchange rate. They seemed to have a negative relationship, suggesting that real depreciation reduced real GDP whereas real appreciation raised real GDP. Figure 2 shows that relationship between real GDP and the deficit-to-GDP ratio. They appeared to have a positive relationship.

Table 1 reports empirical results. Approximately 92.86% of the change in real GDP can be explained by the nine independent variables. All the coefficients are significant at the 1% level. Real GDP is positively associated with the deficit-to-GDP ratio and the lagged real GDP in Germany and three seasonal binary variables and negatively influenced by the real exchange rate, the real lending rate in the euro area, the real oil price and the expected

inflation rate. Real GDP is very sensitive to a change in the real exchange rate as a 1% real depreciation of the denar versus the euro would reduce real GDP by 1.6979%. The negative significant coefficient of the real exchange rate suggests that the negative effect of real depreciation such as higher import costs, higher domestic inflation and less international capital inflows would dominate the positive effect such as more exports and less imports. The lagged real GDP in Germany also has a powerful impact. A 1% rise in Germany's lagged real GDP would lead to a 1.0061% increase in real GDP.

Figure 1. *Scatter diagram between real GDP and the real exchange rate*

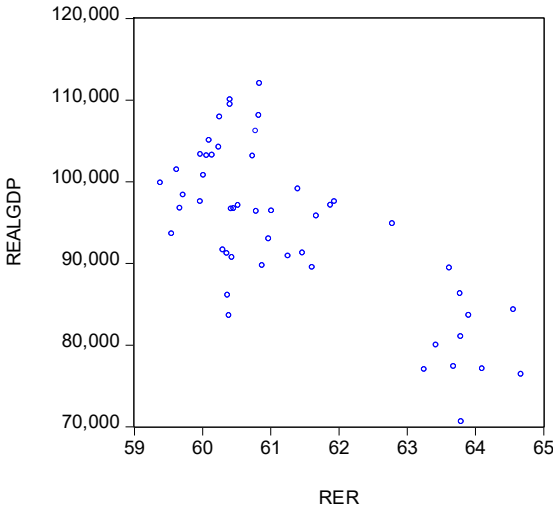
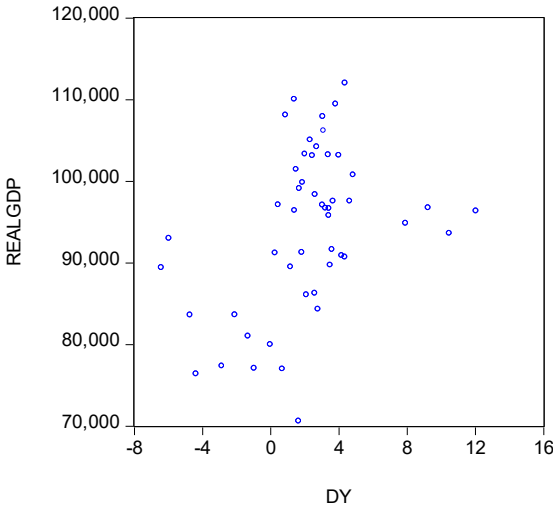


Figure 2. *Scatter diagram between real GDP (REAGDP) and the government deficit-to-GDP ratio (DY)*



Several other versions are considered. If the real exchange rate is measured as units of the denar per US dollar times the relative prices in the US and Macedonia, its coefficient is estimated to be -0.2427, indicating that a 1% real depreciation of the denar versus the US

dollar would reduce real GDP by 0.2427%. Hence, real GDP is less sensitive to the real exchange rate measured in the US dollar. When the real exchange rate is replaced with the real effective exchange rate, its coefficient is estimated to be 0.8931 and is significant at the 1% level, suggesting that a 1% real appreciation of the denar would raise real GDP by 0.8931%. The result is consistent with the finding reported in Table 1. The value of R-squared is estimated to be 0.8738. The mean absolute percent error is 2.7102%. Other results are similar. In comparison, the use of the real effective exchange rate yields a smaller explanatory power and a larger forecast error.

Table 1. *Estimated regression of log(real GDP) in Macedonia*

Variable	Coefficient	z-Statistic	Probability
C	5.268041	154.0578	0.0000
Log(Real exchange rate)	-1.697889	-164.7404	0.0000
Deficit as a percent of GDP	0.002820	3.981556	0.0001
Real lending rate in the euro area	-0.009669	-5.529432	0.0000
Log(Lagged real GDP in Germany)	1.006062	928.8510	0.0000
Log(Real oil price)	-0.041701	-226.2874	0.0000
Expected inflation rate	-0.007476	-8.927631	0.0000
Q2	0.068682	13.20427	0.0000
Q3	0.085779	12.02793	0.0000
Q4	0.092001	15.64089	0.0000
R-squared	0.928564		
Adjusted R-squared	0.912491		
Akaike info criterion	-4.162385		
Schwarz criterion	-3.665259		
Sample period	2005.Q1-2017.Q2		
Observations	50		
MAPE	2.087616%		
Methodology	EGARCH		

5. Conclusions

This paper has examined the effects of exchange rate movements, more government deficits and other relevant variables on real GDP in Macedonia. Real depreciation reduces real GDP, and more government deficit as a percent of GDP raises real GDP. In addition, a lower real lending rate in the euro area, a higher lagged real GDP in Germany, a lower real oil price or a lower expected inflation rate would help increase real GDP.

There are several policy implications. The conventional approach of real depreciation of a currency in order to stimulate exports and raise aggregate output may not apply to Macedonia because real depreciation produces both positive and negative effects including more exports, higher import costs, higher domestic inflation, and less international capital inflows. The net impact is country specific. In the case of Macedonia, real depreciation is contractionary whereas real appreciation is expansionary. This finding is in line with monetary policy of the National Bank of the Republic of Macedonia that the benefit of exchange rate stability outweighs the costs of denar depreciation such as high inflation and international capital outflows.

Expansionary fiscal policy in the form of more deficit spending as a percent of GDP appears to be expansionary. However, there may be threshold or turning point beyond which further increase in government deficits as a percent of GDP may reduce real GDP. Hence, fiscal discipline may be needed.

The National Bank of the Republic of Macedonia responds to a change in the real interest rate in the euro area. Fortunately, the ECB has reduced its policy interest rate since November 2011. Thus, the National Bank of the Republic of Macedonia would not have too much pressure to raise its domestic real interest rate and hurt private spending. As the impact of the lagged real GDP in Germany is relatively large, it may be more desirable for Macedonia to expedite the process of becoming an EU member so that its trade with Germany and other EU countries would increase due to decreases in tariffs and other regulations. As the crude oil price is on the rise, its negative impacts on aggregate supply and real GDP need to be monitored.

There are areas for future research. Many countries are concerned about the impacts of exchange rate movements and expansionary fiscal policy on aggregate output. The model may be applied to other countries in the South East European region and beyond in order to see if similar results would be obtained.

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Models and theories in a frictions and wage rigidities labor market

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Abstract. *Unlike the classic market vision, where demand and supply meet immediately, at no cost, and prices are determined in such a way that demand equals supply, in the real world frictions occur in the searching process, the price offers of one of the parties are considered too high, be it the goods or services market, the real estate market or the labor market, so there are imbalances that vary over time, excess supply or excess demand.*

In this paper we aim to present the main models and theories in a labor market characterized by friction and wage rigidity, starting from contributions in the field of "frictions on search-based markets" by Peter A. Diamond, as well as from works belonging to economists Dale T. Mortensen and Christopher A. Pissarides, who developed and adapted the Diamond model to make it applicable to the labor market, thus resulting in one of the most used models for the analysis of unemployment and wage formation.

Keywords: labor market, wage rigidities.

JEL Classification: J01, J08, J31.

Introduction

Increased competition in the goods and services market, limiting barriers to trade and increased integration of the goods and services market among European economies, a high level of globalization and outsourcing of services, have the effect of creating a more turbulent environment, an environment with high job volatility, with many creations and destructions jobs. When the economic environment becomes turbulent, existing labor market institutions may become dysfunctional and can lead to high unemployment. Wage protection, which is rarely compulsory before firms dismiss their employees, becomes costly, requires high contributions, and will again generate additional costs for businesses.

In the 1990s, the average unemployment rate in Europe remained extremely high, reaching even 10.4% in 1993 (for the EU15), but this was primarily due to the high heterogeneity between the economies of the member countries. In an OECD report from 1994, it is argued that this was the cause of the high level of unemployment, namely "*rigidities of the labor market*". These were the decisive factor behind the high unemployment in Europe, and this new concept began to be accepted among economists (OECD, 1994, pp. 1-55).

Since 2000, unemployment in Europe has been associated with almost constant inflation. This suggests that the current unemployment rate corresponds rather with a high natural rate rather than a deviation from the natural rate. This explains why the European Central Bank focused on inflation. Keeping a constant inflation rate is the equivalent of keeping unemployment around its natural rate; this natural rate can only be reduced by labor market reforms and this is not the responsibility of the Central Bank.

Thus, more and more economists, both adepts of Keynesian and neo-classics theorists, have tried to promote new theories explaining the changes in time of the natural rate, bringing into question "wage rigidities" and "frictions" existing on the labor market.

Defining the concept of "rigidity"

By the term "rigidity" is meant a certain resistance to changes, to amend, to evolutions. Transposed into the economy, the "rigidity" concept can be associated with both economic systems and certain economic variables.

If we are talking about economic systems, rigidity or resilience (as it is called) is generated by the structure of this system and is therefore a structural rigidity, and when we talk about the rigidity of economic variables, we refer to the "discrepancy" between forecasts the dynamics of a certain economic variable and the actual change of that variable. Therefore, the rigidity of a variable occurs when the effective variation of that variable differs from its expected variation.

The most commonly used economic variables that economists take into account when analyzing rigidities in the economy are the prices of goods and services and salaries, so we

can talk about "price rigidity" and "wage rigidity." Both variables, goods and services prices and labor wages can be deflated, process that will results values related to purchasing power.

In the present paper we will address one of the two economic variables, characterized by rigidity, namely the wages of the labor force. "Salary rigidities" means the property of wages to be constant over time, not to change.

The first attempt to explain by theory a change in time of the natural rate belongs to Bruno and Sachs (1985). They argued that an increase in unemployment could be explained by the interaction of shocks with two types of wage rigidities, namely rigidities of the real wage and rigidities of the nominal wage. The difference between the nominal wage and the real wage is due to deflation, so that by deflating the nominal wage with inflation, which actually indicates the purchasing power of the nominal wage, results the concept of real wage.

Therefore, "real wage rigidities" refers to the rate at which real wages are adjusted to changes in the guaranteed real wage, that is, the time at which, at a given unemployment rate, an employee would accept a reduction in the current wage as a result of productivity reductions, and the rigidities of nominal wage refer to the rate at which nominal wage are adjusted to price changes and inflation. Differences between real and nominal rigidities may explain why, despite similar shocks, to a large extent, different countries have experienced different increases in unemployment. A small increase in unemployment may be due to low real rigidities, resulting in a lower increase in the natural rate.

The European labor market is rigid in many ways. The high cost of dismissal, generous unemployment benefits, and strong employee syndication may be the causes of slow adjustments in the labor market. Moreover, the wage negotiation process is seen as a factor that hinders wages from a rapid adjustment, introducing an important level of wage rigidity. Therefore, rigidities and frictions labor market can be crucial to understanding the inertia of the marginal cost of firms and the way in which they set their price.

Theories and models on a labor market characterized by friction and wage rigidity

The "insider – outsider" theory

The "insider-outsider" theory developed by Lindbeck and Snower (1985) is based on the premise that wage negotiation usually takes place between employees or unions and firms, and for this reason unemployed do not participate in wage negotiating process.

Assuming that trade unions only take care of employment prospects of existing employees, they will require salaries to a value that will allow the firm to keep its current employees and not make new hires. But, due to unexpected, unpredictable shocks, employment may sometimes be higher or lower than desired or expected. In other words, employment will follow a "random walk" for a given workforce (existing in the firm), and the same thing will happen with unemployment. Therefore, for a long time there will not be a natural rate

of unemployment to which the economy will recover, unemployment will not return to an earlier particular value, but instead will be influenced by all shocks in the economy (Blanchard, 2005, p. 53).

Theoretically, even if unemployed do not participate in wage negotiation, there are at least two reasons to believe that unemployment will affect or influence income. The first consideration is that, given the possibility for employees themselves to become unemployed at a certain point in time, they will have to deal directly with the labor market situation, for which reason they will pay close attention to how they will set the salary. Second, wages are not unilaterally established by trade unions, but through a bargaining with employers, and the latter may threaten to hire new labor. Thus, the effect that unemployment has on salary can be reduced, but even if unemployed do not participate directly in wage bargaining, there is a high unemployment rate that can cause the economy to return to the natural rate of unemployment.

An important addition to these series of arguments was provided by Richard Layard and Stephen Nickell (1987) who analyzed the effects of high unemployment on human capital, continuing in this respect the argument originally developed by Phelps in 1972. They showed that in European countries, a high unemployment consistently involves a very long period of unemployment, and this long period of high unemployment means that workers lose their skills and their morale decreases, which creates the possibility for unemployed people to become unemployed. Separating the unemployment rate in short-term and long-term unemployment, Layard and Nickell have shown that in the relationship between unemployment and inflation in the Phillips curve, it is actually about short-term rather than long-term unemployment.

Employees protection is probably one of the key factors underpinning long-term unemployment in Europe. The differences in the protection offered to workers seems to be unrelated to the differences in unemployment rates among European countries. High unemployment insurance makes unemployment less painful and may lead to an increase in negotiated wage. Both effects, in turn, involve an increase in the duration of the unemployment balance and consequently an increase in the natural rate.

Institutional changes do not seem to explain the evolution of unemployment rates over time. Although the rise in unemployment was originally due to external shocks rather than to institutions, the differences between today's unemployment and 1960s unemployment can be explained by less “employment-friendly” institutions than 50 years ago (Blanchard, 2005, pp. 1-53).

It has often been demonstrated that the labor market in Europe is rigid in many ways. The high cost of employment, unemployment benefits and strong unionisation of workers are seen as contributing to a high level of unemployment and a slow adjustment of the labor market, therefore a rigid market. Collective wage negotiations are seen as a mechanism that not allow wages to adjust immediately and therefore generates a high level of wage rigidity.

By marginal cost, any change in wages will be felt in persistent inflation. Records from the OECD countries demonstrates a direct relationship between wages and inflation (Christoffel and Linzert, 2006, pp. 1-47).

The endogenous model of job creation and job destruction

The basic model for the balance of unemployment is the endogenous model of job creation and job destruction developed by Mortensen and Pissarides (1994). They propose a model of unemployment that does not take account of wage behavior or evolution, a model in which creating and destructing jobs is an endogenous process, not influenced by external factors. They demonstrated that an incentive aggregate or a shock in the economy directly influence the labor market causes a negative correlation between the creation and destruction jobs while the dissipation shock of economy, that not acting concentrated and direct to the labor market generates a positive correlation between creating and destructing of jobs. The process of job destruction has higher volatility than job creation process. Mortensen and Pissarides have developed an endogenous model of job creation and job destruction that has been embedded in the equilibrium model of unemployment and wage determination. The authors analyzed the implications that the standard equilibrium model of unemployment has on the process of job creation and job destruction and the aggregate behavior of unemployment or job vacancies. It has been analyzed a type of economy where each job is created to produce a single unit of variation from a particular product. Each variation is unique to a job. A key assumption is that the investment is irreversible in the sense that an already created job cannot change its destination, meaning it cannot produce other product than the one for which it was created. Before creating a job, technology is very flexible and the company can choose which product it wants to achieve.

Wide negative shocks lead to job destruction or losses, but the decision to choose when a job is to be destructed belongs to the companies. Job creation depends on the information available to potential employers. In practice, it is considered that both new and existing firms can generate new jobs. Most new jobs created over an economic cycle belong to existing businesses. Existing firms have better information on the profitability of different product ranges within the sector where they operate, and therefore we can assume that these companies will create more productive jobs than existing ones, which is why the authors state that “newly created jobs are the most profitable in the market (Mortensen and Pissarides, 1994, p. 398).

Each firm has a job that can be in one of the following situations: “busy and productive” or “vacant and looking for workers”. Jobs that are not actively producing or not looking for workers are destructed.

Following the literature, the authors say that job creation occurs when a job vacancy meets with a worker and the job becomes productive; just opening a vacancy job cannot say that there is a job creation process, but we can only relate to a vacancy job creation process. In order to be able to talk about a new jobs creating process, it is necessary that those new vacancies created jobs must become productive, namely engaged.

Regarding to job destruction, this happens when a job already engaged leaves the market. Workers may similarly be unemployed and looking for a job or can be employed and productive.

The conclusion reached by the authors regarding to the dynamics of job creation and job destruction is that because of labor productivity changes at random, it was discovered that the anticipation of change occurring cyclic in economy can reduce the cyclicality of job creation and the short-term response to the various economic shocks of job destruction will increase the cyclicality of job destruction.

Studies in the US economy have shown that the flow of job creation and job destruction coexists in all phases of an economic cycle (Blanchard and Diamond, 1990, pp. 85-143).

Shimer (2005) considers that the Mortensen-Pissarides unemployment equilibrium model explains less than 10% of the volatility of vacancies jobs and of US unemployment when fluctuations are influenced by productivity shocks. Shimer argues that the fluctuations in the unemployment rate are primarily determined by changes in the job search rate and by the transition rate from vacancy to engaged more than the job loss rate.

An addition to the Mortensen and Pissarides endogenous model of job creation and job destruction was brought by Nagypal (2004). He studied the motivation behind the choices that companies make when choosing to hire a worker or an unemployed person arguing that employing an already existing worker may generate large fluctuations in vacancy rates. Nagypal also considers that the transition from one job to another has a significant role in the labor market because firms prefer to hire workers who already have a job because, when a worker is already employed is willing to accept another job, this is a sign that the worker really wants that new job, unlike a person who is not occupied and who can accept that job due to lack of alternative and temporary, that person is still looking for a better job. Given that replacing one employee with another is costly and a worker can not be forced to bear the cost of replacement when deciding to leave, the firms will always prefer to hire people who are already employed and who accept the new job considering it better than the existing one and not just as an alternative until he finds a better one, as would an unoccupied person.

Mortensen and Nagypal (2007) expanded the standard equilibrium model of unemployment developed by Mortensen and Pissarides, considering that wages are the result of the strategic negotiation between the employee and the firm, also the elasticity of the employment function and the opportunity cost of a job have reasonable values. This modified model may explain, according to the authors, almost two-thirds of the volatility of vacancies. They argue that a flexible salary is not the main issue of the model, but Shimer's results are due in particular to the following causes:

- A relatively low estimate of the job vacancy elasticity in terms of vacancies.
- A big difference between labor productivity and the opportunity cost of a job.
- Extremely strong response to the search rate for a salary job.

The authors also argue that the opportunity cost of employment is not only influenced by unemployment benefits and by the amount of time lost, but also depends on the cost of employing and training workers.

The standard equilibrium model of unemployment is designed to take into account the fact that a certain amount of time is needed for a worker to find a job. As a consequence of these emerging frictions, the authors of the original model (Mortensen-Pissarides) consider that both the employer and the workers bear a cost until the vacancy becomes occupied, namely the cost of looking for the right job (supported by the worker) and the cost of looking for the right worker (supported by the firm) (Mortensen and Nagypal, 2007, p. 328).

Another addition to the standard equilibrium model of unemployment developed by Mortensen and Pissarides is the research by Tim Kane. Kane's analysis comes to contradict some of the conclusions of the model conceived by Mortensen and Pissarides, arguing that in fact, the creation of new jobs is mainly driven by new firms. The reasoning is the study he conducted on the US economy. between 1977 and 2005, where it found that most new jobs were created by new firms and not by the existing ones, concluding that there is no net job growth without newly firms appearing on market.

As we have seen in the Mortensen and Pissarides model, most new jobs created over an economic cycle belong to existing businesses. In his study, Tim Kane talks about the importance of a "startup" of a company in creating or destructing jobs. Starting from the US sports slogan that "winning is not everything, but it's the only thing you have to do", Kane says that "starting to create jobs is not enough, it's the only thing that needs to be done". It is very clear to everyone that companies, irrespective of their size, are in a permanent and simultaneous process of job creation and job destruction (Kane, 2010, p. 2).

The equilibrium model of unemployment based on the labor market frictions

Another model approaching the balance of unemployment is Garibaldi and Wasmer model (2005). This model takes into account the labor market frictions, considering the labor force to be endogenous, and the decision to participate in the labor market is different depending on the intention of the workers to enter or leave the labor market. This model also investigates the effects of wage tax and unemployment benefits on employees' decision to enter/exit the labor market. The authors believe that taxes reduce labor market entry and increase outflows, while unemployment benefits, at a certain rate of job creation, increase labor market entry and have unknown effects on outcomes.

Most economic studies have looked at factors that influence labor supply only on a labor market without friction, and worker participation in the labor market is often defined by a neoclassical job function. From a macroeconomic perspective, very little is known about the interactions between the decision to enter the labor market of workers and the motivation of companies to create jobs. In order to better understand the functioning of a

labor market imperfect with an endogenous job offer, Garibaldi and Wasmer present three situations of the macroeconomic model of a labor market where the following decisions of the agents are endogenous:

- the firm's decision to create jobs;
- job destruction by workers/firms;
- the worker's decision to enter/exit on the labor market.

The approach is based on the idea that people spend much of their time both on the labor market and at home. The issue of time allocation has been extensively dealt with in the literature, considering that the choice a person in a household can do is: rest or relaxation, domestic activities or the labor market.

The model proposed by Garibaldi and Wasmer is to set the limit on how an individual's time is allocated between domestic work and work on an imperfect labor market. In today's world, individuals can opt for work in their own household, which means low productivity, or they can choose paid work on the labor market, which however involves a cost due to existing frictions. The authors show how job search costs influence the decision to participate in the labor market and make the decision to enter the market different from the decision to leave the market when the labor market is characterized by important frictions and makes the decisions coincides when labor market frictions disappear.

The differences between the two decisions arise because of already employed workers who are kept by firms at the workplace, because giving up on them involves irreversible loss of search costs when there is friction in the labor market. The effects of retention of workers do not exist in the absence of friction.

According to some authors, the flows between activity and inactivity (occupation/vacancy) are influenced by macroeconomic changes (in productivity or unemployment) and for this reason they can be considered cyclical or cyclic flows (Burdett and Mortensen, 1978, Pissarides, 1990). Contrary to this idea, Garibaldi and Wasmer (2005) consider that their theory based on both macroeconomic factors and individual factors (households) is able to take into account the permanent and structural flows, taking place on the labor market even when the conditions macroeconomic indicators remain unchanged.

This means that the labor market flows also occur in the absence of external, exogenous shocks related to productivity and the unemployment rate, which in fact have endogenous causes, related to the decision of individuals on the allocation of free time between rest (relaxation), work in own household or paid work on the labor market**.**

Conclusion

A microeconomic approach based on labor market flows has become the dominant paradigm for modern macroeconomic theories about unemployment and labor market dynamics. Such approaches are encountered in the studies of several economists including:

Haltiwanger (1995); Davis et al., (1996), Davis and Haltiwanger (1999), Mortensen and Pissarides (1999) or Hall (1999).

In practice, the process of employment is more complex because the flow of workers and the workforce take place simultaneously. Davis, Haltiwanger and Schuh (1996) and Bleakley, Ferris and Fuhrer (1999) showed that there is an almost constant correlation among some types of flows, but the link between them is not one to one. As a rule, when a job becomes unoccupied, it tends to generate a flow of workers that usually leads to an increase in unemployment. Also, when jobs become busy, this process generates new flows of workers, which usually reduce unemployment. Even in this regard, the link between the shocks on the labor market is not one-to-one, meaning that employment and unemployment are not necessarily correlated.

The conclusion of economists that wealth or long-term wealth is also gained from trade, comes from the standard model Heckscher-Olin-Samuelson, which assumes that production factors are homogeneous distributed across the economy and there is no impediment to their mobility, and employment is constant. Referring to the influence of trade on employment, Baldwin (1995, pp. 13-14) mentioned in his study that "the effects on employment due to changes in international trade were not significant among OECD countries, but have produced considerable effects only in certain sectors of activity".

Responding to Blinder's idea, some authors such as Davison, Martin, and Matusz (1999) have reconsidered Heckscher-Olin-Samuelson's predictions by adding that unemployment can arise as a result of labor displaced by trade and must look for another work in another sector of activity. Their main conclusion is that unemployment is rising in large countries with surplus capital that they can invest in and which increase trade with small countries with a relatively high labor force, for which workers in large countries can see a reduction in their level of well-being.

"Full employment conditions are needed to validate standard proposals in trade theory. The high unemployment rate brings up many of these proposals. Both the positive prediction of trade theory and its normative prescriptions may be wrong." (Blinder, 1988, p. 11). This statement did not lead Blinder to support the idea of barriers to free trade, but concluded that a vigorous full employment policy is needed so that redundant workers are quickly re-hired. In Blinder's view, there is a huge difference among economists in supporting this theory that free trade brings added wealth and the opinion of those who radically oppose free trade.

Klein, Schuh and Trier explain why they considered workflows in their analysis of the effects that international factors have on employment by the fact that changes in real exchange rates and trade liberalization directly affect labor demand, because it affects the creation or destruction of jobs. These factors can indirectly affect the flow of workers. For example, job destruction caused by international factors may reduce employment if workers, whose jobs are destructed, become unemployed or leave the labor market

permanently and will not reduce employment if workers move to another job (Klein et al., 2002, p. 7).

The labor market approach, in terms of flows, highlights that key changes in net employment minimize the size of gross labor market flows and this means that even when employment remains unchanged, international factors can produce significant adjustment costs in the process of job creation or job destruction (Klein et al., 2002, p. 9).

The first analysis of job flows and international factors belongs to the authors Davis, Haltiwanger and Schuh. They said: *"Surprisingly, the data show that there is no consistent relationship between the size of gross jobs and international trade. The only point that can be drawn from the analysis of empirical data suggesting the influence of international trade on job security is a high rate of gross job destruction among sectors of activity where international trade has a significant share. In the balance, the evidence does not confirm the view that a large exposure to the external trade of a sector of activity implicitly has the effect of reducing job security"* (Davis et al., 1996, pp. 48-49).

Other authors who have studied empirically the implications of external factors on employment are Davidson and Matusz (2001). They argued that companies must pay compensatory salary differences associated with the rate of workforce flows and jobs. Those companies that have low job destruction rates and high rates of new job creation will pay low wages and therefore will have an extra advantage in foreign trade.

Another important research (Shimer, 2005, pp. 493-507) deals with the balance of unemployment through employment rates, job loss and job transition rates from one job to another in the United States in the period 1948-2004. Shimer has developed a model where unemployed workers are looking for a job and those who are already employed are looking for a better job. The authors found that the finding job rate and the transition from one job to another rate are pro-cyclical and the rate of job loss is heavily acyclic. The author also found that an increase in the finding jobs rate and in the losing jobs rate makes the transition rate from one job to another also increase (Shimer, 2005, p. 493).

Davis, Haltiwanger and Schuh, based on empirical evidence developed by Davis and Haltiwanger (1990 and 1992), concluded that the US production sector indicates that "the job destruction significantly increase during a recession while the job creation is declining slightly" (Davis et al., 1996, p. 34).

Blanchard and Diamond have come to the same conclusion: "The magnitude of the volatility of outflows on the labor market is higher than that of labor market entry flows. In turn, this determines a greater amplitude of the fluctuations in job destruction than in job creation" (Blanchard and Diamond, 1990, p. 87).

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Human capital and the FDI-Income inequality nexus in African countries: Panel smooth transition regression approach

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Abstract. *The link between foreign direct investment (FDI) and income inequality has received little attention in the literature. This paper investigates empirically the relationship between FDI and income inequality using an unbalanced panel data made up of 26 African countries over the period 1990-2013. First, we estimate the linear relation using the now popular System-GMM estimation techniques to control for potential endogeneity bias. We find that FDI deepens income inequality. Secondly, we go further in the analysis to examine whether the impact of FDI on income inequality depends on absorptive capacity, by employing a panel smooth transition regression model which is more suitable to deal with cross-country heterogeneity issues. We use human capital stock as a proxy for absorptive capacity, and the results show that the impact of FDI on income inequality is conditioned by the level of human capital stock in the host country. Specifically, we find that FDI increases income inequality in countries with low levels of human capital stock, and reduces income inequality in countries with high levels of human capital stock. These findings suggest that policies oriented towards FDI liberalization in African countries should go hand in hand with policies that aim at improving human capital stock in order to mitigate the potential inequality-increasing effect of FDI.*

Keywords: Foreign direct investment, human capital, income inequality, absorptive capacity, System-GMM, Panel Smooth Transition Regression.

JEL Classification: F21; O15; O11.

1. Introduction

While the predominant conclusion from the recent literature is that FDI can enhance significantly economic growth in the recipient countries with better domestic conditions also known as absorptive capacity, the question of whether the whole population benefit equally from FDI or not, is less documented (Figini and Görg, 2011; Mah 2012; Lin et al., 2013). Understanding the effect of FDI on income distribution has important policy implications. For example, if FDI improves economic growth and income distribution, inclusive growth can be achieved through FDI liberalization policy since this policy breaks the tradeoff (dilemma) between efficiency and equity which is often confronted by policymakers. In contrast, if FDI enhances growth and exacerbates income inequality, unless appropriate policy is implemented, the growth gain from FDI may not be sustainable since the growing inequality can lead to socio-political instability which in turn reduces investment with a negative effect on economic growth (Alesina and Rodrick, 1994; Persson and Tabellini, 1994; Alesina and Perroti, 1996; Ostry et al., 2014).

Despite the high level of income inequality and the increasing FDI flows to Africa in recent years(1), only a handful of papers has attempted to investigate the distributional impact of FDI in the specific context of Africa. Sharma and Abekah (2017), and Kaulihowa and Adjasi (2017) look into this issue; however, they did not systematically investigate the role of domestic conditions in the relationship between FDI and income inequality. Recently, the inconclusive results concerning the impact of FDI on income inequality has triggered a new generation of studies examining the role of domestic conditions such as human capital, local financial development, and infrastructure development among others in modulating the link between FDI and income inequality (see for example, Wu and Hsu, 2012; Lin et al., 2013; Lin et al., 2014; Mihaylova, 2015).

This new approach concerning the relationship between FDI and income inequality remains largely unexploited in the specific context of Africa. It is against this backdrop that this study seeks to investigate the effect of FDI on income inequality in African countries and ask whether the relationship varies with domestic conditions (absorptive capacity) or not. In particular, we choose human capital as a proxy for absorptive capacity and examine whether it exerts a nonlinear effect on the relationship between FDI and income inequality in African countries.

The remainder of the paper is organized as follows: section 2 provides a review of some theoretical arguments and previous empirical findings on the link between FDI and income inequality. The third section highlights the data and methodology used. Section 4 presents the empirical results and discussions while the latter draws a conclusion.

2. Literature review

The existing theoretical and empirical literature concerning the effect of FDI on income inequality is inconclusive. According to Mundell (1957), FDI liberalization leads to capital inflows from capital abundant countries (developed countries) to capital-scarce countries (developing countries) in order to take advantage of the returns on capital differentials.

Thus foreign firms compete with local firms in the labor market. As a result, the labor income will increase and domestic firms profit will decrease. Ultimately, the relative returns on capital to labor fall thereby reducing income inequality in developing countries. In other words, FDI has an equalizing effect in developing countries according to Mundell "hypothesis".

Modernization theory is one of the important theories about the consequences of foreign direct investment in the host country. The position of the proponents of modernization theory on income inequality is consistent with what is referred to as "Kuznets hypothesis" according to which income inequality tends to rise in the initial phase of economic development and then falls in the latter stages of development. According to the modernization theory, the development of countries follows a process with different stages, and each stage has different impact on income inequality. According to this theory, foreign capital increases income inequality at the initial phase of development, but this income inequality will decline once the country has reached a certain optimal level of development (Tsai, 1995; Kaulihowa and Adjasi, 2017).

In contrast to the modernization theory, the dependency theory is more critical of the distributional impact of FDI. According to this theory, multinational corporations often use more advanced technology which requires high skilled labor. As a result, the demand for high skilled workers increases, and consequently increases their wage. In other words, as unskilled workers are abundant in developing countries, FDI activities in these countries is highly likely to exacerbate income inequality by generating a highly paid elite and a large number of marginalized unskilled workers (Girling, 1973; Bornschier and Chase-Dunn, 1985).

This argument is well developed by Feenstra and Hanson (1997). Using a framework of North-South model, they argue that a relatively cheap labor in the South (developing countries) encourages firms in the North (advanced countries) to shift the labor-intensive parts of their production to the South. However, activities that are known to be intensive in low-skilled labor in the North (advanced countries) might be high-skilled labor-intensive in the South (developing countries). As a consequence, the skill premium increases in the South thereby deepening income inequality.

Although not exhaustive, the theoretical literature shows that the impact of FDI on income inequality is a matter of controversy. This has triggered empirical studies which are also inconclusive. Empirical results on the link between FDI and income inequality can be categorized into four main groups.

The first group of studies reports that FDI inflows increase income inequality in the recipient country. In a widely cited paper, Tsai (1995) investigates the effect of FDI inflows on income inequality in 33 developing countries during the 1970s. The results obtained by the author tend to vary according to geographical areas. Specifically, the results indicate that FDI worsens income inequality in East and Southeast Asian countries. Using a panel data made up of 88 countries over the period 1969-1994, Alderson and Nielsen (1999) find that Inward FDI stock deepens income inequality. In a similar fashion (panel data), Reuveny and Li (2003) for the case of 69 countries over the period 1960-1996, Choi (2006) for the case of 119 countries over the period 1993-2002, Basu and Guariglia (2007) for the

case of 119 developing countries over the period 1970-1999, Jaumotte et al. (2013) for 51 countries over the period 1981-2001, Herzer et al. (2014) for the case of Latin America, Asteriou et al. (2014) for the case of EU-27 during the period 1995-2009, and Huang et al. (2016) for the case of 39 middle-income countries over the period 1981-2006, report that FDI deepens income inequality. In country-specific context, Feenstra and Hanson (1997) for the case of Mexico in the period 1975-1988, Zhang and Zhang (2003) in the case of China over the period 1985-1998, and Mah (2012) on South Korea over the period 1982–2008, find that FDI worsens income inequality.

