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DOES CORRUPTION GREASE OR SAND THE WHEELS OF GROWTH? PANEL EVIDENCE FROM THE EUROPEAN UNION

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Abstract: This paper assesses the impact of corruption on economic growth in the European Union between 1995 and 2019. Using panel data analysis, the corruption-growth nexus for the 27 members of the European Union is assessed. The results suggest a growth-decreasing effect of corruption. Furthermore, the impact tends to worsen when quality of governance is low. This supports the "sand the wheels" hypothesis, and contradicts the "grease the wheels" hypothesis which states that corruption may mitigate the costs of bad governance. In addition, this paper analyses whether corruption affected growth differently in Central European and Western European countries. The paper finds conflicting results in the impact of corruption in Central European and Western European countries.

Keywords: Panel data, Corruption, Institutions and growth, Economic growth, European Union, Governance

1. Introduction

Is corruption as deleterious for economic growth as common sense might tell us? Or, can it actually have positive effects? This still is an ongoing debate that has divided scholars for many decades now. The rather bold statement that corruption might be desirable was first put forward by Leff (1964), Leys (1965), and Huntington (1968) and is commonly referred to as the "grease the wheels" hypothesis. This hypothesis states that corruption may be beneficial in countries with low quality governance because it can help circumvent ill-functioning institutions. The grease in the form of graft acts as a lubricant that enhances efficiency and productivity.

International institutions however reject this hypothesis. Organizations like the World Bank, United Nations (UN), European Union (EU), and International Monetary Fund (IMF) consider corruption to be a major threat to the economy and society as a whole, making the fight on corruption

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a top priority. Kaufmann (2004) estimated the total worldwide bribe payments to be US$600 billion - US$1.5 trillion per year. In its Anti-Corruption Report, published in 2014, the EU estimates the annual cost of corruption on its economy to be €120 billion per year, providing evidence of the severity of the issue. The institutions' standpoint on corruption is supported by a great deal of recent empirical literature, where it is referred to as the "sand the wheels" hypothesis. Mauro (1995) first provided significant evidence of a negative relationship between corruption and investment, which in turn decreases economic growth. These results were later confirmed by many other scholars (see, e.g., Brunetti and Weder, 1998; Mo, 2001; Doh and Teegen, 2003; and Lambsdorff and Cornelius, 2015). They do not however allow for the "grease the wheels" hypothesis to be rejected. Leff (1964), Leys (1965), and Huntington (1968) simply state that corruption can act as a distortion alleviating device for underdeveloped, inefficient government institutions, speeding up economic growth. The "grease the wheels" hypothesis is in line with the "sand the wheels" hypothesis on the detrimental impact corruption forms on efficient institutions. Thus, although on average, research found significant evidence for corruption to decrease economic growth, a positive correlation might be found for the countries included in the sample whose quality of governance is on the lower end. To tackle this issue, Mauro (1995) split his sample into countries with excessive bureaucratic regulations and countries with a well-functioning bureaucratic framework. He found no significant difference between the two groups, leading to his rejection of the "grease the wheels" hypothesis.

The present research assesses the impact of corruption on growth in the European Union. Specifically, this paper analyses how corruption affected growth and whether support is found for either the "sand the wheels" hypothesis or the "grease the wheels" hypothesis. The analysis is performed using a two-way fixed effects model in order to control for unobserved unit-specific and time effects. In doing so, this paper makes a number of contributions to the literature. First, apart from testing whether corruption sanded or greased the wheels of growth in the EU during the 1995-2019 period, differences between Western and Central Europe are also analysed. Second, in addition to using Transparency International's Corruption Perception Index (CPI), this paper also uses the corruption dimension of the World Bank's Worldwide Governance Indicators, for which values are better suited for panel data analyses. Finally, five measures for governance are included in an econometric model for testing the "grease the wheels" hypothesis versus "sand the wheels" hypothesis.

The remainder of this paper is organized as follows: The next section provides a brief review of the theoretical and empirical literature. Section 3 presents the empirical model as well as a description of the data. The empirical results are presented and discussed in sections 4 and 5. Section 6 concludes the paper.

2. Literature Review

2.1. "Grease the Wheels" versus "Sand the Wheels" Hypothesis

Corruption is a complex phenomenon that has been proven hard to pin down. There is no consensus on the meaning of corruption among scholars (Johnston, 1996). Tanzi (1995) put it as: "the intentional noncompliance with arm's length relationship aimed at deriving some advantage from this behaviour for oneself or for related individuals". A simpler and more widely adopted definition is "the abuse of public office for private gain" (see, e.g., Bardhan, 1997; and Kaufmann, 1997).

The nexus between corruption and economic growth has been studied extensively and resulted in conflicting evidence on the impact of corruption on economies. The debate originates in some

scholars arguing that corruption should not only be looked at from a moralistic point of view. Leys (1965) and Nye (1967) stated that the moral implications of corruption may bias the understanding of the consequences of corruption on economic growth. One strand of the literature argues that corruption can—in certain circumstances—enhance efficiency and productivity. In economies where the quality of government is low and rules are complex, corruption can grease inefficiencies (see, e.g., Huntington, 1968; Leff, 1964; and Leys, 1965). This is known as the "grease the wheels" hypothesis. Another strand argues that, although corruption may be beneficial in certain situations where institutions are ill-governed, it creates additional costs and inflates existing ones (Myrdal, 1968; and Rose-Ackerman, 1997). This is known as the "sand the wheels" hypothesis. Both strands tend to agree on the fact that corruption is detrimental to growth in countries with well governed institutions. The debate therefore lies in the presence of corruption in ill-governed economies. When studying the hypotheses, literature has mainly focused on two types of distortions in economies, being inefficiency of bureaucracy and inferior public policies (Méon and Sekkat, 2005).

2.1.1. Grease the Wheels

The first school of thought, here referred to as the "grease the wheels" hypothesis, supports the idea that corruption can—in some circumstances—wield a beneficial effect on growth (see, e.g., Huntington, 1968; Leff, 1964; and Leys, 1965). Both theoretically and empirically, it has been shown that in certain conditions (often in developing economies), corruption can have a positive impact on economic growth. The inefficiency of bureaucracy has often been put forward by scholars as being the most prominent inefficiency that corruption can grease. As Huntington (1968) puts it: "In terms of economic growth, the only thing worse than a society with a rigid, overcentralized, dishonest bureaucracy is a society with a rigid, overcentralized, honest bureaucracy". Focusing on the inefficiency of bureaucracy, Leys (1965) stated that ill-functioning bureaucracies often deliberately promote inefficiency as agents do not have an incentive to speed-up work. Bribes can stimulate government officials into speeding up the decision-making process and operationalization of contracts and licences.

Another problem corruption can address in transition economies is the quality of civil servants. Wages in the private sector are often higher compared to those in the public sector. The outlook of supplementing their wage with bribes can attract competent civil servants who would otherwise opt for higher paying jobs in the private sector (Leys, 1965; and Bailey, 1966). Furthermore, Beck and Maher (1986) and Lien (1986) argue that corruption may help civil servants in their decision-making process. When bureaucrats act on limited information or do not possess the needed competence in order to select the most efficient competitor to award a license or contract, corruption can help the bureaucrat in selecting the most efficient project. They formally show that the most efficient firm is always the winner of a bidding contract and thus that bribery can reproduce the outcome of a competitive auction.

Apart from serving as a remedy for inefficient bureaucracies, Leff (1964) and Bailey (1966) argue that corruption also functions as a hedge and safeguard against losses stemming from bad economic policy. When entrepreneurs make investments, they want to have a certain level of guarantee that policy implications will not harm the outcome of their investments. Entrepreneurs can make use of corruption to lobby for policy that is more favourable in their opinion than the government-implemented policy.

Lastly, Leff (1964) provides counterarguments for the alleged negative effect corruption has on growth due to tax evasion. One side of the argument argues that bureaucratic corruption may hamper development by preventing governments from collecting tax revenues necessary for developmental

policies. However, Leff (1964) states that of the revenues taxation might have brought in, only a part would have been invested in development. Moreover, when a government is reluctant to invest the collected tax revenues, which is often the case in the second-best world,[1] the tax collections the ineffective government missed out on due to corruption may lead to a net gain for development, provided the bribers invest efficiently (Leff, 1964).

2.1.2. Sand the Wheels

According to the "sand the wheels" hypothesis, corruption creates costs in the economy and inflates existing ones, reducing efficiency, growth, and investment (Myrdal, 1968; and Rose-Ackerman, 1997). Myrdal (1968) argues that corrupt bureaucrats often delay processes in order to attract bribes. Corrupt civil servants are also incentivized to create new distortions in the economy in order to secure their illegal source of income (Kurer, 1993). For example, a corrupt agent may ration a service in order to be able to provide that service in exchange for a bribe. He might also be incentivised to limit new agents' access to key positions in order to secure his income from corruption (Méon and Sekkat, 2005). Furthermore, the gain of bribing a public servant may be limited when the decision-making involves multiple agents. In order for the bribing to be effective, more bribes need to be provided (Shleifer and Vishny, 1993). The increasing number of transactions for every corrupt official to be satisfied acts as a distortion, lowering efficiency (Jain, 2001).

It is also unlikely that bribe payments lead to awarding the license or contract to the most efficient bidder, as argued by Beck and Maher (1986) and Lien (1986). Mankiw and Whinston (1986) point out that a firm's entry into a market may be desirable to the entrant but harm society as a whole, since the entrant's output reduces that of established firms. Moreover, as Méon and Sekkat (2005) point out, corruption may not be the most effective way of granting a contract or license to the most efficient producer. Rather than being the most efficient bidder, the winner may just be the most optimistic bidder.

Focusing on public policy, the argument that corruption may act as a hedge and safeguard against bad public policy is questionable. Méon and Sekkat (2005) point out that this argument may hold when the additional risks involved in corrupt transactions are not taken into account. However, as corruption is illegal, the recipient of the bribe may not be committed to delivering on the terms of agreements of the deal. The uncertainty of corrupt agreements may just nullify the efficiency gain that is sought-after (Bardhan, 1997).

Finally, the argument that corruption may lead to an increase in both quantity and quality of investment, pointed out by Leff (1964), is also questionable. Tanzi and Davoodi (1998) show empirically that a high level of corruption is negatively correlated with public investment. Mauro (1995; 1998) argues that corruption leads to a diversion of public spending towards less efficient allocations, making it unlikely that high levels of corruption foster growth.

2.2. Empirical Evidence

Mo (2001) confirmed the findings of Mauro's pioneering work that on average, corruption reduces economic growth. Their findings do not however provide for sufficient evidence to reject the "grease the wheels" hypothesis, which implies that corruption may enhance efficiency and productivity in countries where bureaucracy is ill-functioning and public policy is inferior, but remains detrimental elsewhere. So, while on average, evidence is found in support of the "sand the wheels" hypothesis,

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[1]Economic policy of many underdeveloped countries may be predicated on priorities other than global economic development (Leff, 1964).

the "grease the wheels" hypothesis may hold for some cases within the sample. Mauro (1995) addressed this issue by dividing his sample in low red tape countries and high red tape countries, with red tape referring to the excessive amounts of bureaucratic regulations. The results confirmed the "sand the wheels" hypothesis in both subsamples. Méon and Sekkat (2005), using a sample of around 70 countries, found the negative impact of corruption on growth to be significant, providing support for the results of Mauro (1995) and Mo (2001). Interestingly, they also found the impact of corruption on growth to worsen when the quality of governance deteriorated. Furthermore, Ugur and Dasgupta (2011) also found the negative impact of corruption on per capita growth to be significant for a set of countries in Asia and the Pacific for the 1985 to 2012 period. Cieślik and Goczek (2018) found low levels of corruption to have a positive and significant effect on GDP per capita growth, using a sample of 142 countries for the period from 1994 to 2014. The impact of corruption on growth in the African continent was studied by d'Agostino et al. (2016). They found significant evidence for the "sand the wheels" hypothesis for the period from 1996 to 2010. Deyshappriya (2015) studied the effect of corruption and peace on economic growth for a panel of 126 countries for the period from 2008 to 2012. The obtained results confirm that corruption negatively affects GDP per capita. Using panel data for more than 100 countries, Drudy et al. (2006) studied the impact corruption and democracy have on economic growth. They argued that corruption has no significant effect on economic growth in democracies. This is due to the fact that one of democracy's indirect effects is its ability to mitigate the detrimental effect of corruption on growth. Non-democracies do suffer significantly from corruption, they found. For the 2012-to-2018 period, the nexus between corruption and growth was examined by Gründler and Potrafke (2019), based on a sample of 175 countries. Their results are in line with those discussed above. High levels of corruption lead to decreasing per capita GDP growth. They found the effect to be especially pronounced in autocracies.

The evidence for the "sand the wheels" hypothesis is overwhelming, yet not conclusive. Méon and Weill (2010) prove that the debate still stands on whether corruption can act as an efficient grease for the wheels of growth of an ill-governed institutional framework. In their analysis, the interaction between aggregate efficiency, corruption, and other dimensions of governance was assessed for a panel of 69 countries, both developed and developing, and this for the period from 2000 to 2003. Unlike other studies, this resulted in significant evidence in favour of the "grease the wheels" hypothesis. Corruption was found to be less detrimental in countries where the institutional framework is weaker. In extreme cases, this results in positive correlations, supporting the hypothesis that corruption greases the wheels of growth. Huang (2016) also found mixed results on a macroeconomic level. In his cross-country analysis of thirteen Asia-Pacific countries, he obtained results that are not in line with the "sand the wheels" hypothesis. During the period from 1997 to 2013, corruption in South-Korea positively affected economic growth.