The second group of empirical studies finds that FDI reduces income inequality. For example, Herzer and Nunnenkamp (2013) assess the effects of FDI on income inequality in 8 European countries over the period 1980- 2000, and the results show a negative long-run relationship between FDI and income inequality. Also, Hyejoon and McLaren (2015) investigate the impact of FDI on inequality and poverty using a sample of 127 developing countries during the period 1977-2012. Without controlling for the endogeneity issue, they find no any effect of FDI on income inequality. They further control for the endogeneity issue, and find that FDI reduces income inequality and poverty. The authors emphasize the necessity to control for endogeneity issue while investigating the effect of FDI on income inequality. In single country studies, Jensen and Rosas (2007) find that FDI inflows reduce income inequality in Mexico during the period 1990-2000. An equalizing effect of FDI was also found by Ucal et al. (2015) in Turkey over the period 1970-2008. In the same vein, Bhandari (2006), and Chintrakarn et al. (2012) report that FDI improves income distribution in the United States. However, they conclude that the effect is not homogeneous across U.S. States.

The third group of studies did not find any link between FDI and income inequality. Examples of these studies are Sylvester (2005) with a sample of 29 developing countries over the period 1970-1990, Milanovic (2005) based on household surveys for 129 countries for the year 1988, 1993 and 1998, and Mah (2003) on South Korea for the period 1975-1995.

The fourth group of studies which emerge recently deviate from the standard approach to explore the non-linear relationship between FDI and income inequality. In particular, this group of studies investigates the role of absorptive capacity (domestic conditions) in modulating the impact of FDI on income inequality. Cho and Ramirez (2016) investigate the link between FDI and income inequality in the case of seven selected Southeast Asian countries over the period 1990-2013. The results show a non-linear relationship between FDI and income inequality. FDI raise income inequality in the short run while in the long run it reduces income inequality. In their study, they find that the inequality-reducing effect of FDI starts when FDI inflows (% of GDP) reach 5.6. Cho and Ramirez (2016) conclude that "the fact that the Gini coefficient reaches it maximum at a moderate level of FDI inflows suggests that the sample countries are endowed with substantial absorptive capacity" (p. 421). Wu and Hsu (2012) use infrastructure development as a proxy for absorptive capacity and investigate its role in the link between FDI and income distribution in 54 countries over the period 1980-2005. They employ a panel threshold regression technique, and the results indicate that FDI has little effect on income inequality in countries with better absorptive capacity while it deepens income inequality in countries with low levels of absorptive capacity. Using the same approach, Lin et al. (2014) find that

FDI has income inequality-increasing effect and this effect increases as the local financial development increases in the case of 42 countries during the period 1976-2005. In sum, the results show that local financial development defines the association between FDI and income inequality. Mihaylova (2015) examines whether the effect of FDI on income inequality depends on the level of human capital stock in ten Central and Eastern European countries over the period 1990-2012. Using a linear interaction model, the results show that FDI increases income inequality but the effect diminishes as the level of human capital stock increases. In particular, the author finds that FDI exacerbates income distribution when the level of human capital stock measured by the secondary school enrollment ratio is below 81%. Beyond this level, FDI improves income distribution.

Concerning the specific context of Africa, empirical studies are scarce. For example, using GMM estimation techniques, Anyanwu et al. (2016) find that FDI is among the factors that increase income inequality in 17 West African countries over the period 1970-2011. However, using OLS estimation method, Sharma and Abekah (2017) find that FDI reduces income inequality in 46 African countries over the period 1970-2014 while Kaulihowa and Adjasi (2017), by employing a Pooled Mean Group (PMG) model, report that FDI reduces income inequality in the short run, and increases it in the long run in the case of 16 African countries over the period 1980-2013. These contradictory findings call for a new empirical study with an improved methodology.

3. Model specification and data

3.1. Econometric model

Following Wu and Hsu (2012), we first consider the following linear regression:

$$INEQ_{it} = \beta FDI_{it} + \varphi X_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

where $INEQ$ stands for the income inequality indicator, FDI is foreign direct investment, X is the vector of control variables including the constant term, μ_i and ε represent respectively the country specific effect and the error term. FDI increases income inequality if $\beta > 0$. In contrast, FDI reduces income inequality if $\beta < 0$. Model 1 captures the linear relationship between FDI and income inequality. However, the predominant conclusion from the recent literature is that the link between FDI and inequality may vary according to the level of absorptive capacity in the host country. Consequently, we employ the panel smooth transition regression (PSTR) approach proposed by Gonzalez et al. (2005) to investigate the nonlinear relationship between FDI and income inequality. PSTR is the suitable threshold regression approach to explore not only the nonlinear relationship between FDI and income distribution but also to circumvent the problem of cross-country heterogeneity (Lin et al., 2014; Jude and Levieuge, 2016). For simplicity, we assume a two-regime PSTR model, and we have the following expression:

$$INEQ_{it} = \beta_0 FDI_{it} + \beta_1 FDI_{it} g(q_{it}\ ;\ \gamma, c) + \varphi_0 X_{it} + \varphi_1 X_{it} g(q_{it}\ ;\ \gamma, c) + \mu_i + \varepsilon_{it}, \quad (2)$$

where $g(q_{it}\ ;\ \gamma, c)$ is the transition function which is continuous and bounded between 0 and 1 ; q_{it} is the transition variable which is human capital stock in this study. As in

Gonzalez et al. (2005), and Fouquau et al. (2008), the transition function g(.) is specified as the following logistic function:

$$g(q_{it}\,;\,\gamma,c) = \frac{1}{1+\exp[-\gamma(q_{it}-c)]} \tag{3}$$

where $\gamma > 0$, is the slope parameter which represents the speed of transition from one regime to another, and c is the threshold parameter. For $\gamma \to \infty$, the transition function approaches an indicator function, which means that $g(q_{it}\,;\,\gamma,c) = 0$ if $q_{it} < c$, and $g(q_{it}\,;\,\gamma,c) = 1$ if $q_{it} \geq c$. However, when $\gamma \to 0$, the transition function tends to be a constant and the model becomes a linear panel regression model with fixed effects. In model 2, the coefficient of FDI is β_0 when $g(q_{it}\,;\,\gamma,c)$ tends toward 0, and $\beta_0 + \beta_1$ when $g(q_{it}\,;\,\gamma,c)$ tends toward 1. Between these two extremes, the sensitivity of income inequality to FDI is obtained as a weighted average of parameters β_0 and β_1. Thus, as in probit or logit model, the values of the parameters β_0 and β_1 are not directly interpretable. Only their signs are interpreted to indicate the effect of FDI on income inequality depending on the value of the transition variable. For a given transition variable q_{it} , the FDI coefficient for country *i* at time *t* is:

$$\frac{\partial INQ_{it}}{\partial FDI_{it}} = \beta_0 + \beta_1 \times g(q_{it}\,;\,\gamma,c) \tag{4}$$

Following Colletaz and Hurlin (2006), and Fouquau et al. (2008), a three-step procedure is adopted in order to estimate the parameters of the PSTR model. The first step is the linearity test. In this study, the linearity test consists of testing if the relationship between FDI and income inequality can be properly captured by a homogeneous linear panel model or by a PSTR model. Thus the null hypothesis of linear model (H_0) is tested against the alternative hypothesis (H_1) of PSTR model with at least one threshold or two regimes. This test is performed by using the Fisher LM test, Wald test, and the likelihood ratio test which are specified respectively as follows:

The Fischer LM test: $$LM_f = \frac{(SSR_0 - SSR_1)/K}{SSR_0/(NT - N - K)} \tag{5}$$

The Wald LM test: $$LM_w = \frac{NT(SSR_0 - SSR_1)}{SSR_0} \tag{6}$$

The likelihood ratio test $$LR = -2\left[\log(SSR_1) - \log(SSR_0)\right] \tag{7}$$

Where SSR_0 denotes the sum of squared residuals under H_0 (linear panel model with individual effects). SSR_1 stands for the sum of squared residuals under H_1 (PSTR model with one threshold or two regimes). It is worth noting that the Fischer LM test (LM_f) has an approximate $F(K, NT-N-K)$ distribution, while the Wald LM test (LM_w) and the likelihood ratio test (LR) follow a $\chi^2(K)$ distribution with K degrees of freedom. K , N , T represent respectively the number of explanatory variables, the number of countries and the number of years.

If linearity is rejected, then the relationship between FDI and income inequality is nonlinear, and hence, can be captured by a panel smooth transition regression (PSTR) model. In this case, the second step is the test of no remaining nonlinearity. It consists of testing whether a PSTR model with one threshold or two regimes is enough to capture the nonlinearity between FDI and income inequality. The null hypothesis (H_0) is a PSTR model with one threshold or two regimes while the alternative hypothesis (H_1) is a PSTR model with at least two thresholds or three regimes.

This test is also carried out using the Fischer LM test, the Wald LM test and the likelihood ratio test. If the null hypothesis (H_0) is accepted, the procedure ends, and we conclude that a PSTR model with one threshold or two regimes captures properly the relationship between FDI and income inequality. In contrast, if the null hypothesis (H_0) is rejected, the testing procedure continues until the first acceptance of the null hypothesis of no remaining nonlinearity. Once the number of thresholds and the number of regimes are selected, the final step is to apply the Nonlinear Least Squares (NLS) method to estimate the parameters.

Fouquau et al. (2008) conclude that "using the PSTR model limits the potential endogeneity bias, because, for each level of threshold variable, there is a particular value of the estimated regression parameter" (p.299). Despite this assurance, we still mitigate any potential endogeneity and reverse causation problems by using the first lag of FDI and hence the first lag of the threshold variable including other control variables(2). Thus the actually estimated PSTR model is:

$$INEQ_{it} = \beta_0 FDI_{it-1} + \beta_1 FDI_{it-1} g(q_{it-1}\,;\,\gamma, c) + \varphi_0 X_{it-1} + \varphi_1 X_{it-1} g(q_{it-1}\,;\,\gamma, c) + \mu_i + \varepsilon_{it} \quad (8)$$

3.2. Data

To investigate the effect of FDI on income inequality in African countries, we use an unbalanced panel data made up of 26 countries over the period 1990-2013. The year 1990 is chosen as the starting point of our study period because most of the African countries received significant amounts of FDI only from the 1990s following the waves of liberalization and privatization brought by the "Washington Consensus". The selection of the study period and the countries are also dictated by data availability, especially income inequality indicator. Due to data constraints and the fact that the yearly changes in income inequality are very small, the data is averaged over non-overlapping three-year periods as in Lin et al. (2014). Thus, as data permits, we use an unbalanced panel made up of 26 countries over 8 time periods (1990-1992, 1993-1995, 1996-1998, 1999-2001, 2002-2004, 2005-2007, 2008-2010, 2011-2013). The 26 countries selected accounted for 79.5% of the total FDI flows to Africa in 2013 and 83.5% in 2016. They accounted also for 80.2% of the total FDI stock in Africa in 2013 and 79.2% in 2016(3). This makes our sample more representative to assess the effect of FDI on income distribution in Africa. The list of the selected countries is shown in Table A1 in the Appendix.

Regarding the variables selected for the analysis, we follow the existing literature. The income inequality indicator used is the Gini index. We acknowledge that is not the best

measure of income inequality but it is the most preferred measure in the literature due to its availability. In addition, it is argued that the Gini coefficient is highly correlated with other existing income inequality indicators (see for example, Clarke, 1995). The data regarding the Gini index is sourced from the Standardized World Income Inequality Database (SWIID) developed by Solt (2016). The SWIID which is known as one of the most comprehensive and comparable datasets on income inequality, has been used by Bergh and Nilsson (2010), Lin, Kim and Wu (2014), Anyanwu et al. (2016), and Kaulihowa, and Adjasi (2017) among others.

FDI which is our main independent variable is measured as FDI stock in percentage of GDP as in Franco and Gerussi (2013), Herzer and Nunnenkamp (2013), Mihaylova (2015), and Kaulihowa and Adjasi (2017) because it captures well the long-run effects than the annual FDI inflows which are more volatile. The expected sign is uncertain as the literature has provided mixed results regarding the impact of FDI on income inequality. The data on FDI stock is collected from UNCTAD. The control variables are education (human capital), GDP per capita, trade openness, Government expenditure, inflation, and the initial income inequality. Due to data constraints, the secondary school enrollment ratio is used as a proxy for human capital stock, and it is expected to reduce income inequality. The logarithm of GDP per capita in purchasing power parity (2011 constant US dollar) is used to control for the effect of the level of economic development on income inequality (Kuznets effect). Based on the Kuznets hypothesis, we expect GDP per capita to increase income inequality in African countries as their GDP per capita is still lower than those of developed countries. Trade openness is measured as the sum of exports and imports in percentage of GDP. The effect of trade on inequality is a matter of controversy in the literature; the impact of trade on income inequality is therefore uncertain. Government expenditure as a percentage of GDP captures the effect of fiscal policy on income inequality. Especially the redistributive expenditure has a potential to reduce inequality as it favors more the poorer segments of the society. Government expenditure is therefore expected to reduce income inequality. Inflation measures the effect of macroeconomic instability on income distribution. High inflation affects disproportionately the purchasing power of the poor and therefore tends to increase inequality. A positive relationship between inflation and the Gini index is expected. Inflation is measured as the growth rate of the GDP deflator. Financial development measured as credit to private sector (% of GDP) is also included in the regression. Financial development can exacerbate income inequality if it results in skilled-biased employment (Demirgüç-Kunt and Levine, 2009). Also, financial deepening does not necessary mean financial inclusion; the effect of financial development on inequality is therefore uncertain. Finally, the initial inequality is included in the regression to capture the persistence of inequality across time. Gini index lagged one period is used as a measure of initial inequality. The initial inequality is expected to increase the current level of inequality in African countries. With the exception of FDI and the Gini coefficient, all the data is sourced from the World Bank.

Table 1 presents some descriptive statistics concerning the data used in this study. In the sample, the Gini index has a mean of 43.04%, while the secondary school enrollment ratio used as a proxy for human capital stock has a mean of 35.8%. The relatively low average of the human capital variable in the sample countries indicates the low level of human capital

stock in African countries. The mean of FDI stock as percentage of GDP is 21.7%, while the trade openness (import plus export as percentage of GDP) has a mean of 61.90%. This suggests that countries include in the sample are relatively opened to foreign trade. The correlation matrix is shown in Table A2 in the Appendix. The small size of the correlation coefficients between the explanatory variables indicates no risk of multicollinearity.

Table 1. *Descriptive statistics*

Variables	Observations	Mean	Standard deviation
Gini index	168	43.04	7.90
FDI stock (% GDP)	168	21.74	19.46
Human capital	168	35.82	23.96
GDP per capita*	168	7.78	0.88
Trade openness	168	61.90	22.27
Inflation rate	168	16.52	40.06
Government spending (% GDP)	168	14.82	5.28
Credit to private sector (% GDP)	168	22.27	27.83

Note: * indicates that the variable is measured as Log (variable).

4. Empirical results and discussions

4.1. Linear panel regression

This section presents and discusses the empirical results regarding the relationship between FDI and income inequality. Firstly, we estimate the linear relationship between FDI and income inequality using System-GMM to control for endogeneity and reverse causation, and the results are summarized in Table 2. the P-values associated with the Hansen test statistic of over-identifying restrictions and the Arellano–Bond test statistic for second-order autocorrelation are all higher than 5%. In other words, the instruments used are valid, and there is no second-order autocorrelation. This reveals the validity of the GMM estimates.

Table 2. *FDI and income inequality: System-GMM estimates*
(The dependent variable is the Gini index)

Variables	Coefficient	t-Statistic
FDI	0.072	4.29***
Initial inequality	0.703	3.48***
GDP per capita	0.122	0.55
Human capital	-0.033	-2.67**
Trade Openness	- 0.159	-4.76***
Gov.Spending	0.238	1.33
Inflation	0.046	2.61**
Credit to private sector	0.044	0.96
Constant	16.651	2.47**
Observation	142	
AR(2) test (p-value)	0.544	
Hansen test (p-value)	0.858	

Note: the t-statistics are based on robust standard errors. ***; **; * indicate respectively the significance levels at 1%, 5% and 10%.

The coefficient of FDI is positive and highly significant. This implies that FDI increases income inequality in African countries included in the sample. This finding tends to support the dependency theory which claims that FDI generates income inequality in developing countries. There are several plausible explanations for this inequality-increasing effect of FDI in the context of Africa. The large share of FDI flows to Africa go into the extractive

industries and to a lesser extent the services sector. Since these two sectors tend to be skilled labor intensive, increasing FDI inflows raise the demand for skilled labor. The increasing demand for skilled labor increases the wage gap between the skilled and unskilled workers, and subsequently increases the overall level of income inequality. This finding is consistent with the results obtained by Anyanwu et al. (2016) in the context of West African countries.

As expected, human capital or education reduces income inequality. The coefficient is negative and statistically significant. The coefficient of trade openness is also negative and statistically significant. In other words, openness to international trade has the potential to improve income distribution in African countries. This finding is in line with Wu and Hsu (2012). In line with our expectation, initial inequality, GDP per capita, and inflation appear with a positive coefficient. In other words, they increase income inequality; however, the coefficient of GDP per capita is not statistically significant. The positive coefficient of initial inequality indicates that inequality is persistent across time in African countries. The same conclusion was reached by Anyanwu et al. (2016) for the case of West African countries. In contrast to our expectation, the coefficient of government expenditure is positive, however, it is not statistically significant. This finding is in conformity with Odedokun and Round (2004), and Anyanwu (2011) who find no significant effect of government expenditure on income inequality for African countries. The positive sign and the non-significance of the coefficient associated with the government expenditures variable may be explained by the fact that the variable does not capture only the government redistributive expenditures which has a potential to influence significantly income inequality, but also other expenses such as expenditures on defense or security. However, due to data constraints we could not do otherwise than using this broad measure of government expenditures. Also, financial development measured as credit to private sector (% GDP) appears with positive coefficient. However, it is not statistically significant.

According to the recent literature, the effect of FDI on income inequality may be conditioned or shaped by some domestic factors, known also as absorptive capacity. If this is true, limiting the investigation method to a linear panel model may lead to a misleading conclusion regarding the effect of FDI on income inequality in African countries. We therefore explore the nonlinear relationship between FDI and income inequality by estimating a panel smooth transition model.

4.2. Panel smooth transition regression approach

Table 3 shows the results of the linearity tests which consists of verifying if the relationship between FDI and income inequality in African countries can be captured by a linear panel model or by a PSTR model (nonlinear panel model). As we mentioned earlier, human capital stock, measured as the gross secondary school enrollment ratio, is used as the transition or threshold variable in the PSTR model(4). The null hypothesis (H_0) that a linear panel model is suitable to investigate the link between FDI and income inequality in African countries is highly rejected at 1% level of significance by the LM test, LM_F test, and the LRT test. In other words, human capital exerts a nonlinear effect on the relationship between FDI and income inequality, and this can be properly captured by a PSTR model with at least one threshold or two regimes.

Table 3. *Linearity tests*

Threshold variable	Wald (LM)	Test	Fisher(LM_F)	Test	LRT	Test
	Statistic	P-value	Statistic	P-value	Statistic	P-value
Human capital	35.310	0.000	3.934	0.000	40.465	0.000

H_0: Linear panel model H_1: PSTR model with at least one threshold

In the second step, we identify the number of thresholds by performing the tests of no remaining non-linearity. The null hypothesis (H_0) of the test is that a PSTR model with one threshold or two regimes is suitable to capture the link between FDI and income inequality while the alternative hypothesis (H_1) is that a PSTR model with at least two thresholds or three regimes is suitable. The results presented in Table 4, show that the null hypothesis (H_0) cannot be rejected by all the tests performed. This implies that a panel smooth transition regression model with one threshold or two regimes is suitable to capture properly the nonlinear relationship between FDI and income inequality in the countries included in our sample. We estimate therefore a PSTR model with one threshold or two regimes by applying the Nonlinear Least Squares (NLS) as suggested by Gonzalez et al. (2005).

Table 4. *Tests of no remaining non-linearity: Tests for the number of regimes*

Threshold variable	Wald(LM)	Test	Fisher(LM_F)	Test	LRT	Test
	Statistic	P-value	Statistic	P-value	Statistic	P-value
Human capital	11.553	0.240	0.885	0.542	12.039	0.211

H_0: PSTR model with one threshold (two regimes) H_1: PSTR model with at least two thresholds (at least three regimes).

Table 5 shows the results obtained from the estimation of the PSTR model with one threshold or two regimes using human capital stock as a threshold variable.

Table 5. *PSTR model estimates*
(The dependent variable is the Gini index)

	$ß_0$		$ß_1$
FDI	0.0791***		-0.0936**
	(3.93)		(-2.42)
Initial inequality	0.715***		- 0.049
	(3.17)		(-0.49)
GDP per capita	0.0754		- 0.1114
	(0.22)		(-0.32)
Trade openness	-0.0020**		- 0.0994*
	(-2.66)		(-1.68)
Government	0.2158		0.0659
Spending	(1.52)		(0.41)
Inflation	0.0064**		0.0345***
	(2.67)		(3.45)
Credit to private sector	0.0714		-0.1193**
	(1.16)		(-2.29)
Human capital	-0.2101***		-0.2374 ***
(Education)	(-3.53)		(-3.59)
Threshold (c)		60.04	
Slope (γ)		35.03	
No. of country		26	

Note: t-statistics, based on standard errors corrected for heteroskedasticity are in parentheses. ***; **; * indicate respectively the significance levels at 1%, 5% and 10%. γ is the speed of adjustment from the low-human capital regime to the high human capital regime; C is the threshold value.

It is worth noting that, in the PSTR model, the signs of the estimated parameters are the most important since their values are not directly interpretable (Fouquau et al., 2008). The

results show that the coefficient of FDI is positive and statistically significant in the regime of low human capital stock ($ß_0$). However, this coefficient becomes negative and statistically significant in the regime of high human capital stock ($ß_1$). The threshold of human capital stock found is 60.04%. These results imply that, in countries where the human capital stock is below the threshold, FDI deepens income inequality whereas in countries where the human capital stock is above the threshold, FDI tends to reduce income inequality. In other words, the effect of FDI on income inequality is conditioned by the level of human capital stock in the sample countries.

The slope parameter (γ) which indicates the speed of adjustment from the low regime to upper regime is 35.03. The relatively small size of the slope parameter suggests that the transition from one regime to another is smooth and gradual. Our finding is qualitatively in conformity with Mihaylova (2015) who finds that FDI increases income inequality in Central and Eastern European countries where the human capital stock measured by the secondary school enrollment ratio is below 81%. Above this threshold, FDI tends to reduce income inequality.

These findings indicate that, using only a homogeneous linear panel model to investigate the effect of FDI on inequality may lead to a misleading conclusion, as this effect of FDI may vary from one country to another and changes over time depending on the level of human capital stock. This finding can be explained by the fact that FDI activities are associated with technology transfer, and since the adoption of superior technologies required skilled labor, increasing FDI inflows lead to higher demand for skilled labor which is initially limited. As a result, the wages of skilled workers increase, and consequently increase the wage gap between skilled and unskilled workers. However, as a large share of the population is getting access to education, the supply of skilled labor also increases. This gradual improvement in human capital stock and the adoption of new technologies by domestic firms narrow the wage gap between skilled and unskilled workers, and ultimately reduce the overall level of income inequality (see Figini and Gorg, 2011; Franco and Greussi, 2013).

The key message from these results is that the impact of FDI on income inequality is not homogenous across African countries. While FDI reduces income inequality in some African countries, it increases income inequality in other countries. Looking into our sample, countries that have their level of human capital stock above the threshold found in this study in 2013 are: Algeria, Botswana, Egypt, Ghana, Kenya, Morocco, Namibia, South Africa, and Tunisia. In other words, FDI contributes to reducing income inequality in these nine (9) countries while it contributes to deepening income inequality in the other countries included in the sample.

5. Conclusion

This paper investigates the effect of foreign direct investment on income inequality in 26 African countries over the period 1990-2013. Firstly, we estimate a linear panel model using System-GMM approach and the results show that FDI increases income inequality. Secondly, we go further in the analysis to examine whether the effect of FDI on income inequality in African countries depends on absorptive capacity. To this end, we use human capital as a proxy for absorptive capacity, and estimate a Panel Smooth Transition

Regression (PSTR) model which is suitable to deal with cross-country heterogeneity and the time variability issues. We find that the relationship between FDI and income inequality is nonlinear. It changes over time and across countries depending on the level of human capital stock. In particular, FDI increases income inequality in countries with low levels of human capital stock and reduces it in countries with high levels of human capital stock. In other words, FDI reduces income inequality in some African countries while it deepens inequality in others. These results show that the conclusion from previous studies assuming homogeneity and constant effect of FDI on income inequality across countries should be taken with caution. The major contribution of this study is the adoption of an improved methodology, namely the panel smooth transition regression approach to capture the dynamic relationship between FDI, human capital, and income inequality.

From a policy perspective, the findings suggest that African countries should improve their domestic conditions also known as absorptive capacity in order to benefit from the positive effects of FDI. In particular, increasing investment in education will allow a large portion of the population to acquire quality education thereby improving the level of human capital stock. This will not only mitigate the potential negative effect of FDI on income distribution, but also attract more FDI (Dutta and Osei-Yeboah, 2010), and enhance the growth gain from FDI (Borensztein et al., 1998).

Finally, as this study focuses mainly on the role of human capital in the link between FDI and inequality, future studies should consider other aspects of absorptive capacity such as local financial development, infrastructure development, and institutional development for a better understanding of the effect of FDI on income inequality in African countries.

Notes

(1) Africa is the World's second most inequitable region after Latin America (African Development Bank[AfDB], 2012). Also according to the World Bank (2014), Africa has now become a fast-growing destination of FDI.

(2) For similar approach, see Lin et al., 2014, and Jude and Levieuge, 2016.

(3) Author's calculations using UNCTAD online database.

(4) The transition variable, namely human capital has a direct effect on income inequality as shown in the GMM estimates. Thus it is included in the PSTR model as transition variable and also as explanatory variable in order to avoid erroneous switching (see, for example, Fouquau et al., 2008, p. 291).

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APPENDIX

Table A1. *List of countries in the sample*

Algeria	Gambia	Mozambique	Tunisia
Angola	Ghana	Namibia	Uganda
Botswana	Guinea	Niger	
Burkina Faso	Kenya	Nigeria	
Cameroon	Madagascar	Senegal	
Cote d'Ivoire	Malawi	Sierra Leone	
Egypt	Mali	South Africa	
Ethiopia	Morocco	Tanzania	

Table A2. *Correlation matrix*

	Gini	Initial Gini	FDI	Human capital	Trade openness	Government spending	Inflation	GDP per capita	Private credit
Gini	1.00								
Initial Gini	0.94	1.00							
FDI	0.33	0.30	1.00						
Human capital	-0.35	-0.35	0.29	1.00					
Trade openness	-0.31	-0.28	0.64	0.25	1.00				
Gov.spending	0.43	0.41	0.32	0.20	0.48	1.00			
Inflation	0.08	0.10	0.14	-0.09	0.34	0.33	1.00		
GDP per capita	0.34	0.33	0.35	0.66	0.42	0.33	0.02	1.00	
Private credit	0.41	0.42	0.25	0.60	0.06	0.25	-0.07	0.6	1.00

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Are institutions a crucial determinant of cross country economic efficiency? A two-stage double bootstrap data envelopment analysis

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Abstract. *This paper analyses the role of institutions in enhancing the economic efficiencies across countries in a two stage Double Bootstrap DEA framework based on nonparametric frontier analysis as proposed by Simar and Wilson (2007). In the first stage, cross country workers' efficiency is estimated using a bootstrapped DEA approach over the period of 1990-2000 for 78 countries. In the second stage, the impact of institutions on these efficiency estimates is analyzed in a truncated bootstrapped regression. Twenty-nine institutional indicators from the same period have been utilized to extract three orthogonal factors based on principal component analysis. These factors namely institutional and policy rents, political rents and risk reducing technologies, along with their aggregated index are used as institutional variables. Findings suggest that inefficiencies in the economy are less where institutions are stronger. This study also shows that institutions that curb corruption, bureaucratic inefficiencies, lax regulations and unfriendly business policies, tend to have a larger effect on workers efficiency than other two indices that curb political rents and those that reduce transactional risks. Furthermore, when they are aggregated, the combined impact is more than the individual impact.*

Keywords: institutions; DEA; efficiency; bootstrap.

JEL Classification: C23, D24, Q22, O 43, Z13.

Economic growth does not depend only on the number of inputs in the production process but also on the better allocation of resources and introduction of productivity-enhancing innovations. (Olson, 1982; Baumol, 1990; North, 1990; Restuccia, 2004 and Landon-Lane and Robertson, 2005) attribute lower productivity and efficiency to the barriers for technological adoption as well as inefficient use of existing technology due to weak institutions. Siddiqui and Ahmed (2013) empirically explained how institutions influence economic growth in a theoretical framework proposed by North (1981)(1). The present study takes this work a step further to explore if the growth is caused mainly by increase in efficiency of production and how this efficiency is affected by the quality of institutions. To accomplish this task, the present study follows a two-stage procedure.(2) In the first stage, efficiency indices of 78 countries are constructed covering a period of 1990-2000 based on a non-parametric method developed by Fare et al. (1985, 1994) using the data envelopment analysis (DEA). In the second stage, these efficiency indices as dependent variable are regressed against other determinants of efficiencies including institutions(3).

Most of the contemporary empirical literature relies on the traditional growth accounting approach to estimate efficiency and productivity (Solow, 1957; Denison, 1972; Griliches and Joregenson, 1967, etc.). This approach implicitly assumes that all countries are efficient and the relative efficiency is interpreted as distance from the frontier line. However later studies like (Kumar and Russell, 2002; Los and Timmer, 2005; Henderson and Russell, 2005) decompose productivity growth into technological change, changes in efficiency, and capital deepening.

Growth accounting approach also assumes that factor markets are perfectly competitive which is not true in practice. Another issue arises that it imposes a functional form restriction, i.e. TFP computed as a residual value (Solow residual) from the Cobb-Douglas production function. This seems to be unrealistic (see Hulten, 2000) hence, it will bias the estimates of the relative contributions of factors and productivity. Even relaxing the Cobb-Douglas assumption and dealing with different functional forms may face functional mis-specification problems (Basu and Weil, 1998; Caselli and Coleman, 2006). Furthermore, there is evidence that the share of capital's income is not equal across countries and also varies time wise especially in poor countries (Gollin, 2002; Caselli and Feyrer, 2007; Aiyar and Dalgaard, 2005). Hence, treating all countries as a single homogeneous group, for which the same variables have the same effect on economic growth, seems increasingly questionable and would lead to overestimation of the role of total factor productivity (TFP) (Caselli, 2005; Jerzmanowski, 2007; Brock and Durlauf, 2001).

An alternative parametric frontier methodology to measure efficiencies is the Stochastic Frontier model developed by Sealey and Lindley (1977)(4). The stochastic frontier approach (SFA) allows disentangling the inefficiency component and a purely random component. Studies such as (Fare et al., 1994; Moroney and Lovell, 1997; Méon and Weill, 2006; Kuhey and Weill, 2007; Koop et al. 1999, 2000; Limam and Miller, 2004; Mastromarco, 2002; Kneller and Stevens, 2003; and Henry et al., 2003) applied this approach to aggregate production functions to estimate efficiency. However, its disadvantage is that it is a parametric approach and needs to impose a functional form. But the mis-specification of the functional form often results in bias in efficiency scores. For Instance Giannakas et al. (2003) estimated this bias up to 10-30% of output.

The nonparametric approach eliminates most of the above mentioned problems. DEA is considered a standard non-parametric methodology that is applied to firms, industries(5) and aggregate production functions (Fare et al., 1994; Chang and Luh, 1999; Kumar and Russell, 2002; Henderson and Russell, 2005; Arestis et al., 2006; Growiec, 2008; Maudos et al., 2000; Taskin and Zaim, 1997; Mathur, 2007; Milner and Weyman-Jones, 2003; Jerzmanowski, 2007; Dimelis and Dimopoulou, 2002; Deliktas and Balcilar, 2002). Efficiency frontier is formed from the most efficient countries on the frontier, and relative efficiency of the countries is calculated from their distance from this frontier. The smaller the distance (from the frontier), the higher the efficiency level as compared to others. In such a case, efficiency is defined as the ratio of the weighted sum of outputs to the weighted sum of inputs.

The main advantage of the method is that no subjective weights are used to combine the different measures of performance involved into a single composite measure. DEA resolves that problem by arguing that countries may have their own particular value system and therefore may legitimately define their own peculiar set of weights. Hence each country is 'free' to choose weights for the criteria that maximize its own composite performance measure and derive the frontier values directly from the data. However, this property can be viewed also as a disadvantage of the method since this can lead to some countries being assessed only on a small subset of their performance. In addition, DEA neither requires specification of any particular functional form of the aggregate production function nor it assumes a perfectly competitive factor market. It is also free from distribution assumptions made in SFA and it does not assume a constant factor share in income. However, it does require an assumption concerning the returns to scale of the technology(6).

Nevertheless, the biggest drawback in this approach is that it is sensitive to noise and a measurement error as it attributes all the variation from the frontier to inefficiency. Hence, the estimation of inefficiency may show an upward bias. Simar and Wilson (1998, 2000) pointed out owing to measurement error, a frontier constructed by DEA methods should be treated as an estimate of the frontier based on a single sample drawn from some unknown population. Second, the estimator is biased, since the technological frontier is only defined relative to the best practice observations in the sample not the "true" frontier. What it uncovers is not absolute efficiency, but efficiency relative to the best practice country in the sample. An associated complication with inference is that since the true efficiency scores are not observed directly but are empirically estimated, they are serially correlated in an unknown way. Thus, the usual estimation procedures that assume independently distributed error terms are not valid (Simar and Wilson (1998, 2000)).

Additional issue can arise if these efficiency estimates are used in the 2 stage procedure, like in our case. Since the two-stage procedure also depends upon other explanatory variables that are not taken into account in the first-stage efficiency estimation, these variables might be correlated with inputs and outputs of efficiency estimates. This implies that the error term must be correlated with the second-stage explanatory variables. In order to overcome these deficiencies, Simar and Wilson (1998, 2000, and 2007) introduced a bootstrapping method that provides the means of incorporating a stochastic element into DEA to obtain unbiased beta coefficients and valid confidence intervals. In this way, it

allows one to benefit from the advantages of DEA, while performing statistical hypothesis testing on the DEA efficiency scores. The bootstrap is a computer-based method that re samples the original data in order to assign statistical properties. We follow the double bootstrap procedure of Simar and Wilson (2007) in which DEA scores are bootstrapped in the first stage to obtain bias corrected efficiency scores, and then in second step, regressing them on potential covariates with the use of a bootstrapped truncated regression. The bootstrap method is asymptotically efficient since the approximation error due to the bootstrap re sampling tends to zero.

Studies such as (Enflo and Hjertstrand, 2008; Badunenko et al., 2008) used this bootstrapping approach to obtain bias-corrected efficiency scores. Jeon and Sickles (2004) used this approach to test Malmquist-Luenberger productivity indices calculated through directional distance function method. There were attempts made to analyze the factors that influence macroeconomic efficiency in a 2 stage approach. However, large number of studies attributed this role to institutions. For example, (Hall and Jones, 1999; Olson et al., 1998; Bjørnskov and Foss, 2010; Chanda and Dalgaard, 2008) explained institution's influence in TFP growth through growth accounting approach. (Méon and Weill, 2005, 2006; Adkins et al., 2002; Klein and Luu, 2003; Doucouliagos and Ulubasoglu, 2005; Dang, 2009) used SFA to measure the impact of institutions on technical efficiency level, whereas Lambsdorff (2003) used the similar approach to measure institutional impact on productivity. Institution productivity relationship was also being tested using DEA based nonparametric Malmquist productivity index approach (Baris Yoruk, 2007; Krüger, 2003; and M del Mar and Javier, 2007), while (M del Mar and Javier, 2011; Lall et al., 2002; Cherchye and Moesen, 2003) tested institutional impact on efficiency estimates calculated through DEA. Nearly all of the above mentioned studies found a strong and positive influence of institutions including those that inhibit corruption, on countries macroeconomic productivity and in terms of efficiency level.

There could be other determinants of efficiency. Yves and Laurent (2010), using SFA, identified financial development as a major factor while Milner and Thomas (2003) applying DEA approach, found trade openness playing this role. Using Traditional growth accounting approach, (Easterly and Levine, 2003; Alcála and Ciccone, 2004) focused on the impact of other determinants like trade openness and geography on TFP growth.

However, efficiency estimates in all of these studies could be biased due to limitation in their approaches as discussed above. Furthermore, the institutional proxies used in these studies might not be fully representative nor do they identify the channels through which these institutions could influence efficiencies.

2. Efficiency estimates methodology

Concept of efficiency analysis and measurement was developed by Farrell (1957), inspired by the earlier work of Debreu (1951) and Koopmans (1951). He defined efficiency as the ratio of the observed values to the optimal values of output and input relative to a given technology. Efficiency frontier is made up of these optimal values and acts as a benchmark. Country's relative efficiency (E^{it}) is calculated as a ratio of radial distance between their

inputs-outputs (y^{it}, x^{it}) and potential optimum inputs-outputs that lies on the frontier(y^{*t}, x^{*t}). This efficiency could have an output orientation or input orientation. An output oriented efficiency (E_o) would then be the increase in output produced with given inputs and technology as compared to the output produced with similar inputs but with a reference technology $\left(E^{ot} = \frac{(y^{*t}, x^{*t})}{(y^{it}, x^{it})}\right)$. An alternative input oriented efficiency (E_i) change would be the reduction in inputs to produce the same output under given technology as compared to the possible reduced inputs without reducing outputs under a reference technology $\left(E^{it} = \frac{(y^{it}, x^{it})}{(y^{*t}, x^{*t})}\right)$. Those countries that lie on efficiency frontier would have E = 1, comparatively less efficient countries would have scores less than one (in case of input orientation) or more than one (in case of output orientation).

Radial distance functions used to measure efficiency are calculated in this study through DEA linear programming (LP) methodology. This nonparametric deterministic approach pioneered by Farell (1957), used input and output quantities data points of countries in our sample to solve a series of LP problems one for each country. To estimate input distance functions, Variable Return to Scale (VRS) models (Banker et al., 1984) assume convexity whereas Constant Return to Scale (CRS) (Charnes et al., 1978) assumes proportionality between inputs and outputs i.e. a proportionate increase in inputs results in the same proportionate increase in outputs. In that case, CRS measures the overall efficiency for each unit, aggregating pure technical efficiency and scale efficiency into one value whereas VRS measures pure technical efficiency alone (Gollani and Roll, 1989). The scale efficiency score is obtained by dividing the aggregate CRS score by the pure technical efficient VRS score (Fare et al., 1994). A unit is considered scale efficient when its size of operation is optimal, whereas for reduced or increased sizes its efficiency will drop. In the real world, however, this optimal behavior is often precluded by a variety of circumstances such as types of market power, constraints on finances, externalities, imperfect competition, regulatory and financial environment, and protectionist policies.

Since DEA approach has serious shortcomings, we apply the double bootstrap procedure of Simar and Wilson (2007). This method is the only practical avenue to estimate confidence intervals, as well as to correct for the above mentioned bias. Details of the estimation algorithm can be found in Simar and Wilson (2007). More specifically, this consists of the following steps:

- First, standard DEA efficiency point estimates are calculated.
- Then we carry out a truncated normal regression with the maximum likelihood method, regressing estimated efficiency scores that are larger than one on the environmental variables.
- We then perform a bootstrap, drawing 10000 samples from the truncated empirical normal distribution of the estimated efficiency scores.
- Bias-corrected efficiency scores are then calculated with the bootstrap results.
- Bias-corrected efficiency estimates are then used in the second (double) parametric bootstrap based on the truncated maximum likelihood to re-estimate the marginal effects of the environmental variables in the second stage. We obtain 1,600 replications for

each parameter estimate of the marginal effect of environmental variables. Standard errors are thus created for the parameters of the regression.

- Confidence intervals are then constructed for the regression parameters as well as for the efficiency scores.

Practically, to obtain the DEA efficiency scores, we utilized FEAR 2 software (Wilson, 2008) which is freely available online, and then truncated regression models were performed in STATA(7).

3. Input/output specification and data description in efficiency analysis

In productivity analysis, output per worker is used as output, whereas Physical capital per worker and human capital per worker are taken as inputs. We took these values from the data set developed by Baier et al. (2006). They used a perpetual inventory method of calculating the stock of physical and human capital, human capital stock made up of enrolment rates, years of schooling and experience. This data set covers 145 countries and spans for about hundred years for few countries.

Regions	Countries included
Africa	9
East Asia and Australia	11
Eastern Europe	12
Latin America	18
Middle East and North Africa	8
North America	2
South Asia	4
Western Europe	14

This data set is divided into a 10 year interval. The time span is long enough to neutralize the impact of business cycle fluctuations in the data. Table 1 reports the summary statistics of input and output variable used in this analysis.

We included 78 countries from this data set in our analysis and used the last two observations for each country covering the period of 1990 and 2000. In Growth accounting literature Summers and Heston (1988) database is widely used to estimate the production function. However, the information on human capital is not included in that database and is taken separately from other databases like Barro and Lee (1993).

Table 1. *Summary statistics of input and output variables*

	Input Variables				Output variable	
	Human Capital per Worker		Physical Capital per Worker		Income per Worker	
	2000	1990	2000	1990	2000	1990
Mean	5.505933	4.959734	29955.59	26161.26	15931.57	13531.3
Median	5.624855	5.227323	21327.7	17807.79	10637.72	9507.424
Maximum	7.620805	7.299808	83329.67	77606	47047.83	38854.14
Minimum	2.411952	2.219233	656.1504	128.0718	743.4831	1001.961
Std. Dev.	1.332949	1.254658	25019.51	22726.33	13278.2	10648.75
Skewness	-0.433125	-0.288717	0.737446	0.786006	0.772058	0.808043
Kurtosis	2.377278	2.129405	2.21345	2.226252	2.212441	2.31949
Observations	82	82	82	82	82	82

Table 2. *Output oriented efficiency indices*

S. No.		2000			1990		
	Country	Pure Efficiency (P) VRS	Efficiency (E) CRS	Scale Efficiency (E / P)	Pure Efficiency (P) VRS	Efficiency (E) CRS	Scale Efficiency (E / P)
1	ALGERIA	1.788	1.826	1.021	1.498	1.621	1.082
2	ARGENTINA	1.135	1.148	1.011	1.792	1.819	1.015
3	AUSTRALIA	1.282	1.306	1.018	1.083	1.094	1.010
4	AUSTRIA	1.147	1.170	1.020	1.242	1.260	1.014
5	BANGLADESH	1.111	2.085	1.877	1.000	1.000	1.000
6	BELGIUM	1.000	1.020	1.020	1.000	1.006	1.006
7	BOLIVIA	2.117	2.259	1.067	2.101	2.189	1.042
8	BOTSWANA	1.039	1.107	1.066	1.527	1.618	1.059
9	BRAZIL	1.450	1.503	1.037	1.449	1.489	1.028
10	BULGARIA	3.037	3.085	1.016	2.083	2.103	1.010
11	CANADA	1.253	1.303	1.040	1.122	1.124	1.002
12	CHILE	1.424	1.428	1.003	1.244	1.307	1.051
13	CHINA	2.222	2.384	1.073	3.440	3.777	1.098
14	COLOMBIA	1.443	1.505	1.043	1.540	1.541	1.001
15	COSTA RICA	1.172	1.211	1.034	1.547	1.557	1.007
16	CZECH REP.	1.410	1.425	1.010	1.705	1.946	1.142
17	DENMARK	1.260	1.295	1.028	1.350	1.373	1.017
18	DOMINICAN REP.	1.370	1.422	1.038	1.687	1.716	1.017
19	ECUADOR	2.333	2.397	1.028	1.578	1.657	1.050
20	EGYPT	1.000	1.000	1.000	1.196	1.247	1.042
21	EL SALVADOR	1.220	1.346	1.103	1.941	1.948	1.004
22	ESTONIA	2.067	2.104	1.018	1.770	1.966	1.111
23	FINLAND	1.361	1.420	1.043	1.226	1.227	1.001
24	FRANCE	1.208	1.247	1.032	1.000	1.000	1.000
25	GERMANY	1.280	1.318	1.029	1.158	1.163	1.005
26	GREECE	1.167	1.180	1.011	1.374	1.392	1.013
27	GUATEMALA	1.000	1.140	1.140	1.000	1.141	1.141
28	HONDURAS	2.119	2.314	1.092	1.699	1.731	1.018
29	HUNGARY	1.547	1.550	1.002	1.464	1.674	1.144
30	INDIA	2.019	2.249	1.114	2.635	2.722	1.033
31	INDONESIA	2.482	2.650	1.068	1.951	1.961	1.005
32	IRELAND	1.000	1.000	1.000	1.203	1.245	1.035
33	ISRAEL	1.111	1.111	1.000	1.112	1.158	1.041
34	ITALY	1.223	1.250	1.022	1.045	1.059	1.013
35	JAMAICA	2.895	2.927	1.011	1.836	2.099	1.143
36	JAPAN	1.329	1.354	1.019	1.274	1.275	1.001
37	JORDAN	1.823	1.927	1.057	1.122	1.176	1.048
38	KENYA	3.094	4.130	1.335	3.632	3.818	1.051
39	KOREA, SOUTH	1.459	1.470	1.007	1.226	1.290	1.052
40	LATVIA	1.967	1.975	1.004	1.671	1.778	1.064
41	LITHUANIA	2.154	2.189	1.016	1.825	2.055	1.126
42	MALAWI	2.278	4.833	2.122	2.182	3.786	1.735
43	MALAYSIA	1.795	1.880	1.047	1.209	1.404	1.161
44	MEXICO	1.575	1.594	1.013	1.067	1.197	1.122
45	MOROCCO	1.000	1.197	1.197	1.000	1.000	1.000
46	NAMIBIA	1.140	1.203	1.055	1.000	1.387	1.387
47	NETHERLANDS	1.214	1.280	1.055	1.218	1.220	1.002
48	NEW ZEALAND	1.477	1.515	1.026	1.321	1.325	1.003
49	NICARAGUA	1.831	2.087	1.140	2.170	2.235	1.030
50	NIGERIA	2.777	4.167	1.500	2.038	2.651	1.301
51	NORWAY	1.106	1.127	1.019	1.190	1.205	1.012

S. No.		2000			1990		
	Country	Pure Efficiency (P) VRS	Efficiency (E) CRS	Scale Efficiency (E / P)	Pure Efficiency (P) VRS	Efficiency (E) CRS	Scale Efficiency (E / P)
52	PAKISTAN	1.268	1.989	1.569	1.000	1.497	1.497
53	PANAMA	1.816	1.838	1.012	1.754	1.855	1.058
54	PARAGUAY	1.465	1.569	1.071	2.245	2.263	1.008
55	PERU	1.599	1.622	1.014	2.161	2.336	1.081
56	PHILIPPINES	1.697	1.701	1.003	2.274	2.692	1.184
57	POLAND	1.567	1.604	1.024	1.855	2.016	1.087
58	PORTUGAL	1.364	1.366	1.001	1.358	1.372	1.010
59	ROMANIA	1.423	1.423	1.000	2.478	2.876	1.161
60	RUSSIA	2.851	2.926	1.026	1.623	1.701	1.048
61	SINGAPORE	1.000	1.030	1.030	1.209	1.274	1.053
62	SLOVAKIA	1.456	1.459	1.002	1.834	2.161	1.179
63	SOUTH AFRICA	1.059	1.080	1.020	1.678	1.853	1.105
64	SPAIN	1.366	1.366	1.000	1.100	1.153	1.048
65	SRI LANKA	2.094	2.133	1.019	1.868	2.237	1.198
66	SWEDEN	1.350	1.364	1.010	1.143	1.168	1.022
67	SWITZERLAND	1.059	1.062	1.003	1.108	1.185	1.069
68	TAIWAN	1.209	1.217	1.006	1.026	1.026	1.000
69	TANZANIA	1.000	3.273	3.273	1.000	2.871	2.871
70	THAILAND	2.225	2.317	1.042	1.771	1.790	1.011
71	TUNISIA	1.000	1.036	1.036	1.095	1.116	1.019
72	TURKEY	1.485	1.547	1.042	1.380	1.399	1.014
73	UKRAINE	3.725	3.818	1.025	1.840	2.155	1.171
74	UNITED KINGDOM	1.215	1.235	1.016	1.111	1.141	1.027
75	UNITED STATES	1.000	1.049	1.049	1.000	1.000	1.000
76	VENEZUELA	2.233	2.296	1.028	1.331	1.513	1.137
77	ZAMBIA	3.395	4.865	1.433	3.686	3.893	1.056
78	ZIMBABWE	2.164	2.317	1.070	2.767	3.092	1.118
	Mean	1.626	1.809	1.110	1.583	1.736	1.099

Table 3. *Bias corrected efficiency indices and their confidence intervals*

		2000						1990					
	Country	Pure Efficiency (P) VRS	95% confidence Interval		Efficiency (E) CRS	95% confidence Interval		Pure Efficiency (P) VRS	95% confidence Interval		Efficiency (E) CRS	95% confidence Interval	
			Low	High		Low	High		Low	High		Low	High
1	ALGERIA	1.866	1.803	1.959	1.879	1.831	1.975	1.579	1.518	1.655	1.695	1.628	1.792
2	ARGENTINA	1.180	1.143	1.238	1.178	1.151	1.229	1.896	1.805	2.001	1.884	1.825	1.977
3	AUSTRALIA	1.385	1.299	1.492	1.396	1.311	1.532	1.185	1.093	1.289	1.189	1.106	1.298
4	AUSTRIA	1.226	1.158	1.327	1.239	1.174	1.360	1.320	1.256	1.422	1.332	1.269	1.443
5	BANGLADESH	1.253	1.128	1.419	2.410	2.104	2.843	1.315	1.016	1.706	1.186	1.021	1.376
6	BELGIUM	1.070	1.012	1.157	1.082	1.024	1.187	1.063	1.009	1.150	1.059	1.011	1.145
7	BOLIVIA	2.299	2.142	2.520	2.374	2.270	2.571	2.240	2.117	2.441	2.305	2.200	2.490
8	BOTSWANA	1.082	1.049	1.127	1.134	1.110	1.180	1.644	1.549	1.748	1.660	1.622	1.736
9	BRAZIL	1.504	1.461	1.567	1.539	1.507	1.602	1.520	1.466	1.595	1.532	1.494	1.597
10	BULGARIA	3.158	3.056	3.315	3.159	3.093	3.288	2.241	2.106	2.377	2.198	2.112	2.324
11	CANADA	1.346	1.264	1.461	1.388	1.309	1.515	1.210	1.137	1.320	1.182	1.130	1.275
12	CHILE	1.485	1.439	1.550	1.465	1.432	1.529	1.294	1.252	1.355	1.343	1.312	1.399
13	CHINA	2.321	2.244	2.427	2.453	2.391	2.572	3.790	3.466	4.346	4.210	3.807	4.756
14	COLOMBIA	1.498	1.455	1.558	1.541	1.509	1.605	1.639	1.562	1.748	1.585	1.546	1.664
15	COSTA RICA	1.217	1.181	1.271	1.241	1.214	1.293	1.632	1.565	1.710	1.603	1.562	1.672
16	CZECH REP.	1.467	1.420	1.538	1.461	1.428	1.526	1.756	1.710	1.837	2.001	1.951	2.099
17	DENMARK	1.343	1.275	1.454	1.372	1.299	1.493	1.470	1.367	1.582	1.467	1.387	1.564
18	DOMIN. REP.	1.424	1.382	1.483	1.457	1.425	1.518	1.770	1.704	1.854	1.761	1.722	1.836
19	ECUADOR	2.444	2.356	2.576	2.463	2.404	2.577	1.638	1.587	1.713	1.701	1.662	1.774
20	EGYPT	1.300	1.019	1.560	1.179	1.013	1.395	1.408	1.208	1.652	1.433	1.269	1.645
21	EL SALVADOR	1.288	1.236	1.350	1.392	1.351	1.472	2.117	1.969	2.300	2.039	1.956	2.191
22	ESTONIA	2.146	2.079	2.253	2.159	2.110	2.255	1.832	1.777	1.925	2.018	1.972	2.103
23	FINLAND	1.473	1.376	1.600	1.524	1.428	1.666	1.325	1.242	1.445	1.295	1.235	1.401
24	FRANCE	1.299	1.224	1.402	1.333	1.252	1.462	1.124	1.019	1.220	1.102	1.020	1.203
25	GERMANY	1.391	1.304	1.499	1.425	1.327	1.560	1.233	1.169	1.339	1.225	1.170	1.326
26	GREECE	1.220	1.174	1.292	1.225	1.184	1.305	1.471	1.384	1.560	1.451	1.397	1.531
27	GUATEMALA	1.086	1.018	1.139	1.168	1.143	1.218	1.164	1.018	1.284	1.171	1.143	1.225
28	HONDURAS	2.243	2.146	2.349	2.368	2.320	2.461	1.817	1.721	1.951	1.787	1.736	1.886
29	HUNGARY	1.619	1.564	1.698	1.597	1.554	1.682	1.509	1.469	1.578	1.720	1.679	1.802
30	INDIA	2.161	2.049	2.311	2.353	2.259	2.535	2.937	2.663	3.309	2.960	2.737	3.310

		2000						1990					
	Country	Pure Efficiency (P) VRS	95% confidence Interval		Efficiency (E) CRS	95% confidence Interval		Pure Efficiency (P) VRS	95% confidence Interval		Efficiency (E) CRS	95% confidence Interval	
			Low	High		Low	High		Low	High		Low	High
31	INDONESIA	2.585	2.505	2.696	2.720	2.658	2.841	2.101	1.978	2.264	2.033	1.968	2.156
32	IRELAND	1.118	1.013	1.208	1.085	1.011	1.188	1.265	1.215	1.351	1.310	1.252	1.412
33	ISRAEL	1.203	1.122	1.293	1.176	1.115	1.279	1.173	1.124	1.242	1.232	1.166	1.311
34	ITALY	1.318	1.238	1.420	1.336	1.256	1.466	1.120	1.056	1.213	1.130	1.067	1.230
35	JAMAICA	3.061	2.924	3.256	3.006	2.935	3.144	1.896	1.844	1.985	2.170	2.105	2.296
36	JAPAN	1.416	1.338	1.534	1.430	1.357	1.571	1.376	1.292	1.504	1.342	1.282	1.451
37	JORDAN	1.960	1.854	2.090	1.982	1.932	2.080	1.185	1.140	1.240	1.213	1.180	1.266
38	KENYA	3.577	3.149	4.135	4.654	4.156	5.401	4.176	3.667	4.808	4.354	3.861	4.931
39	KOREA, SOUTH	1.537	1.470	1.637	1.534	1.474	1.650	1.284	1.232	1.354	1.330	1.294	1.389
40	LATVIA	2.070	1.988	2.180	2.020	1.980	2.100	1.744	1.678	1.837	1.831	1.784	1.910
41	LITHUANIA	2.246	2.167	2.361	2.239	2.194	2.328	1.885	1.831	1.976	2.108	2.061	2.200
42	MALAWI	2.589	2.312	2.949	5.696	4.892	6.743	2.634	2.221	3.078	4.370	3.857	4.994
43	MALAYSIA	1.982	1.816	2.145	1.956	1.884	2.096	1.301	1.226	1.398	1.481	1.412	1.570
44	MEXICO	1.647	1.587	1.733	1.646	1.599	1.739	1.126	1.080	1.194	1.279	1.208	1.362
45	MOROCCO	1.085	1.017	1.142	1.251	1.202	1.345	1.228	1.018	1.404	1.178	1.022	1.330
46	NAMIBIA	1.184	1.150	1.233	1.231	1.206	1.279	1.274	1.017	1.500	1.452	1.394	1.536
47	NETHERLANDS	1.323	1.228	1.439	1.382	1.289	1.515	1.318	1.236	1.434	1.286	1.229	1.382
48	NEW ZEALAND	1.555	1.485	1.670	1.584	1.520	1.703	1.416	1.337	1.541	1.398	1.334	1.514
49	NICARAGUA	2.021	1.864	2.236	2.227	2.097	2.464	2.270	2.186	2.394	2.298	2.241	2.412
50	NIGERIA	3.038	2.826	3.244	4.441	4.185	4.909	2.339	2.073	2.611	2.876	2.663	3.211
51	NORWAY	1.179	1.114	1.277	1.191	1.130	1.307	1.295	1.200	1.409	1.304	1.216	1.423
52	PAKISTAN	1.423	1.289	1.555	2.047	1.995	2.149	1.294	1.017	1.570	1.551	1.502	1.645
53	PANAMA	1.887	1.832	1.965	1.880	1.842	1.955	1.820	1.763	1.905	1.904	1.860	1.984
54	PARAGUAY	1.534	1.481	1.603	1.605	1.572	1.668	2.378	2.267	2.539	2.327	2.269	2.442
55	PERU	1.673	1.614	1.759	1.661	1.626	1.731	2.235	2.171	2.333	2.398	2.343	2.507
56	PHILIPPINES	1.843	1.719	1.993	1.760	1.708	1.861	2.355	2.285	2.478	2.808	2.703	3.002

		2000						1990					
	Country	Pure Efficiency (P) VRS	95% confidence Interval		Efficiency (E) CRS	95% confidence Interval		Pure Efficiency (P) VRS	95% confidence Interval		Efficiency (E) CRS	95% confidence Interval	
			Low	High		Low	High		Low	High		Low	High
57	POLAND	1.635	1.576	1.721	1.641	1.608	1.705	1.929	1.862	2.031	2.072	2.023	2.159
58	PORTUGAL	1.441	1.377	1.530	1.422	1.370	1.524	1.441	1.375	1.517	1.427	1.376	1.503
59	ROMANIA	1.543	1.440	1.664	1.470	1.428	1.550	2.556	2.487	2.674	2.973	2.885	3.142
60	RUSSIA	2.966	2.867	3.138	3.019	2.934	3.188	1.724	1.631	1.829	1.763	1.707	1.853
61	SINGAPORE	1.143	1.019	1.246	1.085	1.032	1.193	1.321	1.226	1.431	1.365	1.285	1.487
62	SLOVAKIA	1.525	1.473	1.597	1.493	1.462	1.553	1.891	1.841	1.977	2.235	2.168	2.364
63	SOUTH AFRICA	1.097	1.069	1.139	1.106	1.083	1.150	1.787	1.703	1.889	1.932	1.860	2.038
64	SPAIN	1.525	1.380	1.649	1.480	1.379	1.621	1.154	1.110	1.229	1.216	1.161	1.306
65	SRI LANKA	2.250	2.120	2.431	2.210	2.141	2.344	1.946	1.877	2.070	2.361	2.248	2.557
66	SWEDEN	1.450	1.362	1.561	1.450	1.369	1.582	1.204	1.154	1.289	1.231	1.176	1.323
67	SWITZERLAND	1.163	1.071	1.268	1.119	1.064	1.231	1.212	1.124	1.316	1.304	1.198	1.425
68	TAIWAN	1.287	1.219	1.372	1.270	1.221	1.365	1.093	1.040	1.150	1.064	1.030	1.117
69	TANZANIA	1.322	1.016	1.693	3.784	3.299	4.533	1.318	1.020	1.711	3.336	2.921	3.872
70	THAILAND	2.318	2.246	2.427	2.374	2.323	2.473	1.869	1.787	1.990	1.838	1.795	1.924
71	TUNISIA	1.038	1.009	1.080	1.061	1.039	1.105	1.149	1.106	1.213	1.146	1.119	1.193
72	TURKEY	1.540	1.495	1.606	1.583	1.550	1.646	1.454	1.392	1.546	1.436	1.403	1.501
73	UKRAINE	3.891	3.748	4.100	3.906	3.827	4.060	1.900	1.847	1.991	2.212	2.160	2.314
74	UNTD KINGDOM	1.286	1.223	1.382	1.300	1.239	1.408	1.183	1.123	1.267	1.215	1.151	1.296
75	UNITED STATES	1.097	1.018	1.191	1.135	1.056	1.242	1.129	1.017	1.217	1.071	1.011	1.141
76	VENEZUELA	2.355	2.258	2.492	2.368	2.302	2.500	1.469	1.351	1.593	1.592	1.522	1.717
77	ZAMBIA	3.688	3.446	3.980	5.266	4.896	5.889	4.129	3.749	4.471	4.088	3.909	4.404
78	ZIMBABWE	2.436	2.197	2.744	2.474	2.328	2.741	3.007	2.784	3.430	3.419	3.112	3.858
	Mean	1.742			1.907			1.711			1.838		

These values obtained from 10,000 bootstrap replications.

4. Efficiency results and discussion

Tables 2 and 3 report the efficiency scores of the sample countries at 1990 and 2000 intervals. Efficiency score starts from one; the lower the efficiency score, the higher the countries' efficiency. Belgium, United States and Tunisia are considered as the most efficient countries since they have lower scores under constant and variable return to scale assumption in both the tables. Countries that ranked high in pure efficiency were Belgium, Tunisia, United States, Guatemala, Morocco and Switzerland. Out of the top eleven countries, five belong to the western European region. These countries are considered to be frontier countries under variable return to scale as they scored unity in both periods. Whereas least efficient countries under VRS were Zambia, Kenya, China, Ukraine, and Zimbabwe. Average pure efficiency of all the countries in both periods is about 1.73. This implies that on average all countries could achieve the desired output even after cutting their inputs by 43%. North America seems to be the most efficient region with 83% efficiency followed by Western Europe with 79%, whereas least efficient regions seem to be South Asia and Africa with about 56% and 42% efficiency respectively. Overall efficiency witnessed a marginal increase of about 2% and 4% with CRS and VRS assumption respectively, from period 1990 to 2000. Moreover, efficient regions like North America and Western Europe, witnessed a decline in efficiency over the period, whereas Africa and South Asia witnessed an increase, demonstrating some signs of convergence. However, average efficiency of all countries in both periods measured under CRS assumption is lower than similar efficiency under VRS assumption. This decrease is due to countries operating at inefficient scale; the scale efficiency refers to size of production and working at economies of scale. As depicted in table 2, United States and Belgium were operating at most efficient scale closest to CRS frontier and capturing economies of scale more than others. There was a marginal increase of about 1% in scale inefficiencies during the period. This could be due to technological innovation causing major structural changes in the economies that might have moved them away from optimal scale of production.

Tables 2 and 3 show that bias corrected inefficiency scores for every country are more than its corresponding uncorrected biased figure. This is in line with other empirical evidence that the 'true' frontier lies somewhat above the estimated frontier. However, the ranking of regions according to efficiency remains relatively stable even after the bias-correction.

One of the objectives of the paper is to see the impact of institutional quality on workers' efficiency. This requires the construction of a comprehensive index that can measure the quality of institutions across countries and encompass various facets to institutions. A brief methodology and description of Institutional index is elaborated below.

5. Methodology and rationale for the index

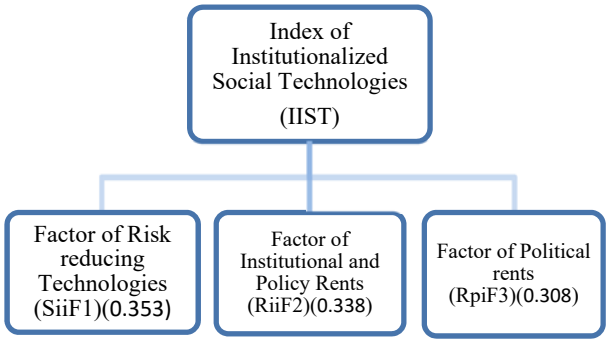
Following Siddiqui and Ahmed (2013), this study tried to collect twenty-nine indicators for 84 countries. Total observations of the data set are 2314 with 122 missing observations less than 5% in 7 indicators. These missing observations were replaced by using the expectation maximization (EM) method[(8)] and some other indicators measuring the same

concept were also utilized as predictor variables for missing values. For each country one observation was made by taking the average of all available observations for the period from 1990 to 2000. We performed exploratory factor analysis(9) in which the data set was first standardized, then factors were extracted using Principal Components Analysis (PCA) following the criteria of Kaiser (1974) retaining the factors followed by Orthogonal rotation using Equamax Method. Factors retained explained about 75 per cent of the total variance of the dataset distributed almost evenly among three factors (Table 4). They were then combined into an index using the similar weights. Table 4 also shows each factor loadings along with a relative weight of each variable in each factor in proportion to its loadings. Three orthogonal factors were identified as the factor of Institutional and Policy Rents (RiiF1), the factor of Political Rents (RpiF2) and, the factor of Risk reducing Technologies (SiiF3) respectively. Indicators were also found suitable for factor analysis following Bartlett and KMO test. Factor scores were estimated using multiple regressions and later the scores were rescaled from 0 to 1 with higher values denoting stronger institutions.

Theoretical and economic intuitions of the indices and their principal components can be found in Siddiqui and Ahmed (2013). The Index of Institutional Social Technologies (IIST) is made up of three factors identified above with almost equal weights according to Factor analysis. This First factor of the IIST named *Risk-reducing Technologies (SiiF1)* refers to institutions that reduce the cost of protecting property rights and strengthen contract enforcement. These services include provision of public goods such as rule of law and justice. Indicators that are strongly related to this factor include the rule of law, Non-discriminatory Judiciary, Political Stability, torture, extrajudicial killings, and political imprisonment. However, the 'Property rights' index of Heritage foundation are also conceptually related to this factor.

The Second factor named as Factor of Institutional and Policy Rents (RiiF2), focuses on technologies that help to eliminate or minimize two kinds of rent – institutional and policy rents which include Bureaucracy efficiency and Effectiveness, control of corruption, freedom to start and operate business, market structure, informal economies, and price controls. Third factor named Factor of Political Rent (RpiF2) measures the extent of power granted by institutions to political authorities. This factor focuses on political competitiveness, as well as voice and accountability, political rights, civil liberties, executive recruitment and constraints.

Countries' scores of these indices are reported in Table 5. Apart from absolute values, their relative rankings are also shown. According to the results, New Zealand, Netherlands and Denmark bagged first three positions respectively, while Nigeria, Cameroon and Algeria were the worst performers. Western European region captured eight out of top eleven positions whereas six out of bottom eleven went to African region. These scores seem to be highly correlated with the level of human development and economic progress. This index along with the two sub-indices was later used as explanatory variable in second stage regression.



Box Legend: Index name is displayed followed by its abbreviation (first bracket) and its weights[2] in the parent index (second bracket).

Anti-Rent Seeking Technologies

Table 4. *Factor analysis*

Variance explained by Retained Factors			
Factors	Initial Eigenvalues	After Rotation	% of Variance
RiiF1	17.51183	7.74371	26.7025
RpiF2	2.88673	7.41850	25.5810
SiiF3	1.50571	6.74206	23.2485
Cumulative % of variance by all retained Factors.			75.5320

Variables			Factor loadings after Rotation[1]					
Mean	St. Dev.	Name	(Weights and correlations between each variable and the factor.)					
6.304	1.275	Bureaucracy costs	0.3582	27%	0.6971	53%	0.2610	20%
0.399	0.979	Government Effectiveness-WGI	0.6097	37%	0.6559	40%	0.3739	23%
0.611	0.205	Government Effectiveness-ICRG	0.5334	34%	0.6286	40%	0.3981	26%
0.578	0.186	Control of Corruption-ICRG	0.5839	41%	0.3994	28%	0.4384	31%
0.300	1.071	Control of Corruption-WGI	0.6144	37%	0.6465	39%	0.3801	23%
68.866	11.696	Business Freedom-HI	0.1692	15%	0.7189	62%	0.2765	24%
5.480	1.379	Starting a business-EFW	0.3379	32%	0.7521	70%	-0.0214	-2%
10.578	4.270	regulation of entry-The number of procedures	-0.3507	35%	-0.6357	63%	-0.0198	2%
0.606	0.654	regulation of entry-cost+time as share of per capita GDP	-0.0624	7%	-0.5699	63%	-0.2698	30%
0.468	0.698	Type of Economic Organization	0.5271	33%	0.6325	39%	0.4524	28%
6.992	0.692	Administrative requirements-EFW	0.2762	31%	0.5693	63%	0.0525	6%
3.465	1.231	Economic Organization closer to capitalist	-0.0779	15%	0.4112	78%	0.0386	7%
4.845	2.327	Price controls	0.3026	24%	0.5584	44%	0.4165	33%
31.444	13.990	shadow economy as % of GDP-Schnider	-0.4183	33%	-0.5994	48%	-0.2380	19%
6.967	1.750	Executive Recruitment	0.0146	1%	0.0702	7%	0.9088	91%
7.804	2.455	Political Competition	0.2435	20%	0.0792	6%	0.8979	74%
2.695	1.649	Political Rights-FH	-0.3880	27%	-0.1415	10%	-0.8889	63%
3.059	1.395	Civil Liberties-FH	-0.5441	36%	-0.2106	14%	-0.7666	50%
0.335	0.823	Voice and Accountability-WGI	0.5818	36%	0.3172	20%	0.7229	45%
5.592	1.617	Executive Constraints	0.2072	16%	0.1601	13%	0.9051	71%
7.119	2.267	Military interference in rule of law and the political process	0.8301	57%	0.2952	20%	0.3201	22%
4.879	1.913	Protection of property rights –EFW	0.5518	37%	0.6962	46%	0.2524	17%
62.238	18.739	Property Rights-HF	0.4346	30%	0.6723	46%	0.3493	24%
0.290	0.973	Rule of Law-WGI	0.6402	38%	0.6080	37%	0.4170	25%
6.000	1.775	Impartial courts-EFW	0.5563	39%	0.6146	43%	0.2708	19%

Variables			Factor loadings after Rotation[1]					
Mean	St. Dev.	Name	(Weights and correlations between each variable and the factor.)					
4.235	3.142	Equality of Citizens Under the Law and Access of Citizens to a Non-discriminatory Judiciary	0.6659	45%	0.3040	21%	0.4952	34%
5.146	2.094	Physical Integrity Rights Index –CIIRII	0.8158	63%	0.1031	8%	0.3740	29%
0.765	0.096	Political Stability & Absence of Violence/Terrorism- ICRG	0.8593	76%	0.1172	10%	0.1531	14%
0.080	0.867	Political Stability & Absence of Violence/Terrorism - WGI	0.8412	57%	0.2530	17%	0.3928	26%

[1] Factors are extraction using Principal Component Analysis method, and Rotation is performed using Equamax method with Kaiser Normalization.