2.3. Governance and Economic Growth

According to the Solow-Swan model for long-run economic growth, changes in growth can be explained by capital accumulation, labour, and productivity (Solow, 1956). Hall and Jones (1999) however argue that cross-country differences in output do not just originate in factor accumulation and factor productivity; significant differences across countries can be attributed to government policies and institutions, since more qualitative government policies and institutions encourage both investment and production (Acemoglu et al., 2004). Romer (2001) stresses that neoclassical growth models perform great at explaining evolution in growth over time, however, perform poorly at explaining economic differences across regions. The belief that governance is a significant driver of

economic growth was confirmed by Emara and Jhonsa (2014), based on the results from a global sample of countries.

Kraay et al. (2010) define governance as "the traditions and institutions by which authority in a country is exercised". The authors put forward six dimensions of governance. Those six fundamental measures of governance are: (i) voice and accountability, (ii) political stability and absence of violence and terrorism, (iii) government effectiveness, (iv) regulatory quality, (v) rule of law, and (vi) control of corruption. These six dimensions that measure the quality of governance are known as the Worldwide Governance Indicators (WGI). The WGI is a popular set of indicators used in empirical growth literature.

Gani (2011) studied the impact of governance on economic growth for a sample of 84 developing countries. Similar to this paper, the framework for measuring quality of governance by Kraay et al. (2010) was used. The results showed that both political stability and government effectiveness were significantly correlated with growth. The impact of voice and accountability and corruption were found negative and statistically significant. Regulatory quality and rule of law were both negatively related to economic growth, but the effect was found statistically insignificant. By studying the impact of democracy on economic growth for the 1970-to-2013 period, Salahodjaev (2015) found a positive and statistically significant relationship between democracy and growth, in line with the results of Butkiewicz and Yanikkaya (2006). Younis et al. (2008) studied the political stability-growth nexus for ten Asian economies for the period from 1990 to 2005. A close relationship between political stability and economic growth was found. Butkiewicz and Yanikkaya (2005) found political violence, as a proxy for political instability to have a significant negative effect on growth for a panel of over 100 countries for the 1970-to-1997 period. Besides that, Aisen and Veiga (2013) studied the impact of political instability on growth for a global sample of countries for the 1960-to-2004 period and found significant evidence of a negative impact of corruption on growth. Alam et al. (2017) studied the effect of government effectiveness on economic growth for a panel of 81 countries and found the relationship to be positive and statistically significant.

2.4. Corruption and Growth in the European Union

2.4.1. East-West Divide

According to Transparency International's 2019 CPI, a large variance in corruption is observable within the EU. Tsanana et al. (2016) showed the existence of two distinct groups in the EU, based on CPI scores. By calculating the mean CPI values for the two groups from 2000 to 2013, the mean CPI of the (old) EU-14 countries[2] was found to be significantly better than the (new) EU-13 countries.[3] However, a downward trend in corruption was clearly observed for the EU-14 countries, going from a mean value of approximately 60 in 2000 to 45 in 2013, where 0 is very clean and 100 is very corrupt, since this paper used inverted CPI values. For the EU-13, the value remained stable around 25-30 during the period under study. The EU's efforts at fighting corruption are visible in the 2019 CPI. Nine out of the top twenty countries are European member states. However, Slovakia, Greece, Croatia, Romania, Hungary, and Bulgaria each maintained a CPI score of 50 or less, 0 being highly corrupt (Transparency International, 2019).

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[2] Refers to the countries that were part of the EU before 2004 and comprise the EU-15 minus the UK: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, and Sweden.

[3] Refers to the countries that became member states of the EU since 2004: Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia.

2.4.2. Empirical Evidence

The impact of corruption on growth for EU member states has also been studied several times, be it by focusing on a specific sample of countries or on the EU as a whole. A brief summary is provided below.

Wallace and Haerpfer (2000) studied the relationship between corruption and economic growth for a sample of eleven countries in Central and Eastern Europe from 1993 to 1998. They observed a high and negative correlation between corruption and economic growth (r = -0.69). Poland, for example, witnessed the highest GDP per capita growth of the sample, with a cumulative growth of 33.8 percent, while at the same time experiencing the lowest perception of corruption, according to Transparency International's CPI. Ukraine, on the other hand, saw its GDP per capita plummit by 64.3 per cent, while also being the sample's country with the highest perception of corruption. Paiders (2008) analysed the relationship between corruption levels and economic growth for a global sample, where he also focused on the European region. The results showed a high correlation between the average values of GDP per capita and Transparency International's CPI values for the 1998-to-2005 period. Piplica and Čovo (2011) studied the impact of corruption on economic growth in eleven EU member states, all transition countries, whereby focusing on Croatia. They found that reducing corruption in Croatia during the period from 1999 to 2009 would have positively affected economic growth. The correlation between low levels of corruption and economic growth was found to be positive (r = 0.595) and significant, leading to the conclusion that corruption control would have led to an increase in GDP per capita in Croatia for the observed period. Next, they examined the impact for the ten transition countries for the period 1995 to 2009. Although the correlation coefficient is slightly lower (r = 0.556), reducing corruption in the transition countries would have also positively impacted economic growth during the observed period.

Grochová and Otáhal (2013) tested the impact of corruption on economic growth in Central and Eastern Europe for a set of eleven post-transition countries, for a fourteen-year period. They also found that high levels of corruption led to lower GDP growth. In order to improve economic performance, they suggest focusing on establishing and enforcing a well-defined legal framework. Papaconstantinou et al. (2013) studied the impact of bureaucracy and corruption on economic development for the EU-15.[4] They found significant evidence that corruption control stimulated GDP per capita growth between 1996 and 2006. Graeff and Svendsen (2013) searched for an answer to the question of why Scandinavian countries in the European Union are significantly richer than Southern and Eastern European member states. Based on a sample of 25 countries, they found corruption to be a strong predictor of low levels of economic development for the period, using data from the late 1990s. Tsanana et al. (2016) tried to provide evidence on the possibly different ways corruption and bureaucracy cause impacts on economic growth in the EU over the 1995-to-2012 period, using panel data techniques. Furthermore, they examined whether differences were noticeable between established EU member states (EU-14) and newer member states (EU-13). Interestingly, they concluded that fighting corruption and bureaucracy does not always lead to increased growth. During the period under study, corruption was positively correlated with growth in the EU-13 states. In the EU-14 states on the other hand, a negative correlation was observed. Lastly, Borlea et al. (2017) investigated the relationship between corruption and shadow economy among the 28 European Union countries for the period 2005 to 2014. They found the correlation between corruption and growth to be high and negative (r = -0.701) and significant at the 1% level. Their findings provide evidence that corruption reduced economic growth in the EU

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[4] Countries that became part of the EU in 1995 or earlier.

in the period under study.

To summarize the findings discussed above: although most researchers find support for the "sand the wheels" hypothesis, some cases exist, also within the EU, as Tsanana et al. (2016) showed, where corruption had a positive impact on economic growth.

3. Data and Method

3.1. The Model

Below we use a macroeconomic Cobb-Douglas production function that measures economic growth through capital accumulation, labour, and technological progress (total factor productivity). As Acemoglu et al. (2004) and others have stressed, a measure for governance is also imperative in cross-country growth modelling. Apart from a measure for quality of governance, a corruption measure is also added to the model. This results in the (basic) specification in Equation 1. The variables used in this equation are defined in Table 1. As further discussed in the *data* section, this paper uses two proxies for measuring corruption. The datasets of the World Governance Indicators (WGI) and Transparency International's Corruption Perception Index (CPI) were consulted for the analysis.

$$GDP_{it} = \beta_0 + \beta_1 CAP_{it} + \beta_2 EMP_{it} + \beta_3 CORR_{it} + \beta_4 QoG_{it} + \varepsilon_{it} \qquad \dots (1)$$

Table 1: Data Description

Indicator	Abbreviation	Definition	Source
Economic growth	GDP	log of GDP (2015 constant prices, in Mrd of home currency)	AMECO, 2019
Capital stock	CAP	log of net capital stock (2015 constant prices, in Mrd of home currency)	AMECO, 2019
Employment	EMP	log of net employment of all domestic industry (in thousands)	AMECO, 2019
Corruption	CORR	WGI: log of inversed Control of corruption index (range: 0 to 100) CPI: log of inversed Corruption Perception Index (range: 0 to 100)	WGI, 2019; Transparency International, 2019
Quality of governance	QoG	log of proxy for quality of governance (range: 0 to 100)	WGI, 2019

This paper uses five proxies for measuring quality of governance, which are listed in Table 2 and further defined in the data section. Apart from the typical variables used in growth theory and a measure for corruption and quality of governance, one more type of explanatory variable is to be included in a model for testing the "grease the wheels" hypothesis versus the "sand the wheels" hypothesis. Given the fact that the quality of governance in a country and the amount of corruption that is perceived are related, as the literature review pointed out, it makes sense to include this relationship in an econometric model on corruption and growth. Second to that, in order to test whether support is found for either the "grease the wheels" hypothesis or the "sand the wheels" hypothesis, the interaction between corruption and governance is to be assessed. The addition of this interaction term results in Equation 2.

$$GDP_{it} = \beta_0 + \beta_1 CAP_{it} + \beta_2 EMP_{it} + \beta_3 CORR_{it} + \beta_4 QoG_{it} + \beta_5 (CORR_{it} * QoG_{it}) + \varepsilon_{it} \dots (2)$$

Table 2: Proxies for Quality of Governance

Indicator	Abbreviation	Definition	Source
Regulatory quality	RQ	log of Regulatory quality index (range: 0 to 100)	WGI, 2019
Voice and accountability	VA	log of Voice and accountability index (range: 0 to 100)	WGI, 2019
Government effectiveness	GE	log of Government effectiveness index (range: 0 to 100)	WGI, 2019
Rule of law	RL	log of Rule of law index (range: 0 to 100)	WGI, 2019
Political stability and absence of violence	PS	log of Political stability and absence of violence index (range: 0 to 100)	WGI, 2019

Descriptive statistics for the variables included in the model can be found in Table A-1 (see Appendix). The focus of this paper is laid on parameters β_3 and β_5. β_3 is the parameter for the corruption measure and is expected to be < 0. Next, β_5 is perhaps most interesting since it measures whether bad governance increases the cost of corruption, as stated in the "sand the wheels" hypothesis, or whether bad governance alleviates the cost of corruption, following the "grease the wheels" hypothesis.

Apart from testing the impact of corruption on growth for the total 27-country sample, this paper also analyses whether an East/West divide is observable. In order to do so, the method of Tsanana et al. (2016) is followed, dividing the sample of European member states into two subsamples, based on their date of entry to the EU. The 14 countries that became part of the EU before 2004 are pooled in one subsample, while countries that joined later are pooled in a second subsample. The division based on date of entry also implicitly creates a distinction between Central European countries and Western European countries. Figure 1 visualizes the average values for the corruption data, based on the World Bank's WGI database. A clear distinction is observed between the Western European and Central European countries. The average corruption score for the EU-14 countries is around 10 to 15 points, whereas the EU-13 countries score significantly worse with average values ranging from 30 to 35 points.

Figure 1: Corruption in Central (EU-13) and Western (EU-14) Europe
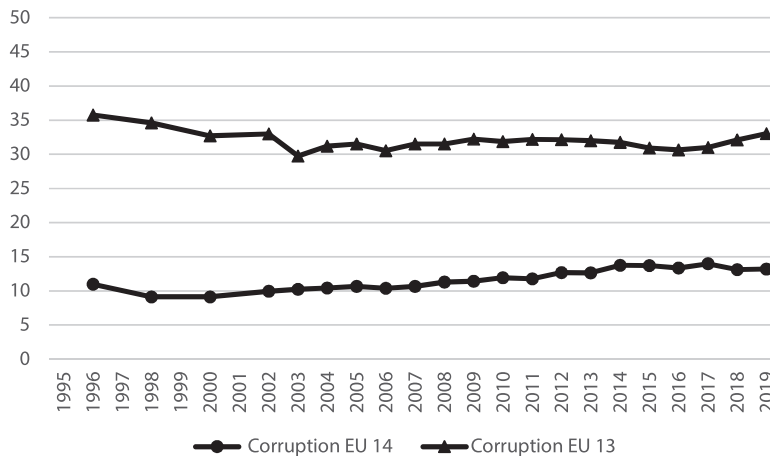
Source: Own calculations based on data from the World Bank's World Governance Indicators

The paper uses a panel data analysis to examine the existence of individual-specific effects and time effects and can control for these effects. Failing to control for unobserved variables that are constant across individuals but change over time, or variables that are constant over time but change across individuals leads to unobserved variable bias after all (Stock and Watson, 2015). The individual-specific and time effects can either be fixed or random. The choice of a fixed or random effects model specification was made with the aid of the Hausman test (Hausman, 1978).

3.2. Data

3.2.1. Corruption Data

This paper relies on data on corruption from two different sources, in order to assess whether the results are robust. Data from the WGI's Control of Corruption index and Transparency International's CPI are consulted for they have been proven valid and reliable, comparable over time, and available over longer periods. The WGI "compiles and summarizes data from over 30 sources that report the views and experiences of citizens, entrepreneurs, and experts in the public, private and NGO sectors from around the world, on the quality of various aspects of governance" (Kraay et al., 2010). A weighted average of the data from each source for each country is then constructed via an unobserved components model, as described in (Kraay et al., 2010). Results are generated in units of a standard normal distribution with mean zero, standard deviation of one, and ranging from -2.5 to +2.5. However, data are also reported in a percentile rank, ranging from 0 to 100, with higher values representing better control of corruption. In order for interpretation to be straightforward, this paper uses the inverted index so that an increase in the index corresponds to an increase in corruption level.

Data from Transparency International are unfit for panel-data analysis for the years preceding 2012 as a result of a change in methodology for calculating corruption scores. This paper, however, does use the CPI in order to test the robustness of the results from the World Bank's Control of Corruption index. The change in methodology is portrayed in the model in the form of a dummy variable. The variable equals zero when the years preceding 2012 are assessed, and equals one if not. Similar to data from the World Bank, the CPI is transformed to a 0 to 100 scale, where higher values represent a high level of corruption.