[2] Weight of factors are based on the amount of variance explained by each factor in proportion to of total variance explained by all retained factors.

Test Statistics for the suitability of data for common factor analysis				
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.922		
Bartlett's Test of Sphericity	Chi-Square	3458.321		
	Df	406		
	Sig.	0.000		

Table 5. *Index of institutionalized social technology and its sub indices*

Rank	Countries	Institutio-nalized Social Techno-logies (IIST)	Index of Institutionalized Social Technologies (IIST)					
			Factor of Risk reducing Techno-logies (SiiF1)	Rank	Factor of Institutional and Policy Rents (RiiF2)	Rank	Factor of Political rents (RpiF3)	Rank
1	NEW ZEALAND	0.8116	0.7635	20	0.8169	5	0.8610	23
2	NETHERLANDS	0.8074	0.9189	3	0.6669	15	0.8341	39
3	DENMARK	0.8063	0.8317	9	0.7249	10	0.8665	21
4	FINLAND	0.8033	1.0000	1	0.6073	21	0.7929	49
5	SWITZERLAND	0.7952	0.8731	6	0.6714	13	0.8420	33
6	UNITED STATES	0.7891	0.6788	35	0.8525	4	0.8459	32
7	CANADA	0.7880	0.8200	10	0.6829	11	0.8670	20
8	U.K.	0.7848	0.6471	39	0.8636	3	0.8563	29
9	SWEDEN	0.7829	0.9152	4	0.5663	27	0.8694	18
10	NORWAY	0.7826	0.8922	5	0.5906	23	0.8679	19
11	GERMANY	0.7712	0.8044	12	0.6580	17	0.8576	27
12	AUSTRALIA	0.7705	0.7885	15	0.6713	14	0.8591	25
13	IRELAND	0.7658	0.7955	13	0.6734	12	0.8333	41
14	AUSTRIA	0.7588	0.8340	8	0.5544	32	0.8973	12
15	BELGIUM	0.7231	0.7308	27	0.5694	25	0.8833	13
16	JAPAN	0.7149	0.7387	24	0.5396	34	0.8805	14
17	FRANCE	0.7109	0.6867	31	0.5605	30	0.9043	11
18	PORTUGAL	0.7072	0.8559	7	0.3640	57	0.9139	10
19	SPAIN	0.6945	0.6864	32	0.4877	39	0.9315	9
20	HUNGARY	0.6944	0.7736	18	0.4609	43	0.8602	24
21	CHILE	0.6883	0.4797	61	0.7619	7	0.8468	31
22	SLOVENIA	0.6874	0.7744	17	0.4264	49	0.8748	17
23	SINGAPORE	0.6810	0.7710	19	1.0000	1	0.2267	78
24	ESTONIA	0.6736	0.6856	33	0.6377	19	0.6992	60
25	CZECH REPUBLIC	0.6693	0.6488	38	0.5006	38	0.8786	15

Rank	Countries	Institutio-nalized Social Techno-logies (IIST)	Index of Institutionalized Social Technologies (IIST)					
			Factor of Risk reducing Techno-logies (SiiF1)	Rank	Factor of Institutional and Policy Rents (RiiF2)	Rank	Factor of Political rents (RpiF3)	Rank
26	ISRAEL	0.6662	0.1699	80	0.9354	2	0.9400	8
27	COSTA RICA	0.6652	0.7910	14	0.2838	68	0.9404	7
28	TAIWAN	0.6631	0.6653	36	0.6531	18	0.6715	63
29	ITALY	0.6612	0.7253	28	0.3344	63	0.9470	6
30	POLAND	0.6507	0.7355	26	0.3892	53	0.8411	35
31	BOTSWANA	0.6459	0.7515	23	0.3897	52	0.8066	46
32	GREECE	0.6373	0.6429	41	0.3345	62	0.9640	2
33	LITHUANIA	0.6187	0.5870	46	0.3479	60	0.9529	3
34	SOUTH AFRICA	0.6137	0.3556	71	0.6624	16	0.8565	28
35	KOREA, SOUTH	0.6120	0.5740	47	0.4526	44	0.8312	44
36	SLOVAKIA	0.6100	0.7372	25	0.3149	66	0.7885	50
37	NAMIBIA	0.6045	0.7625	21	0.3653	55	0.6862	61
38	ARGENTINA	0.5997	0.4299	66	0.5573	31	0.8414	34
39	JAMAICA	0.5962	0.5029	57	0.4483	46	0.8660	22
40	LATVIA	0.5944	0.6254	43	0.3414	61	0.8373	38
41	MALAYSIA	0.5815	0.5416	52	0.7295	9	0.4643	68
42	THAILAND	0.5669	0.4828	60	0.4823	40	0.7568	55
43	PANAMA	0.5509	0.5368	53	0.3091	67	0.8333	40
44	BULGARIA	0.5509	0.6260	42	0.1932	77	0.8581	26
45	PHILIPPINES	0.5485	0.4129	68	0.4330	48	0.8314	42
46	BRAZIL	0.5482	0.3365	74	0.5119	36	0.8313	43
47	EL SALVADOR	0.5459	0.4530	63	0.4456	47	0.7631	53
48	INDIA	0.5417	0.2503	79	0.5633	29	0.8526	30
49	TURKEY	0.5380	0.0815	82	0.7420	8	0.8379	37
50	JORDAN	0.5364	0.7798	16	0.5008	37	0.2960	73
51	ROMANIA	0.5328	0.6434	40	0.2193	73	0.7508	56
52	DOMINICAN REP.	0.5011	0.6211	44	0.1515	79	0.7481	57
53	SRI LANKA	0.5002	0.0462	83	0.7619	6	0.7335	59
54	VENEZUELA	0.4988	0.3037	76	0.3589	59	0.8768	16
55	TUNISIA	0.4980	0.6924	30	0.5658	28	0.2002	80
56	MADAGASCAR	0.4942	0.4969	58	0.2019	76	0.8127	45
57	MEXICO	0.4923	0.4877	59	0.3642	56	0.6386	65
58	BOLIVIA	0.4919	0.5207	55	0.0000	84	1.0000	1
59	CROATIA	0.4891	0.8104	11	0.2720	69	0.3590	71
60	ECUADOR	0.4882	0.4494	65	0.1082	80	0.9509	4
61	MALI	0.4881	0.5295	54	0.2126	75	0.7436	58
62	PERU	0.4880	0.3600	70	0.5189	35	0.6009	66
63	COLOMBIA	0.4865	0.0000	84	0.5746	24	0.9482	5
64	MALAWI	0.4820	0.6067	45	0.3248	65	0.5117	67
65	NICARAGUA	0.4805	0.5069	56	0.1630	78	0.7997	48
66	PARAGUAY	0.4703	0.4009	69	0.2376	72	0.8059	47
67	HONDURAS	0.4677	0.5438	49	0.0516	83	0.8381	36
68	MOROCCO	0.4676	0.7610	22	0.4502	45	0.1499	82
69	ZAMBIA	0.4675	0.6792	34	0.2565	71	0.4565	69
70	GUATEMALA	0.4660	0.3018	77	0.3667	54	0.7639	52
71	UKRAINE	0.4635	0.5519	48	0.0884	81	0.7746	51
72	PAKISTAN	0.4564	0.2860	78	0.4631	42	0.6448	64
73	RUSSIA	0.4440	0.3396	73	0.2672	70	0.7587	54
74	BANGLADESH	0.4405	0.4522	64	0.2170	74	0.6730	62
75	UGANDA	0.4303	0.3540	72	0.6122	20	0.3179	72
76	CHINA	0.4229	0.6527	37	0.5675	26	0.0000	84
77	EGYPT	0.4225	0.7085	29	0.4180	50	0.0990	83

Rank	Countries	Institutio-nalized Social Techno-logies (IIST)	Index of Institutionalized Social Technologies (IIST)					
			Factor of Risk reducing Techno-logies (SiiF1)	Rank	Factor of Institutional and Policy Rents (RiiF2)	Rank	Factor of Political rents (RpiF3)	Rank
78	TANZANIA	0.4191	0.9382	2	0.0651	82	0.2123	79
79	ZIMBABWE	0.4091	0.5419	51	0.4056	51	0.2605	76
80	INDONESIA	0.4070	0.3273	75	0.5919	22	0.2952	75
81	KENYA	0.4033	0.4255	67	0.4784	41	0.2952	74
82	ALGERIA	0.3629	0.1559	81	0.5453	33	0.4001	70
83	CAMEROON	0.3594	0.4533	62	0.3610	58	0.2500	77
84	NIGERIA	0.3559	0.5422	50	0.3301	64	0.1704	81

Table 6. *Descriptive statistics*

	Mean	Max	Min	Std. Dev.	Skewness	Kurtosis	Obs.
E9000CRS	1.772	4.379	1.013	0.733	1.718	6.018	78
BCE9000CRS	1.872	5.033	1.070	0.818	1.982	7.107	78
E9000VRS	1.604	3.541	1.000	0.552	1.305	4.632	78
BCE9000VRS	1.727	3.908	1.066	0.599	1.581	5.674	78
IIST	0.585	0.812	0.356	0.129	0.206	1.893	84
SiiF1	0.589	1.000	0.000	0.216	-0.574	2.926	84
RpiF2	0.467	1.000	0.000	0.209	0.078	2.730	84
RiiF3	0.712	1.000	0.000	0.248	-1.299	3.407	84
TRADEBAL	-0.0269	0.139	-0.244	0.069	-0.527	4.017	83
GOVBAL	-0.756	15.729	-6.537	4.018	2.612	10.978	61
INFLATION	53.439	770.072	1.037	147.198	4.187	20.022	81

Table 7. *Correlation coefficient matrix*

	BCE9000 VRS	E9000 VRS	BCE9000 CRS	E9000 CRS	GOV-BAL	TRADE-BAL	INFLA-TION	SiiF1	RiiF2	RpiF3	IIST
BCE9000VRS	1										
E9000VRS	0.993	1									
BCE9000CRS	0.889	0.847	1								
E9000CRS	0.917	0.883	0.995	1							
GOVBAL	-0.206	-0.207	-0.215	-0.220	1						
TRADEBAL	-0.173	-0.153	-0.266	-0.264	0.530	1					
INFLATION	0.216	0.248	0.147	0.177	-0.100	0.003	1				
SiiF1	-0.287	-0.305	-0.187	-0.217	0.293	0.138	-0.180	1			
RiiF2	-0.386	-0.382	-0.424	-0.442	0.286	0.425	-0.177	0.000	1		
RpiF3	-0.297	-0.237	-0.405	-0.379	-0.092	0.152	0.012	0.000	0.000	1	
IIST	-0.561	-0.535	-0.585	-0.598	0.271	0.404	-0.195	0.590	0.550	0.591	1

6. Regression results and analysis

Before analysing regression results, Table 7 provided information about their correlations coefficient. There is a strong and positive correlation of 0.92 among inefficiency indices. As expected, the Institutional indices observed a negative correlation with inefficiency indices. This effect is stronger in IIST as compared to its sub-indices. This shows there is a considerable impact of the quality of institutions on workers' efficiencies. Inefficiency indices are also negatively correlated with government balance and trade balance but positively with inflation.

Institutions are also positively correlated with government and trade balances and negatively correlated with inflation. Government balance is positively correlated with trade balance, and negatively linked with inflation. Institutional sub-indices are uncorrelated with one another. This is because factors extracted through Principal Component Analysis provide orthogonal factor solution. Therefore, our indices allow for a clear sense of the dimensionality that is lacking in other established indices particularly WGI.

Regression results reported in Table 8 show the truncated regression of average efficiency estimates of 1990 and 2000 in level form on institutional indices and other explanatory variables. Both pure efficiency (P) through VRS assumption and simple efficiency applying CRS assumption are used as dependent variables.

The regressions provide a reasonably good fit and the estimation results clearly indicate a robust positive (negative) impact of institutional variables on workers' efficiency (inefficiency) levels under both CRS and VRS assumptions as their coefficients are significant and positive. Their impact on efficiency under CRS assumption is comparatively higher as compared to efficiency under VRS assumptions as they have considerably higher coefficients.

Among the three types of institutions, Factor of institutional and policy rents (RiiF2) seems to have a more significant impact on efficiency as compared to others. However their combined coefficient (IIST) is much larger than any of its sub-indices, showing some degree of complementarities among institutions. Among other variables, inflation has expected positive sign, implying that an increase in inflation will result in higher inefficiency. In other words, macroeconomic instability has a negative effect on efficiency as the increased variability of the inflation rate is likely to involve social cost that concerns inefficiency in production. Friedman (1977) mentioned *"The growing volatility of inflation and growing departure of relative prices from the values alone shall set combine to render the economic system less efficient"*.

Negative coefficient of government and trade balance indicated that countries with either budget deficit or trade deficit or both, are inefficient which may happen directly or the inflation may increase the trade deficit and hence increase inefficiency. For instance, Bussière et al. (2005) showed that budget deficit may produce an adverse impact on current account and efficiency. Similarly, trade surplus may directly contribute to efficiency as it leads to reallocation of resources from less to more efficient sectors (Melitz, 2002; Bernard et al., 2003). It also improves efficiency by raising the skill levels of the labor force, generating economies of scale, and cutting costs due to international competition (Egan and Mody, 1992; Clerides et al., 1998). Furthermore, it also serves as a conduit for technology and knowledge spillover (Grossman and Helpman, 1991). These coefficients retain their relationship in all forms of regression meaning they are robust to biasness of efficiency estimates as well as in regression with environmental variables.

Our model assumes normal distribution of efficiency scores in terms of population. This assumption is statistically verified with high sigma values in all cases (not reported).

Overall, these findings prove robust positive relationship between institutions and efficiencies. Their estimates are large showing that marginal improvement in institutional qualities would produce huge impact on workers' efficiency.

7. Conclusion

This paper analyses the role of institutions in enhancing economic efficiencies across countries in a two stage analysis Double Bootstrap DEA based on nonparametric frontier analysis as proposed by Simar and Wilson (2007). In the first stage, cross country workers' efficiency was estimated using a bootstrapped DEA approach over the period of 1990-2000 for 78 countries. We used the dataset developed by Baier et al. (2006) including physical and human capital as inputs. Output orientated efficiency estimates were then calculated under both CRS and VRS assumptions. The effect of institutions on cross country efficiency level was estimated using truncated regression. These efficiency estimates were improved adding stochastic elements using bootstrap procedure with 10,000 replications. To further improve the results, bias corrected estimates were used in truncated regression to re-estimate the marginal effect of institutions and other environmental variables. And lastly, the second (double) parametric bootstrap was performed on the above regression with 1600 replications, thus producing bias correct regression coefficients and standard errors. Institutions are classified into three distinct dimensions as identified by Siddiqui and Ahmed (2013). Twenty-nine institutional indicators from the same period have been used to extract three orthogonal factors based on principal component analysis. These factors namely institutional and policy rents, political rents and risk reducing technologies, along with their aggregated index are used as institutional variable.

The findings suggest that across countries, efficiency showed a decline during the period of study. North America seems to be the most efficient region, whereas South Asia and Africa are the least efficient regions. The study also found that efficient regions witnessed a decline in efficiency, whereas Africa and South Asia witnessed an increase, showing some signs of convergence.

Findings from second stage of regression analysis suggest that inefficiencies in the Economy were reduced where institutions are strong and the institutions also help to increase the scale of operation and enjoy the economies of scale. Their impact on efficiency under CRS assumption is comparatively high as compared to efficiency under VRS assumptions. This study also shows that among the two types of institutions, institutions that curb corruption, bureaucratic inefficiencies, lax regulations and unfriendly business policies seem to have a larger impact on efficiency as compared to the other two indices that curb political rents and those that reduce transactional risks. Overall, these results suggest that institutional reforms might play a pivotal role in improving efficiency level of workers.

Table 8. *The determinants of inefficiencies (second stage bootstrapped truncated regression)*

1. Constant returns to scale assumption

Dependent Variables: Farrell's Output Oriented (Biased and Bias-corrected) Inefficiency scores																
	E9000CRS (Biased)	BCE9000CRS (Bias-corrected)			BCE9000CRS (Bias-corrected)				E9000CRS (Biased)	BCE9000CRS (Bias-corrected)			BCE9000CRS (Bias-corrected)		
Variables	Coefficients (unadjusted)	Coefficients (unadjusted)	95% confidence interval Low	High	Bias-adjusted coefficients	95% Bootstrap confidence interval Low	High		Coefficients (unadjusted)	Coefficients (unadjusted)	95% confidence intervals Low	High	Bias-adjusted coefficients	95% Bootstrap confidence intervals Low	High
IIST	-9.887606***	-9.606565***	-16.76387	-2.449264	-10.1623***	-17.37829	-4.0936								
SiiF1									-3.400254**	-3.074815**	-6.065814	-.0838155	-3.437128***	-5.749178	-0.6480873
RiiF2									-5.317727 ***	-5.048202**	-9.016133	-1.080272	-5.447193***	-8.899967	-2.047062
RpiF3									-2.216371***	-2.400686**	-4.548812	-.2525608	-2.61387***	-4.320647	-0.5080191
INFLATION	.0008982	0.0007236	-.001293	.0027402	.0008436	-0.0016536	0.0025054		.0002617	.0001961	-.0018469	.002239	.0002902	-0.0021503	0.0018653
TRADEBAL	-4.411812	-4.048425	-12.35	4.253154	-4.324976	-11.12113	3.065394		-4.681686	-3.817005	-12.45789	4.823874	-4.312796	-10.15646	3.635156
GOVBAL	-.0687651	-.0617199	-.2525223	.1290824	0.0505907	-0.2718129	0.0882555		-.0617611	-.0613233	-.2506359	.1279894	-.0626982	-0.2573352	0.0889847

*, **, *** Significance at the 10%, 5%, and 1% level respectively.
Bias-adjusted coefficients and their Confidence intervals obtained from 1600 bootstraping interactions.
Constants and sigma not reported.

2. Variable returns to scale assumption

Dependent Variables: Farrell's Output Oriented (Biased and Bias-corrected) Inefficiency scores															
	E9000VRS (Biased)	BCE9000VRS (Bias-corrected)			BCE9000VRS (Bias-corrected)				E9000VRS (Biased)	BCE9000VRS (Bias-corrected)			BCE9000VRS (Bias-corrected)		
Variables	Coefficients (unadjusted)	Coefficients (unadjusted)	95% confidence interval Low	High	Bias-adjusted coefficients	95% Bootstrap confidence interval Low	High		Coefficients (unadjusted)	Coefficients (unadjusted)	95% confidence intervals Low	High	Bias-adjusted coefficients	95% Bootstrap confidence intervals Low	High
IIST	-6.935712***	-6.782711***	-11.35932	-2.206107	-7.108316***	-11.76578	-3.074856								
SiiF1									-1.537942**	-1.906032***	-3.293678	-.5183851	-2.001528***	-3.344196	-0.6698034
RiiF2									-2.579436***	-2.502012***	-4.030183	-.9738403	-2.581115***	-4.119636	-1.203033
RpiF3									-1.610319***	-1.600231***	-2.634928	-.5655335	-1.642743***	-2.618622	-0.6507304
INFLATION	.0007304	.0006688	-.0008218	.0021593	.000734	-0.0009879	0.0020053		.0005507	.0006119	-.0006624	.0018862	.0006498	-0.0008421	0.0017643
TRADEBAL	-3.17806	-2.582262	-8.650506	3.485981	-2.736824	-7.85327	2.76581								
GOVBAL	-.0356972	-.0349054	-.1670816	.0972708	-.0319167	-0.1735115	0.0697059								

*, **, *** Significance at the 10%, 5%, and 1% level respectively.
Bias-adjusted coefficients and their Confidence intervals obtained from 1600 bootstraping interactions.
Constants and sigma not reported.

Notes

(1) They identified three channels through which institutions influence growth. First kind of Institutions limits rent-seeking opportunities that divert innovation and resources from productive avenues. Second kind that includes justice and law reduces transactional risk through proper enforcement of property rights. Whereas the third kind which includes political competition and participation raises the opportunity cost to monopoly thereby increasing bargaining power of the society in favor of growth.

(2) The approach offers several advantages as compared to one stage analysis (Coelli et al., 1999; Pastor, 2002).

(3) See Simar and Wilson (2007) for survey of two-stage procedure for analysis on determinants of DEA scores.

(4) See Aigner et al. (1977) for efficiency measurement using this technique.

(5) Especially popular in efficiency analysis of banking industries. See Berger and Humphrey (1997) for a detailed survey.

(6) DEA was first developed by Charnes, Cooper and Rhodes (1978) with constant returns to scale (CRS) assumptions. However it was later refined by Banker, Charnes and Cooper (1984) accommodating variable returns to scale (VRS) in their analysis.

(7) STATA codes for bootstrap truncated regression were based on the algorithm used in Wolszczak-Derlacz and Parteka (2011).

(8) The EM algorithm is an iterative method for finding maximum likelihood estimates of missing values given predictor variables. See (Dempster et al., 1977; McLachlan and Krishnan, 1997) for detailed discussion on EM and its applications.

(9) See Siddiqui and Ahmed (2013) for details.

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The relationship between unemployment and some macroeconomic variables: Empirical evidence from India

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Abstract. *The study examined the relationship between some macro-economic variables and unemployment in India, it focuses on the impact of some macroeconomic variables on unemployment for the period 1991-2017.Cointegration test and its associated vector error correction model (VECM) and Granger causality test were used in the analysis. The variables such as unemployment rate (UNEMP), real gross domestic product (RGDP) used as common proxy for economic growth, consumer price index used as proxy for inflation, Gross fixed capital formation, literacy rate and labour force were employed in the investigation. Stationarity test was conducted through the application of the Augmented Dickey - Fuller (ADF) test, and the results indicated that all the variables became stationary after first differencing. Furthermore, the result of the Johansen cointegration test revealed that significant long run relationship exists among UNEMP, GDP, INFL, LF, LR and GFCF. Similarly, VECM shows that the economic unemployment of India is somewhat predictable by the given explanatory variables. In the VECM, intercept β_0 is positive 0.147108 and significant at 1% level indicating overall unemployment's increases proportionately during that period. Finally, the result of the Granger causality test indicated unidirectional relationship between UNEMP and RGDP with causality running from RGDP to UNEMP. From gross domestic product, domestic private investment (GFCF) and labour force significantly causing unemployment as per there probability value. There is bi-directional Granger causality between labour force and unemployment Based on these findings, the study therefore recommends that government should as a matter of urgency create more employment opportunities in order to absorb the teeming population of the unemployed work force in the country through modernization of the agricultural sector, bring in modern equipment in the facilities of agriculture to make the sector more attractive to all citizens despite one's qualifications and profession.*

Keywords: unemployment; economic growth; co-integration; Granger causality India.

JEL Classification: F21, F43, J2.

1. Introduction

Unemployment is a multidimensional phenomenon; because it affects economic activity of a country as well as social structure of societies. So these two dimension create complexity and impose adopting extensive analysis to solve this problem. The main objective of every policy maker either from fiscal policy or monetary policy is to attain high economic growth. There are many determinants are responsible for detaining growth rate of a country. One of them is high rate of unemployment. As per Okun's law there is an inverse relationship between economic growth and unemployment rate. When unemployment's fall by 1%, GNP rises by 3%. The main objective of economic policies tends to high economic growth which leads to demand of more job by constructing investment programs. So unemployment is a global phenomena with economic and social effects (Al-Habeas et al., 2012).

A citizen is classified as a member of the labour force if he has a job or is actively looking for a job. The participation rate is the percentage of adult Americans, excluding those incarcerated or otherwise institutionalized, who are members of the labour force. The 21st century has seen a steady decline in labour force participation. In 2000, it was 67%; by October 2017, it had fallen to 62.7%. Many economists argue the labour force decline is the result of low-skilled workers losing their jobs to outsourcing or automation, having no success finding new employment and therefore dropping out of the labour force entirely. For this reason, they feel the participation rate is a more accurate measure of the state of the job market than the unemployment rate, which only considers those in the labour force. An unemployment rate of 5% means only 5 out of 100 workers in the labour force are without jobs, but it does not consider those unemployed workers who have given up looking altogether, even though they want to work.

In an ideal world, increase in employment leads to increase in wage earnings, hence, increase in consumer spending (and investment etc. through indirect effects), and eventually, an increase in overall demand in the economy. Since, the supply is fixed in short term, the price level rises and we observe inflation. However, there could be a scenario where the inflation is caused by factors on the supply side, that is, production side (production of goods and services). Let's just say that oil prices increase 50% overnight. This leads to a hefty increase in the cost of production and the producer pass it on through to the consumers through price increase (as the operating increases, so does the market price). Now, with higher prices, there will be less demand, and cutbacks on production, which will lead to higher unemployment.

The effects of capital investments on employment is a complex and sensitive matter, because the impact on the economy (and thus on unemployment) depends not only on their volume but also of the establishment, the field concerned, the input modality and the existing conditions in the economy in which investments are made. In the case of foreign direct investment (FDI), the economic and social effects also depend on the motivation of investors and the investing business strategy.Net investments lead to enhanced existing activities in the economy, with positive impact on employment, while replacement investments of the worn fixed asset, representing that part of gross investments made of the depreciation fund, do not generate new jobs, their positive effect being materialized mainly

in maintaining existing jobs. Similarly, Economic growth refers to increase in goods and services produced by an economy over time. It is conventionally measured as percentage of increase in real gross domestic product (GDP). Growth is usually calculated in real terms i.e. inflation adjusted terms to make it comparable nationally and internationally. The increase in GDP is supported increase in agricultural and industrial production. When there is economic growth in the country there should be increase in exports and imports as well. The increase in exports should result in increase in foreign exchange reserve in the country. The increase in income of the people should be able to increase the saving and capital formation in the country. Besides, there are some social indicators of economic growth, as well, like falling birth and death rates, increase life expectancy at birth and literacy rates.

2. Review of literature

Hussain et al. (2010) investigated the causality between growth and unemployment in Pakistan for the period 1972-2006 and found that unemployment has negative relationship with economic growth in Pakistan. Similarly, Zagler (2006) examined the links between growth and unemployment in the United Kingdom for the period 1982-1999, and the result indicated negative relationship between unemployment and growth in the economy of United Kingdom. Oluyomi and Ogunrinola (2011) studied the relationship between employment and economic growth in Nigeria for the period 1986-2010, and found that positive and significant relationship exists between employment and the real GDP in the economy. Stephen (2012) investigated the impact of unemployment on economic growth in Nigeria for the period 1980-2008, and the study found that unemployment has negative relationship with economic growth in Nigeria.

Bashir et al. (2012) uses data for the period from 1972 to 2010. With the object of long run and short run estimates, they have taken Cointegration test and VECM respectively. They conclude that in long run educational expenditure, health expenditure and gross fixed capital formation are significant features in magnifying employment level in Pakistan. At the end it is suggested that there should be more spending on education to support enrolment at primary and expert levels by offering scholarships to students. For superior health and education, Govt. should extend health expenditure as well. They also play very important role in enhancing employment level, output and economic growth by providing identical opportunities of education and health to all people of any nation all differences can be removed. Considering the importance, this Study indicates some of the important elements of education and health in reducing unemployment level in the long run as well as in the short-run.

Faridi et al. (2010) prepared research on primary data collected through field survey from district Bahawalpure. For the measurement of coefficients of variables Logistic regression technique has been used. The study has concluded that education is negatively and significantly related to unemployment level. The human condition of the worker for work has also important impact on unemployment. The study advocates that Government should suggest health and education services to all the people of the country. Health and education has an important function in the process of human capital improvement. A country well-off

in human capital can cover the growth and development in that country. Manoj and Pandey (2009) measures the change in labour force participation rate due to change in health structure of the people. Study takes unemployment as dependent variable and health expenditures and number of hospitals are used as independent variables 2SLS method is used to estimate results. Results indicates negative and significant results for the case of India.

Christelle et al. (2010) examines the relationship between long-term unemployment and education. The study has been run using both a binary logit model and a binary Scobit model for time period 2004-2006 to investigate the impact of education on unemployment. The outcome suggests that the chances of a person to be remain in long-term unemployment decreases with increases in her/his educational level. Study also told that younger workers (20-30) are more beneficial than older workers (50-65) and there is a decline in returns of education after the age of 40.

Makaringe and Khobai (2018) explored the relationship between unemployment and economic growth on South Africa. Taking the quarterly data from $1994Q_1$ to $2016Q_4$. They used ARDL bound testing approach to show the long run relationship between the variables. They found that there is negative relationship between unemployment and economic growth in short run as well as long run. This also validates the Okun's law (1962), which discovered the linkage unemployment and economic growth. They suggested that government should come up with efficient macroeconomic policies, needful structural change in the economy, stabilizing growth, flexible labour market policies to reduce unemployment rate.

Alhabees and Rumman (2012) verified the causal relationship between economic growth and unemployment rate. The study focused on some Arab countries and more details analysis for the case of Jordan. They used application of Okun's law, which shows the linkage between potential or actual rate of economic growth and unemployment rate prevailing in an economy. They indicate that high growth rate leads to high operational rate which reduce unemployment rate. They found that rich Arab countries are less unemployment than poor Arab countries. They attributed that main cause of unemployment in Arab countries due to political, social and economic instability and high population growth rate. They suggested that social development is most important for efficiently and effectively increasing of growth rate. Separate policies should be need to address the problems in Arab country.

Eze and et al. (2016) examined the relationship between economic growth, structural change and unemployment in case of Nigeria during 1980-2013. The cointegartion analysis and VECM approach are used to show the results. The study reveals that structural change affect both economic growth and unemployment. They found that unemployment has negative and significant impact on economic growth. It was recommended that Govt. should create more employment, modernizing agricultural sector, so that some part of total labour force will absorb by agricultural sector despite of profession and skill.

Nikolli (2014) examined the relationship between economic growth and unemployment rate in Albania. As Okun's law state that, 1% decline in unemployment rate leads to GDP

will increase by 3%. The study analysed data from 2000 to 2013 by using regression between gross domestic product and unemployment rate. The study does not found any significant or stable relationship between economic growth and unemployment rate due to economic crisis during this period.

3. Theoretical framework and background

Economic growth and unemployment are clearly discussed by different school in different way. Adam smith claim that economic growth can be possible by division of labour and specialization. Followed by classical economist Karl Marx considered surplus value is only means of increasing production or economic growth in a cumulative process (Ajamieh, 1983). In his theory entrepreneur plays an important role for increasing production or economic growth. Rostow's stages of economic growth is one of most important theory of growth. He discussed that from traditional society to high mass consumption, he puts different conditions in each stage to achieve high growth rate. Harrod-Doamar more focus on investment for economic growth. On the other hand, Arthur Lewis states that movement or shifting of surplus labour from agricultural sector to industrial sector for the economic development. Keynesian theory on economic growth and development based on demand side. In his book "The General Theory of Employment, Interest and Money" particularly with regard to the role of government in stimulating and regulating a nation's economic life.

4. Data and methodology

In order to examine the relationship between unemployment and some macroeconomic indicators like GDP, LR, GFCF, LF, INFL in India. The study employed annual time series data from the 00 world development indicator for period ranging from the 1991 to 2017.cointegration test, Vector Error Correction Model and Granger causality tests are applied in the analysis. Cointegration test is applied to know the long run relationship among the variables, VECM applied for to study the short run and long run dynamic relation and Granger causality test used to know the causality unemployment and other variables. All the variables are expressed in terms of their real values in this study. Applying econometric modelling requires the same order of integration in the data set. So, we transform the data set into log linear specification to have consistent estimates, Shahbaz and Rahman (2010).

Model specification

The model express the relationship between unemployment and other macro-economic indicators like inflation (INFL), gross fixed capital formation (GFCF), labour force (LF), literacy rate (LR) and gross domestic product (GDP) are represented follows

$$UNEMP = f(GDP, INFL, GFCF, LR, LF) \quad (1)$$

We estimate the long run impact of the indicators on unemployment by employing the Johansen-Juselius multivariate co-integration test which can be written as:

$LUNEMP_t = \alpha_1 LGDP_t + \alpha_2 LINFL_t + \alpha_3 LGFCF_t + \alpha_4 LLR_t + \alpha_5 LLF_t + u_t$ (2)

Where:

$LGDP_t$ – indicates economic growth in terms of GDP per capita in current US $ during the time period t (indicator of economic growth).

$LGFCF_t$ – indicates Gross Fixed Capital Formation in current US $ during the time period t (as private domestic investment).

LLF_t – indicates Labour Force, measured as the % of total population aged 15-64 during the time period t.

$LINFL_t$ – indicates inflation rate (as CPI) during the time period t.

LLR_t – indicates literacy rate during the time period t (proxy of school enrolment secondary, % gross).

Unit root test:

This stage of estimation procedure tests the stationarity of the variables employed in the study. It helps to determine the order of integration of the data series by applying the Augmented Dickey-Fuller (ADF) unit root test, postulated by Dickey and Fuller (1981). This test is adopted in order to find the long term properties of the variables in the study. If the time series are found to be stationary, it means that their variance, mean and covariance are constant overtime and that the result obtained from their analysis is reliable and can be used to predict future economic activities of the economy. The ADF test is conducted through the following models.