3.2.2. Governance Data

The perceived level of corruption in a country is often seen as a component of the quality of a government. In order to get an understanding of the quality of governance, scholars and institutions have put forward pools of indicators. Indicators of which (the control of) corruption is often one. The International Country Risk Guide (ICRG) and WGI are examples of providers of such pooled indicators that give an understanding of the quality of a government. The popularity of the WGI is portrayed in the great deal of recent literature that includes one or multiple measures on governance in their studies.

Apart from the control of corruption, which is discussed above, the WGI reports on five other dimensions of governance, viz., voice and accountability, political stability and the absence of violence and terrorism, government effectiveness, regulatory and the rule of law. All six dimensions are reported in percentile rank, with values ranging from 0 to 100 with again higher values representing better quality of governance (Kraay et al., 2010).

Similar to the data on corruption, data on all other five dimensions of governance is available for all 27 EU member states for the 1995-to-2019 period. Annual data is available, with the exception of the 1995-to-2002 period, where the data was updated biennially.

3.2.3. Economic Data

Data on GDP, capital stock, and employment are taken from the annual macro-economic database of the European Commission (AMECO) (European Commission, 2019). The sample contains data for all 27 EU member states, where data for the 1995 to 2019 period was selected. Descriptive statistics for each variable used in the model can be found in Table A-1 (see Appendix).

4. Results

This section presents the results of the panel data. The analysis is first performed for the full 27-country sample. Subsequently, the two subsamples are analysed. The estimated results using a two-way fixed effects model are presented in the basic specification columns of Table 3 for the full sample and Table 4 and Table 5 for the subsamples. The basic specification is regressed five times. Each regression includes a different proxy for quality of governance.

First, the variables are checked for stationarity. Non-stationary data may produce spurious inference after all (Kao, 1999). The Levin-Lin-Chu (LLC) test was performed to check whether the panels contain unit roots (Levin et al., 2002). For each variable in the model, the data is checked for unit roots. The null hypothesis for the LLC test holds when the panels contain unit roots. The alternative hypothesis holds when the statistical properties of the panels are constant over time. The null hypothesis for the LLC test is rejected for all variables ($p < 0.05$), indicating all panel data are stationary.

The basic specification explains 87 to 92 percent of variance in growth, depending on the sample and which proxies for governance and corruption are included in the model. Capital stock (CAP) and employment (EMP) enter the regression with positive coefficients, all being significant at the 1 percent level. A significant difference is observable in the coefficients between the two subsamples. Where capital stock and employment rates are substantial drivers of economic growth in the EU-14, the impact of these economic variables is far less present in the EU-13. A one percent increase in capital stock in the EU-14 led on average to a 0.70 percent increase in GDP, keeping all else equal. In the EU-13, the increase in GDP was on average only 0.24 percent, again keeping all else equal. The difference in the impact of employment rates on growth is also significant between the two subsamples, though less drastic than the capital stock rates.

All five proxies for governance are positive and significant at the 1 percent level in the full sample, with coefficients ranging from 0.14 to 0.48. This leads to the conclusion that during the 1995 to 2019 period, good quality governance was a significant predictor of economic growth in the European Union. Again, the basic specification columns of Table 4 and Table 5 visualise the difference between Central European and Western European countries. The coefficients for governance in the EU-14 are all positive and statistically significant at the one percent level. Except for political stability and the absence of violence (PS), all coefficients are higher compared to the full sample.

In the EU-13 sample, the impact of quality of governance on growth is less significant. In the models where corruption is proxied by the WGI, only government effectiveness (GE) is found to be a significant driver of growth. When the CPI is considered as a measure for corruption, the effect becomes more present, with all but one proxy for quality of government being significantly positive. Contrary to the arguments in favour of growth-stimulating effect of good governance, empirical results show that good governance does not always foster economic growth.

Next, the impact of corruption on growth is considered. In the EU as a whole, corruption was not found to have a significant impact on growth for the period under study. This is remarkable considering the mass of empirical literature providing significant evidence for a growth-reducing

effect of corruption, based on global samples and EU-specific analyses. For the EU-14 subsample in Table 4, the same conclusion can be drawn: corruption did not affect growth in Western Europe during the 1995 to 2019 period. In Central Europe on the other hand, on average, higher levels of corruption are associated with lower growth rates.

As mentioned in the model specification, the amount of corruption that is perceived and a country's quality of governance are two interlinked phenomena. Many scholars already pointed out the significance of the interaction between corruption and governance. To improve the quality of the model and in order to test for support for the "grease the wheels" hypothesis or the "sand the wheels" hypothesis, an interaction term is included in the second section of the analysis. Again, the analysis is first performed for the EU as a whole and subsequently, the sample is split into the Western EU-14 and Central EU-13 countries.

The interaction term in column 2 of Table 3 is positive and statistically significant in seven out of the ten specifications. The positive coefficients can be interpreted as follows: An increase in quality of governance mitigates the cost of corruption. In other words, these results support the "sand the wheels" hypothesis, which states that declining quality of governance increases the cost of corruption. Where the coefficient for corruption (CORR) was previously zero, they are now negative and significant for eight of the ten specifications. The coefficients for quality of governance on the other hand are not found significant anymore except for three specifications that become negative when the interaction term is added. The effect of capital stock (CAP) and employment (EMP) remains constant.

Table 3: Determinants of Growth, Two-way Fixed Effect Model for the EU-27

Specification	Basic Specification									
	RQ		GE		PS		VA		RL	
	WGI	CPI	WGI	CPI	WGI	CPI	WGI	CPI	WGI	CPI
Explanatory Variables										
Constant	-2.37	-3.76	-3.46	-4.15	-1.33	-2.33	-1.59	-2.74	-2.62	-3.84
	(-5.31)**	(-8.80)**	(-7.64)**	(-9.49)**	(-3.60)**	(-6.33)**	(-3.60)**	(-6.19)**	(-6.39)**	(-9.55)**
CAP	0.58	0.57	0.57	0.60	0.60	0.62	0.62	0.65	0.51	0.50
	(18.08)**	(18.47)**	(18.86)**	(20.15)**	(19.01)**	(20.57)**	(19.65)**	(20.78)**	(15.23)**	(15.08)**
EMP	0.33	0.44	0.38	0.47	0.29	0.39	0.29	0.38	0.40	0.51
	(7.92)**	(10.53)**	(9.34)**	(11.33)**	(7.05)**	(9.32)**	(6.82)**	(8.84)**	(9.37)**	(12.12)**
CORR	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.00	0.01
	(0.00)	(-1.27)	(0.16)	(-1.51)	(-0.83)	(-1.55)	(-0.49)	(-1.68)	(0.06)	(-1.62)
RQ	0.32	0.47								
	(5.55)**	(8.16)**								
GE			0.49	0.46						
			(8.75)**	(8.94)**						
PS					0.14	0.16				
					(5.47)**	(6.76)**				
VA							0.16	0.24		
							(2.79)**	(3.91)**		
RL									0.36	0.48
									(8.00)**	(9.82)**
Obs.	567	546	567	546	567	546	567	546	567	546
R² adj	0.87	0.88	0.88	0.88	0.87	0.87	0.87	0.87	0.88	0.88

Table 3 contd…

	Basic Specification + Interaction									
Specification	RQ		GE		PS		VA		RL	
	WGI	CPI	WGI	CPI	WGI	CPI	WGI	CPI	WGI	CPI
Explanatory Variables										
Constant	-1.12	-0.85	-1.38	1.00	-0.85	-0.45	1.46	5.73	-1.90	1.66
	(-1.13)	(-0.52)	(-1.42)	(0.63)	(-1.96)*	(-0.61)	(1.27)	(3.10)**	(-1.60)	(0.94)
CAP	0.57	0.56	0.56	0.56	0.60	0.62	0.61	0.60	0.51	0.47
	(17.55)**	(17.34)**	(18.18)**	(17.96)**	(19.19)**	(20.31)**	(18.99)**	(18.86)**	(15.23)**	(14.29)**
EMP	0.34	0.46	0.39	0.51	0.29	0.39	0.32	0.44	0.40	0.53
	(8.03)**	(10.70)**	(9.48)**	(11.94)**	(7.04)**	(9.46)**	(7.32)**	(10.00)**	(9.31)**	(12.61)**
CORR	-0.33	-0.75	-0.54	-1.30	-0.16	-0.50	-0.80	-2.19	-0.18	-1.35
	(-1.41)	(-1.87)	(2.42)*	(-3.43)**	(-2.15)*	(-2.94)**	(-2.87)**	(-4.73)**	(-0.65)	(-3.22)**
RQ	0.05	-0.17								
	(0.23)	(-0.49)								
GE			0.04	-0.68						
			(0.21)	(-2.00)*						
PS					0.02	-0.24				
					(0.40)	(-1.71)				
VA							-0.53	-1.66		
							(-2.12)*	(-4.07)**		
RL									0.21	-0.74
									(0.84)	(-1.93)
CORR*RQ	0.07	0.16								
	(1.41)	(1.85)								
CORR*GE			0.12	0.28						
			(2.42)*	(3.41)**						
CORR*PS					0.04	0.11				
					(2.10)*	(2.89)**				
CORR*VA							0.18	0.48		
							(2.86)**	(4.71)**		
CORR*RL									0.04	0.29
									(0.65)	(3.20)**
Obs.	567	546	567	546	567	546	567	546	567	546
R² adj	0.87	0.88	0.88	0.88	0.87	0.88	0.87	0.87	0.88	0.89

Notes: *significant at 5% level, **significant at 1% level; t-statistic values are displayed in parentheses under the coefficient estimates. CAP = log of Net capital stock (2015 constant prices, in Mrd of home currency; EMP = log of Net employment of all domestic industry (in thousands); CORR = log of Inversed corruption index; RQ = log of Regulatory quality index; GE = log of Government effectiveness index; PS = log of Political stability and absence of violence index; VA = log of Voice and accountability index; RL = log of Rule of law index. Fixed effects estimations were chosen as the Hausman test resulted in a rejection of the null hypothesis that the preferred model would be random effects. Data were checked for stationarity with the aid of a Levin-Lin-Chu (LLC) test. The null hypothesis for the LLC test is rejected for all variables ($p < 0.05$), indicating all panel data are stationary.

Subsequently, the model is regressed for the EU-14 and the EU-13 sub-samples. The results are found in the interaction-included columns of Table 4 and Table 5. Similarly, to the full sample, the coefficients of capital stock (CAP) and employment (EMP) remain constant when compared to the basic specification. The interaction term that was positive and significant in seven specifications in the full sample is positive and significant in only five specifications for the EU-14 sample. The "sand the wheels" hypothesis thus also holds for the EU-14 subsample, though the results are less robust. Qualitative government policies and institutions lowered the cost of corruption during the 1995-2019 period. In line with results for the full sample, corruption did cause harm to economic growth in the EU-14. The coefficients of corruption (CORR) are all negative and statistically significant in five of the specifications. The impact of quality of governance on growth is also negative and statistically significant in three of the specifications.

Table 4: Determinants of Growth, Two-way Fixed Effect Model for the EU-14 (Old Member States)

	Basic Specification									
Specification	RQ		GE		PS		VA		RL	
	WGI	CPI	WGI	CPI	WGI	CPI	WGI	CPI	WGI	CPI
Explanatory Variables										
Constant	-5.39	-5.27	-5.68	-5.62	-3.51	-3.63	-5.34	-5.28	-4.63	-4.68
	(-11.06)**	(-10.91)**	(-11.06)**	(-10.94)**	(-8.31)**	(-8.42)**	(-10.08)**	(-10.13)**	(-10.68)*	(-10.66)**
CAP	0.75	0.74	0.68	0.68	0.64	0.63	0.77	0.77	0.62	0.61
	(12.04)**	(11.94)**	(11.32)**	(11.26)**	(9.96)**	(9.94)**	(11.63)**	(11.58)**	(10.25)**	(10.23)**
EMP	0.40	0.41	0.52	0.53	0.55	0.57	0.37	0.38	0.48	0.50
	(5.97)**	(5.77)**	(8.33)**	(8.20)**	(8.01)**	(8.18)**	(5.05)**	(4.97)**	(7.50)**	(7.54)**
CORR	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
	(1.25)	(1.13)	(0.74)	(0.59)	(0.40)	(1.02)	(1.11)	(1.01)	(0.63)	(0.39)
RQ	0.59	0.60								
	(6.90)**	(6.66)**								
GE			0.53	0.51						
			(6.91)**	(6.67)**						
PS					0.08	0.07				
					(2.80)**	(2.77)**				
VA							0.60	0.58		
							(5.67)**	(5.60)**		
RL									0.48	0.48
									(6.75)**	(6.68)**
Obs.	287	293	287	293	287	293	287	293	287	293
R² adj	0.90	0.89	0.90	0.89	0.88	0.88	0.89	0.89	0.89	0.89