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \gamma Y_{t-1} + \sum_{i-1}^{k} \beta_i Y_{t-i} + \varepsilon_t \quad (3)$$

Where:

Y is a data series, t is linear time trend, Δ is first difference operator, $\alpha 0$ is constant, n is optimum number of lags in the development variable and it is stochastic variable. Meanwhile, if the ADF result fails to reject the test in levels but rejects the test in the first difference, it means that the series contains one unit root and is of integrated order one. More so, if the test fails to reject the test in levels and at first difference but rejects it in second differences, it therefore implies that the series contains two unit roots and is of integrated order two.

Test of cointegration

The second estimation procedure involves the test of the level of cointegration among the variables of the same order through the application of the Johansen cointegration test. The implication is that, if in the long run, two or more series move closely together, whether the series itself is trend, the difference between them is constant. In theory, they can wander arbitrarily far away from each other. According to Johansen and Juselius (1990) achieving empirical result amount to establishing maximum-likelihood test procedure. Trace test statistic (λ_{trace}) given below:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1 - \lambda_i) \quad (4)$$

Where λ_i are the estimated values of characteristic roots or the eigenvalues, T is the number of observations and n is the number of variables. The second test statistic is known as the maximal eigenvalue test statistic (λ_{max}) which tests the null hypothesis that there are exactly r co-integrating vectors in X_t and is given by:

$$\lambda_{max}(r+1) = -T \ln(1-\lambda_r) \quad (5)$$

The distributions for these test statistics are not given by the usual chi-squared distributions. The asymptotic critical values for these likelihood ratio tests are calculated via numerical simulations (Johansen and Juselius, 1990).

Granger causality

The third stage of the estimation procedure examine the causality between unemployment and other macro-economic variables through the application of Granger causality test propounded by Engle and Granger (1989). It focused on determining the nature of relationship among the variables; that is whether the direction of the relationship is bi-directional, unidirectional, feedback or no causation between the variables. Thus the model is specified as

$$UNEMP_t = \gamma_0 + \sum_{i=1}^{n} \alpha_{1t} GDP_{t-1} + \sum_{j-1}^{n} \beta_j S_{t-j} + u_{1t} \quad (6)$$

$$LUNEMPt = \lambda 0 + \Sigma\lambda 1tLGDPt\text{-}1 + \Sigma\lambda 2tLINFLt\text{-}1 + \Sigma\lambda 31tLGFCFt\text{-}1 +$$

$$+ \Sigma\lambda 4tLLRt\text{-}1 + \Sigma\lambda 5tLLFt\text{-}1 + \acute{\varepsilon}1t \quad (7)$$

Where LUNEMP = unemployment, LGDP = gross domestic product at constant price, LGFCF = gross fixed capital formation, LLR = literacy rate, LLF = labour force, ε_t = error term, t = current time period, t-1= lag time period.

Vector error correction model (VECM)

This step of estimation procedure is possible if the results of the cointegration test showed evidence of long run relationship among the variables. The conventional vector error correction model (VECM) is employed to examine the short run dynamics and cointegrating equation among the series. The term 'error correction term is estimated for the coefficients, such that when the series fails to cointegrate, it means that the short run model Unit root test:

This stage of estimation procedure tests the stationarity of the variables employed in the study. It helps to determine the order of integration of the data series by applying the Augmented Dickey-Fuller (ADF) unit root test, postulated by Dickey and Fuller (1981). This test is adopted in order to find the long term properties of the variables in the study. If the time series are found to be stationary, it means that their variance, mean and covariance are constant overtime and that the result obtained from their analysis is reliable and can be used to predict future economic activities of the economy. The ADF test is conducted through the following models.

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \gamma Y_{t-1} + \sum_{i-1}^{k} \beta_i Y_{t-i} + \varepsilon_t \quad (8)$$

Where:

Y is a data series, t is linear time trend, Δ is first difference operator, α is constant, n is optimum number of lags in the development variable and it is stochastic variable. Meanwhile, if the ADF result fails to reject the test in levels but rejects the test in the first difference, it means that the series contains one unit root and is of integrated order one. More so, if the test fails to reject the test in levels and at first difference but rejects it in second differences, it therefore implies that the series contains two unit roots and is of integrated order two.

5. Data analysis and discussion of empirical results

Table 1. *Augmented Dickey-Fuller unit root test*

	level			1st Difference			
variables	ADF statistics	5% critical value	10% critical value	ADF statistics	5% critical value	10% critical value	Remarks
UNEMP	-2.84	-3.00	-2.64	-4.16	-2.98	-2.63	I(1)
GDP	1.30	-2.98	-2.62	-4.11	-2.98	-2.63	I(1)
INFL	-0.38	-3.01	-2.64	-5.44	3.02	-2.65	I(1)
GFCF	0.75	-2.99	-2.63	-5.09	-2.99	-2.63	I(1)
LR	-0.29	-2.98	2.62	-4.48	-2.98	-2.63	I(1)
LF	-1.17	-2.98	-2.63	-4.73	-2.99	-2.63	I(1)

Source: Author's calculation.

The Table 1 depicts stationary test of the time series employed in this investigation through the application of the Augmented Dickey-Fuller (ADF) stationary test. The results of the test indicate that all the variables i.e. UNEMP, GDP, GFCF, INFL, LR and LF were non-stationary at level; however, the variables became stationary after first differencing at 5% and 10% critical values. This claim is supported by the ADF statistics and the critical values as shown in the table 1. However, after first differencing, the ADF statistics of all the variables are greater than the critical values, which imply that all the series became integrated of the same order after first differencing. The attainment of stationary of the variables as indicated in the first difference implies that their variance, mean and covariance are constant overtime and that long term properties of the series are established.

Optimal lag order selection criteria

Table 2. *Optimum lag order selection criterion*

Lag	LogL	LR	FPE	AIC	SC	HQ
0	329.15	NA	2.52	-28.10	-27.80	-28.02
1	529.69	278.93*	1.74	-42.40	-40.33*	-41.88
2	581.76	45.31	9.93	-43.80*	-41.95*	-42.83*
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: Author's calculation.

Further, we have employed optimum lag selection criteria to choose the appropriate lag as it is essential for using any advanced econometric techniques such as Cointegration test, VECM test and Granger-Causality test. While determining lag length, econometricians have either fixed the lag length arbitrarily or chosen it through some statistical procedure. For this study, we use five lag order selection criterion such as Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC) and Hannan-Quinn Information Criterion (HQ) to select the optimum lag. The lowest value of each criterion is used to select the optimum lag. The Table 2 shows the selection procedure of the optimum lags by using the five criterion such as LR, FPE, AIL, SC, HQ.

Co-integration Test

Table 3. *Cointegration rank test (trace)*

Hypothesized No. of CE(s)	Eigenvalue	Trace statistics	0.05 critical value	Prob.**
None*	0.94448	182.92	95.7536	0.0000
At most 1*	0.8620	116.29	69.8189	0.0000
At most 2*	0.7189	70.7383	47.8561	0.0001
At most 3*	0.6246	41.5448	29.7907	0.0014
At most 4*	0.5588	19.0061	15.4947	0.0142
At most 5	0.0078	0.1814	3.8416	0.6701

Source: Author's calculation.

Table 4. *Cointegration rank test (maximum eigenvalue)*

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen statistics	0.05 critical value	Prob.**
None*	0.94448	66.6279	40.0775	0.0000
At most 1*	0.8620	45.5606	33.8768	0.0013
At most 2*	0.7189	29.1935	27.5843	0.0308
At most 3*	0.6246	22.5386	21.1316	0.0315
At most 4*	0.5588	18.8246	14.2646	0.0089
At most 5	0.0078	0.1814	3.8414	0.6701

Source: Author's calculation.

Tables 3 and 4 represented the analysis of co-integration test through the application of Johansen
co-integration test. The results indicated five co-integrating equations in both the trace statistic and the maxeigen statistic respectively. In Johansen co-integration method, the trace statistic and max-Eigen statistic in any investigation determines level of cointegration among the data series employed in the study. In this sense, the results of the Johansen cointegration test in this study indicate long run relationship among the variables such as UNEMP, GDP, INFL, GFCF, LR and LF by indicating five cointegrating equations. Judging from the results, the study rejects the null hypothesis of no long run relationship and concludes that long run relationship exist among the variables under study. Specifically, the result showed that all macro variables has significant long run relationship with unemployment in India.

Granger causality test

Granger's Causality Test (Granger, 1969, 1981) is used to examine for the forecasting relationship between two variables. Introduced by Granger (1969), it was popularized by Sims (1972). The Granger-causality test is used, since it is very sensitive to the number of lags used in estimation procedure, the Schwarz Criterion (SC) has been applied to

determine the optimum lag length. The optimum lag length k, according to this criterion, is obtained by minimizing the function. The co-integration test ignores the effect of the past values of one variable on the current value of the other variable. The Granger causality test was hence used to examine such possible instances. As this test is sensitive to the choice of lag length, to avoid this problem, different lag length criterion has been applied to choose the optimum lag length (Enders, 1995).

Table 5. *Granger causality test*

Null Hypothesis	Direction of causality	F-Statistic	P-value
LGDP does not Granger Cause LUNEMP	LGDP ⟹ LUNEMP	6.09604	0.0086
LGFCF does not Granger Cause LUNEMP	LGFCF ⟹ LUNEMP	3.75987	0.0414
LINFL does not Granger Cause LUNEMP	LINFL ⟹ LUNEMP	2.91703	0.0773
LLF does not Granger Cause LUNEMP	LLF ⟹ LUNEMP	2.55788	0.1025
LLR does not Granger Cause LUNEMP	LLR ⟹ LUNEMP	4.6913	0.0229
LUNEMP does not Granger Cause LLR	LUNEMP ⟹ LLR	3.0768	0.0709
LGDP does not Granger Cause LINFL	LGDP ⟹ LINFL	4.8563	0.0191
LLF does not Granger Cause LGDP	LLF ⟹ LGDP	1.79133	0.1925
LGDP does not Granger Cause LLF	LGDP ⟹ LLF	4.8017	0.0198
LGDP does not Granger Cause LLR	LGDP ⟹ LLR	5.1366	0.0172
LGFCF does not Granger Cause LUNEMP	LGFCF ⟹ LUNEMP	4.60844	0.0226
LLF does not Granger Cause LGFCF	LLF ⟹ LGFCF	3.7435	0.00416
LGFCF does not cause LLF	LGFCF ⟹ LLF	4.3028	0.0279
LLR does not Granger cause LGFCF	LLR ⟹ LGFCF	2.4700	0.1127
LGFCF does not Granger cause LLR	LGFCF ⟹ LLR	4.5313	0.0255
LLR does not Granger cause LINFL	LLR ⟹ LINFL	2.5690	0.1043
LINFL does not Granger cause LLR	LINFL ⟹ LLR	1.8483	0.1862
LLR does not Granger cause LLF	LLR ⟹ LLF	7.6016	0.0040

Note:
(i) Optimum lag lengths (m) are determined by minimizing the Akaike Information criteria (AIC) by E-views package.
(ii) * Denotes significant at 5% confidence level.
(iii) The significant result only presented in the table.

From Table 5, the results of the Granger causality test revealed unidirectional relationship between unemployment (UNEMP) and gross domestic product (RGDP) with causality running from GDP to UNEMP in the economy. Like there is reversed unidirectional between UNEMP to GFCF, INFL, LR and LF. From gross domestic product, domestic private investment (GFCF) and labour force significantly causing unemployment as per there probability value. There is bi-directional Granger causality between labour force and unemployment. As labour participation rate increases unemployment decreases and vice versa. Similarly, labour force and gross domestic product, labour force and private investment, literacy rate and private investment; when literacy rate increases it may increase private domestic investment that leads to greater employment. These are Granger causes with each other.

Vector Error Correction Model (VECM)

Having established the existence of long run equilibrium relationship among the variables employed in the study through the application of Johansen cointegration test, the study proceed to carry out the estimation of the vector error correction model (VECM) in order to examine the short run dynamics and long run relationship among the variables of the study. The estimation result of the test is presented below

$$\Delta Y_t = \beta_0 + \varphi_i z_{t-1} + \sum_{i=1}^{n} \beta_i \Delta y_{t-i} + \sum_{i=0}^{n} \delta_i \Delta x_{t-i} + u_t \quad (9)$$

$$LUNEMP_t = 0.147108 + 0.048995 ect_{t-1} - 0.316055 \Delta lUNEMP_{t-1} +$$

$$+ 1.828525 \Delta lGDP_{t-1} + 0.161030 \Delta lINFL_{t-1} + 0.554847 \Delta lGFCF_{t-1} +$$

$$+ 0.661855 \Delta lLR_{t-1} - 0.113884 \Delta lLF_{t-1} + u_t \quad (10)$$

Table 6. *Vector Error Correction Model (VECM)*

	Coefficient	Std. Error	t-statistics	Prob.
β_0	0.147108	0.07289	2.01816	0.00010
φ_1	0.048995	0.01703	2.87700	0.00012
β_{lunemp}	-0.316055	0.27576	-1.14612	0.00102
β_{lgdp}	1.828525	0.73334	2.49342	0.00012
β_{linfl}	0.161030	0.10729	1.50092	0.10194
β_{lgfcf}	0.554847	0.17046	3.25504	0.00000
β_{llr}	0.661855	0.40960	1.61587	0.10970
β_{llf}	-0.113884	0.07437	-1.53133	0.10094
F-statistic	4.6665			
Prob(F-statistic)	0.0000			

Source: Author's calculation.

In equation 10, the VECM shows that the economic unemployment of India is somewhat predictable by the given explanatory variables. In above table, the VECM intercept β_0 is positive 0.147108 and significant at 1% level indicating overall unemployment's increases proportionately during that period.

In Table 6 and Equation 10, the first error correction term φ_1 is positive and significant at 1% level confirms the unemployment is not departed from the long run equilibrium. Hence there error correction term is a positive impact on unemployment.

Moreover, the short run coefficient (β) of the lagged values of GDP are positive and statistically significant at 1% level confirming a significant short run positive impact of the said variable on Unemployment.

Likewise if we consider other variable like inflation, literacy rate, GFCF which are positive and significant at 5% level hence it confirms that there is short run causality with unemployment. If we focus on another variable labour force give us the idea that there is a negative relationship exist with labour and unemployment .Where it statistically significant at 5% level.

$$ect_{t-1} = Y_{t-1} - \beta_0 + \beta_1 X_{1_{t-1}} + \beta_2 X_{2_{t-1}} + \cdots + \beta_n X_{n_{t-1}} \ldots \quad (11)$$

After putting the values of the coefficient, the equation stands as;

$$Ect_{t-1} = 1.00LUNEMP_{t-1} - 8.9436 + 0.1148LGDP_{t-1} + 0.2145\ LGFCF_{t-1} +$$

$$+ 3.8554LLF_{t-1} - 0.9101LLR_{t-1} + 0.2147LINFL_{t-1} \quad (12)$$

The intercept β_0 is negative (-8.9436) verifies an overall long run negative causal relationship of the explanatory variables with the unemployment. The cointegrating coefficients of literacy rate, is negative which indicates the long run causal relationship with unemployment.

Diagnostic test

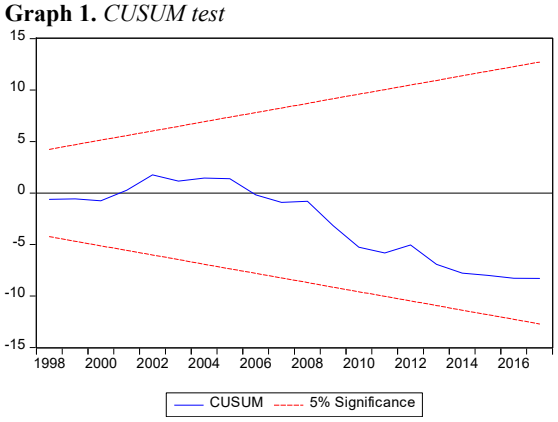
The results of diagnostic are shown in the Table 7. This indicate that model has no serial correlation, homoscedasticity and normal distribution

Table 7. *Diagnostic tests*

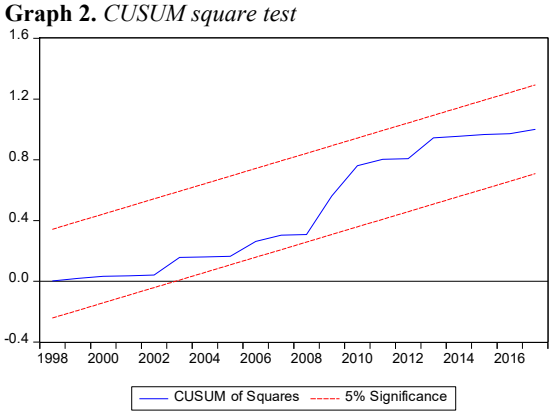
Test	Null hypothesis	Test statistics	Probability
Serial correlation	No serial correlation	0.77	.0.7489
Heteroskedasticity	homoscedasticity	0.71	0.62
Jarque-bera	There is normal distribution	0.78	0.67

Source: Author's calculation.

Graph 1. *CUSUM test*



Graph 2. *CUSUM square test*



Source: Author's calculation.

Graph (1) and (2) tests the CUSUM and CUSUM square test for stability properties. It point out that both test are satisfy the properties because both residuals are lies within the range of 5% level of significance.

6. Conclusion

The main purpose of this study is to examine the relationship between some macroeconomic variables and unemployment in India; specifically, it focuses on the impact of some macroeconomic variables on unemployment for the period 1991-2017.Cointegration test and its associated vector error correction model (VECM) and Granger causality test were used in the analysis. The variables such as unemployment rate (UNEMP), real gross domestic product (RGDP) used as common proxy for economic growth, consumer price index used as proxy for inflation, Gross fixed capital formation, literacy rate and labour force were employed in the investigation. Stationarity test was conducted through the application of the Augmented Dickey - Fuller (ADF) test, and the results indicated that all the variables became stationary after first differencing. Furthermore, the result of the Johansen cointegration test revealed that significant long run relationship exists among UNEMP, GDP, INFL, LF, LR and GFCF. Similarly, VECM shows that the economic unemployment of India is somewhat predictable by the given explanatory variables. In the VECM, intercept β_0 is positive 0.147108 and significant at 1% level indicating overall unemployment's increases proportionately during that period. Finally, the result of the Granger causality test indicated unidirectional relationship between UNEMP and RGDP with causality running from RGDP to UNEMP. From gross domestic product, domestic private investment (GFCF) and labour force significantly causing unemployment as per there probability value. There is bi directional Granger causality between labour force and unemployment Based on these findings, the study therefore recommends that government should as a matter of urgency create more employment opportunities in order to absorb the teeming population of the unemployed work force in the country through modernization of the agricultural sector, bring in modern equipment in the facilities of agriculture to make the sector more attractive to all citizens despite one's qualifications and profession.

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Inequity in health care sector in India: A case study of district level in four Indian states

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Abstract. *Across the nations, national health policies, including that of India, have emphasised a preference for equitable health care facilities. Keeping this emphasis on equity in mind we explored four Indian states using sub-state level (or district level) data. We applied mainly three well established indicators, namely Gini coefficient and Thiel's T and L indices to gauge magnitudes of inequity. We compared our results between two periods for the same state which included one high income and another low income Indian state. Also we compared across four states, namely, Punjab, Karnataka, Madhya Pradesh and West Bengal using the information for latest available year. Our results indicate that government investment in three tier health facilities expansion indeed has resulted in low inequities in terms of health facilities available. However, private health facilities or certain specific public health facilities do not seem to be much equitable particularly at the sub-state level. Our results focus on availability aspects and thus necessarily do not indicate equitable utilisation of health care facilities or health care outcomes at the district levels.*

Keywords: inequity; Indian states; district level; health care sector; Gini coefficient.

JEL Classification: I11; I18; R58

Introduction

Health care inequalities are considered to be unfair. It is presumed that differences in people's health care access and utilization across different population groups are avoidable by proper health policies. Preference for equity is emphasised in most of the health policy documents of different countries. In India, for instance, the National Health Policy 2015 (GOI, 2014)(1) has mentioned that there is a mismatch between the health system ability and delivery of health services to those in greatest need. Being merit public good basic health facilities should be available to all despite differences in socio-economic differences. This emphasis on equity is also notable ever since the National Health Policy of 1983 and further with the National Health Policy of 2002. The major impetus globally for equity came through the World Health Organization (WHO) in 1985 by highlighting differences across different continents (WHO, 1985).(2)

In this paper we deal with inter and intra state dimensions of health care inequities in India. The following section provides brief review of relevant studies carried out in different countries including India. This is followed by a description of our methodology and data bases used. Sections 4 and 5 provide our analysis relating to different dimensions of equity mainly in terms of access and utilization. Conclusions and policy implications are discussed in the last section.

Inequity in healthcare can be considered in terms of three main variables, namely health related outcomes, service use and finance (Roberts, 2004; O'Donnell et al., 2008; Yang, 2013). These variables provide a view to evaluate health system inequity. Various ways in which inequity is focused include age, gender standardized health inequality, socioeconomic variation, etc. Inequity in health use between people with the same healthcare needs has been called as horizontal inequity. For health financing, measures like catastrophic health payment and health payment-induced poverty are used(3). Different methods have been used to quantify inequity. Mostly these have been based on concentration index (CI). These are being widely used by international organizations, government bodies, and academic institutions to measure equity in health and healthcare (Watanabe and Hashimoto, 2012; Wagstaff, 2005; Somkotra and Lagrada, 2008, Allin et al., 2010). Advantage of an approach using CI lies in Concentration Curve, which gives an easy visual of the distribution across income groups pertaining to health related variable. Among studies for countries other than India one could, for instance include Teresa, Andrew and Doorslaer (2009), Allin et al. (2009), Doorslaer, Masseria and Koolman (2006), Leu and Schellhorn (2004), Balsa, Rossi and Triunfo (2011), Winetrobe et al. (2015), Steele et al. (2006), Chao Shu Yao and Michael I. MacEntee (2014), Levy et al. (2013), Naomi (2005), King (2014), Barnett and Barnett (2004) which relate to European, American, Canadian, Australian or New Zealand context. In the context of Asian continent one could mention Shinjo and Aramak (2012), Ryo Watanabe and Hideki Hashimoto (2012) (for Japan), Peltzer et al. (2014) (for China, Ghana, India, Mexico, the Russian Federation, and South Africa). Saito et al. (2016) (for Nepal), Trani and Cecile (2012) (for Afghanistan) Hassanzadeh et al. (2013), Mohammadbeigi et al. (2015), Babaie (2012) (for Iran),Kim, Kwon and Xu (2013) (for China), Wagstaff and van Doorslaer, Lee and Shaw (2014) (for Korea), Kien et al. (2014)(for Vietnam), Leander and García-Gómez (2015)

(for South Africa), Mutangadura et al. (2007) (for selected African countries namely Ethiopia, Kenya, Ghana, Senegal, Zambia, Malawi, Egypt, Morocco and Cameroon), Odaga (2004) (for Uganda), Phiri and Ataguba (2014) (for Zambia), Hyun (2009) (for Philippines), Anwar et al. (2015) (for Bangladesh), Baru et al. (2010), Mondal (2014), Bose and Dutta (2015) and Purohit (2017) (for India), Flato and Zhang (2016), Lam (2014) (for China), Boccolini and Borges de Souza Junior (2016), Lopes et al. (2016), Szwarcwald et al. (2016), Lima-Costa et al. (2016) (for Brazil). Among others these studies have focused on different dimensions including regions, socio-economic criteria, access, utilization, finance and methodological issues.

Our methodology and data base

There are as many as ten measures of inequity which can be used. These include relative Mean Deviation, coefficient of variation, Standard Deviation of Logs, Gini Coefficient, Mehran Measure, Piesch Measure, Kakwani Measure, Theil Entropy Measure and Theil Mean Log Deviation Measure and Erreyger index.(4) From time to time, there are some modifications suggested and applied by researchers to account for income or socio-economic status. However, among these popular indicators remain Lorentz curve and Gini coefficient or its modifications. The major disadvantages of Gini coefficient is its shortcoming that the within group component cannot be neatly added to the between group component. This weakness of Gini coefficient is overcome by the entropy based measures of inequality which are known as Theil's T and L coefficients(5). In this paper, we use two main indicators of inequity which include Gini index and Theil's T and L measures.

The most widely used single measure of inequality is the Gini coefficient. It is based on the Lorenz curve, a cumulative frequency curve that compares the distribution of a specific variable (for example, income) with the uniform distribution that represents equality. To construct the Gini coefficient, graph the cumulative percentage of households (from poor to rich) on the horizontal axis and the cumulative percentage of expenditure (or health expenditure or household income) on the vertical axis. The Lorenz curve is shown in figure 1. The diagonal line represents perfect equality. The Gini coefficient is defined as A / (A + B), where A and B are the areas shown in the figure. If A = 0, the Gini coefficient becomes 0, which means perfect equality, whereas if B = 0, the Gini coefficient becomes 1, which means complete inequality. In this example, the Gini coefficient is about 0.35. If we multiply this number by 100, in which case it would be reported as 35.

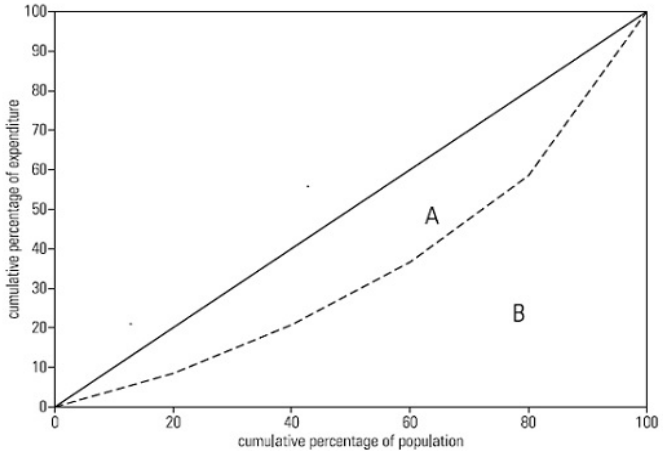
Formally, let xi be a point on the x-axis, and yi a point on the y-axis. Then

$$\text{Gini} = 1-\sum_{i=1}^{N} (x_i-x_{i-1}) (y_i + y_{i-1}) \quad (1)$$

When there are N equal intervals on the x-axis, equation (1) simplifies to

$$\text{Gini} = 1- 1/N \sum_{i=1}^{N} (y_i + y_{i-1}) \quad (2)$$

Figure 1. *Lorentz curve and Gini coefficient*



Source: Haughton and Khandker, 2009.

The Gini coefficient is not entirely satisfactory. Although it does satisfy some of the criteria that makes a good measure of income inequality[6]. The Gini index is not easily decomposable or additive across groups or the total Gini of society is not equal to the sum of the Gini coefficients of its subgroups. In the latter (namely statistical testability) one should be able to test for the significance of changes in the index over time. Partly this problem is overcome by confidence intervals and it can typically be generated using bootstrap techniques.

Generalized Entropy Measures (Theil's T and L measures)

There are a number of measures of inequality that satisfy all six criteria. Among the most widely used are the Theil indexes and the mean log deviation measure. Both belong to the family of generalized entropy (GE) inequality measures. The general formula is given by

$$GE(\alpha) = 1/\alpha(\alpha-1)\left[1/N\sum_{i=1}^{N}(y_i/\bar{y})^{\alpha}-1\right] \quad (3)$$

Here $\bar{y}$ is the mean income per person (or expenditure per capita). The values of GE measures vary between zero and infinity, with zero representing an equal distribution and higher values representing higher levels of inequality. The parameter α in the GE class represents the weight given to distances between incomes at different parts of the income distribution, and can take any real value. For lower values of α, GE is more sensitive to changes in the lower tail of the distribution, and for higher values GE is more sensitive to changes that affect the upper tail. The most common values of α used are 0, 1, and 2. GE (1) is Theil's T index, which may be written

$$GE(1) = 1/N\sum_{i=1}^{N}(y_i/\bar{y})\ln(yi/\bar{y}) \quad (3.1)$$

GE (0), also known as Theil's L, and sometimes referred to as the mean log deviation measure, is given by

$$GE(0) = 1/N\sum_{i=1}^{N}\ln(\bar{y}/yi) \quad (3.2)$$

Data base

We focus on district level inequity for health care availability, utilisation and outcomes for four Indian states namely Madhya Pradesh, West Bengal, Punjab and Karnataka. Based on their per capita average income compared to al India average, both Madhya Pradesh and West Bengal belong to lower income states and other two states belong to higher income states(7). We also compare change in district level inequity between two periods for West Bengal and Punjab. Data have been collected from various government publications. These include District Level Household and Facility Survey (DLHS-4), 2012-13: India. Madhya Pradesh (IIPS 2014), Estimates of State Domestic Product Madhya Pradesh; 2004-2005 to 2012-2013 (RBI, 2017), Annual Health Survey 2012-2013 (GOI, 2014), Karnataka at Glance (Government of Karnataka, 2018), Punjab-At-A-Glance (District Wise), Publication No. 936(Government of Punjab, 2012), Statistical Abstract West Bengal 2015 (Government of West Bengal, 2017) and others.

Results

Madhya Pradesh

Results for four states using district level data are presented in Tables 1-11 (and Figures 1-13). Results for Madhya Pradesh presented in Table 1 depict a range of unequal distribution of different health care facilities. For instance minimum population covered by a sub-centre is 4136 in contrast to 10255 in maximum coverage (Table 1). Likewise difference between minimum and maximum per capita income (PCI) is nearly four times. Similar disparities could be observed in terms of population coverage by PHCs and CHCs. Except for ANMs, for most of other manpower like MHW, medical officer, lady medical officer, AYUSH doctors and Pharmacist, the percentage SHCs having these types of manpower is much higher for maximum value districts relative to their minimum value districts (Table 1, columns 3-10). This observation also holds for facilities like regular electricity and water supply (columns 12-13, Table 1), toilet facilities, labour room availability and usage and sub-centres with govt. buildings (columns 14-17, Table 1). Such differentials in health inputs are also reflected in minimum and maximum IMR (37-85, column 18) in the districts of MP.

Keeping in mind these variations across districts, inequity coefficients, namely, Gini coefficient, Thiel's mean log deviations and Thiel's entropy measure (Thiel's T) are depicted in Figures 1a-2. As presented in Figure 1a, it could be observed that lowest inequity coefficient remains for ANMMP and very high inequity in terms of three inequity coefficients is for AYUSH doctors (AYUSHMP). Likewise in terms of facilities including regular water supply, electricity, availability and use of labour rooms and sub-centres with govt. buildings, the lowest and highest inequity pertains to toilet facilities and labour rooms used respectively.

Table 1. *District level maximum and minimum values relating to health facilities' average population coverage, percentage of health facilities having requisite medical manpower (or a particular facility) and Per Capita Income (PCI) in MP*

MP Total Districts 45	sub-Centre	PHC	CHC	ANM (%)	MHW (%)	Addi-tional ANM (%)	Medical officer (%)	Lady Medical Officer (%)	AYUSH Doctor (%)	Phar-macist (%)	PCI
minimum	4136	13538	47924	83.3	14.3	0	30	0	0	0	12892
maximum	10255	95591	229374	100	85.7	59.1	100	71.4	100	81.8	49327

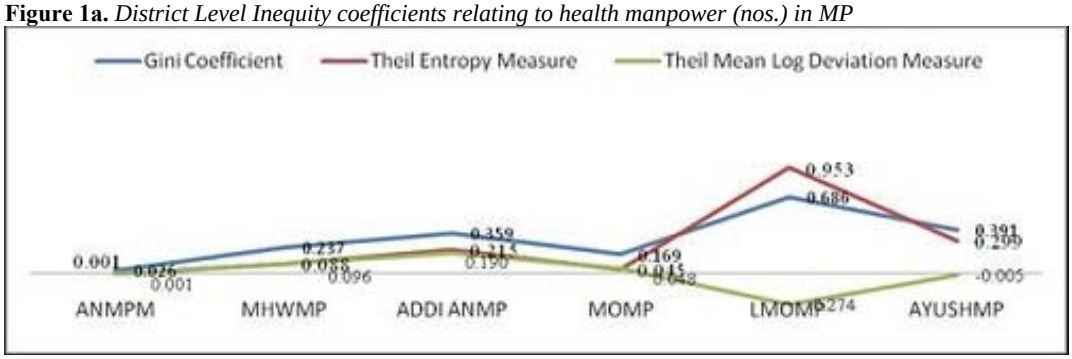
Source: Estimated; PHC = Primary Health Centres, CHC = Community Health Centre, ANM-Auxiliary Nurse Midwife, MHW = Male health Worke, SHC = Sub Health Centre, PCI = Per Capita Income at District level.

Table 1. contd

	Mpregelectr (%)	mpWater (%)	Mptoilet (%)	Mplaborroom (%)	Mplbinuse (%)	Mpscgbuil (%)	total imr mp
minimum	0	24	35.7	0	0	5	37
maximum	50	91.7	100	81.3	100	59	85

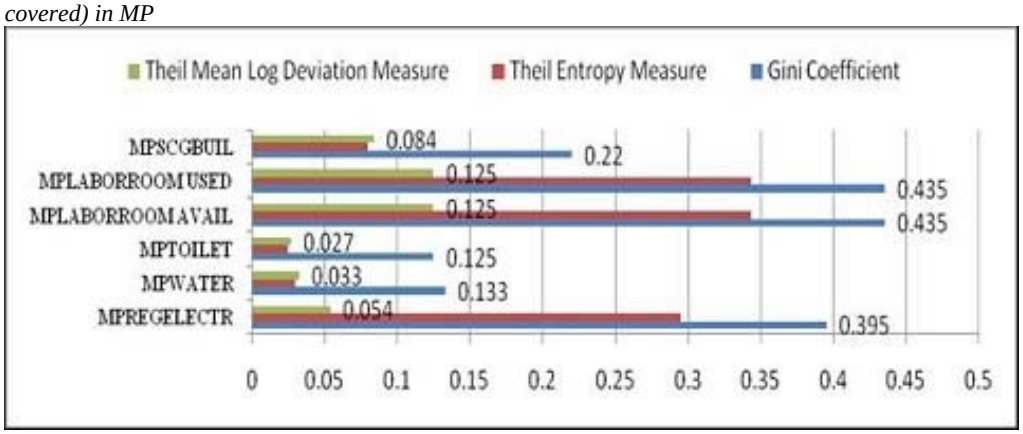
Source: Estimated; Number of sub-centres with regular electricity (mpregelectr), water supply (mpWater), toilet facilities (mptoilet), labour room (mplaborroom), labour room in current use (mplbinuse), sub-centres with govt. buildings (mpscgbuil), imr = infant mortality rates.

Figure 1a. *District Level Inequity coefficients relating to health manpower (nos.) in MP*



Source: Estimated; ANM-Auxiliary Nurse Midwife, MHW = Male health Worker, MOMP = Medical officer, LMOMP = Lady Medical Officer, AYUSHMP = AYUSH Doctor.

Figure 2. *District level inequity coefficients relating to health facilities (in terms of average population covered) in MP*

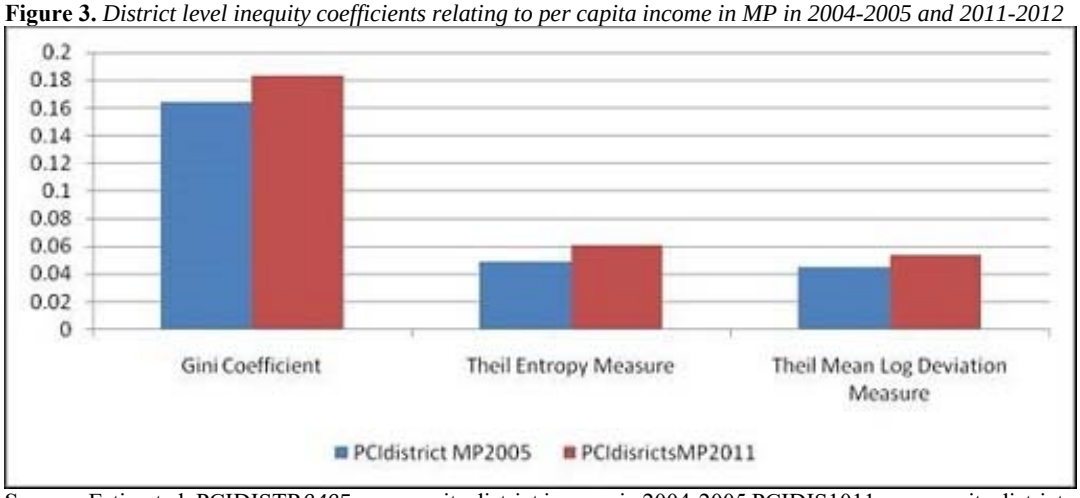


Source: Estimated; Number of sub-centres with regular electricity (MPREGELECTR), water supply (MPWATER), toilet facilities (MPTOILET), labour room (MPLABORROOM), labour room in current use (MPLBINUSE), sub-centres with govt. buildings (MPSCGBUIL).

However, as presented in Figure 3 and Table 2 inequity coefficients at district level per capita income and infant mortality rates for MP seem to be quite low. Thus there does not seem to be any pattern that a low income State has higher inequality. To explore any possible correlation between some selected health care facility variables and per capita income (PCI), we looked into correlations among selected variables and PCI which are depicted in Table 3.

The Pearson correlation between PCI and CHC population coverage is positive and significant at 5 percent level (Table 3). Also it is significant between percentages of Primary health centres having medical officer and PCI (Table 3). Thus possibly the better off areas might have attracted more medical manpower's posting and presence. Yet health system of this low income states has been largely guided by requirements of the norm to be satisfied under three tier health systems existing in Indian set up.

Figure 3. *District level inequity coefficients relating to per capita income in MP in 2004-2005 and 2011-2012*



Source: Estimated; PCIDISTR*0405* = per capita district income in 2004-2005 PCIDIS1011 = per capita district income in 2010-2011.

Table 2. *District level inequity coefficients relating to total infant mortality rate for MP*

inequality measures of totalimrmp	
Gini coefficient	0.076
Theil entropy measure	0.010
Theil mean log deviation measure	0.010

Source: Estimated; totalimrmp = total infant mortality rate district level for MP.

Table 3. *Pearson correlation for selected variables: Madhya Pradesh*

Per capita income	1				
chc pop covered	0.3746*	1			
Medical officer	0.3439*	0.015	1		
Lady medical officer	-0.2179	0.073	0.1918	1	
pharmacist	-0.0766	0.1234	-0.0239	-0.0527	1

Source: Estimated. * significant at 5% level.

Punjab

The maximum and minimum values for Punjab health care facilities are presented in Table 4 below. In case of Punjab the available information pertains to average population

coverage in hospitals (Hosp), Primary health centres (Phc), dispensaries (Dis) and community health centres (Chc), Ayurvedic, Unani and Homeopathic institutions (Aurv, Una and Homeo). Unlike other states the government publications provide us comparable data for two years namely 2001 and 2011. The comparison between two years facilitates inequity contrast after a decade. Indeed as seen in Table 4 below, maximum and minimum values gap has rather reduced for almost all the health facilities depicted here. This suggests that in some districts these health care facilities were not available in 2001(the minimum value being zero) and the same have been established by the year 2011. Also as presented in Table 5, we can observe that per capita income gap between maximum and minimum which was 1.86 times in 2004-2005 has reduced to 1.68 times in 2010-2011.

Table 4. *District level maximum and minimum values relating to health facilities (in terms of average population covered) in Punjab for 2001 and 2011*

punjab health facility (20 districts)	Hosp 2001	Hosp 2011	Phc 2001	Phc 2011	Dis 2001	Dis 2011	Chc 2001	Chc 2011
minimum	0	154502	0	36139	0	11815	0	124452
maximum	223714	992289	91904	105693	22954	26870	303283	622723

...contd

health facility	Aurv 2001	Aurv 2011	Una 2001	Una 2011	Homeo 2001	Homeo 2011
minimum	0	25598	0	0	0	98615
maximum	127836	141756	1183295	1388859	894854	992289

Source: Estimated; Hosp2001 and Hosp2011 = Hospitals in 2001 and 2011, Phc2001 and Phc2011= Primary Health Centres in 2001 and 2011, Dis2001 and Dis2011 = Government dispensaries in 2001 and 2011, Chc2001 and Chc2011 = Community health centres in 2001 and 2011, Aurv2001 and Aurv2011 = Ayurvedic Institutions in 2001 and 2011, Una2001 and Una2011 = Unani Institutions in 2001 and 2011 Homeo2001 and Homeo2011 = Homeopathic Institutions in 2001 and 2011.

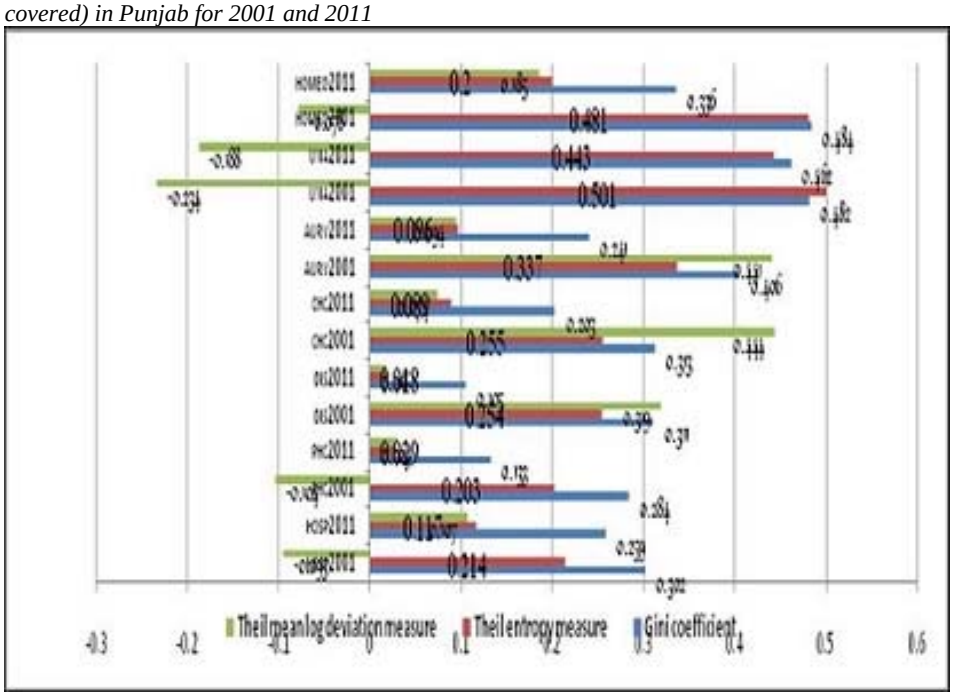
Table 5. *District level maximum and minimum values relating to per capita income in Punjab in 2004-2005 and 2010-2011*

	PCIpun0405distr	PCIpun 1011disr
minimum	26790	56429
maximum	49976	94798

Source: Estimated; Pcipun0405distr and Pcipun1011disr = per capita district income in Punjab in 2004-2005 and 2010-2011.

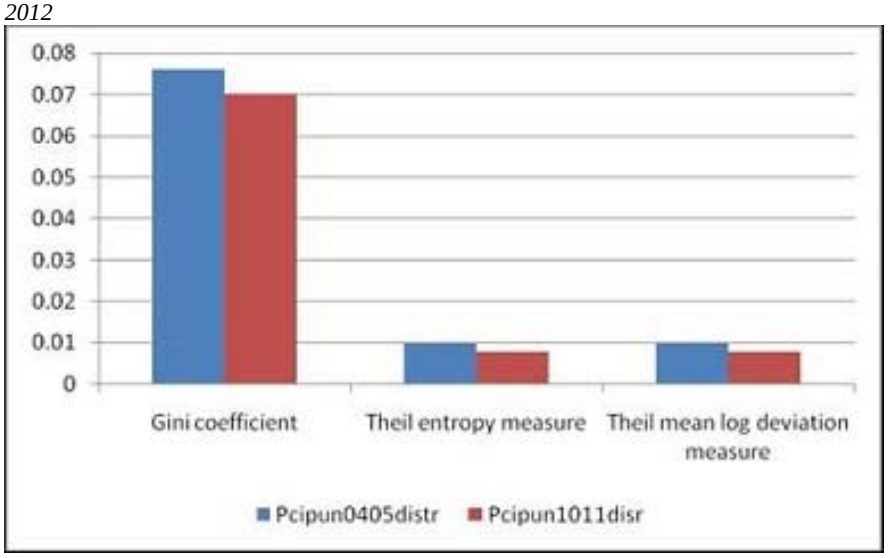
Further as depicted in Figure 4, the inequity coefficients pertaining to hospitals, PHCs, Dispensaries, CHCs, ayurvedic, unani and homeopathic institutions have reduced in magnitude for all these facilities in Punjab between 2001 to 2011. For instance, Gini coefficient which was highest in 2001 for homeopathic institutions (.484) and Thiel's entropy measure which was highest for unani institutions (.501) came down to .336 and .443 respectively in 2011. Also by and large the patterns of all the three inequity coefficients remain in tune with each other. However among homeopathic and unani institutions the highest was different for Gini in 2011 which was unani institutions and it was unani institutions for Thiels entropy measure in both the periods. Also as presented in Figure 5, the inequity across per capita incomes in the districts of Punjab has come down and thus a similarity between downward movements of inequity values relating to health facilities and per capita incomes is observed for Punjab.

Figure 4. *District level inequity coefficients relating to health facilities (in terms of average population covered) in Punjab for 2001 and 2011*



Source: Estimated; Hosp2001 and Hosp2011 = Hospitals in 2001 and 2011, Phc2001 and Phc2011 = Primary Health Centres in 2001 and 2011, Dis2001 and Dis2011 = Government dispensaries in 2001 and 2011, Chc2001 and Chc2011 = Community health centres in 2001 and 2011, Aurv2001 and Aurv2011 = Ayurvedic Institutions in 2001 and 2011, Una2001 and Una2011 = Unani Institutions in 2001 and 2011 Homeo2001 and Homeo2011 = Homeopathic Institutions in 2001 and 2011.

Figure 5. *District level inequity coefficients relating to per capita income in Punjab in 2004-2005 and 2011-2012*



Source: Estimated; Pcipun0405distr and Pcipun1011disr = per capita district income in Punjab in 2004-2005 and 2010-2011.

West Bengal

The results for another low income state namely West Bengal are presented below. As depicted in Table 6, there is one district (which is largely urban and it is the capital Kolkata) which is not having any sub-centre and sub-centre beds in both the years and thus the minimum population coverage is zero in these years. It should be noted that more population coverage actually denotes that a health facility is catering in a more populated district and thus in year 2014 due to increase in number of health facilities we see a decline in total population coverage for all the health facilities depicted in Table 7. Also the difference in terms of gap between maximum and minimum which was highest for private beds (40.62 times in 2011) and the lowest (2.329 times in 2011) for total health units has not altered in 2014 thus indicating probably no change in inequity between the two years. This pattern of no change is in contrast to Punjab where a decline was indicated. However we also underline that the gap between contrasting years is only three years in West Bengal and in case of Punjab it is 7 years. Further the figures for minimum and maximum for per capita disposable income (in 2004-2005 and 2011-2012) and the population served per bed (in 2016) are presented in Table 8 which suggest that the gap between minimum and maximum income levels (less than three times in 2004-2005) increased in 2011-2012 to more than three times. Also as shown in Table 8, the population served per bed in 2016 in terms of maximum and minimum populations was nearly 18 times.

The inequity coefficients are presented for different health facilities variables and per capita incomes for the similar periods as discussed above. These indicate actually inequity increase for West Bengal (figures 6 and 7). For instance Gini coefficient value which was the lowest for total health units (.122) in the year 2011 went up to .141 (in 2014). Likewise the maximum Gini value which was .412 for private hospitals in 2011 increased to .438 (in 2014) (figure 6). Even the per capita income has also shown an increase in inequality from 2004 to 2011-12 with the Gini values as being .135 and .165 in the respective years (Figure 7). Keeping in view the highest level of inequity pertaining to private hospitals and hospital beds we also looked into Pearsons correlation coefficients across Per capita incomes and different health facilities. Presented in Table 9 below these indicated a very high positive and significant correlations between both the government and private hospitals (as well as beds in them) and Per capita incomes. Probably part of increase in inequality in the latter period could also be attributed to these high correlations.

Table 6. *District level maximum and minimum values relating to health facilities (in terms of average population covered) in West Bengal for 2011*

per health facility population covered WB 2011									
	wbg bhos	wbgh osbed	wbpv thos	wbpvth osbed	wbhcent	wbhecentbed	wbscent	wbtothltunit	wbtothltbed
minimum	87716	275	12259	395	0	0	0	4652	162
maximum	849040	4227	243997	16047	136255	9761	13589	10837	2450

Source: Estimated; wbgbhos = Government hospitals in WB, wbghosbed = beds in Government hospitals in WB, wbpvthos = private hospitals in WB, wbpvthosbed = beds in private hospitals in WB, wbhcen = health centres in WB, wbhecentbed = beds in health centres in WB, wbscent = sub-centres in WB, wbtothltunit = total health units in WB, wbtothltbed = beds in total health units in WB.

Table 7. *District level maximum and minimum values relating to health facilities (in terms of average population covered) in West Bengal for 2014*

per health facility population covered WB 2014								
wbgbhos	wbghosbed	wbpvthos	wbpvthosbed	wbhcent	wbhecentbed	wbscent	wbtothltunit	wbto thltbed
87716	268	12259	395	0	0	0	4652	160
750212	4168	243997	16047	136255	9548	13589	10864	2422

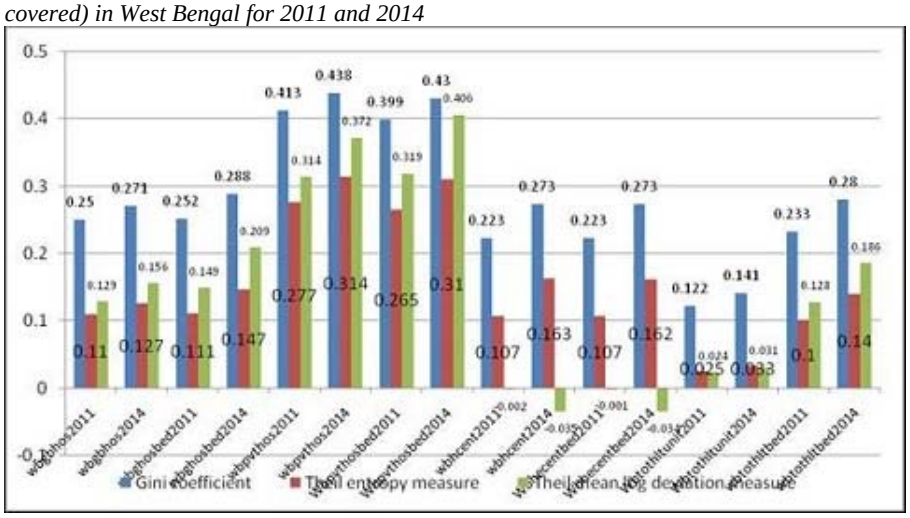
Source: Estimated.

Table 8. *District level maximum and minimum values relating to per capita income in 2004-2005 and 2011-2012 and population served per bed in West Bengal*

	Pcidiswb 0405	Pcidis Wb1112	Popserperbed Totwb 2016
minimum	13684.03	17465.64	138
maximum	38393.62	57907.11	2477

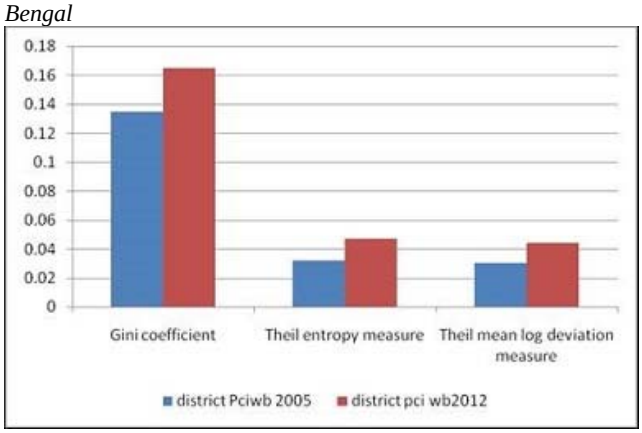
Source: Estimated.

Figure 6. *District level inequity coefficients relating to health facilities (in terms of average population covered) in West Bengal for 2011 and 2014*



Source: Estimated; wbgbhos = Government hospitals in WB, wbghosbed = beds in Government hospitals in WB, wbpvthos = private hospitals in WB, wbpvthosbed = beds in private hospitals in WB, wbhcen = health centres in WB, wbhecentbed = beds in health centres in WB, wbscent = sub-centres in WB, wbtothltunit = total health units in WB, wbtothltbed = beds in total health units in WB, suffix 2011 and 2014 refers to values of these variables in the respective years.

Figure 7. *District level inequity coefficients relating to per capita income in 2004-2005 and 2011-2012 in West Bengal*



Source: Estimated.

Table 9. *Pearson correlation for selected variables: West Bengal*

Pcidis 11-12	1					
wbgbhos	0.7851*	1				
wbghosbed	0.7780*	0.8519*	1			
wbpvthos	0.8702*	0.9085*	0.8054*	1		
wbpvthosbed	0.8556*	0.9004*	0.9569*	0.8961*	1	
wbtothltbed	0.8199*	0.8933*	0.9903*	0.8687*	0.9828*	1

Source: Estimated.

Karnataka

For Karnataka, the detailed information for 28 health related variables are presented below. Among others, these include the number of units and number of beds in various categories of hospitals covering: taluk, district, health and family welfare and teaching hospitals, PHCs, CHCs, government hospitals, private hospitals, nursing homes, allopathic, and ISM hospitals. Also details include variables relating to numbers of govt. doctors and other facilities like blood banks and medical shops. Table 10 depicts the maximum and minimum values for these variables. We can observe from it that gap between maximum and minimum is lowest (2.208 times) for total health institutions and beds therein. The largest gap between minimum and maximum (22.319 times) pertains to beds in Taluka hospitals. Also as given in the same table, the gap between maximum and minimum for total number of infant deaths is nearly 80 times.

Table 10. *District level maximum and minimum values relating to health facilities (in terms of average population covered) in Karnataka for 2016*

Karnataka Total Districts 30	taluk hospno	taluk beds	Distrhospno	Dhosp bed	hfwhosp	Hfw bed	Teach hospi	Tea hospi bed	Total hosp	Tot hosp bed
minimum	143717	1437	0	0	0	0	0	0	50411	377
maximum	3207184	32072	2678980	12551	3001127	60023	4779661	6459	356354	2446

Source: Estimated; talukhospno = number of TalukaHq Hospitals, talukbeds = number of beds inTalukaHq Hospitals, Distrhospno = number of District Hospitals, Dhospbed = number of District Hospitals beds, hfwhosp = Other Hospitals under HFW, Hfwbed = beds in Other Hospitals under HFW, Teachhospi = Number of teaching hospitals, Teahospibed = Number of beds in teaching hospitals, chc = Number of community health centres, Chcbed = Number of beds in community health centres, Totalhosp = total number of hospitals, Tothospbed = total number of beds in all hospitals.

Table 10. contd
population covered by health facility

Karnataka Total Districts 30	Govtho spino	Nurs Homno	Total	Govt Doctors	beds Govt Hospi	Med Shops	Blood Banks	Allo pathy hospi	allo beds	ism hosp	ism Beds
minimum	10635	11262	7967	6161	323	959	152723	11156	329	184840	10037
maximum	68238	115827	17594	29696	1553	5130	1703300	73447	1581	1044825	165154

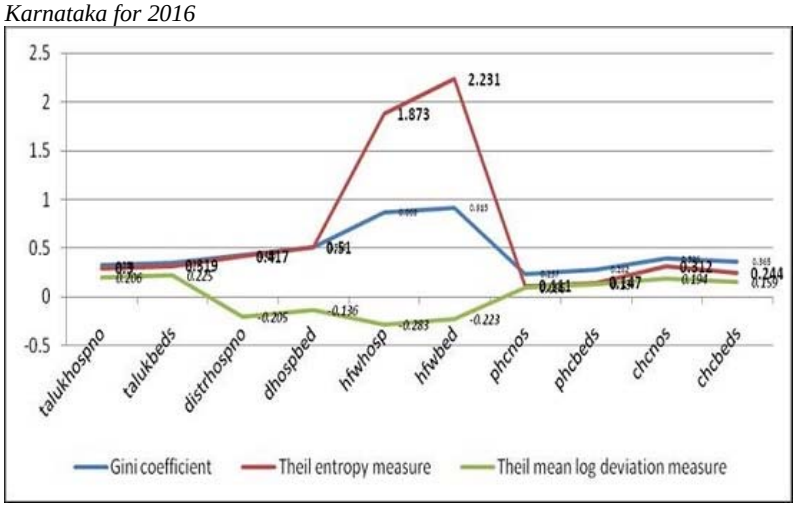
Source: Estimated.
Govthospino = total number of government hospitals, NursHomno = total number of nursing homes, Total = total number of health institutions, Govt Doctors = total number of Govt Doctors, beds Govt Hospi = total number of beds in Govt Hospitals, Med Shops = total number of Medical Shops, Blood Banks = total number of Blood Bank, Allopathy hospi = total number of Allopathy hospitals, allobeds = total number of beds in Allopathy hospitals, ismhosp = total number of Indian system of medicines(ISM) hospitals, ismBeds = total number of beds in Indian system of medicines(ISM) hospitals.

Table 10. contd
population covered by health facility

Karnataka Total Districts 30	pvthosp	phcNos.	phcBeds	chcNos.	chcBeds	pcidistrkantka0910	Infantdeaths karntka
minimum	11262	12644	1704	0	0	25078	16
maximum	115827	92515	15930	1924310	43734	140369	1289

Source: Estimated.
Pvthosp = total number of private hospitals, phcNos. = total number of primary health centres, phcBeds = total number of beds in primary health centres, chcNos. = total number of community health centres, chcBeds = total number of beds in community health centres, pcidistrkantka0910 = per capita district income in Karnataka in 2009-10, Infantdeaths karntka = number of infant deaths in districts of Karnataka in 2011.

Figure 8. *District Level Inequity values relating to Health Facilities (taluk, district, health and family welfare hospitals, primary and community health centres and beds (in terms of Average Population Covered) in Karnataka for 2016*

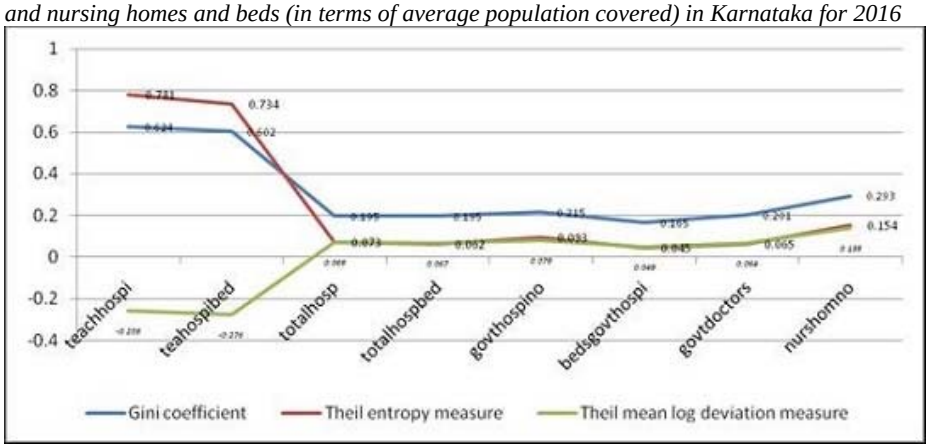


Source: Estimated; talukhospno = number of TalukaHq Hospitals, talukbeds = number of beds inTalukaHq Hospitals, Distrhospno = number of District Hospitals, Dhospbed = number of District Hospitals beds, hfwhosp = Other Hospitals under HFW, Hfwbed = beds in Other Hospitals under HFW, chc = Number of community health centres, Chcbed = Number of beds in community health centres.

As presented in Figure 8, the highest values of Gini (.915) is for hfw beds and lowest (.237) is for PHC numbers. Other inequity coefficients namely Thiel's entropy and mean log deviations follow nearly the same order of values as that of Gini. This indicates that most

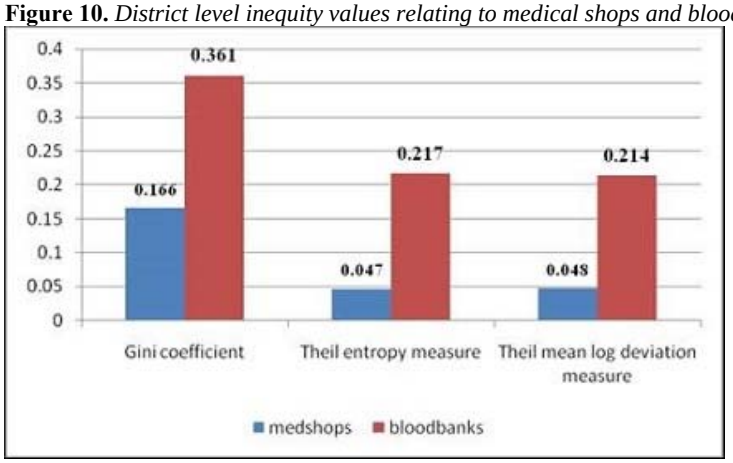
other government established health facilities except HFW hospitals are more equitably distributed across the districts in Karnataka. Likewise the highest inequity as observed from Gini coefficients in Figure 9 depicts more inequitable distribution of teaching hospitals since the coefficient for this category of health facilities (.624) is the highest. The lowest inequity in this group (.165) (as presented in Figure 9) is for beds in government hospitals which denotes a better health facility planning in the state. However, if we compare other kind of facilities like blood banks or medical shops, we find that the absolute values are not high (Figure 10) yet relative to medical shops; blood banks are less equitably distributed across the districts of the state. Further as presented in Figure 11, broadly two systems of medicines, namely allopathic and Indian systems of medicines, the latter is more inequitably distributed both in terms of numbers of hospitals (Gini .266) and beds (Gini .338). Even the inequity in numbers of private hospitals (.293) is also higher than in numbers of ISM hospitals (Gini .266). A similar lower value (.201) for Gini coefficient is observed for distribution of government doctors in the districts (Figure 12). Thus keeping in view in general lower values of government established institutions, we looked into inequity pertaining to Per capita income (for 2009-10) and a variable which was available from the published data as a broad indicator of health system output namely infant mortality at district level. These are presented in Figure 13. Although the per capita income inequity is very low but infant deaths inequity seemed to quite high with Gini and other inequity coefficients nearing towards 0.50 magnitudes (Figure 13). Further with a presumption that per capita income may have a significant correlation mostly with private health facilities like nursing homes and private hospitals, we looked into Pearson's correlation coefficients among per capita incomes, public and private health facilities (Table 11). However, as observed from Table 11, this correlation with per capita incomes was high and significant for public as well as private health facilities probably indicating an overall influence of the economic development of the state on health sector.

Figure 9. *District level inequity values relating to health facilities (teaching, govt. and total hospitals, and beds and nursing homes and beds (in terms of average population covered) in Karnataka for 2016*



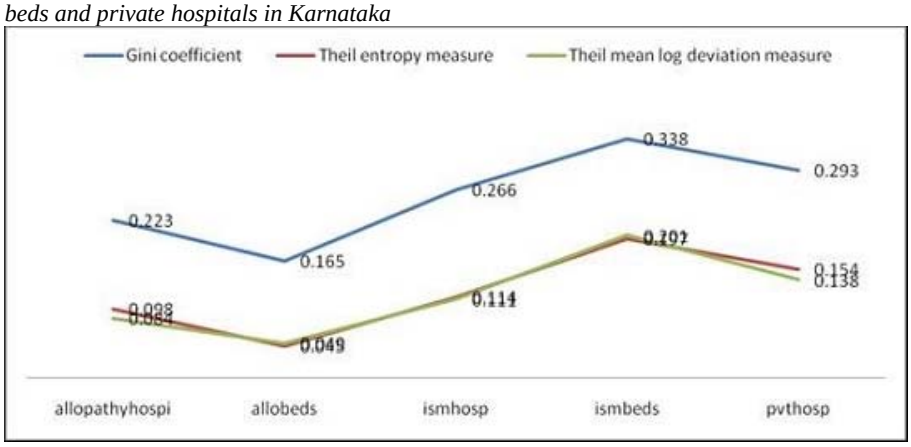
Source: Estimated. Teachhospi = Number of teaching hospitals, Teahospibed = Number of beds in teaching hospital, Totalhosp = total number of hospitals, Tothospbed = total number of beds in all hospitals
Govthospino = total number of government hospitals, bedsGovt Hospi = total number of beds in Govt Hospitals GovtDoctors = total number of Govt. Doctors, beds, NursHomno = total number of nursing homes.

Figure 10. *District level inequity values relating to medical shops and blood banks*



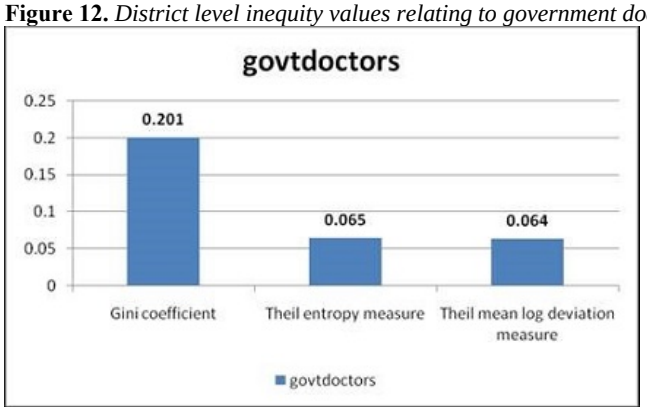
Source: Estimated.

Figure 11. *District Level Inequity values relating to Allopathic, Indian system of medicine (ISM) hospitals and beds and private hospitals in Karnataka*



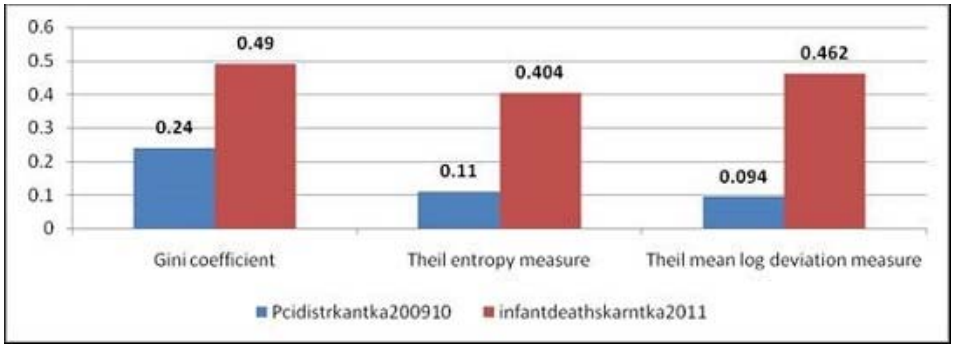
Source: Estimated. Allopathy hospi = total number of Allopathy hospitals, allobeds = total number of beds in Allopathy hospitals, ismhosp = total number of Indian system of medicines(ISM) hospitals, ismBeds = total number of beds in Indian system of medicines(ISM) hospitals, pvthosp = total number of private hospitals.

Figure 12. *District level inequity values relating to government doctors in Karnataka*



Source: Estimated.

Figure 13. *District level inequity values relating to district per capita income (2010) and infant deaths (2011) in Karnataka*



Source: Estimated.

Table 11. *Pearson correlation for selected variables: Karnataka*

	pcidist~0910	teach hospi	teahos pibed	tothospbed	nurshomno	pvthosp	medshops	bedsgov thospi
Pcidist 2009-2010	1							
teachhospi	0.7145*	1						
teahospibed	0.7060*	0.9818*	1					
tothospbed	0.6990*	0.9387*	0.9496*	1				
nurshomno	0.6412*	0.8146*	0.8252*	0.8678*	1			
pvthosp	0.6412*	0.8146*	0.8252*	0.8678*	1.0000*	1		
medshops	0.7272*	0.9471*	0.9249*	0.9337*	0.9136*	0.9136*	1	
bedsgovthospi	0.6462*	0.9084*	0.9271*	0.9878*	0.8428*	0.8428*	0.9088*	1

Source: Estimated.

Conclusions

Our results for inequity at district levels relating to health system variables, per capita incomes and a proxy for health system output covering two low income and two high income Indian states indicated that: i) it is not necessary that a low income state or high income state may have high intra state disparity either in health care facilities, health care output and per capita incomes; ii) comparing two periods for intra state inequity for a high income state like

Punjab and low income state like West Bengal, we observed that in the high income state there is generally a decline in inequity. By contrast in low income state, between two periods with a shorter gap of three years, in general for health system variables the inequity seemed to be on rise; iii) despite being a high income state (like Karnataka) with low magnitudes of inequity for health system variables (in general) and per capita incomes, due to some other reasons a broad health system output indicator, infant deaths, could show a large magnitude of inequity; iv) the results across all the four states covered by us indicate that overall three tiers of health facilities expansion by the central and state governments in India has led in general to more equitable public health facilities, yet private health facilities are less equitable and per capita incomes at district levels seemed to have some influence for creating demand and thus establishment of private health facilities within the state; v) our results are more indicative rather than conclusive since we have restricted to correlations and not explored causation through more elaborate models.