Table 4 contd…

Specification	Basic Specification + Interaction									
	RQ		GE		PS		VA		RL	
	WGI	CPI	WGI	CPI	WGI	CPI	WGI	CPI	WGI	CPI
Explanatory Variables										
Constant	-3.80	-5.02	-3.51	-5.25	-2.37	-1.67	-3.04	-4.48	1.35	-2.66
	(-3.84)**	(-2.85)**	(-3.09)**	(-2.58)**	(-5.10)**	(-2.10)*	(-2.46)*	(-2.21)*	(0.84)	(-1.04)
CAP	0.75	0.75	0.68	0.68	0.68	0.66	0.76	0.77	0.62	0.62
	(12.03)**	(11.89)**	(11.27)**	(11.23)**	(11.02)**	(10.42)**	(11.48)**	(11.57)**	(10.59)**	(10.24)**
EMP	0.38	0.40	0.48	0.53	0.49	0.53	0.36	0.38	0.41	0.49
	(5.47)**	(5.61)**	(7.40)**	(8.03)**	(7.42)**	(7.60)**	(4.92)**	(4.92)**	(6.26)**	(7.29)**
CORR	-0.44	-0.06	-0.55	-0.09	-0.35	0.51	-0.64	-0.21	-1.43	-0.51
	(-1.84)	(-0.13)	(-2.12)*	(-0.18)	(-4.97)**	(-2.89)**	(-2.04)*	(-0.40)	(-3.85)**	(-0.80)
RQ	0.30	0.52								
	(1.68)	(1.44)								
GE			0.14	0.44						
			(0.73)	(1.04)						
PS					-0.14	-0.33				
					(-2.77)**	(2.34)*				
VA							0.14	0.41		
							(0.55)	(0.95)		
RL									-0.70	0.04
									(-2.22)*	(0.08)
CORR*RQ	0.10	0.01								
	(1.85)	(0.14)								
CORR*GE			0.12	0.02						
			(2.13)*	(0.19)						
CORR*PS					0.08	0.11				
					(5.00)**	(2.92)**				
CORR*VA							0.14	0.05		
							(2.05)*	(0.41)		
CORR*RL									0.31	0.11
									(3.86)**	(0.80)
Obs.	287	293	287	293	287	293	287	293	287	293
R² adj	0.90	0.89	0.90	0.89	0.89	0.88	0.89	0.89	0.90	0.89

Notes: *significant at 5% level, **significant at 1% level; t-statistic values are displayed in parentheses under the coefficient estimates. CAP = log of Net capital stock (2015 constant prices, in Mrd of home currency; EMP = log of Net employment of all domestic industry (in thousands); CORR = log of Inversed corruption index; RQ = log of Regulatory quality index; GE = log of Government effectiveness index; PS = log of Political stability and absence of violence index; VA = log of Voice and accountability index; RL = log of Rule of law index. Fixed effects estimations were chosen as the Hausman test resulted in a rejection of the null hypothesis that the preferred model would be random effects. Data were checked for stationarity with the aid of a Levin-Lin-Chu (LLC) test. The null hypothesis for the LLC test is rejected for all variables ($p < 0.05$), indicating all panel data are stationary.

Turning to the EU-13 subsample, the impact of capital stock (CAP) and employment (EMP) on growth remains constant with the inclusion of the interaction term. In the specification where governance is proxied by regulatory quality (RQ), the effect of corruption on growth becomes positive and substantial, while also statistically significant at the 5 percent level when corruption is proxied by the WGI. The coefficients for the other specifications are statistically insignificant. When data on corruption from the CPI is included, the coefficients become negative and statistically significant in all but one specification. Similar results are observed for the coefficients for quality of governance.

In this sample, a large discrepancy is visible in the coefficients of the interaction terms. When data from the CPI is used, the coefficients are significantly positive in four out of five specifications and thus in line with findings from the EU-14 sample and the all-country sample. However, when data on corruption from the WGI is used to regress the model, the coefficients become negative, though only statically significant in one of the five specifications.

Table 5: Determinants of Growth, Two-way Fixed Effect Model for the EU-13 (CEEC Member States)

Basic Specification										
Specification	RQ		GE		PS		VA		RL	
	WGI	CPI	WGI	CPI	WGI	CPI	WGI	CPI	WGI	CPI
Explanatory Variables										
Constant	1.39	-1.52	0.00	-1.22	1.17	-0.55	1.61	-0.71	0.76	-2.25
	(2.01)*	(-2.34)*	(-0.01)	(-1.84)	(2.19)*	(-1.01)	(2.59)**	(-1.12)	(1.11)	(-3.18)**
CAP	0.24	0.25	0.25	0.29	0.24	0.30	0.24	0.27	0.23	0.24
	(4.70)**	(5.65)**	(4.99)**	(6.35)**	(4.77)*	(6.54)**	(4.69)**	(6.03)**	(4.59)**	(5.26)**
EMP	0.30	0.55	0.32	0.54	0.29	0.49	0.31	0.51	0.32	0.62
	(4.56)**	(9.06)**	(5.02)**	(8.80)**	(4.44)*	(8.07)**	(4.68)**	(8.40)**	(4.79)**	(9.69)**
CORR	-0.09	-0.14	-0.05	-0.14	-0.08	-0.14	-0.10	-0.14	-0.06	-0.09
	(-2.81)**	(-3.44)**	(-1.60)	(-3.35)**	(-2.80)	(-3.52)**	(-3.01)**	(-3.39)**	(-1.95)*	(-2.19)*
RQ	-0.01	0.28								
	(-0.12)	(3.68)**								
GE			0.23	0.19						
			(2.74)**	(2.84)**						
PS					0.04	0.11				
					(1.03)	(2.78)**				
VA							-0.07	0.14		
							(-0.81)	(1.90)		
RL									0.09	0.31
									(1.26)	(4.43)**
Obs.	273	253	273	253	273	253	273	253	273	253
R² adj	0.90	0.92	0.91	0.92	0.90	0.92	0.90	0.92	0.90	0.92

Table 5 contd…

	Basic Specification + Interaction									
Specification	RQ		GE		PS		VA		RL	
	WGI	CPI	WGI	CPI	WGI	CPI	WGI	CPI	WGI	CPI
Explanatory Variables										
Constant	-3.53	0.72	0.02	11.29	0.09	6.40	-0.05	14.70	-2.23	5.56
	(-1.61)	(0.19)	(0.01)	(4.26)**	(0.07)	(2.60)**	(-0.03)	(3.79)**	(-1.32)	(2.13)*
CAP	0.23	0.25	0.25	0.25	0.24	0.28	0.23	0.30	0.21	0.24
	(4.53)**	(5.65)**	(4.98)**	(5.71)**	(4.74)**	(6.18)**	(4.36)**	(6.76)**	(4.16)**	(5.35)**
EMP	0.28	0.56	0.32	0.64	0.29	0.52	0.30	0.57	0.33	0.63
	(4.24)**	(8.97)**	(4.91)**	(10.35)**	(4.40)**	(8.53)**	(4.59)**	(9.35)**	(4.92)**	(10.07)**
CORR	1.21	-0.69	-0.05	-3.40	0.23	-1.89	0.35	-4.16	0.70	-2.02
	(2.20)*	(-0.76)	(-0.11)	(-5.05)**	(0.62)	(-3.12)**	(0.67)	(-4.17)**	(1.77)	(-3.24)**
RQ	1.14	-0.24								
	(2.30)*	(-0.28)								
GE			0.22	-2.80						
			(0.53)	(-4.52)**						
PS					0.30	-1.53				
					(0.96)	(-2.69)**				
VA							0.33	-3.50		
							(0.70)	(-3.86)**		
RL									0.78	-1.48
									(2.14)*	(-2.54)**
CORR*RQ	-0.29	0.13								
	(-2.36)*	(0.61)								
CORR*GE			0.00	0.75						
			(0.01)	(4.86)**						
CORR*PS					-0.07	0.41				
					(-0.83)	(2.89)**				
CORR*VA							-0.10	0.92		
							(-0.86)	(4.03)**		
CORR*RL									-0.17	0.44
									(-1.93)	(3.10)**
Obs.	273	253	273	253	273	253	273	253	273	253
R² adj	0.91	0.92	0.91	0.93	0.90	0.92	0.90	0.92	0.91	0.93

Notes: *significant at 5% level, **significant at 1% level; t-statistic values are displayed in parentheses under the coefficient estimates. CAP = log of Net capital stock (2015 constant prices, in Mrd of home currency; EMP = log of Net employment of all domestic industry (in thousands); CORR = log of Inversed corruption index; RQ = log of Regulatory quality index; GE = log of Government effectiveness index; PS = log of Political stability and absence of violence index; VA = log of Voice and accountability index; RL = log of Rule of law index. Fixed effects estimations were chosen as the Hausman test resulted in a rejection of the null hypothesis that the preferred model would be random effects. Data were checked for stationarity with the aid of a Levin-Lin-Chu (LLC) test. The null hypothesis for the LLC test is rejected for all variables ($p < 0.05$), indicating all panel data are stationary.

5. Discussion

The first research question of this paper was how corruption affected growth in the European Union from 1995 to 2019. Data on corruption from two organizations were consulted in order to assess the robustness of achieved results. The first column in Table 3 shows that corruption did not affect growth, which is remarkable, considering the consensus among scholars and intergovernmental institutions on the deleterious effect of corruption. Concluding from the basic specification that corruption on average did not affect growth in the EU may be too premature. The cause of the insignificance of the corruption variable may lie in the model used in this analysis, given the substantial amount of empirical literature proving the opposite.

Apart from corruption, the Solow-Swan model was augmented with a measure for quality of governance. Assessing the impact of quality of governance was no primary objective of this paper, nevertheless, the results merit discussion. Five proxies for governance were separately tested for significance in the model. Each proxy, representing a different dimension of governance significantly stimulated growth. These results are in line with the arguments of Hall and Jones (1999), Romer (2001), and Acemoglu et al. (2004), who stressed the importance of good quality governance for enhancing economic growth.

The quality of governance and the corruption that is perceived in a country are two inter-connected phenomena. Research has proved that one affects the other. Hence it makes sense to introduce the interaction effect between these two phenomena. With the interaction-term included, the main effects change significantly. The expected negative effect of corruption becomes visible. These findings support the EU's standpoint on corruption. The negative impact of corruption on growth is also what is to be expected when looking at the empirical literature. The meta-analysis of Ugur (2014) points out that the absolute majority of the 29 studies included in the analysis reached significant evidence of a negative association between corruption and per-capita GDP growth. Borlea et al. (2017) also studied the impact of corruption on growth for the EU and this for the 2005-2014 period. Their obtained results are in line with the results of this analysis. Significant evidence was found for the deleterious effect of corruption.

The quality of governance on the other hand is no significant driver of growth anymore. Increasing freedom of expression and access to government elections (voice and accountability) and a more effective government even led to diminishing growth. This contradicts the theory on the impact of governance on growth discussed before. Gani (2011) however found a similar negative relation between voice and accountability and growth.

The interaction effect between governance and corruption is also of interest when assessing whether support is found for either the "grease the wheels" hypothesis or the "sand the wheels" hypothesis. Significant evidence in support of the "sand the wheels" hypothesis was found. Considering the vast amount of empirical research that found evidence of the "sand the wheels" hypothesis since Mauro's pioneering work in 1995, no remarkable result is found here. Tsanana et al. (2016) also included the interaction between corruption and governance in their study on corruption and growth in the EU from 1995 to 2012. They found significant support for the "grease the wheels" hypothesis, meaning low quality governance mitigated the growth-hampering effect of corruption. The fact that the results of Tsanana et al. (2016) are not in line with the results of the analysis performed here might be found in the time period during which the impact of corruption was studied, or in the proxies that were used to measure corruption and governance, or in the model specification, which are all different.

Another objective of this paper was to assess whether corruption affected growth differently in

Central Europe, compared to Western Europe. The results for the 14 Western European countries are in line with those of the EU as a whole. Papaconstantinou et al. (2013) found similar results for the EU-15.[5] They found that corruption control stimulated GDP per capita growth between 1996 and 2006. The results are also in line with those of Tsanana et al. (2016), who found a significant growth-decreasing effect of corruption for the EU-14 countries.

In Central Europe on the other hand, corruption had a different effect on growth. The first impression was that corruption negatively affected growth. This is however when the interaction between governance and corruption is not considered. With the interaction included, the results show that corruption stimulated growth during the period under study, though only when the regulatory quality dimension of governance is considered and corruption data from the WGI are used. This is a remarkable finding that does not follow the majority of empirical literature. Second to that, significant support is also found for the "grease the wheels" hypothesis in the EU-13, meaning low quality governance further increased the growth-stimulating effect of corruption. Although this contradicts the findings of most empirical literature, Tsanana et al. (2016) also found support for the "grease the wheels" hypothesis for the same sample of countries. The impact of corruption in Central Europe has been studied extensively and although the results of Tsanana et al. (2016) reject the deleterious effect of corruption, other empirical work on the Central European region repeatedly found the opposite to be true. When corruption is proxied by the CPI, however, the results follow the majority of research on the matter. Here, evidence is found for the "grease the wheels" hypothesis. Due to the conflicting evidence found in this research, no unambiguous answer can be found as to whether corruption greased or sanded the wheels of growth in the EU-13.

6. Conclusions

The objective of this paper was to expand on empirical findings concerning the relationship between corruption, governance, and economic growth in the European Union. The impact of corruption and quality of governance was estimated for the 27 EU member states using a fixed effects model, and this for the 1995-to-2019 period. Additionally, the panel was split into two subsamples based on their date of entry to the EU. The 13 (mainly Central European) member states that joined the EU since 2004 were pooled in one subsample while the 14 established (mainly Western European) member states were pooled in a second subsample.

The results for the EU as a whole suggest that, during the 1995-2019 period, high capital stock rates and high employment rates significantly enhanced economic growth. The impact of corruption on growth follows the generally accepted view among scholars and institutions that corruption lowers economic growth. The analysis showed a significant negative impact of corruption on growth. The same conclusion holds for the Western European countries. For the Central European countries, conflicting results are found, based on the source of data on corruption. Data from the WGI supports the controversial view that corruption stimulates growth. Although most empirical findings support the idea that corruption is detrimental for growth, literature exists that proves the opposite. Subsequently, the moderating impact of governance structures was tested. For the EU as a whole, this resulted in significant support of the "sand the wheels" hypothesis, which states that low quality of governance increases the detrimental effect of corruption on growth. This result supports the vast majority of empirical findings and provides further evidence for governments to foster an efficient institutional framework. A similar conclusion can be drawn with regards to the Western European countries. Significant evidence is provided in favour of the "sand the wheels" hypothesis.