Notes

(1) Government of India (2014), National Health Policy 2015, Ministry of Health and Family Welfare, December, 2014.

(2) *Targets for health for all*. Copenhagen, WHO Regional Office for Europe, 1985 (European Health for All Series No. 1). The extent of differentials in health in European nations including UK, France, Spain and Hungary in terms of mortality across income and occupation groups, employed vs. unemployed, rural-urban areas, gender, type of locality, disease specific incidences and disability has been nicely highlighted by a WHO document in 1985 (WHO, 1985).

(3) For a detailed review of literature, see Purohit (2017).

(4) See for instance, Haughton, Jonathan; Khandker, Shahidur R. 2009. Handbook on poverty and inequality. Washington, DC: World Bank. http://documents.worldbank.org/curated/en/488081468157174849/ Handbook-on-poverty-and-inequality
Alicja Krol and Judy Maan Miedema (2009), Measuring Income Inequality: an Exploratory Review, Document #: 451158 Region of Waterloo Public Health Health Determinants, Planning and Evaluation Division June. Yang Wei (2013), An analysis of inequities and inefficiencies in health and healthcare in China, thesis submitted to the Department of Social Policy of the London School of Economics for the degree of Doctor of Philosophy London.

(5) Some measures have focus on welfare and income orientation these include Atkinson's index, Mehran measure, Piesch measure and Kakwani measure.

(6) For instance it satisfies mean independence (If all incomes were doubled, the measure would not change), Population size independence (If the population were to change, the measure of inequality should not change, all else equal), Symmetry (If any two people swap incomes, there should be no change in the measure of inequality), Pigou-Dalton Transfer sensitivity (Under this criterion, the transfer of income from rich to poor reduces measured inequality). However, it does not satisfy two other criteria including decomposability and statistical testability. In the former (namely decomposability) inequality may be broken down by population groups or income sources or in other dimensions.

(7) See, Annexure Table A1.

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Annexure 1

Table A1. *Per capita incomes of Indian states*

S. No.	State/*Union territory*	GRDP per capita (nominal)	Data-year
1	*Andaman and Nicobar Islands*	₹121,954 (US$1,800)	2014–15
2	Andhra Pradesh	₹142,054 (US$2,100)	2017–18
3	Arunachal Pradesh	₹113,645 (US$1,700)	2015–16
4	Assam	₹60,952 (US$910)	2015–16
5	Bihar	₹34,168 (US$510)	2015–16
6	*Chandigarh*	₹242,386 (US$3,600)	2015–16
7	Chhattisgarh	₹91,772 (US$1,400)	2016–17
8	*Delhi*	₹303,073 (US$4,500)	2016–17
9	Goa	₹270,150 (US$4,000)	2015–16
10	Gujarat	₹138,023 (US$2,100)	2015–16
11	Haryana	₹180,174 (US$2,700)	2016–17
12	Himachal Pradesh	₹158,462 (US$2,400)	2017–18
13	Jammu and Kashmir	₹72,958 (US$1,100)	2015–16
14	Jharkhand	₹62,816 (US$940)	2015–16
15	Karnataka	₹146,416 (US$2,200)	2015–16
16	Kerala	₹155,516 (US$2,300)	2015–16
17	Madhya Pradesh	₹72,599 (US$1,100)	2016–17
18	Maharashtra	₹134,081 (US$2,000)	2014–15
19	Manipur	₹52,436 (US$780)	2014–15
20	Meghalaya	₹79,332 (US$1,200)	2016–17
21	Mizoram	₹85,659 (US$1,300)	2014–15
22	Nagaland	₹78,526 (US$1,200)	2014–15
23	Odisha	₹75,223 (US$1,100)	2016–17
24	*Puducherry*	₹190,384 (US$2,800)	2016–17
25	Punjab	₹114,561 (US$1,700)	2014–15
26	Rajasthan	₹76,881 (US$1,100)	2014–15
27	Sikkim	₹227,465 (US$3,400)	2015–16
28	Tamil Nadu	₹157,116 (US$2,300)	2016–17
29	Telangana	₹175,534 (US$2,600)	2017–18
30	Tripura	₹71,666 (US$1,100)	2014–15
31	Uttar Pradesh	₹48,520 (US$720)	2015–16
32	Uttarakhand	₹151,219 (US$2,300)	2015–16
33	West Bengal	₹78,903 (US$1,200)	2014–15
	India	₹112,764 (US$1,700)	2017–18

Source: Reserve Bank of India (2017); State Wise Data, *rbi.org.in*, New Delhi, pp. 29-33.

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Performance in public administration: Doing outside the box under the rule of procedures

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Abstract. *Under the economic and technological progress, innovation represents a vector of national development through excellence, competition and accountability. Moreover, new information, knowledge, and regulation are bringing valuable advantages, thus contributing through its results to the general performance level in both organizations and society. Innovation is becoming therefore increasingly important for achieving the desired levels of flexibility, durability, performance and strength.*
The present paper aims to present new ideas regarding the role of innovation in society and organizations, as well as how to harmonize innovative processes with rules and procedures which already exist in organizations. Also, the mechanisms in which innovation can boost performance are presented. Last but not least, there is a strong link between innovation and organizational risk, which is presented here.
The conclusions reached are oriented towards explaining the place of innovation within organizations as well as in society.

Keywords: innovation; sustainable economic development; risk of innovation; performance in public administration.

JEL Classification: O2, O3, O38.

1. Introduction

Efficiency and performance have many facets, which all converge at management levels and which rely on innovations and innovative processes in order to be able to fully contribute to the sustainable development of organizations (Dumitrescu, 2012: 11-24). Hence, public administration is dependent in equal manners as the private sector on innovation for serving society and building a modern state. In this regard, innovation has several properties which define its strategic role in the public sector (Dumitrescu and Dumitrescu Peculea, 2014: 84-87):

- Innovation is both a strength and an opportunity – highly innovative organizations serve society at their best and have the ability to adapt to changes in the environment (Rainey, 1999).
- Innovation is strong player in society – societies tend to follow institutions and organizations which show high levels of innovation. Societies are currently benchmarked according to the levels of innovation that they generate (Pollitt and Bouckaert, 2011).
- Innovation weakens rigid hierarchies – innovation needs short and efficient communication channels (Matei and Savulescu, 2014) between all levels of hierarchy. A rigid hierarchy is in this regard inefficient since it is based on long communication channels, bureaucracy and centralized decision processes.
- Innovation guarantees access to financial resources – innovative organizations and societies are strong and durable. Thus they present higher guarantees for external financing than those who do not innovate.
- Innovation means leadership – organizations that innovate are trendsetters and innovative societies have higher levels of welfare and development.

It should be clear that thinking outside the box often leads to new systems that are better than previous ones (Clapton et al., 2008; Eisner, 2011). The light bulb, airplane, transistor, microchips and digital technology, harvesting nuclear power are all good examples of inventions and innovations, which have led to better systems. More aspects regarding this context can be seen in the table below.

Table 1. *Ways to approach different organization issues from inside and outside the box*

Issue	Thinking inside the box	Thinking outside the box
Integration of all stovepipes	100% of all systems must be integrated	Integrate what is cost-effective to integrate
System optimization	Optimizing subsystem choices will optimize the whole system	May not work, there is no guarantee
Measurements	Measure as much as you ca think of	Measure a minimum set that works and tells the “whole story”
Getting back on schedule	Add more people to the project	Adding people is more likely to worsen the situation
Requirements change and volatility	Requirements are to be taken ass fixed and inviolate	Requirements can, at times, be variables
Reserves on a project	All levels of management must have dollar reserves	Project manager needs enough money to get the job done
Customer/citizen negotiation	Promise whatever the customer/citizen appears to want	Promise only that what you know you can fulfill
Dealing with customers/ citizens	The customer/citizen is always right	Customers and/or citizens can be wrong

Issue	Thinking inside the box	Thinking outside the box
Overall approach	Do it right the first time	Provide continuous improvement and iteration
Employee trust	Employees cannot be trusted to know how the organization is really doing	Have the obligation to tell the truth and focus on the organization's well being
Work trust strategy	Never do work unless you can profit from it	Invest in key areas for the future health of the organization
Processes, products and services	Get the process right and the products and services will always be right	The right process still doesn't guarantee the right product or service

Source: Adaptation of Eisner (2011).

Internal standardization processes which take place in organizations are meant to ensure the constant improvement of staff and activities and are based on the creativity of the involved personnel. Public administration is dependent just like private organizations on process optimization and innovation (Pollitt, 2010). Innovation cannot be conceived without creative processes and the willingness to accept accountability and needs to be treated specifically, especially in the conditions in which it is allowed (Roman and Roman, 2012).

2. Innovating under the rule of procedures

As "social groups and communities", we need to obey the rules of the organisms with which we have contact (organizations, people, and states). However, not all rules are good, and there are always ways to improve them (even the good ones become obsolete with time). That is why there actually is a demand for people who have the ability to recognize flaws and their potential for improvement and are also able to act upon them.

What is the link between rules and procedures? Are they one and the same thing? While the general misconception that they are actually exists, they are not one and the same thing. They actually are terms that complement themselves. While rules usually are something like the Ten Commandments, in the sense that they tell us which actions are not admissible (for example, stealing is a faux pas), they are too general and lack specificity in determining which behaviors actually are infringements to our set rules and which are not. For example, is it admissible for an employee to accept a voluntary small gift from a person for who he has already performed a required and paid service? Studies reveal that different organizations will have different approaches to the same matter. While some will allow the employee to accept the small gift, as long as it does not exceed a certain value, others will deny their employees such behaviors. So while some rules are logical and common sense and very easy to understand and follow, other such as rules regarding ethics and morality are subject to interpretation. There are a series of questions arising from this:

- When is an action or a behavior considered to be infringing?
- How can such a behavior or action be avoided?
- How can different persons protect themselves against such actions or behaviors?
- How to act when such an action or behavior is witnessed?

This is where procedures come in handy. Procedures are addendums to rules, and are meant to exactly define the framework in which behaviors and actions are considered as being

compliant to rules. This is why most companies rely on procedures to guide the actions of their employees. Organizations will not allow their employees decide which action is compliant with the company policy, or the rules that it enforces, but will tell them exactly how to act in almost any given situation.

So how do we solve the apparent paradox of innovating under the rule of procedures? Innovation and innovative behavior are usually at the border between these two areas. When acting innovative one must walk the fine line between compliance and infringement to accepted rules, especially when said innovative behaviors may have an effect on these very rules.

If we take a look on how children were educated at the beginning of the 20th century and how they are educated now, the leap is remarkably huge. And, even though it were psychologists who started this transformation, it came down to each parent to find ways to efficiently communicate with their children and teach them how society works, and how they can unfold their full potential and still function within the boundaries set by society. So even at the level of the family, there is a huge need for innovation.

As said before, here is a huge demand for innovation on one side, and there are rules and procedures on the other; and while it seems to be a contradiction in terms here, it actually isn't. In fact it's just the opposite. Real innovation must obey rules, in order to be effective. Let's say, an innovative idea has emerged in an organization. There are the proper channels to be followed, in order to communicate with the right people to make the idea available to the decision makers in the organization (Finnish Ministry of Finance, 2006). Organizations that are oriented towards innovation will make it easy for their employees to turn good innovative ideas into reality by setting up a set of rules, which will help harness the best of these proposals. In the same time, the capacity of innovation has essential determinants in the external environment of any organization, especially for public administration (Matei and Savulescu, 2014).

From the opposite perspective, innovation without rules is chaos. It's just like ballet without music – mere jumping around on a stage, no matter how graceful these dancers are. Just like music gives ballet harmony and beauty, rules give innovation direction and meaningfulness. It is to no avail for an organization to develop a new product or (public) service, if sales don't know how to sell it, or do not fully understand its purpose, its use or its potential. It is of no use to anybody introducing a new technology if those who this new technology targets do not understand it or cannot use it.

There are several reasons, why innovation must go through the proper channels of decision:

- Information must be available to the whole organization – innovation is a collective effort of the whole organization and only so will the idea be turned into a success.
- Innovation demands for an intensive organization-wide coordination, which employees are usually not able to carry out the tasks associated to it.
- Innovation is a complex venue, requiring specific activities, which cannot be effectively and efficiently carried out by one and the same person:

  - sales must know who the targeted customers are, and how to sell it;
  - marketing must know how to brand and to promote the new product;
  - finance and accounting will have to budget the venue, and find ways how to finance it.
- Innovation requires accountability – shareholders (for the private sector) and stakeholders (for both the public and private sector) will want to know what the returns on the investment will be.

As briefly mentioned before, innovation usually leads to changes in regulation. After a successful innovation the rules that so successfully guided the process often need to be changed, or just simply change all on their own. In conclusion, innovation changes the organization that introduces it.

The relationship between innovation and rules is a bidirectional one. Rules are needed in order to be able to gain the most out of innovative processes, and innovation is needed to keep rules working. Unfortunately rules and regulations are often perceived as being an obstacle to creative processes and thus to innovation. Solving this apparent paradox takes a huge communication effort, persuasion and determination and this is the reason why we can say that development of communication means contributed to a multiplication of changes (Roman and Roman, 2012). Also, the creative forces that drive innovation in organizations need to be flexible, take in ideas and suggestions from their environment (colleagues, co-workers, decision makers, etc.).

3. The risks of innovation

Like all processes that have an uncertain ending, innovation is risky. There are some inherent risks that come with such processes (Sitnikov et al., 2017), which have to be carefully weighted and analyzed and which can, in the case of becoming a reality, lead to the projects failure. Thus innovation needs proper risk management, in order to be effective. Of the many types of risk that influence innovative processes, here are a few:

- Risk of bias – the owner of innovative ideas or processes may not be objective in relation to his own ideas, and may over-evaluate them. By decentralizing decision the risk of bias can be reduced.
- Risks of target – when the set goals are too far away, and become unreachable. Such risks can be avoided by a good process and evolution control.
- Organizational risks – when the members of an organization do not understand, fear, and are unwilling to embrace the changes that innovation processes require. These risks can be diminished by effective communication, trainings and strong leadership (Walker et al., 2011).
- Financial risks – the risk of overspending, risks associated with external financing, and generally destabilizing the organization. Also there is the risk of low return on investment. Performant budgeting processes, audit, controlling and financial management are the best tools to ensure the proper financial coverage to innovative processes.

- Ethical, moral and environmental risks – the innovation raises ethical arguments in society or its results are not environmentally sustainable. The tools for dealing with these risks are market and technological research, as well as established tools of strategic marketing and management (such as PEEST analysis, SWOT analysis, portfolio and so on).
- Social risks – closely related to ethical, moral and environmental risks, for this category society does not accept the effects of innovative processes or it has split strong opinions about it (a good example here would be some aspects of developing artificial meat products). Here also market research can be used to diminish the effects of these risks.
- Market risks – the innovations do not have any moral, environmental or social issues, however, they are not market successes. Causes for this are technologies that appear before their time, or failing to be first to market with the innovation. These would be the leas controllable risks, since their source lies outside of the organization. Market research and god information from the market are crucial for the management of these risks.

From the list above, it becomes obvious that innovative processes rely heavily on risk management to ensure their success. Risk management also isn't a new idea. It's actually as old as the idea that the result of ones actions might not be as good as intended. Only the scientific concept is somewhat newer. Risk management is actually a complex process (Drennan, 2007: 2-7; 89-93) of risk identification, analysis and response of a public or private organization or a society, helping processes reach their objectives, and organizations/societies minimize loss and avoid failure (Bekkers et al., 2011). In relationship to innovation, risk management is a tool which is used to avoid innovation failure.

In regard to failure, many fail to take it into account. However, this is always a possibility, since the outcome of our actions is always burdened with uncertainty. This is especially true when thinking about innovation and innovative processes (Clapton et al., 2008). It is all because failure is always a possibility. And failure brings with it losses (mainly financial) and with it accountability of the management towards shareholders, stakeholders and sometimes even legal accountability (Lewis et al., 2018). Therefore, organizations spend a lot of effort in avoiding failure.

4. Conclusion

Innovative behavior is as natural to humans as is the instinct to survive. Actually, innovative behavior is one of the key factors that have led to the survival of the human species over time. Innovation is art of our lives, whether it is at work, in society or with our families. And since the world around us is changing at an incredible rate, the need for innovation is also greater than ever.

Innovation is what makes us, humans, what we are today; it is the driving force behind our survival and evolution. However it is also a highly complex, resource and coordination

intensive process, with unforeseeable effects and outcomes. Innovative processes are also the key element for the success of organizations. There is a bidirectional relationship between innovation and performance. Innovation relies on other highly skilled and performant processes in order to deliver intended results, and organizations rely on innovation to ensure highest performance levels.

Rules and procedures can reduce the inherent risks of innovation if they are set up right. By standardizing communication channels and decision making processes and prerogatives and by setting up strong control systems innovative processes can be managed in the direction of ensuring their success. Also, vision and leadership are key components of innovation. And innovation processes must be harmonized with the core values of the organization and/or society they take place in.

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Trade effects based on general equilibrium

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Abstract. *The Rybczynski theorem describes the trade effect within production analyses between factor endowments and outputs. The Stolper-Samuelson theorem focuses on cost analyses between factor reward and commodity price. This paper examines the trade effect of changes of factor endowments on prices, based on general equilibrium. The study shows that changes of factor endowments cause domestic output changes (the Rybczynski effect), which affect output prices and factor prices (the Stolper-Samuelson effect). It is like a chain of effects that the Rybczynski's trade effect triggers the Stolper-Samuelson's trade effect. The analysis of this paper shows that a small increase of a factor endowment of any country rewards another factor and the commodity using the latter factor intensively. It displays a tuneful circle. Trade brings a well-balanced development to the world.*

Keywords: E; Factor price equalization; Heckscher-Ohlin; Equilibrium price; equalized factor price.

JEL Classification: F10, F20.

1. Introduction

The trade effects are very important parts of Heckscher-Ohlin theories. The Rybczynski theorem addressed the trade effect of factor endowments on output. The Stolper-Samuelson theorem states the trade effects of commodity price on factor price. There are fewer of literature talk about trade effects of changes of factor endowments on prices. This is due to no consolidated expression of price-trade equilibrium.

Dixit-Norman (1980)'s Integrated World Equilibrium (IWE) is remarkable to characterize equalized factor price. They illustrated that if the allocation of factor endowment of two countries changed within IWE box, the factor price and commodity price should remain the same. Guo (2005) initial his study on the possible structure of equalized factor price. Recently, Guo (2018) proposed a general equilibrium of trade on the Heckscher-Ohlin 2x2x2 model. The equalized factor price at the equilibrium is just also the factor price Dixit-Norman predicted.

This study investigates the trade effect of changes of factor endowment on prices, by using the trade equilibrium Guo (2018) proposed. It is a cross trade effect from production on cost.

This paper is divided into four sections. Section 2 reviews the general equilibrium of trade (Guo 2018). Section 3 presents the trade effects of changes of factor endowments on factor price, commodity price, and commodity output. Section 4 is a discussion.

2. Review of general equilibrium of the Heckscher-Ohlin Model by IWE approach

Guo (2018) proposed an approach to study the trade equilibrium by identifying a trade box on Dixit-Norman (1980) integrated world equilibrium (IWE) diagram. We review his work briefly in the following. With the normal assumptions, a standard 2x2x2 Heckscher-Ohlin model is presented as followings:

a. The production constraint of full employment of resources is

$$AX^h = V^h \qquad (h = H, F) \qquad (2\text{-}1)$$

where A is the 2x2 technology matrix, X^h is the 2x1 vector of commodities of country h, V^h is the 2x1 vector of factor endowments of country h. The elements of matrix A is $a_{ki}, k = K, F, i = 1,2.$

b. The zero-profit unit cost condition is

$$A'W^* = P^* \qquad (2\text{-}2)$$

where $W^*$is the 2 x1 vector of factor prices, P^* is the 2x1 vector of commodity prices. Both P^* and W^* are world price when factor price equalization happened.

c. The definition of the country h's share of GNP to world GNP is,

$$s^h = P'\,X^h / P'\,X^W \qquad (2\text{-}3)$$

d. The trade balance condition is

$$P' T^h = 0 \tag{2-4}$$

or

$$W' F^h = 0 \tag{2-5}$$

where T^h is the 2x1 vector of export of commodity, $F^h$is the 2x1 vector of factor content of trade.

e. The constraint of the cone of diversification of factor endowments(1)

$$\frac{a_{K1}}{a_{L1}} > \frac{K^H}{L^H} > \frac{K^F}{L^F} > \frac{a_{K2}}{a_{L2}} \tag{2-6}$$

f. The constraint of commodity price limits(2)

$$\frac{a_{K1}}{a_{K2}} > \frac{p_1^*}{p_2^*} > \frac{a_{L1}}{a_{L2}} \tag{2-7}$$

g. The home country's GNP share limits

$$s_b^H = \frac{K^H}{K^F + K^H}, \qquad s_a^H = \frac{L^H}{L^F + L^H} \tag{2-8}$$

where $s_b^H$is the upper limit of the home country GNP, s_a^H is the lower limit of GNP.

By adding the shares of GNP limits on the IWE diagram, using a simple utility function to maximize two countries' distributable GNP on trade box, it obtained the competitive share of GNP of the home country as

$$s = \frac{1}{2}\frac{K^H L^W + K^W L^H}{K^W L^W} \tag{2-9}$$

It is just the middle point of the GNP boundaries. He interpreted the result that the best welfares of two countries avoid the hurts of extreme trade at s_b^H *or* s_a^H as far as possible. When taking a share of GNP as s_b^H, then $w^* = 0$; and when taking a share of GNP as s_a^H, then $r^* = 0$. The middle point is a good position to reward both factors fairly based on existing factor endowment supplies.

With the share of GNP of the home country by equation (2-9), it obtained the general equilibrium of trade of the Heckscher-Ohlin model as

$$r^* = \frac{L^W}{K^W} \tag{2-10}$$

$$w^* = 1 \tag{2-11}$$

$$p_1^* = a_{k1}\frac{L^W}{K^W} + a_{L1} \tag{2-12}$$

$$p_2^* = a_{k2}\frac{L^W}{K^W} + a_{L2} \tag{2-13}$$

$$F_K^H = \frac{1}{2}\frac{K^H L^W - K^W L^H}{L^W} \quad (2\text{-}14)$$

$$F_L^H = \frac{1}{2}\frac{K^H L^W - K^W L^H}{K^W} \quad (2\text{-}15)$$

$$X^H = A^{-1}V^H \quad (2\text{-}16)$$

$$X^F = A^{-1}V^F \quad (2\text{-}17)$$

All the endogenous variables (p_1^* ,p_2^* , w^* , r^* ,x_1^H , x_2^H , x_1^F , x_2^F, and s) in the model are expressed by exogenous variables (K^h, L^h, K^w, L^w) . The equalized price at the equilibrium is just the Dixit-Norman's IWE factor price that if the allocation of the factor endowments for two countries in the IWE box changes, the factor price and the commodity price will remain the same.

The solution for a giving IWE box is unique since there is only one trade equilibrium point in IWE diagram that made the angle of trade equal to the angle of world factor endowments in the IWE diagram. In addition, the equilibrium solution implies that world resources (factor endowments) determine world prices.

3. Trade effects of changes of factor endowments

The Rybczynski theorem describes the relationship between commodity output and factor input, holding output price. With the general equilibrium of trade in the last section, we know that equalized factor price and common commodity prices are functions of factor endowments. We can process a trade effect without holding any variables unchanged. The trade effects we talk here is an interactive relationship between endogenous variables (commodity outputs and prices) and exogenous variables (factor endowments).

3.1. Trade effects of changes of factor endowments on factor price

Differentiating the relative factor price in equations (2-10) with respect to world capital yields,

$$\frac{\partial r^*}{\partial K^w} = -\frac{L^w}{(K^w)^2} \quad (3\text{-}1)$$

It shows that

$$\frac{\partial r^*}{\partial K^w} < 0 \quad (3\text{-}2)$$

Differentiating equations (2-10) with respect to world capital yields,

$$\frac{\partial r^*}{\partial L^w} = \frac{1}{K^w} \quad (3\text{-}3)$$

It shows that

$$\frac{\partial r^*}{\partial L^w} > 0 \quad (3\text{-}4)$$

Similarly, we can obtain the trade effect respect to factor endowments of each country K^h, L^h, K^F, L^F as

$$\frac{\partial r^*}{\partial K^h} < 0 \qquad (h = H, F) \tag{3-5}$$

$$\frac{\partial r^*}{\partial L^h} > 0 \qquad (h = H, F) \tag{3-6}$$

r^* is relative price respect to w^* here.

3.2. Trade effect of changes of factor endowments on commodity price

We express a relative commodity price as the following, by using equation (2-12) and (2-13)

$$\frac{p_1^*}{p_2^*} = \frac{a_{1k}L^W + a_{1L}K^W}{a_{2k}L^W + a_{2L}K^W} \tag{3-7}$$

Analyses of relative commodity price will be more convenient for later presentations.

The changing of factor endowments may have effects both on the commodity price and on factor price. Therefore, this may have some effects on the technological coefficient a_{ik}. However, by the envelope theorem, any small movement of the unit requirement of a factor will not violate the isoquant. We will ignore possible substitutions and elasticities in production caused by the small changes in this study.

Differentiating the relative commodity price in equations (3-7) with respect to world capital yields,

$$\frac{\partial \frac{p_1^*}{p_2^*}}{\partial K^w} = \frac{(a_{1L}a_{2K} - a_{2L}a_{1K})L^W}{(a_{2k}L^W + a_{2L}K^W)^2} \tag{3-8}$$

By the specification of this paper, commodity 1 is the relatively capital intensive as

$$\frac{a_{1k}}{a_{1L}} > \frac{a_{2K}}{a_{2L}} \tag{3-9}$$

so,

$$(a_{1L}a_{2K} - a_{2L}a_{1K}) < 0 \tag{3-10}$$

This means

$$\frac{\partial \frac{p_1^*}{p_2^*}}{\partial K^w} < 0 \tag{3-11}$$

Similarly, differentiating equations (3-7) with respect to world labor yields,

$$\frac{\partial \frac{p_1^*}{p_2^*}}{\partial L^w} = -\frac{(a_{1L}a_{2K} - a_{2L}a_{1K})K^W}{(a_{2k}L^W + a_{2L}K^W)^2} \tag{3-12}$$

We obtain

$$\frac{\partial \frac{p_1^*}{p_2^*}}{\partial L^w} > 0 \tag{3-13}$$

We can also obtain the trade effect respect to factor endowments of each country K^h, L^h as

$$\frac{\partial \frac{p_1^*}{p_2^*}}{\partial K^h} < 0 \qquad (h = H, F) \qquad (3\text{-}14)$$

$$\frac{\partial \frac{p_1^*}{p_2^*}}{\partial L^h} > 0 \qquad (h = H, F) \qquad (3\text{-}15)$$

3.3. Trade effect of Changes of factor endowments on domestic outputs

The changes of factor endowments only effect on domestic commodities. This kind of effect just follows the Rybczynski theorem; we will not add it anymore.

3.4. Comprehensive Tarde effects of factor endowments

The effect of changes of factor endowments is a very comprehensive effect. We summarize the above analyses as a theorem in following.

If both commodities continuous to be produced and continues to be traded, a small increase in the supply of a factor will cause:

(a) An increase in the output of the commodity using this factor intensively and a decrease in the output of the other commodity.

(b) A decrease of the relative price of the commodity intensively using this factor and an increase of the relative price of the commodity intensively using another factor.

(c) A decrease of relative price of this factor and an increase of the relative price of another factor.

Statement (a) above actually is the trade effects of the Rybczynski theorem.

Statement (c) actually is the trade effect of the Stolper-Samuelson theorem, which is caused by (a).

Statement (b) engages statement (a) and (b) together. The output changes, sourced from changes of factor endowments, lead to the commodity price change, so the Stolper-Samuelson trade effect happens.

The trade effects here describe the Rybczynski theorem and the Stolper-Samuelson theorem work together jointly. It is a scenario that Rybczynski trade effect triggers the Stolper-Samuelson trade effect. However, a single effect of either the Rybczynski theorem or the Stolper-Samuelson is very different from the joint effect.

Market responses the (small) increase of any factor endowment in a country by identifying and signaling which factor is scarce worldwide to adjust economy to maximize productions and consumptions by prices.

A small increase of any factor endowment in the home country causes the relative more increase of output of commodity intensively used this factor. Its price should fall to increase competition in the world market to help to realize its sales in the market. Another factor in the country then is a relatively scarce domestically and internationally. The higher relative return of that factor causes the future increases of its supply.

Given a set of exogenous factor endowments L^F , L^H, K^H, and L^H, the commodity price under factor price equalization is best prices for the commodity using intensively with its abundant factor for each country. No way to improve its reward domestically (Such as an increase of any factor, except economic decrease). Meanwhile, it reserved domestic pressure to increase reward another factor. This is a new result from trade equilibrium. It is much different from the analysis from autarky to free trade.

A movement to free trade causes the bi-nation economy networked together to share productions and consumptions. The development of a country will cause its counterpart producing more quantities of the commodity using intensively another factor. The relatively scarce factor identified by market worldwide will grow fast due to the rise of its real return.

3.5. The magnification effect

Jones (1965) proposed a very useful tool, the magnification effect, which can illustrate trade effects more clearly. We use his method to display the trade effect above by the following:

$\Delta K^W \uparrow$: $\quad \hat{w}^* \uparrow > 0 > \hat{p}_1^* \downarrow > \hat{r}^* \downarrow$

$\Delta L^W \uparrow$: $\quad \hat{w}^* \downarrow > 0 > \hat{p}_1^* \uparrow > \hat{r}^* \uparrow$

$\Delta K^H \uparrow$: $\quad \hat{x}_1^H \uparrow > \hat{K}^H \uparrow > 0 > \hat{x}_2^H \downarrow \quad \rightarrow \quad \hat{w}^* \uparrow > 0 > \hat{p}_1^* \downarrow > \hat{r}^* \downarrow$

$\Delta L^H \uparrow$: $\quad \hat{x}_1^H \downarrow < 0 < \hat{L}^H \uparrow < \hat{x}_2^H \uparrow \quad \rightarrow \quad \hat{w}^* \downarrow > 0 > \hat{p}_1^* \uparrow > \hat{r}^* \uparrow$

or

$\Delta K^F \uparrow$: $\quad \hat{x}_1^F \uparrow > \hat{K}^F \uparrow > 0 > \hat{x}_2^F \downarrow \quad \rightarrow \quad \hat{w}^* \uparrow > 0 > \hat{p}_1^* \downarrow > \hat{r}^* \downarrow$

$\Delta L^F \uparrow$: $\quad \hat{x}_1^F \downarrow < 0 < \hat{L}^F \uparrow < \hat{x}_2^F \uparrow \quad \rightarrow \quad \hat{w}^* \downarrow > 0 > \hat{p}_1^* \uparrow > \hat{r}^* \uparrow$

Beware that we assumed that commodity 1 is capital-intensive (the first commodity intensive in the first factor), i.e. $K^H/K^F > L^H/L^F$ and $a_{1K}/a_{2K} > a_{1L}/a_{2L}$.

We refer it to comprehensive magnifications of the trade effects

3.4. A numerical example

We present a numerical example here to describe the trade equilibrium and trade effects proposed.

Consider two countries, home and foreign, two commodities, 1 and 2, two factors, capital, and labor. The technological matrix is

$$\begin{bmatrix} a_{1K} & a_{2K} \\ a_{1L} & a_{2L} \end{bmatrix} = \begin{bmatrix} 3 & 1 \\ 1 & 2 \end{bmatrix}$$

The factor endowments in the two countries are

$$\begin{bmatrix} K^H \\ L^H \end{bmatrix} = \begin{bmatrix} 2400 \\ 1700 \end{bmatrix}, \qquad \begin{bmatrix} K^F \\ L^F \end{bmatrix} = \begin{bmatrix} 1800 \\ 2300 \end{bmatrix}$$

The outputs of two countries by full employment are separate as

$$\begin{bmatrix} x_1^H \\ x_2^H \end{bmatrix} = \begin{bmatrix} 620 \\ 540 \end{bmatrix}, \qquad \begin{bmatrix} x_1^F \\ x_2^F \end{bmatrix} = \begin{bmatrix} 260 \\ 1020 \end{bmatrix}$$

Commodity 1 is K-intensive and commodity 2 is L-intensive. The factor abundant ranking is that the home country is capital abundant and foreign country is labor abundant. The trade direction is that home country exports commodity 1 and foreign country exports commodity 2.

The share of GNP of the home country is calculated as 0.4982, based on factor endowments across countries.