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[5] EU-14 countries plus the United Kingdom

Again, for the Central European sample, conflicting evidence is reached, depending on what source is used for data on corruption levels. Support is found for both the "sand the wheels" hypothesis and the "grease the wheels" hypothesis. According to the latter, low quality of governance increased the growth-stimulating effect of corruption on growth during the 1995-2019 period.

A controversial conclusion that may be drawn based on these results is that in order to stimulate growth, Central European member states may benefit from letting corruption go unpunished. Méon and Weill (2010) however argue that reducing the fight against corruption may result in a worse global institutional framework, for which punishments by the EU are a likely consequence. In addition, since lower quality of governance is found to have stimulated the effect of corruption, one might argue against the establishment of a well-governed institutional framework. This conclusion is however risky and premature, as Méon and Weill (2010) argue. Lower quality of governance may well increase the growth-stimulating effect of corruption. It is however likely that an ill-governed bureaucracy creates other, perhaps greater costs elsewhere.

Our counterintuitive result regarding the impact of corruption in EU-13 could point at the existence of an endogeneity problem due to omitted variables, measurement errors or simultaneity between the dependent and independent variables. Although this paper controls for unobserved heterogeneity by employing a two-way fixed effects regression, other causes of endogeneity were not addressed in this paper, which further research may want to investigate.

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Appendix

Table A-1: Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
All countries					
GDP	675	5.6254	2.0406	1.5648	10.6188
CAP	675	6.5002	2.1815	2.2579	11.3658
EMP	675	8.0714	1.3583	4.9758	10.7200
WGI	567	2.4463	1.7420	-4.6052	4.2195
CPI	628	3.3904	0.9015	-4.6052	4.3041
Regulatory Quality	567	4.4200	0.1293	3.8561	4.6052
Rule of Law	567	4.3775	0.1977	3.4390	4.6052
Voice and Accountability	567	4.4146	0.1491	3.7327	4.6052
Government Effectiveness	567	4.3865	0.1769	3.4200	4.6052
Political Stability and Absence of Violence	567	4.2890	0.2258	3.4108	4.6052
EU14					
GDP	350	6.3023	1.2862	3.2561	8.4362
CAP	350	7.3611	1.3638	4.0324	9.7010
EMP	350	8.6222	1.2262	5.3757	10.7200
WGI	294	1.5610	2.0244	-4.6052	3.8585
CPI	348	2.9789	1.0256	-4.6052	4.2499
Regulatory Quality	294	4.4851	0.1028	4.0798	4.6052
Rule of Law	294	4.4898	0.1288	4.0383	4.6052
Voice and Accountability	294	4.5132	0.0838	4.2206	4.6052
Government Effectiveness	294	4.4862	0.1147	4.0976	4.6052
Political Stability and Absence of Violence	294	4.3278	0.2518	3.4108	4.6052
EU13					
GDP	325	4.8964	2.4192	1.5648	10.6188
CAP	325	5.5732	2.4967	2.2579	11.3658
EMP	325	7.4783	1.2400	4.9758	9.7053
WGI	273	3.3997	0.3745	2.2634	4.2195
CPI	280	3.9019	0.2101	3.2581	4.3041
Regulatory Quality	273	4.3499	0.1178	3.8561	4.5355
Rule of Law	273	4.2566	0.1876	3.4390	4.5280
Voice and Accountability	273	4.3083	0.1298	3.7327	4.5222
Government Effectiveness	273	4.2792	0.1692	3.4200	4.5263
Political Stability and Absence of Violence	273	4.2471	0.1855	3.4906	4.6001

HOW WATERSHED MANAGEMENT PRACTICES ENHANCE THE LIVELIHOOD OF RURAL HOUSEHOLDS? A CROSS SECTIONAL SURVEY

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Abstract: Developing countries which are heavily dependent on rain-fed agricultural system, watersheds are increasingly being managed for poverty alleviation and environmental conservation. Watershed management practices should have a big role in improving the livelihoods of the households but the reality is unknown due to dearth of studies. Hence, the objective of this paper is to explore the effect of watershed management practices on the livelihood of rural households in Bona Zuria District of Ethiopia. An analytical design with mixed research approach was adopted to address the specific objectives. Required data were collected from 182 randomly selected households from two purposefully selected villages. Collected data were analysed with SPSS and STATA software. Descriptive statistics such as frequencies, percentages, mean, standard deviation and inferential tools like chi-square test, one sample t-test and binary logistic regression were used for analysis. The findings reveal that the majority of respondents were involved in physical soil as well as water conservation practices, due to which natural resources conservation has been improved in the study area. Economically, the households benefited from generating additional income and an increase in crop productivity. All this somewhat enhanced their livelihood. However, there are challenges in practice of watershed management. Therefore, local community participation, access to markets, expanding the use of agricultural technologies, and strengthening local institutional capacity are imperative to improve livelihood and realize the goals of watershed management practices.

Keywords: Watershed management practices, Livelihood, Rural households, Ethiopia

1. Background and Rationale

The world is facing enormous complex and interrelated problems including climate change, population growth, urbanization, water scarcity, unsustainable food and agricultural production, hunger, poverty, environmental degradation, biodiversity loss, gender inequality, and uncertainty in peace and human security. To address these issues, in 2015, the international community agreed on the 2030 Sustainable Development Agenda, including the 17 Sustainable Development Goals and

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169 associated targets which together represent a global plan of action for people, the planet, and prosperity in the twenty-first century.

None of these global challenges can be addressed by one organization alone or by a single-sector programme. While the challenges are global, the 2030 Agenda must be implemented primarily at the local level to reduce vulnerabilities and build resilient communities. Multipronged strategies are needed, especially to tackle the persistent inequalities within and among the poor local communities and economies where the development needs and dependency on natural resources are greatest. Managing collaborative action and planning at the landscape scale is an increasingly popular approach for balancing local needs and global challenges and addressing both environmental protection and food production goals. While landscape approaches have been applied for several decades in forestry, watershed and biodiversity management, their focus has been outside the main agricultural production areas (Scher et al., 2013).

Soil degradation is a major threat to development in most economies of the world (Erkossa, Wudneh et al., 2015; Taguas, 2015; and Keesstra et al., 2016). Soil degradation induced by water erosion in sub-Saharan Africa is of concern mainly because of its consequences for subsistence agriculture, from which about 75% of the population derive their livelihoods (Erkossa et al., 2015). Ethiopia is one of the sub-Saharan African countries with high level of environmental problems including land degradation, soil erosion, deforestation, and recurrent drought resulting in declining agricultural productivity and food shortage (Gessesse et al., 2016). Huge part of the country has fragile ecosystem which includes dry, humid, sub-humid, semi-arid, semi dry and arid conditions. This is frequently exposed to desertification and recurrent drought. The highlands constituting majority of land is under stress due to rising population pressure and their conservative socioeconomic practices (Cesar and Ekbom, 2013). It is reported that this country has been suffering from poverty and environmental problems for a long time and is seriously affected by land degradation that accounts for 8% of the global total. The country consists of many mountains which have created gullies and hillsides that are considered as the main reasons for removal of the top soil through soil erosion (Tesfay et al., 2011). Land degradation has reached a severe stage and it becomes a major root cause of poverty with significant negative impacts on the national economy (Tadesse, 2001). The immediate consequence of land degradation includes reduction in crop yield which, in turn, results in economic decline and social stress (Lakew, 2005).

Soil erosion is the basic form of land degradation, affected by the interacting effects of factors, such as biophysical characteristics and socio-economic aspects. Soil erosion and declining fertility are posing serious challenges to agricultural productivity and economic growth through land degradation (Lemenih, 2014). Increasing weather variability and climate change are contributing to land and natural resource degradation by exposing soils to extreme conditions and straining the capacity of existing land management practices to maintain resource quality. Degradation of vegetation cover, loss of biodiversity, soil erosion, depletion of organic matter, reduced rainwater infiltration, declining water holding capacity of the soil and loss of productivity affect wider ecological functions.

Deforestation is another environmental problem that is rapidly becoming the most serious problem in rural Ethiopia where majority of the population live and depend on the forest products for energy. Mainly, rural households depend on forest and wood land resources to meet their energy needs, to provide construction and roofing materials, to provide fodder for livestock and to have healthy diet as well as various medicinal plants, among others.

There are many opportunities that foster successful watershed planning and management for improving the livelihood of rural households like having excellent environmental policies and strategies (César and Ekbom, 2013), good start and experience in community based watershed management (Desta, 2005), integration of concerned institutions and organizations (federal to household level), integration of indigenous and advance technologies and income generation from degraded lands (Admassie, 2000).

However, there are several challenges such as uneven distribution of costs and benefits between upstream and downstream communities, low level of community participation, wrongly applied techniques, inappropriate technological preference, insufficient research support, low technical capabilities of field activities, lack of linkage between sectors, lack of targeting on the poor, inadequate youth and women participation, weak stakeholder linkage, etc. that pose a risk to the success of watershed development in the study area (BZWARO, 2017).

Even though watershed development calls for the attention of scholars, they focused on single issue like practices and challenges of watershed activities. In this regard, significant number of studies have been done on watershed management in different parts of Ethiopia (Wale and Yalew, 2010; Gashaw, 2015; and Mintesinot, 2007); and several studies have been done by government and non-governmental organizations like UNDP (2015) which focused on challenges, practices or policy implications. They did not deal with effects of watershed management practices on rural livelihood improvement. However, according to the knowledge of this researcher, there is information gap on the effect of watershed management on rural households' livelihood in the study area.

2. Specific Objectives

The study has the following specific objectives:

a) To examine the practices of watershed management in the study area.

b) To identify the influential factors determining the practices of watershed management in the study area.

c) To assess the effect of watershed management practices on the livelihood of rural households in the study area.

3. Conceptual Framework of the Study

The conceptual framework of this study is based on the watershed management technology adoption and Sustainable Livelihood Approach (Figure 1). The measures of adoption in this study is the actual—at least presence of one improved structure of soil and water conservation practice on farmers' plot of land. The World Commission on Environment and Development used the term 'sustainable livelihoods' in the illumination of resource ownership, basic needs, and rural livelihood security, while in the United Nations Conference on Environment and Development 1992, the term was used in the light of socioeconomic and environmental issues (Brocklesby and Eleanor, 2003). In this study, adopters are farmers who have a plot of land on which at least one improved watershed management practice has been adopted.

Figure 1: Conceptual Framework
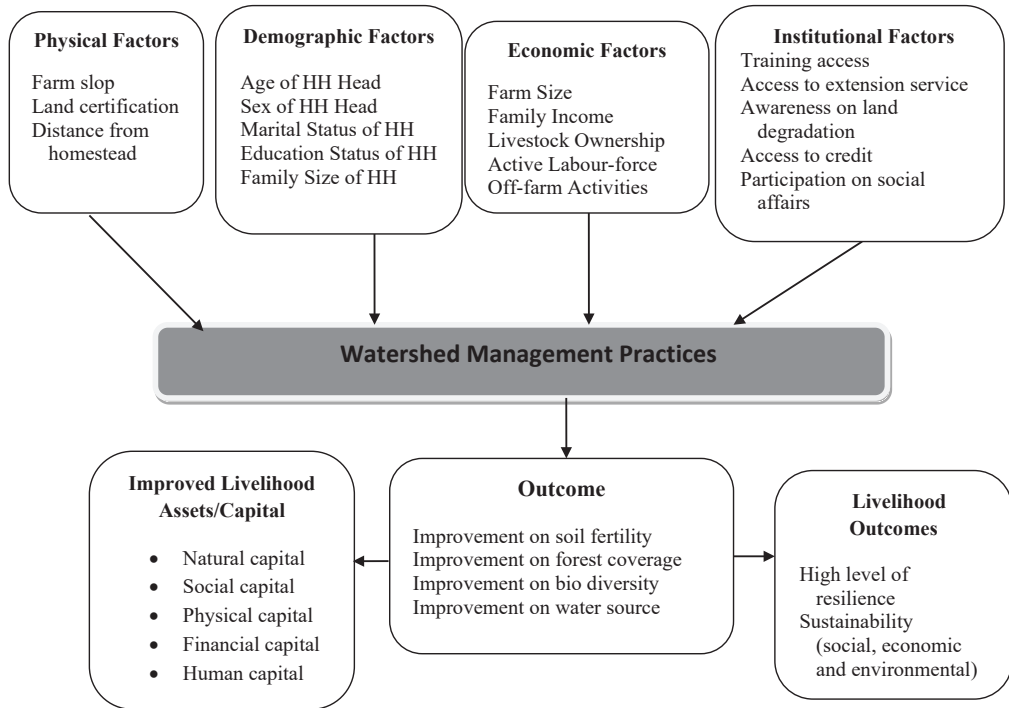
Note: HH stands for household

3. Methodology Adopted

The study employed a cross sectional research design and a mixed (quantitative and qualitative) approach. The qualitative approach helps to understand the perceptions, views, and opinions of the participants, whereas quantitative approach helps to grasps the statistics, figures and facts from the study area. To address the objectives, both primary and secondary data were used. In order to capture a representative sample, multistage sampling technique was employed. In the first stage, out of 22 district in the region, Bona Zuria District, located in Southern Ethiopia was selected purposefully since the district is characterized by high soil erosion, high degradation, food shortage, low biodiversity, population growth, poverty, drought, high gully erosion, etc. In the second stage, out of 27 villages in the district having watershed, two villages were selected by purposive sampling; these villages are having better community based participatory watershed and they are highly exposed to environmental degradation like soil erosion. The total households in the two sample villages are 1659, wherein 1077 (64.3%) were found to adopt improved watershed practices and the remaining 582 (35.7%) use traditional practices. In the third stage, from the total households, 182 sample households (116 adopters and 66 non-adopters) were selected by using sample size determination formula which was formulated by Taro Yamane (Yamane, 1967):

$$n = \frac{N}{1 + N(e)^2} \; ; \text{i.e., } \; n = \frac{1659}{1 + 1659(0.07)^2} = 182 \; .$$

where n = sample size, N = population size, and e refers to the level of precision (0.07). The total sample households were then distributed proportionally to the total households in both villages.

Direct interviews and focus group discussions were held to capture all the important data. The collected data was analysed using Statistical Package for Social Sciences (SPSS version 21) and STATA (version 13). Descriptive statistics like frequencies, percentages, mean, standard deviation, etc. and inferential statistical tool (mainly, binary logistic regression) were used to make valid inferences about the topic under study. Chi-square (χ^2) test was used to check the significant relationship between selected key variables. Independent t-test was used to compare the means of the parameters to see effects of adoption of watershed practices on the livelihood of rural households.

It is assumed that the practice of watershed management by the rural households depends on both demographic characteristics and farm-related factors. With the given assumption, binary logistic regression analysis was carried out to relate practice status of rural households. Hence, the logistic model specified is as follows:

$$\ln(Y) = \ln(\frac{Y}{1-Y}) = \beta_0 + \beta_1 \chi_1 + \beta_2 \chi_2 + ... + \beta_n \chi_n + \varepsilon$$

Fitted Model: $In(\hat{Y}) = In(\frac{\hat{Y}}{1-\hat{Y}}) = \hat{\beta}_0 + \hat{\beta}_1 \chi_1 + \hat{\beta}_2 \chi_2 + \hat{\beta}_3 \chi_3 + ... + \hat{\beta}_n \chi_n$

where

Y = The predicted probability of the event (household level practice of watershed management), which is coded with 1 = practitioners and 0 = non-practitioners.

1 – Y = The predicted probability of the other decision (non-adopters of an improved watershed practices)

β_0 = Constant

β_n = Coefficients of explanatory variables

χ_n = Predictor variables

ε = Error term

3.1. Dependent Variable

Practice of watershed management is defined as participation of rural households on physical activities such as construction of bunds, terraces, check-dams, water diversion (cut-off drain, water ways, etc.) and water harvesting structures (micro basins) which aimed to reduce the velocity of surface runoff and minimize soil erosion by shortening the length and minimizing the gradient of the slope and biological activities: tree planting in the form of aforestation or reforestation. Practice of watershed management is a dummy variable which is coded as 1 = Practitioners and 0 = Otherwise (Table 1).

3.2. Independent variables

The explanatory variables included in the model are gender, age, educational status, family size, labour force availability, farmland size, off-farm income, livestock ownership, access to extension service, access to credit service, slope of farm land, social participation, etc.

Table 1: Summary of Variables Measurement and Working Hypothesis

Variables	Description	Measure	Expected Relationship
Dependent Variable			
Practice of an watershed management	1 = Practitioners 0 = Otherwise	Dummy	
Independent Variables			
Gender	1 = Male 0 = Otherwise	Dummy	+
Age		Continuous	+/-
Education status	1 = Unable to read and write 0 = Otherwise	Dummy	+
Household size	-	Continuous	+/-
Labor force in home	-	Continuous	+
Farm size	-	Continuous	+/-
Off-farm income	-	Continuous	+
Livestock ownership	-	Continuous	+/-
Access to extension service	1 = Yes 0 = Otherwise	Dummy	+
Access to credit	1 = Yes 0 = Otherwise	Dummy	+
Slope of the farm land	1 = Flat 0 = Otherwise	Dummy	+
Social participation	1 = Yes 0 = Otherwise	Dummy	+

4. Results and Discussion

4.1. Farm Characteristics

Studies on watershed management practices indicated that farm size has both negative and positive effects on participation in watershed management, showing that the effect of farm size on technology adoption is inconclusive (Deressa, 2010). Land is an important asset for the majority of Ethiopian people; one way or the other, they depend on agricultural production for their income and subsistence. Variation in accessing land is therefore the major determining factor of livelihood activities, income and food security (Getnet et al., 2012). Land in the study area is scarce mainly due to population pressure.

Table 2: Distribution Respondents in Terms of Land Holding

Land Size in Hectares	Practitioners	Non-Practitioners	χ2
0.5 and below	94(81.0%)	49(74.3%)	
0.51 - 1.00	17(14.7%)	13(19.7%)	
1.00 - 2.00	04(3.4%)	03(4.5%)	.834
Above 2	01(0.9%)	01(1.5%)	

The results indicate that 81% of practitioners and 74.3% of non-practitioners have land below 0.5 hectare and 14.7 percent of practitioners and 19.7 percent of non-practitioners have land between 0.51 and 1.00 hectare (Table 2). The remaining 3.4% of practitioners and 4.5% of non-practitioners have more than 2 hectares of land. The association computed between livelihood strategies and land access was not significant. This signifies that accessing land underlies households' choice of livelihood strategies. This indicates that most of respondents had fragmented lands; as a result, they have low productivity which forces them to involve in watershed management to enhance their agricultural productivity.

Quality of land is also crucial factor which affects the productive capacity of land and livelihood activities. As indicated in Table 3, 1.72% of practitioners and 57.6% of non-practitioners had relatively less fertile land, whereas 80.1% of practitioners and 3.0% of non-practitioners have good fertile land. Test of association between land fertility and practices of watershed management is significant (p = 0.000).

Table 3: Distribution Respondents on Their Perception of Land Fertility

Fertility Type	Adopters	Non-Adopters	χ2
Poor	02(1.72%)	38(57.6%)	
Moderate	21(18.1%)	26(39.4%)	.000
Good	93(80.1%)	02(3.0%)	

The slope of a farmland affects the rate and amount of soil loss from fields. This pushes farmers to control or to mitigate the impact of erosion on fields that are situated on steep slope and hence slope influences the decision of farmers to participate in watershed management practices. The physical distinctiveness of farm plots depicts that majority (79.7%) of households have steep land; 13.2% have gentle land; and 7.1% have flat land. This implies that majority of rural households' land is steep which creates favourable condition to practice watershed management.

It has been found that distance between the farmland and the homestead is an important factor in the practice of watershed management. The average walking time from the homestead to the farm land is 5 minutes. Proximity to fields is one of the factors that encourage farmers to practice watershed management. Bekele and Holden (1998) found that some farmers undertake watershed management practices during the evening, making it difficult to go to the fields that are located far from their home.

On-farm Activities

On-farm income activity comprises all activities which generate income from farming which include crop cultivation and livestock production. These activities determine the practice of watershed management.

Regarding the cultivation of different types of crops, 86.3% of practitioner respondents produced Enset; 78.6% of respondents produced Coffee; 94% of respondents produced Maize; 64.3% of respondents produced Haricot bean; 50.5% of respondents produced Teff; and 7.7% of respondents produced Chat (Table 4). These benefit practitioners of watershed management to some extent to improve their livelihood interims of the production of cereal crops for household consumption. However, vast majority (92.3%) of the non-practitioners produced chat which is a commercial crop and not used for consumption purpose.

Table 4: Major Crops Produced by the Respondents

Name of the Crop	Practitioners		Non-Practitioners	
	No. of Respondents	Percent	No. of Respondents	Percent
Enset	157	86.3	25	13.7
Coffee	143	78.6	39	21.4
Maize	171	94.0	11	6.0
Haricot bean	117	64.3	65	35.7
Teff	92	50.5	90	49.5
Chat	14	7.7	168	92.3

Other crops found in the study area are sugarcane, sweet potato, vegetables, etc. which are subsidiary under rain-fed production. These crops are resilient to water shortage; so households are growing these crops as backups if anything happens to the main crops (Teff and Maize). The households who are engaged in other crops (apart from Enset, Teff and maize) pay low attention to them because most farmers have employed much of their efforts on the marketable crops. A poor market for other crops is one factor as to why people have less priority for such crops.

Incomes generated from livestock and cash income from outputs sold are also included in the on-farm income category. Costs/expenses incurred were deducted from gross income in order to obtain net income. To obtain the total cultivation costs, the study has aggregated all expenses from farming preparation, seeding, weeding, variable inputs, hired labor (own labor not included), harvesting, packaging, freight, storage and others. The range of crops found in the study area includes maize, Khat, coffee, Teff, Haricot bean and Enset.

Table 5: Distribution of Respondents on Their Farm Annual Income

Income in ETB	Practitioners	Non-Practitioners	χ^2
1000-5000	03(2.6%)	04(6.1%)	
5001-10000	69(59.5%)	40(60.6%)	.783
Above 10000	44(37.9%)	22(33.3%)	

The average yearly cash income from on-farm activities of practitioners and non-practitioners has difference. 2.6% of practitioners and 6.1% of non-practitioners earn between 1000 and 5000 ETB (National Currency); 59.5% of practitioners and 60.6% of non-practitioners earn within the range of 5001-10000 ETB; and 37.9% of practitioners and 33.3% of non-practitioners earn above 10,000 ETB annually (Table 5). Test of association between household on-farm income and practice of watershed management was not significant ($p = 0.783$).

Livestock offers a unique contribution to human diet through its diversity of products (meat, cheese, milk and eggs) but there are a few number of households who are engaged in this. Almost all households were found to be keeping at least one livestock. Livestock found in the study area includes cow, oxen, heifer, calf, bull, donkey, horse, mule, goat, seep and poultry. Ownership of livestock resources is an important asset for the majority of Ethiopian people who, in one way or the other, depend on agricultural production for their income and subsistence.

Table 6: Average Livestock Holding by the Respondents

Name of the Livestock	Practitioners	Non-Practitioners	χ2
Oxen	0.89	1.30	
Cows	1.12	1.89	
Bulls	1.02	1.32	
Heifers	1.67	1.71	.871
Calf	1.68	2.30	
Goats	1.76	2.58	
Sheep	1.02	1.44	
Donkey	1.05	1.54	
Mules	0.98	1.00	
Horse	1.02	1.12	
Poultry	2.51	3.56	

Notes: Cow/Ox/Bull = 1TLU, 1 Calf = 0.4 TLU, 1 Heifer = 1 TLU, 1 Sheep/Goat = 0.10 TLU, 1 Donkey = 0.50 TLU, 1 Horse/Mule = 0.80 TLU, and 1 Chicken = 0.013 TLU (Freeman et al., 1996)

The Table 6 results indicate that practitioners have an average oxen of 0.89 TLU and non-practitioners 1.30 TLU. Similarly, practitioners have an average cow of 1.12 TLU and non-practitioners 1.89 TLU. Moreover, practitioners have an average bull of 1.02 TLU, while for non-practitioners 1.32 TLU. Also, for the practitioners, the average Heifer is 1.67 TLU and the same for non-practitioners is 1.71 TLU; likewise, the average calf for practitioners is 1.68 TLU and for non-practitioners is 2.30 TLU. Further, the practitioners have an average of 2.51 TLU poultry and 3.56 TLU for non-practitioners. Test of association between livestock ownership and practice of watershed management was not found to be significant (p = 0.871).

Off-farm Activities

Off-farm income activities comprise all activities of earning income apart from crop income. Off-farm earnings include wage labour and income from local environmental resources (firewood, charcoal, medicine plants and wild plants) and petty trade. In the study villages, few households (4.6%) were engaged in wage labour on others' farms. The willingness of people to offer wage labour is low, because rural wages are relatively low. Wage labour becomes a subsidiary activity, while other activities are their main occupations.

4.2. Practices of Watershed Management Activities in the Study Area

Globally, there are different types of watershed management practices and also in the study area. The types include water and soil conservation practices such as soil bunds, trench hole, tree and grass planting, protecting degraded lands, etc. and water conservation practices such as rain water harvesting, crop management practices and various land use management systems. The biophysical and geological characteristics of watersheds are some of the most important factors that affect the livelihood of the rural households.

Results show that, among the practitioners, 68.1% of respondents practiced trench hole digging; 87.1% practiced water harvesting activities like check dam, micro basin, shallow well excavation for household consumption, irrigation use, river diversion, motor pumping, household pond, and spring development; 82.7% were engaged in building improved soil bund practices; 28.4% participated in building of improved stone bund practices; 62.1% adopted cut of drain practices; and 26.7% participated in waterway practices (Table 7). Similarly, 53.4% practiced compost application; 19.8% practiced construction of gully treatments; and 59.5% participated in plantation of multi-purpose trees.

Table 7: Distribution of Practitioners by the Types of Practices

	Practices	No. of Respondents	Percentage
1	Trench hole digging	79	68.1
2	Water harvest practices	101	87.1
3	Improved Soil bund practices	96	82.7
4	Improved Stone bund practices	33	28.4
5	Cut of drain practices	72	62.1
6	Compost application practices	62	53.4
7	Waterway Practices	31	26.7
8	Plantation of Multi-Purpose trees	69	59.5
9	Gully Treatment	23	19.8

Table 8: Binary Logistic Estimation Results

Variables	β	Sig.	Exp(B)
Gender of the household head	.574	.037**	1.775
Age of the household head	.002	.983	1.002
Education status of the household head	1.171	.000***	3.224
Agricultural labor force	.126	.019**	1.134
Land tenure	.153	.734	1.166
Slope of farm land	.381	.039**	1.464
Farm size	-.110	.036**	.896
Access to credit	.922	.124	2.515
Extension service access	.822	.048**	2.275
Livestock ownership	-.208	.137	.812
Off-farm income	.231	.069	.038
Participation in social affairs	.181	.027**	.191
Number of Obs = 67			
LR chi-square (14) = 22.86			
Prob > chi-square = 0.148			
Log likelihood = 334.771			
Pseudo R^2 = 0.106			

Notes: ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively.