The consumption, export, and prices, under free trade, reach the following equilibrium:

$$\begin{bmatrix} c_1^H \\ c_2^H \end{bmatrix} = \begin{bmatrix} 438.42 \\ 777.21 \end{bmatrix}, \qquad \begin{bmatrix} c_1^F \\ c_2^F \end{bmatrix} = \begin{bmatrix} 441.57 \\ 782.78 \end{bmatrix}, \qquad \begin{bmatrix} T_1^H \\ T_2^H \end{bmatrix} = \begin{bmatrix} 181.57 \\ -237.21 \end{bmatrix}$$

$$\begin{bmatrix} p_1^* \\ p_2^* \end{bmatrix} = \begin{bmatrix} 3.8571 \\ 2.9523 \end{bmatrix}, \begin{bmatrix} r^* \\ w^* \end{bmatrix} = \begin{bmatrix} 0.9523 \\ 1.0000 \end{bmatrix}$$

We now analyze trade effects. When the capital endowment in the home country increases 0.5 percent now, the prices and commodity output will be

$$\begin{bmatrix} K^H \\ L^H \end{bmatrix} = \begin{bmatrix} 2412 \uparrow \\ 1700 \end{bmatrix}, \quad \begin{bmatrix} x_1^H \\ x_2^H \end{bmatrix} = \begin{bmatrix} 620.80 \uparrow \\ 539.60 \downarrow \end{bmatrix}, \quad \begin{bmatrix} p_1^* \\ p_2^* \end{bmatrix} = \begin{bmatrix} 3.8557 \downarrow \\ 2.9519 \downarrow \end{bmatrix}, \begin{bmatrix} r^* \\ w^* \end{bmatrix} = \begin{bmatrix} 0.9519 \downarrow \\ 1.0000 \uparrow \end{bmatrix},$$

When the labor endowment in the foreign country increases by 0.5 percent, the prices and output will be

$$\begin{bmatrix} K^F \\ L^F \end{bmatrix} = \begin{bmatrix} 1800.00 \\ 2302.00 \uparrow \end{bmatrix}, \quad \begin{bmatrix} x_1^F \\ x_2^H \end{bmatrix} = \begin{bmatrix} 296.0 \downarrow \\ 1021.90 \uparrow \end{bmatrix},$$

$$\begin{bmatrix} p_1^* \\ p_2^* \end{bmatrix} = \begin{bmatrix} 3.8585 \uparrow \\ 2.9528 \uparrow \end{bmatrix}, \begin{bmatrix} r^* \\ w^* \end{bmatrix} = \begin{bmatrix} 0.9528 \uparrow \\ 1.0000 \downarrow \end{bmatrix},$$

4. Discussion

The trade effects of this paper can explain some international trade practice. For instance, as China's economic developments, with the interaction with foreign counties, its labor payments increase dramatically those years. The international market incentives its sectors using labor intensively. Those are its sectors with comparative advantages. Its import and exports return new demands on resources and capitals from other countries. That will make incentives to other countries' sectors with comparative advantages. A realistic characteristic of the world is that countries conduct international trade, accompanying economic growth. We see the evidence that the development of industries countries and the under-developed countries benefit mutually.

Another expression for Stolper-Samuelson theorem is that free international trade benefits the abundant factor and harms the scarce factor. It is about the process from autarky to free

trade. It is not the situation from a free trade equilibrium to another free trade equilibrium. The analysis of this paper says that economic activities after trade, such as the change of factor endowments, benefits another factor, which is then a relatively scarce factor both domestically and internationally by the market. The trade effects from autarky to free trade are much different from the trade effects by trade equilibrium. The trade effects discussed in this paper is for the situations of a continuing trade, under trade equilibrium.

We wish that the studies of this paper could help the Heckscher-Ohlin model stepping in explanations of the dynamics of international trade and economic growth more effectively.

Conclusion

This paper displays the trade effect based on the price-trade equilibrium. It is a comprehensive trade effect, which engages the Stolper-Samuelson trade effect with the Rybczynski trade effect together. The important conclusion of the trade effects is that any development or changes of a factor endowment of a country, always incentives to another factor both domestically and internationally. In the long-term, another factor will retune back some incentives to that factor. This is a tuneful circle. Trade brings a well-balanced development to the world.

Notes

(1) We assume that commodity 1 be the relatively capital intensive, and home country is relatively abundant in capital.

(2) This condition will guarantee all possible factor prices are positive. We may refer equation (5) to constraint of the cone of commodity prices, which is a counterpart of the cone of diversification of factor endowments.

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Empirically testing Keynesian defense burden hypothesis, nonlinear hypothesis, and spillover hypothesis: Evidence from Asian countries

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Abstract. *The objective of the study is to evaluate different alternative and plausible hypothesis, i.e., Keynesian defense burden hypothesis, nonlinear hypothesis, and spillover hypothesis by controlling governance indicators in a panel of 5 Asian selected countries during a period of 2000 to 2016. The study employed panel Fully Modified OLS (FMOLS) and Dumitrescu-Hurlin panel causality estimates for robust inferences. The results confirmed the defense burden hypothesis where high military expenditures decrease country's economic growth. The real interest rate, trade openness, and government education expenditures substantially decreases country's per capita income due to market imperfection, arms import, and low spending on education. The political instability decreases economic growth while voice and accountability and regulatory control largely support country's economic growth. The causality estimates confirmed the feedback relationship between i) per capita income and exports ii) trade openness and military expenditures, and iii) real interest rate and exports, while growth led military expenditures and arms conflict, military led exports and political instability, and trade led regulatory control established in causality framework.*

Keywords: military expenditures; economic growth; political instability; regulatory control; voice and accountability; FMOLS; Asian countries.

JEL Classification: C33, G38, H54.

1. Introduction

Military expenditures is professed as undesirable expenditures as well as burden on an economy, because these spending on military or defense divert domestic allocation of the resource within the economic framework and within the different projects in an economy. However, perception beyond the above statement has also face criticism that state continue to add to their military spending and to develop their defense aspects because of foreign protection (Khan et al., 2018). The literature of defense in macroeconomics postulates that these defense spending manages throughout war and peace and its externalities on different sectors of the economy. Usually, not only military expenditures is considered in defense economics as a public good expenditure but also the military expenditures examines the combination of defense spending and growth of that economy through different channels such as spill-over hypothesis as well as Keynesian defense burden (Hatemi-J et al., 2018).

The effects of military expenditures on economic growth have become the subject of literature in the area of defense economics. The theories on spending of defense and their effects on the growth of the economy are highly differ and including the arguments that military expenditures either increases economic growth or crowd out the productive investment. Though, the important argument is that whether the potential losses resulting from resources crowed out by investment in the sector of military exceeds the positive externalities. In addition, current literature recognizes the different channels through which the growth can be effected by defense expenditure. The old-style 'guns-vs.-butter' argument suggests that military spending cause to move more slowly the growth of the economy. But, positive externalities may also be possible that in an economy with military spending has as spin-offs of the technology, spillovers of security in the country as well as formation of human capital. Meanwhile, each viewpoint may lead to conclude it differently. However, the total effect of the military expenditure is unclear on country's economic growth. The empirical investigations of the relationship between economic growth and military expenditures, generally employing the analysis of the cross-countries and that follow the assumption that all areas are same steady-state path of the income of the economy. However, this assumption is highly force as it may reduce heterogeneity problem in the estimated parameter (Yildirim and Öcal, 2016).

The significant part of the resources of an economy is incurred on defense expenditure, based on perceived intimidations insight of political sector of the country. It is justified typically in terms of the security maintenance of the country, the law and order as well as to combat disturbances of the nation internally. According to Stockholm International Peace Research Institute in 2013, it has estimated that the world's military spending was US $1747 billion. It is approximately 2.4 percentage of the world GDP. Specified the extensive poverty all over the world, illiteracy and undernourishment in poor countries, it look like illogical transformation of the limited resources on the way to military spending at the cost of unattended basic people needs. In addition, the South

Asian region has disturbing part of the undernourished people in the world. In 2011, the estimated percentage was 24.5% and 60.2% of the people in South Asia region are surviving their lives less than 1.25 dollar per day (PPP) and 2 dollar in single day (PPP) respectively (Ismail, 2017). In 2015 the estimated Global military expenditure was $1676bn, and the increasing around 1.0% real terms from then 2014, which is 2.3% of the worlds' gross domestic product.

There is seriously debate on the causal relationship (negative or positive) in military spending and economic growths during the last some decades of the twentieth century. The debate has resulted in the existence of the 3rd school of thought, i.e., it is believed that there is no causal relationship between military spending and economic growth. However, military expenditures effects economic growth in two different ways, i.e., (i) effects of demand side and (ii) effects of supply side. As far as effects of demand side is concern, it postulates that aggregate demand in an economy is increasing by military expenditure while, secondly, supply-side effects are concerned, it has further two ways, i.e., (i) Direct effects and (ii) Indirect effects. The nature of direct effects is negative, because of crowd out effects of the investment as well as capital from the civilian's activities in an economy. While, indirect effects have controversial arguments, which are positive or negative. Moreover, there are mainly four types of indirect effects including, (i) training effects, (ii) infrastructural effects (iii), consumable effects, and (iv) security effects (Mirza et al., 2015)

Deger and Smith (1983) and Deger (1986)claimed that the defense spending in under developed countries has positive but minimal on the economic growth through modernization effects. But its net affects the rate of growth of the economy remains negative. In addition, Deger and Smith have also found that there exists causal relationship between military spending and economic growth. Moreover, they claimed that economic 'spin-off' from military to the economic development is weak, but they have found positive correlation of the military expenditure and economic growth of under-developed countries. There are numerous studies that have examined the relationship between military spending and economic growth. The evidences of the previous studies are mixed (Yildirim et al., 2005). It is widely found that military expenditure is conducive to growth as according to the Benoit (1973) and Weede (1983). Apart from this some other studies found that military expenditure may retard growth see Deger and Smith (1983), Huang and Mintz (1990), Heo (1999); Ward and Davis (1992), and Pieroni (2009). Some other empirical studies revealed that military expenditure neither hinders nor foster the economic growth (Loayza et al. 1999). The current studies confirmed the Keynesian defense burden hypothesis in different economic settings, i.e., Khan et al. 2018, Hatemi-J et al. (2018), Emmanouilidis and Karpetis (2018), etc. The spillover hypothesis is verified in the following current studies, i.e., Daddi et al. (2018), Su et al. (2018), Ortiz et al. (2018), etc. The non-linear hypothesis is verified in the following current studies, i.e., Ajmair et al. (2018), etc. The

previous studies largely ignore governance indicators in military-growth nexus, which is included in this study to filled the missing gap of the literature.

On the basis of significant discussion on the stated topic, the study confined its objectives, i.e.:

1. To examine the impact of military expenditures and armed conflict on country's per capita income.
2. To substantiate the non-linear relationship between military expenditure and per capita income for analyzing the inverted U- shaped relationship between them.
3. To investigate the impact of governance indicator on country's per capita income, and
4. To verify the invested U-shaped relationship between good governance expenditure and military expenditure in a panel of selected Asian countries.

2. Data and Methodology

The study developed four simultaneous equations that access the possible impact of military expenditure, good governance indicators and economic growth in Panel of 5 Asian countries, i.e.,

Model-I: Impact of Military Factors on Country's Economic Growth

$$GDPPC = \beta_0 + \beta_1 MILT + \beta_2 AIMP + \beta_3 MILT \times AIMP + \beta_4 TOP + \beta_5 FDI + \varepsilon \quad (1)$$

Where, GDPPC shows GDP per capita, MLIT shows military expenditures, AIMP shows arms import, TOP shows trade openness, and FDI shows foreign direct investment inflows.

Equation (1) shows that GDP per capita served as a dependent variable and military expenditures, arms import, trade openness, and foreign direct investment as the independent variables.

Model-II: Non-Linear relationship between Military Expenditures and Economic Growth

$$GDPPC = \beta_0 + \beta_1 MILT + \beta_2 MILT^2 + \beta_3 CPI + \beta_4 RIT + \beta_5 GEXP + \varepsilon \quad (2)$$

Where, RIT shows real interest rate, CPI shows consumer price index, and GEXP shows government expenditures.

Model-III: Impact of Governance Indicators on Economic Growth

$$GDPPC = \beta_0 + \beta_1 PINS + \beta_2 RQ + \beta_3 VC + \beta_4 EXPORT + \beta_5 EXPORT \times PINS + \varepsilon \quad (3)$$

Where, PINS shows political instability, RQ shows regulatory control, and VC shows voice and accountability.

Model-IV: Impact of Governance Indicators on Military Expenditures

$$MILT = \beta_0 + \beta_1 PINS + \beta_2 VC + \beta_3 RQ + \beta_4 VC^2 + \beta_5 RQ^2 + \beta_6 FDI + \beta_7 TOP + \varepsilon \quad (4)$$

Table 1 shows list of variables and their measurement for ready reference.

Table 1. *List of variables*

Variables	Symbol	Measurement
GDP per capita	GDPPC	Constant 2010US$
Military expenditure s	MILT	% of GDP
Arms import	AIMP	SIPRI Trend indicator value
Trade openness	TOP	% of GDP
Foreign direct investment net inflow	FDI	% of GDP
Government expenditure on Education ,total	GEXP	% of GDP
Consumer price index	CPI	Annual %
Real interest rate	RIT	Annual %
Export of goods and services	EXPORT	% of GDP
Political Instability	PINS	Index value :-2.5 to +2.5
Regulatory Quality	RQ	Index value :-2.5 to +2.5
Voice and accountability	VC	Index value :-2.5 to +2.5

Source: World Bank (2017).

The data is collected from World Development Indicator published by World Bank (2017).

The following are the hypothesis of the study, i.e.:

H_1: There is likelihood that military expenditures either support to economic growth to verify Spillover hypothesis, while it deteriorate the countries per capita income to support defense burden hypothesis.

H_2: There will be a negative correlation relationship arms conflict and per capita income.

H_3: There is expected that growth specific factors includes trade openness, FDI inflows, Government education expenditures, exports, and real interest rate may support countries economic growth.

H_4: There is expected to support an inverted U-shaped relationship between military expenditures and economic growth.

H_5: There will be a positive relationship between economic growth and good governance indicators in a selected panel of countries, and

H_6: There is expected to verify inverted U-shaped relationship between good governance indicators and military expenditures across Asian countries.

The above 4 equations would be empirically estimated by panel FMOLS and Granger causality for robust inferences.

3. Results and discussion

Table 2 shows the descriptive statistics of the variables. Table indicates the descriptive of variables in terms of minimum value, maximum value, mean, standard deviation, skewness, and kurtosis. The political instability, regulatory control and freedom of voice have a negative index value, which clearly shows that the country has a vehicle political instability, low level of regulatory control and lack of freedom of voice. Arms import, CPI, Export, FDI,GDPPC, GEXP, ME and TOP Prices have positively skewed distribution with mean value of 71.9E+08,7.293057, 18.08684,1.064731, 1229.862, 2.708056, 2.469568 and 44.76649 respectively. RIT has a mean value is 3.592942 and negatively skewed distribution. RQ mean value is -0.535561 and VC mean value is –0.376609. VC has positively skewed distribution.

Table 2. *Descriptive statistics*

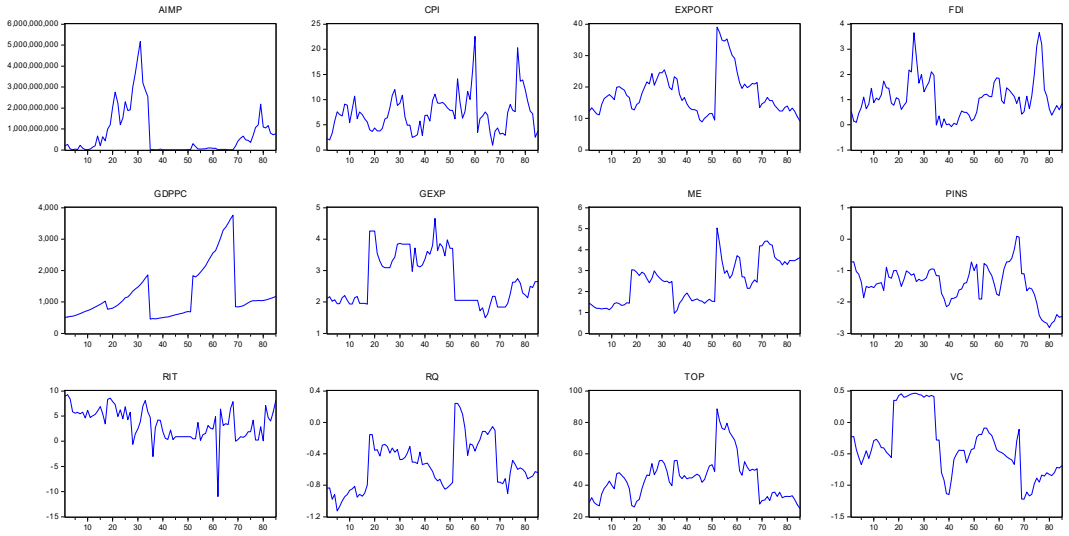
Methods	AIMP (US$)	CPI (Annual %)	EXPORT (% of GDP)	FDI (% of GDP)	GDPPC (US$)	GEXP (% of GDP)
Mean	7.19E+08	7.293057	18.08684	1.064731	1229.862	2.708056
Maximum	5.17E+09	22.56450	39.01570	3.668323	3759.230	4.661810
Minimum	1000000	0.922022	8.904030	-0.098375	459.1163	1.496600
Std. Dev.	1.10E+09	3.801959	6.741500	0.799182	823.9608	0.816209
Skewness	1.983754	1.312967	1.200478	1.171981	1.550479	0.524209
Kurtosis	6.705117	6.020821	4.199899	4.696197	4.592787	1.893056
Observations	85	85	85	85	85	85

Methods	ME (% of GDP)	PINS (Index value: ranging from -2.5 to 2.5)	RIT (%)	RQ (Index value: ranging from -2.5 to 2.5)	TOP (% of GDP)	VC (Index value: ranging from -2.5 to 2.5)
Mean	2.469568	-1.421814	3.592942	-0.535561	44.76649	-0.376609
Maximum	5.033889	0.090368	9.256956	0.240110	88.63644	0.462193
Minimum	0.962150	-2.810035	-11.01738	-1.126801	25.13914	-1.220254
Std. Dev.	1.014176	0.600146	3.195593	0.312645	13.68022	0.483587
Skewness	0.365216	-0.301512	-0.984784	0.431702	1.039410	0.386687
Kurtosis	2.129200	3.174497	6.465185	2.632662	4.039963	2.327223
Observations	85	85	85	85	85	85

Note: AIMP shows arms import, CPI shows inflation, EXPORT shows export, FDI shows FDI inflows, GEXP shows government expenditure on education, ME shows military expenditures, PINS shows political instability, RIT shows real interest rate, RQ shows regulatory control, TOP shows trade openness, and VC shows voice and accountability.

Figure 1 shows the level data plots for ready reference.

Figure 1. *Plots of level data*



Source: World Bank (2017).

Table 3 shows the correlation matrix. There is positive correlation of arms imports, CPI, export, FDI inflows, military expenditure, political inability, regulatory control, trade openness, and voice accountability with per capita income while negative correlation of government education expenditure and real interest rate with per capita income. The result confine that high per capita income increase arms conflict, high price value of good, high export values and high FDI flows across countries. Military expenditures and governance indicators influence by high per capita income across countries. Military expenditures increase arms imports, high prices of goods, high exports, and high FDI inflows, while there is negative correlation of governance indicators and military expenditure in the panel of selected SAARC countries.

Table 3. *Correlation matrix*

Correlation												
Probability	AIMP	CPI	EXPORT	FDI	GDPPC	GEXP	ME	PINS	RIT	RQ	TOP	VC
AIMP	1.000000											

CPI	0.095594	1.000000										
	0.3841	-----										
EXPORT	0.121673	0.173093	1.000000									
	0.2673	0.1131	-----									
FDI	0.386769	0.375513	0.306187	1.000000								
	0.0003	0.0004	0.0044	-----								
GDPPC	0.006897	0.085880	0.535414	0.308485	1.000000							
	0.9500	0.4345	0.0000	0.0041	-----							
GEXP	0.443031	-0.010235	-0.251155	-0.091076	-0.365448	1.000000						
	0.0000	0.9259	0.0204	0.4071	0.0006	-----						
ME	0.226930	0.161905	0.272281	0.345332	0.321440	-0.194722	1.000000					
	0.0367	0.1388	0.0117	0.0012	0.0027	0.0741	-----					

Correlation												
Probability	AIMP	CPI	EXPORT	FDI	GDPPC	GEXP	ME	PINS	RIT	RQ	TOP	VC
PINS	-0.048530	-0.395786	0.265570	-0.027834	0.415253	0.000785	-0.294935	1.000000				
	0.6592	0.0002	0.0140	0.8004	0.0001	0.9943	0.0061	-----				
RIT	0.173259	-0.328481	-0.128765	0.074414	-0.052310	-0.000660	-0.190580	0.161233	1.000000			
	0.1128	0.0021	0.2402	0.4985	0.6345	0.9952	0.0806	0.1404	-----			
RQ	0.163108	0.021531	0.679763	0.255947	0.665167	0.067120	0.462205	0.254022	-0.105037	1.000000		
	0.1358	0.8449	0.0000	0.0181	0.0000	0.5416	0.0000	0.0190	0.3387	-----		
TOP	-0.088341	0.308024	0.861590	0.129874	0.465132	-0.060338	0.060008	0.257451	-0.317041	0.602081	1.000000	
	0.4214	0.0041	0.0000	0.2361	0.0000	0.5833	0.5854	0.0174	0.0031	0.0000	-----	
VC	0.614727	-0.033465	0.383876	0.301116	0.145275	0.462811	-0.113618	0.448035	0.327055	0.398591	0.274046	1.000000
	0.0000	0.7611	0.0003	0.0051	0.1846	0.0000	0.3005	0.0000	0.0022	0.0002	0.0112	-----

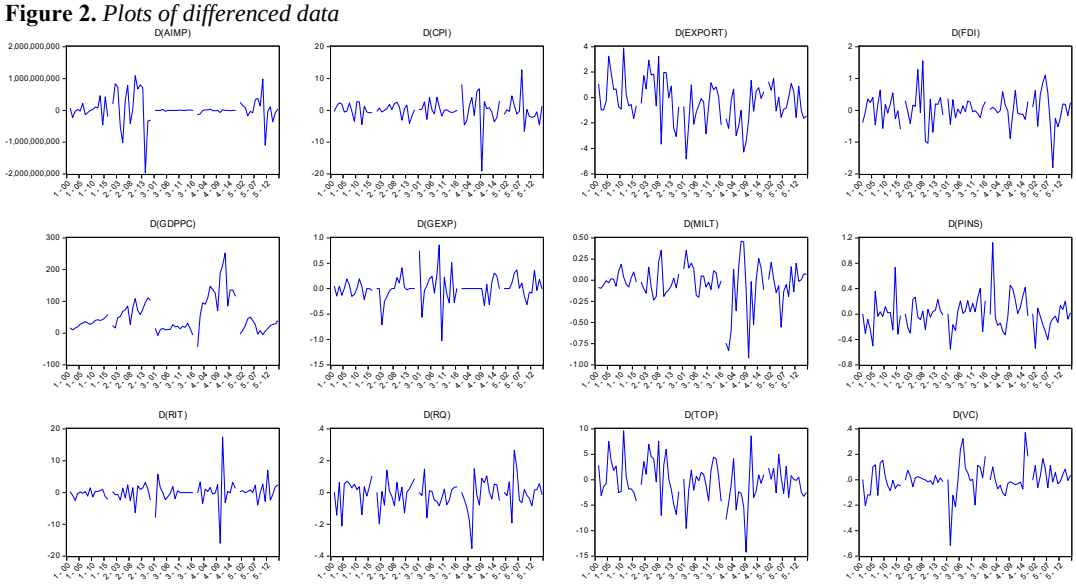
Table 4 shows the panel unit root estimates. The results show that arms import, and per capita income is non-stationary variables, while it is stationary after taking its first difference of the variables. The remaining variables including CPI, exports, FDI, education expenditures, military expenditure, real interest rate, trade openness, and good governance indicators are level stationary variables. The result concludes that arms import and per capita income have a volatile data set therefore both variables exhibit at first difference level. The overall, there is a mixture of variables in terms of its order of integration is visible, however, it is clearly evident that by using four different panel unit root tests, all given variables are non-stationary level and stationary at its first different at least in any one of the prescribed panel unit root test, Thus, it is good justification to used FMOLS regression for robust inferences.

Table 4. *Summary of panel unit root test estimates*

Methods	AIMP	CPI	EXPORT	FDI	GDPpc	GEXP	MILT	PINS	RIT	RQ	TOP	VC
Level Null: Unit root (assumes common unit root process)												
Levin, Lin and Chu t*	-0.508	-2.031**	-2.394*	-1.540***	3.257	-2.180**	-2.758*	-2.132**	-1.500***	-1.670**	-1.850**	-2.403*
Level Null: Unit root (assumes individual unit root process)												
Im, Pesaran and Shin Wstat	-0.684	-0.970	-0.520	-1.146	4.756	-1.776**	-2.050**	-1.369***	-1.170	-1.208	-0.862	-2.023**
ADF - Fisher Chi-square	12.617	12.582	12.959	14.559	0.855	18.531**	20.605**	16.584***	15.454	15.623	15.629	20.809**
PP - Fisher Chi-square	17.195**	16.070	21.929**	12.190	0.224	14.523	15.839	11.225	30.079*	13.585	10.107	12.321
First Difference Null: Unit root (assumes common unit root process)												
Levin, Lin and Chu t*	-3.573*	-5.659*	-3.059*	-1.654**	-1.168	-2.466*	-4.883*	-4.941*	-1.268	-1.729**	-4.610*	-3.527*
First Difference Null: Unit root (assumes individual unit root process)												
Im, Pesaran and Shin Wstat	-4.428*	-4.472*	-1.944**	-2.710*	-1.264	-2.728*	-3.316*	-2.971*	-4.172*	-2.262**	-2.629*	-2.850*
ADF - Fisher Chi-square	37.756*	38.216*	19.719**	24.611*	15.328	25.903*	29.369*	26.329*	36.292*	20.962**	24.924*	27.088*
PP - Fisher Chi-square	70.750*	74.430*	29.890*	56.730*	16.342***	55.224*	30.432*	40293*	90.523*	52.891*	36.969*	42.978*

Figure 2 shows the plots of differenced data for ready reference.

Figure 2. *Plots of differenced data*



Source: World Bank (2017).

Table 5 shows the panel Fisher cointegration estimates and confirmed that Model-I and Model-III possess cointegration process as the number of cointegration equations are 4 in trace statistics and maximum Eigen value statistics, while Model-II and Model-IV although shows that the given equations confirmed the cointegration process, however, there is a difference exists in the number of cointegration statistics both in the trace statistics and maximum Eigen values, thus it confined the 'indifferent' between acceptance and rejection of null hypothesis of cointegration.

Table 5. *Panel Fisher cointegration estimates*

Models	Model-I	Model-II	Model-III	Model-IV
Number of Cointegration equations by Trace Statistics	4	4	4	4
Number of Cointegration equations by Eigenvalue	4	5	4	5
Decision	Cointegration	Indifferent	Cointegration	Indifferent

Table 6 shows the estimates of panel FMOLS for Model-I.

Table 6. *Estimates of panel fully modified least squares (FMOLS) with moderation*

Dependent Variable: GDPPC				
Method: Panel Fully Modified Least Squares (FMOLS)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
MILT	-295.5668	116.0673	-2.546512	0.0131
AIMP	5.73E-07	4.89E-07	1.171531	0.2454
MILT×AIMP	-2.96E-07	1.48E-07	-2.002954	0.0491
TOP	-28.56282	5.877320	-4.859837	0.0000
FDI	153.3499	64.53157	2.376355	0.0203
AIMP×TOP	8.30E-09	4.25E-09	1.950597	0.0552
R-squared	0.923549	Mean dependent var		1251.522
Adjusted R-squared	0.912470	S.D. dependent var		835.4869
S.E. of regression	247.1833	Sum squared resid		4215873
Long-run variance	83706.67			

The results show that military expenditures decreases country's economic growth, which supports 'defense burden hypothesis', while the interactive term of arms import with military expenditures further decreases economic growth across countries. Trade liberalization policies first decreases economic growth and then improves country's per capita income with the interaction of arms import, which confirmed that arms import required for country's safety, which lead to increase country's per capita income. The results are consistent with the previous studies of Khan et al. (2018) and Hatemi-J et al. (2018) that supported the findings of defense burden hypothesis in different economic settings. Table 7 shows the estimates of Model-II for ready reference.

Table 7. *Estimates of panel fully modified least squares (FMOLS) with square term*

Dependent Variable: GDPPC				
Method: Panel Fully Modified Least Squares (FMOLS)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
MILT	3120.600	426.6504	7.314186	0.0000
$(MILT)^2$	-588.3499	90.59888	-6.494008	0.0000
AIMP	2.99E-08	9.62E-08	0.311318	0.7564
CPI	-33.04391	26.80359	-1.232817	0.2215
RIT	-64.00307	33.11511	-1.932745	0.0571
GEXP	-685.4845	134.9561	-5.079314	0.0000
R-squared	0.552365	Mean dependent var		1251.522
Adjusted R-squared	0.522120	S.D. dependent var		835.4869
S.E. of regression	577.5627	Sum squared resid		24684823
Long-run variance	689915.1			

The results confirmed the U-shaped relationship between military expenditures and per capita income, as the second order coefficient value is positive. The results imply that military expenditures improves country's per capita income while at later stages of economic development it decreases country's economic growth, which need strategic policies to reduce military expenditures for economic welfare. The real interest rate and public spending on education both decreases country's per capita income, as higher interest rate reduce financial market transactions while low spending on education lead to decrease per capita income of the selected panel of countries. The results are in line with the previous studies of Emmanouilidis and Karpetis (2018), Daddi et al. (2018), etc. Both of the studies confirmed the significant relationship between military spending and economic growth in diversified panel of countries. Table 8 shows the panel FMOLS estimates for Model-III.

Table 8. *Estimates of panel fully modified least squares (FMOLS) for Model-II with moderation*

Dependent Variable: GDPPC				
Method: Panel Fully Modified Least Squares (FMOLS)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
PINS	-653.7101	291.0821	-2.245793	0.0279
RQ	-338.1949	371.2823	-0.910883	0.3655
VC	-326.3331	249.4400	-1.308263	0.1951
EXPORT	52.92696	25.41586	2.082438	0.0410
EXPORT×PINS	52.93853	15.72200	3.367163	0.0012
R-squared	0.880698	Mean dependent var		1251.522

Adjusted R-squared	0.865359	S.D. dependent var		835.4869
S.E. of regression	306.5693	Sum squared resid		6578934
Long-run variance	125204.4			

The results confirmed that political instability lead to decrease country's per capita income, while export largely supports economic growth of the selected panel of countries. It is quite interesting that under the political instability, export largely supports country's per capita income, which needs more work to understand this causal relationship between them. The results are consistent with the previous studies of Kugler (2018), Cox and Weingast (2018), etc. Table 9 shows the estimates of Model-IV for ready reference.

Table 9. *Estimates of panel fully modified least squares (FMOLS) for Model-II with square term*

Dependent Variable: MILT				
Method: Panel Fully Modified Least Squares (FMOLS)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
PINS	-0.232878	0.131552	-1.770237	0.0812
VC	2.016133	0.998916	2.018321	0.0475
RQ	1.181726	0.644646	1.833139	0.0712
$(VC)^2$	1.881646	0.687432	2.737209	0.0079
$(RQ)^2$	1.546068	0.616549	2.507617	0.0145
FDI	-0.063392	0.082757	-0.766001	0.4463
TOP	0.003056	0.008464	0.361092	0.7192
R-squared	0.909759	Mean dependent var		2.440859
Adjusted R-squared	0.895161	S.D. dependent var		0.962642
S.E. of regression	0.311692	Sum squared resid		6.606346
Long-run variance	0.146498			

The results show that political instability leads to decrease military expenditures, while voice and accountability and regulatory control both substantially increases military expenditures across countries. The results confined that governance indicators partially support to increase military spending for controlling law and order situation in a country. The results are consistent with the previous studies of Arbetman and Kugler (2018), Mares (2018), etc. Table 10 shows the Granger causality estimates for ready reference.

Table 10. *Dumitrescu-Hurlin panel causality estimates*

Variables	CPI	AIMP	EXPORT	FDI	GDPPC	GEXP	MILT	PINS	RIT	RQ	TOP	VC
CPI	----	→	→	≠	≠	≠	≠	≠	→	≠	≠	≠
AIMP	≠	----	≠	≠	≠	≠	≠	≠	→	→	≠	≠
EXPORT	≠	≠		≠	≠	≠	≠	→	↔	→	→	≠
FDI	≠	→	≠		≠	≠	≠	≠	→	≠	→	≠
GDPPC	≠	→	≠	→		≠	→	→	≠	≠	↔	→
GEXP	≠	→	→	→	→		≠	≠	≠	≠	≠	→
MILT	≠	≠	→	≠	≠	≠		→	↔	≠	↔	≠
PINS	≠	≠		≠	≠	≠	≠		≠	≠	≠	≠
RIT	≠	≠	↔	≠	≠	→	↔	≠		≠	→	≠
RQ	≠	↔		≠	≠	≠	≠	→	≠		≠	≠
TOP	≠	≠	≠	≠	↔	≠	↔	≠	≠	→		≠
VC	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	

Note: → shows unidirectional causality, ↔ shows bidirectional causality, and # shows no causality between the variables.

The results show that there is bi-directional causality between GDPPC and EXPORT, RIT and EXPORT, RQ and AIMP, TOP and GDPPC and between TOP and MILT. There is uni-directional causality exists, running from GDPPC to PINS, VC, AIMP, FDI, MILT and TOP, and from GEXP to AIMP, EXPORT, FDI, GDPPC, and VC. There is also one-way causality exist, running from MILT to EXPORT and PINS, from EXPORT to PINS, RQ and TOP, from FDI to AIMP, RIT and TOP, from RIT to GEXP, MILT and TOP, from RQ to PINS, from TOP to RQ, from AIMP to RIT and RQ and from CPI to EXPORT, AIMP .

4. Conclusions

The military expenditure and economic growth is widely used in the previous literature which provoked the need of effective polices to expand money income on war against terrorism and countries economic growth. The study initiate to analysis military expenditures and economic growth controlling good governance indicators and monetary instruments in a Panel of selected Asian countries by using time series 2000 to 2016 and applied Panel unit root test, Pedroni cointegration, fully modified least squares and Dumitrescu-Hurlin panel causality. The result of the study confirmed the defense burden hypothesis therefore it is advisable to reduce military expenditure in order to expand more income of social expenditure including health, education, poverty reduction and rational income distribution, these recommendation does not seem that military expenditure are no more required to expand money on arms import however we propose that government should have to take care about military expenditures for unnecessary expending on prolific of arms nominations in a country. Although the impact of arms import is positive on countries economic growth however the military officials should have to allocate low spending on arms import to spend more budget on social expenditures. This implication does not imply that arms import is bad equilibrium as we need more spending on war against terrorism where Asian countries especially Pakistan is the Alliance partner's for terrorism reduction. The result confirmed the U-shaped results between military expenditure and per capita income hence it is desirable to reduce military spending by sound social reforms in a country. The growth specific factors including consumer price index, real interest rate, government expenditure and trade openness does not positive contribute to the countries per capita income due to structural imperfection in the policy formulation across countries. We have to increase more spending on education expenditures, increase export and improve price level which may translate positively to the per capita income. The result confirmed that political instability harmful for the countries per capita income hence it is imperative to stabilize political scenario across countries. Similar results found for political instability and military expenditure where political instability negative influence military expenditure hence it is desirable for stable political scenario in a panel of country. The good governance indicators including voice & accountability and regulatory control have a positive impact on military expenditure hence it is desirable to regulate our institutions in order to provide fair justice and accountability to promote the cause of war against terrorism in the long run.

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