4.3. Determinants of Watershed Management Practices

In order to identify the determinants of watershed management practices in the study area, binary logistic regression model was used. Prior to the analysis, explanatory variables were checked for existence of multicollinearity problem. Variance Inflation Factors (VIF) among associations within continuous explanatory variables and Contingency Coefficient for dummy variables were tested. As 'a rule of thumb', if the mean VIF of variables exceeds 10, that variable is said to be highly collinear and it can be concluded that multicollinearity exists. The average value of VIF for continuous variables was 2.314 which is less than 10 which indicates that there is no collinearity among independent variables.

Of 12 explanatory variables included in the model, seven variables (Gender, Age, Education, Labor force, Slope of the land, Farm size, Access to extension service, and Participation in social affairs) significantly determine the participation in watershed management practices (Table 8).

Gender of the Household Head

The results show that 80% of the respondents are male and 20% are female. This variable is positive and has significant effect on practice of watershed management (β = .574, p-value 0.037; i.e., p < 0.05). This implies that if the respondents are male, they have a chance to practice watershed management.

Educational Status

The result is the same as expected. The β value (1.171) shows that education is one of the predictors, which has positive relationship with participation in watershed management practices (with p < 0.05). By holding other independent variables constant, a respondent with at least primary education would expect to have 3.224 times chance to be engaged in watershed management practices. A study by Tiwari et al. (2008) found that education is an important determinant of participation in watershed management practices. An educated farmer is able to use modern technologies, perform farming activities based on cropping calendar, and manage resources properly and thus participate in watershed management practices.

Labour Force

The mean agricultural labour force available among the respondents is 2.2 persons ranging from 1 to 5 with a standard deviation of 0.12. Accordingly, the labour force (β = 0.126) is one of the predictors that has positive relationship with participation in watershed management practices (p-value 0.019, i.e., p < 0.05). This means, as the number of the agricultural labour force of a household increases, the farmer's decision to participate in watershed management practices increases. This could be due to the farmer's positive attitude towards the success of previous watershed rehabilitation programme.

Extension Services

There are three extension officers, also known as development agents (DAs), in each village specializing in plant sciences / crop protection, natural resources management, and livestock production. In the study area, agricultural extension services are intended to educate farmers and assist in resolving their agriculture-related problems, thereby motivating them to decide to participate in watershed management programmes. As expected, the regression analysis result reveals that extension service (β = 0.822) is one of the predictors that has positive relationship with participation in watershed management practices (with p-value 0.048, i.e., p < 0.05). This means, as the frequency of agricultural extension services received by a farmer increases, his/her decision to participate in watershed management programme increases. The finding is consistent with the study done by Miheretu and Yimer (2017) in the northern highlands of Ethiopia which reported that access to extension service positively and significantly influences the adoption of stone bund and chemical fertilizer. Hence, DAs need to spend more time with farmers to properly inform and persuade them about the importance of technologies and assist them to enhance land productivity, which is practically challenged by the disproportionately large number of farmers.

Farm Size

In the study area, having large farm size is associated with producing and supplying more farm produce for the market. The survey results showed that 89.8% of the respondents have less than one hectare of farmland. Only 2.4% sample households have farmlands ranging from 1 to 2 hectares. Regression result shows that farm size (β = -0.110) is one of the predictors that has negative relationship with participation in watershed management practices (with p-value 0.036, i.e., p < 0.05). This implies that as the farm size of a household increases, his/her propensity (decision)

to participate in watershed management practices decreases. This could be explained by the fact that farmers having large farm size have more opportunities in getting better production than their counterparts. This result is contrary with the study done in Ethiopia by Bekele and Drake (2003). They reported that existence of conservation measures is positively related to landholding size.

Slope of Farmland

Slope of farmland affects the rate and amount of soil loss from fields. This forces farmers to control or mitigate the impact of erosion and thereby the decision of farmers to participate in watershed management practices. This variable ($\beta = 0.38$) has positive relationship with adoption of watershed management practices (with p-value 0.039, i.e., $p < 0.05$). Slope gradient has the odds ratio ($E(\beta)$) of 1.464. This result is consistent with Wossen et al. (2014) who reported that the slope of the plot affects the adoption decision of farmers on land management practices positively and significantly.

Participation in Social Affairs

Participation of the rural households in social affairs is expected to determine the practice of watershed management because households who have access to information have opportunities to accept new technologies. The result is statistically significant ($p < 0.05$).

4.4. Effects of Watershed Management Practices on Livelihood of Rural Households

The main focus of this paper is on assessing the effects of practicing watershed management on rural households' livelihood. For this purpose, data was collected from respondents who practice watershed management and assessed their livelihood variables like crop productivity, income, saving, access to portable water, land fertility, forest coverage, land degradation and number of livestock resources by comparing the current situation with their earlier watershed management practice. Statistical tool such as one sample t-test was used to test the significance level of their agreement. In this test, the level of agreement is found to have a significant difference, if p value is less than 0.05. This gives the interpretation that the sample mean is significantly different from the average test value (3). For interpretation and analysis, the researcher used the scale for the range by rating the scales as follows: Highly increased = 1.00 - 1.80; Increased = 1.81 - 2.60; No change = 2.61 - 3.40; Decreased = 3.41 - 4.20; and Highly Decreased = 4.21 - 5.00.

As indicated in Table 9, the respondents were asked to rate their agreement level on the change observed on crop productivity after they practiced watershed management. Respondents' agreement level mean value (2.02 with $p < .05$) indicates that watershed management practices had greater effect on improving their livelihood especially on increase in crop production. Similarly, the reports of district revealed that the production of cereal has been increasing among those households who practice a watershed management in major crops like maize and Teff (DARDO, 2019). Moreover, key informants noticed the tendency of increasing production of cereal crops in the degraded land, proper use of extension, improvement of soil fertility, use of agricultural technologies like line ploughing, etc. This is in line with the findings of Mintesinot (2007) who found that the watershed management project has contributed through maximizing the amount of food production.

Further, mean results (1.43 with $p < .05$) show that the respondents observed the change in their household income. This means that practicing watershed management had greater effect on improving livelihood, especially on income. Regarding saving, mean results (3.00 with $p > .05$) indicate that watershed management practices had no greater effect on increase in household saving. In terms of access to portable water, mean results (1.31 with $p < .05$) reveal that there is greater effect on improving livelihood especially on access to portable water due to the practice of

watershed management. Also, the mean results (2.12 with p < .05) prove that practicing watershed management had greater effects on improving livelihood, especially on land fertility. Moreover, the information obtained from focused group discussion and key informants interview showed that the watershed management intervention reduced the rate of soil erosion. In addition, mean value (1.28 with p < .05) ascertains that there is a greater effect on livelihood improvement, especially on forest coverage after the practice of watershed management. Key informants reported that farmlands in the watershed are low in soil erosion due to the physical structure and somehow improved soil fertility due to organic fertilizer such as compost and dung manure.

Table 9: Effects of Watershed Management Practices on Rural Household's Livelihood

No.	Items	One-Sample Statistics					Test Value = 3			
		N	M	SD	t-value	df	p-value	MD	95% CID	
									Lower	Upper
1	Crop productivity	116	2.02	1.28	-9.346	115	.012**	-.974	-1.119	-.642
2	Income	116	1.43	0.89	-20.204	115	.000***	-1.568	-1.691	-1.360
3	Saving	116	3.00	1.12	0.055	115	.956	.008	.301	.618
4	Access to portable water	116	1.31	0.69	-26.13	115	.017**	-1.618	-1.808	-1.553
5	Land fertility	116	2.12	1.68	-7.362	115	.024**	-.879	-.301	-1.594
6	Forest coverage	116	1.28	0.65	-28.131	115	.000***	-1.715	-1.836	-.767
7	Reduction of land degradation	116	1.47	0.83	-18.282	115	.008**	-1.525	-1.722	-1.415
8	Number of livestock	116	3.96	1.40	.360	115	.625	.698	.440	.956

Notes: *** and ** indicate significance at 1% and 5% levels, respectively; N = Number; M = Mean, SD = Standard deviation; df = Degree of freedom.

The mean value 1.47 (p < .05) inferred that watershed management practices had effect on livelihood improvement, especially on reduction of land degradation. Similarly, data generated from qualitative sources and own observation revealed that grazing land resources, particularly grasses and pasture in the watershed area, are found to be improved. However, the mean value (3.96 with p > .05) indicates that there is no change in livestock resources compared to the time before they adopted watershed practices. According to the key informants, the procurement of medicine and health care equipment took long process and hence it made difficult for the experts to provide appropriate health care for livestock. Thus, the overall results indicate that improvement of livelihood has been observed among the sample households due to the practice of watershed management.

5. Conclusions and Recommendations

In the study area, various interventions of watershed management practices have been undertaken like soil and water conservation and bio-physical activities. The implementation process of the structures is performing below the expectation and accomplished only the limited parts of the designed targets. The physical soil and water conservation structures are appropriate for the area. However, the implemented structure layouts and the diversity of implemented structure were poor. Moreover, the timing of conservation structures was also inappropriate. In addition, this study discovered that households practice in watershed management is affected by a number of factors. However, respondents' knowledge and interest towards the watershed management programme was relatively low due to the factors that have negative impacts on their participation. Hence, more effort is needed to create awareness through delivering information on the significance of watershed management practices. The effect of watershed development on the livelihood of rural households

should not only aim at minimizing soil erosion, but should also cover other household objectives such as the improvement of soil fertility, yield increase, fodder for animals, income generation and environmental rehabilitation. Finally, the livelihoods of the individual households show direct links with soil and water conservation practices. Based on the findings, following recommendations are forwarded.

- District administration needs to arrange regular training and extension services regarding the watershed management practices for the rural households.

- Economic resource is found to be limited in the study area that constrained households to pursue non-agricultural activities, which supplement agricultural activities and support the livelihoods. Therefore, financial services need to be provided for non-agricultural activities.

- It is found that technical experts are lacking knowledge to provide needed training in the study area. Therefore, to achieve the anticipated goals of the watershed management, training on institutionalizing, socializing and income generating activities should be given to the community members.

- It is understood that the implementing agents forced the households to practice the watershed management. Hence, local leaders need to stick to creation of awareness about the importance of community-based watershed development strategies and comprehensive capacity building rather than following forceful coercion and punishment as a means for public mobilization and participation.

- Agricultural production in the area needs to be guided by reliable market in order to improve the income level of farm households and concerned bodies should give more emphasis and work on solving marketing problems by establishing and strengthening cooperatives, and improving post-harvest technologies like establishing storage facilities and supplying pesticides.

- The soil and water conservation structures are expected to be implemented in accordance with the standard layouts. Also, regular maintenance and management of the structures should be in the place.

- The contribution of non-farm activities in supporting the livelihoods of rural household is indispensable, but households who are exercising non-farm activities as the major livelihood activity are just a few. This should be given due attention via institutionalizing and socializing the watershed.

- Further, integrating these institutional, social, economic, technical, technological, environmental and physical aspects should be imperative as an option to sustain livelihoods of the rural community.

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CAUSALITY OF MACROECONOMIC VARIABLES IN GENERATION OF NON-PERFORMING ASSETS OF INDIAN COMMERCIAL BANKS

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Abstract: This study is conducted to find the impact of macroeconomic variables on Non-performing Assets (NPAs). A total of four variables—Gross Domestic Product (GDP), Foreign Direct Investment (FDI), Exchange rate (ER) and NPA—have been used for the period of 23 years, i.e., from 1997 to 2019. The study finds a cointegrating equation reflecting some long-run associations among the variables. There exist both short-run and long-run causalities running from the independent variables towards NPA. However, bidirectional causalities running from NPA to GDP and from GDP to NPA at 5% level of significance are also observed. Besides, unidirectional causalities running from FDI towards NPA and from ER towards NPA are observed at 10% level of significance.

Keywords: Non-performing asset, GDP, Exchange rate, Foreign direct investment, Granger causality, VECM.

1. Introduction

Non-performing Assets (NPAs) refer to the assets that cease to generate income for banks. Available literature exhibits that macroeconomic variables have a direct influence on the generation of NPAs. According to Louzis et al. (2012), Non-performing Loans may be termed as a signal toward a banking crisis. NPAs are a permanent fact in the balance sheets of financial institutions. If NPAs are not contained properly it can deteriorate the financial health of the system. The problem of NPAs in the financial sector has been a matter of concern for all the stakeholders in economies. The resolution of NPAs has become identical to the functional efficiency of financial intermediaries. The consequent deterioration in the economic environment has led to a rise in the overall level of stress in the global banking sector. The Indian banking sector is characterized by huge NPAs, low capital adequacy, and low profitability. According to the Financial Stability Report of the Reserve Bank of India (RBI) 2019, Scheduled Commercial Banks' (SCBs) gross NPA increased primarily due to changes in the macroeconomic scenario, the marginal increase in slippages, and the denominator

effect of declining credit growth. It is evident from the observation that the poor performance of the infrastructure sector, power, iron and steel sector, etc. generates a huge amount of NPAs in the Indian banking industry.

The investigation also proved that NPAs heavily hamper the capital adequacy of banks and hamper business of organizations. The business of an organization depends on efficiency in investment. Investment efficiency depends on the asset quality of an organization, and the asset quality of an organization, in turn, depends on the economic variables of the country. Economic variables like exchange rate are positively related to gross NPAs in the banking industry as observed by different researchers in different countries, viz., Quagliariello (2003) in Italy, Jakubik (2007) in the Czech Republic, and Forfock (2005) in Sub-Saharan Africa Region. Foreign direct investment (FDI) is found negatively correlated with NPAs as observed by Brandmeier (2006) in Central Europe, and Festic and Romih (2008) in the Czech Republic. Gambera (2000) in America, Quagliariello (2003) in Italy, and Baboucek and Jancar (2005) in the Czech Republic observed a surge in the unemployment rate along with the increase in the gross NPAs. The lending rate is negatively related to gross NPAs as observed by Bhaarathi and Thilagavathi (2018) in India and Hoggarth et al. (2005) in the United Kingdom. Available literature exhibits that macroeconomic variables have a significant impact on the level of NPAs (e.g., hike in NPAs), leading to consolidation of Public Sector Banks (PSBs). Thus, NPAs may be termed a menace like cancer in the Indian banking Industry. This fact motivated us to undertake the study.

The structure of the paper is as follows. Literature review of the study is presented in section 2. In section 3, objective and methodology are outlined. In Section 4, we use multiple regression results, incorporating 14 bank-specific as well as macroeconomic variables. However, due to multicollinearity issue, we finally reduce the number of variables to 4 after applying the trial and error method. In the next part, we check the unit root followed by the Johansen test. As long-run cointegration is found we use the VECM model. Finally, the implication of the study and conclusion is outlined.

2. Literature Review

Arpa et al. (2001) explored that the loans of the banking sector fluctuate indirectly with real GDP growth and real interest rates, and directly with consumer price index (CPI) inflation and real estate price inflation in Austria through a regression model. Quagliariello (2003) concluded that decreasing real GDP growth and increasing unemployment have a significantly adverse effect on loan portfolio quality in Italy. Baboucek and Jancar (2005) studied that increasing unemployment and inflation deteriorate the NPAs ratio, while faster GDP growth reduces the NPAs ratio in the Czech Republic. Berge and Boye (2007) found that interest rates and unemployment had a strong impact on NPAs in the Nordic banking system during 1993-2005. Festic and Beko (2008) presented empirical evidence on the macroeconomic variables affecting non-performing loans in five Central European Economies by using ordinary least squares and the VAR methodology. Regarding macroeconomic variables, two conclusions were highlighted: First, an improvement in economic conditions through the growth of real GDP reduced the amount of NPA. Second, an increase in real interest rates results in a large NPA ratio. Bofondi and Ropele (2011) studied the main macroeconomic determinants of bank loan quality in Italy during 1990-2010 and concluded that bad loans are significantly related to annual growth rates, unemployment rate, and interest rate. Tsige (2013) found that NPAs are determined by macroeconomic and bank-specific factors.

In the Indian context, Dhal et al. (2011) found a relationship between higher interest rates and NPAs. GhoshRoy (2014) analyzed NPAs with some macroeconomic variables with the help of the

panel regression method. Samantaraya (2016) concluded that an economic slowdown aggravates loan delinquencies in banks which in turn stops economic revival by suppressing credit growth. Das and Dey (2018) found that non-priority sector NPAs are severe compared to priority sector NPAs. NPAs have a strong positive correlation with restructuring and a negative correlation with GDP growth. Arasu et al. (2019) found a significant negative relationship between NPAs and Return on Assets (ROAs) of banks. Prasanth and Sudhamathi (2020) suggested some measures which might be implemented to check future balance sheet-related crises within the banking sector. Sharma et al. (2020) investigated the effect of Gross NPAs on the profitability of different Public and Private Banks from 2006 to 2019. Bhatia (2021) observed that NPAs have negatively affected the Indian economy for several years now. Finally, it can be concluded that NPAs harm the profitability of public and private sector banks.

3. Objective and Methodology

Economic variable like the exchange rate is positively related to gross NPAs in the banking industry, as investigated by different researchers in different countries, viz., Quagliariello (2003) in Italy, Jakubik (2007) in the Czech Republic, and Forfock (2005) in Sub-Saharan Africa Region. FDI is negatively correlated with NPAs, as observed by Brandmeier (2006) in Central Europe, and Festic and Romih (2008) in the Czech Republic. The objective of this paper is to identify the impact of Gross Domestic Product (GDP), Foreign Direct Investment (FDI), and Exchange Rate (ER) on NPAs in the Indian context. The concept of the study originates from Biswas and Peter's (1985) study of money income causality analysis. The study of China's finance-growth nexus by Andersson et al. (2016), and the study of Demirgue and Detragiachee (1998) on the determinants of the banking crisis in developing and developed countries also have triggered this study.

In the present study, we used panel data of four different variables. The data is collected from 1997 to 2019 from the Reserve Bank of India website. Eviews 11 software is used to analyze the data. Simple regression is always discouraged in available literature when unit root is found in the variables. Presence of unit root declares variables as non-stationary. Regression of non-stationary time series lies with difficulties and generally leads to the spurious regression problem. The Augmented Dickey-Fuller test is applied to check the unit root in the variables. The next step is to consider the test of cointegration. If cointegration is present among the variables then Vector Error Correction Model (VECM) is applied. The corresponding VECM (Andrei and Andrei, 2015) model is as follows:

$$\Delta DEP_t = \alpha + \sum_{i=1}^{k-1} \beta_i \Delta x_{t-i} + \sum_{i=1}^{k-1} \phi_i \Delta y_{t-j} + \ldots\ldots + \sum_{i=1}^{k-1} \omega_i \Delta z_{t-m} + \lambda ECT_{t-1} + u_t$$

In VECM lag length is reduced by one; thus, lag k-1 is used instead of lag k. β, ϕ, ω are the short-run coefficients of the model. λ is the coefficient of error correction term (ECT) known as the speed of adjustment parameter with a negative sign. It measures the speed at which the dependent variable (NPAs) returns to equilibrium after changes in the regressors. ECT_{t-1} refers to the error correction term in the lagged value of residuals obtained from the cointegrating regression of the dependent variable on the regressors containing long-run information derived from the long-run cointegrating relationship. Mathematically, it is written as $ECT_{t-1} = [y_{t-1} - \eta_1 x_{t-1} - \xi_1 R_{t-1}]$. Here, u_t is termed as residuals or stochastic error term; or, it may be referred to as impulses or shocks.

The structure of the causal relationships among variables was analyzed through the Granger (1969) causality approach. There exist three types of causalities, viz., long-run causality, short-run causality and strong causality (Pol, 2013). Strong causality arises only when one variable is the sole cause for changes in other variable. A negative and significant error correction term exhibits long-run causality. For short-run causality, the Wald test is applied where the null hypothesis assumes equality of the coefficients and the alternative hypothesis is anything other than the null hypothesis. The significant value of the coefficient rejected the null hypothesis and concludes short-run causality running from one variable to another. An insignificant p-value indicates that there exists no causal relationship among the variables and rejects the null hypothesis. Thus, $H_0 = \beta_1 = \beta_2 = \ldots \ldots = \beta_n = 0, H_0 \neq H_1$.

In the pair-wise Granger causality test, direction of causality is measured. When both pairs of the variable cause each other, i.e., both the coefficient of the variable are significant, we conclude that there exists a bidirectional causality running from variable x to y and y to x. If the causality is running from only one direction, i.e., x to y, or y to x, it is termed as unidirectional causality. Here, only one coefficient is significant. If there exists no causal relationship, i.e., both the coefficients are insignificant, then both the variables are independent. To check the validity of the model, test of heteroscedasticity, serial correlation test, normality test, and CUSUM test are performed.

4. Data Analysis and Findings

A total of 14 variables in their log form are considered to find the impact of macroeconomic variables on NPAs. The variables are Gross Domestic Product (GDP), Gross Capital Formation (GCF), Non-Priority Sector Lending (NPSL), Priority Sector Lending (PSL), Foreign Exchange Reserve (FOREX), Exchange Rate (ER), Cash Reserve Ratio (CRR), GDP Growth (GGROWTH), Inflation (INF), Repo (REPO), Capital to Risk-Weighted Asset Ratio (CRAR), Unemployment (UNEMP), and Lending Rate (LR). To count the effect of major economic variables, including bank-specific variables primarily multiple regression is performed. The outcomes are given in Table 1.

Table 1: Regression Estimates Considering Major Macroeconomic Variables

R	R-Squared	Adjusted R-Squared	Std. Error of the Estimate	Durbin-Watson
0.995	0.991	0.975	0.06887	2.893

We have considered the log of NPAs as the dependent variable and log of all other variables as the independent variables. The R^2 value is 0.991 which simply means 99.1% variability of NPAs is explained through the independent variables. The adjusted R^2 which explains the more accurate variability of the dependent variable explains 97.5% variability of the independent variables. The Durbin Watson statistic (d) shows a value above 2.5. The value is out of the acceptable region of d (where $1.5 < d < 2.5$). The fact indicates towards autocorrelation among the disturbance (Gujarati et al., 2012); still we should move further to check the validity of the model.

An unstandardized beta value for the regression equation is used to predict the dependent variable. As unstandardized coefficient is measured in their natural units, they cannot be compared with another to determine which one is more influential in the model. For this reason, we use a standardized beta value as it converts the entire variable on the same scale. As we see in Table 2, only LGDP is statistically significant. But the problem lies with the variable inflation factor (VIF) which represents the multicollinearity problem. The accepted VIF for analysis as per available literature is

less than 10 (Gujarati et al., 2012). As all the variables except LGROWTH and LUNEMP show a VIF over and above 10, it is argued that multicollinearity is present in the model. The model was also affected by autocorrelation primarily due to the non-stationarity of data and long-run association among the variables. To counter multicollinearity issues we reduce no of the variables.

Table 2: Model Coefficients Statistics Considering Major Variables

Variables	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
Constant	-6.173	2.307		-2.676	0.028		
LGDP	3.518	1.472	3.060	2.390	0.044	0.001	1420.445
LGCF	-1.027	0.824	-0.986	-1.246	0.248	0.002	543.238
LNPSL	1.184	1.847	1.408	0.641	0.539	0.000	4184.498
LPSL	-2.052	1.301	-2.424	-1.577	0.153	0.000	2047.601
LFOREX	-0.305	0.478	-0.339	-0.639	0.541	0.004	243.376
LFDI	-0.001	0.191	-0.001	-0.007	0.995	0.034	29.361
LER	1.681	0.966	0.322	1.740	0.120	0.034	29.655
LCRR	0.598	0.686	0.193	0.871	0.409	0.024	42.481
LGROWTH	0.063	0.147	0.019	0.430	0.679	0.614	1.630
LINF	0.237	0.212	0.129	1.114	0.298	0.087	11.544
LREPO	-0.007	0.862	-0.001	-0.008	0.994	0.037	27.306
LCRAR	0.460	1.371	0.044	0.336	0.746	0.067	15.000
LUNEMP	0.438	0.376	0.077	1.164	0.278	0.263	3.803
LLR	0.007	0.685	0.001	0.010	0.993	0.053	18.766

Vector autoregression is applied only if the variables are stationary after the first difference. The Augmented Dickey-Fuller (ADF) test is applied to check the unit root in the data. If the value of the test statistic is greater than the critical value, then the null hypothesis is rejected and it is concluded that the variable does not have a unit root. In the converse case it is argued that the variable has a unit root. The next step is test of cointegration. Johansen's test of cointegration simply tells us about the long-run association among variables. If cointegration is found among the variables, Vector Error Correction Model (VECM) is applied.

4.1 Descriptive Statistics

The main aim of presenting descriptive statistics is to sum up the whole population in a widespread way without coming to the main conclusion. Table 3 shows that the mean values of NPA, GDP, and ER are greater than their median values. This indicates that they are skewed in shape. The skewness and kurtosis values also credence to the fact that the data does not follow the normal distribution pattern. Again, the Jarque-Bera test which measures the difference between skewness and kurtosis of the series is conducted to test the normality of data (Jarque and Bera, 1987). The probability of the Jarque-Bera test confirms that NPA is not normally distributed.

Table 3: Descriptive Statistics

Descriptive Statistic	NPA	GDP	FDI	ER
Mean	220319.5	6892611	28278	51.19
Median	70861	4898662	34298	46.57
Maximum	895601	19010164	62001	70.96
Minimum	50486	1301788	4029	36.36
Standard Deviation	255314.20	5515568	20644.71	10.18
Skewness	1.52	0.81	0.263498	0.70
Kurtosis	4.09	2.39	1.63785	2.12
Jarque-Bera	10.09	2.90	2.044294	2.65
Probability	0.00	0.23	0.359822	0.26
Sum	5067348	1.59E+08	650395	1177.43
N	23	23	23	23
Sum Square Deviation	1.43E+12	6.69E+14	9.38E+09	2282.43

Table 4: Correlations among Variables

Variables	ER	FDI	GDP	NPA
ER	1.0000	0.8128	0.9466	0.9190
FDI	0.8128	1.0000	0.9230	0.8002
GDP	0.9466	0.9230	1.0000	0.9325
NPA	0.9190	0.8002	0.9325	1.0000

Table 5: Augmented Dickey Fuller Unit Root Test Results

Variables	Trend and Intercept at Level			Trend and Intercept at 1st Difference		
	t-statistic	Critical Value at 5%	Decision	t-statistic	Critical Value at 5%	Decision
NPA	-3.16	-3.69	Non-Stationary	-3.59	-3.29	Stationary
GDP	-3.01	-3.60	Non-Stationary	-4.53	-3.73	Stationary
FDI	-2.84	-3.64	Non-Stationary	-3.90	-3.60	Stationary
ER	-1.02	-3.63	Non-Stationary	-4.18	-3.64	Stationary

4.2 Correlation Analysis

Correlation statistics help to identify the strength and direction of the relationship among the variables. The positive correlation means that any change in the positive direction of any variable brings about positive change in the other variable. Table 4 shows that ER, FDI, and GDP are positively associated with NPA.

4.3 Augmented Dickey-Fuller Unit Root Test

We use the ADF unit root test to find out the stationarity of the variable. If the absolute value of the t-statistic is greater than the critical value then the test is rejected, and it is concluded that the variable does not have unit root and the variable is stationary. If the converse is true then it is concluded that the variable is non-stationary. We observe in Table 5 that the variables are non-stationary at level but become stationary after the first difference.

4.4 Lag Length Determination

It is an automatic procedure done by the system. In the case of Vector Autoregression (VAR), the lag length is k and in the case of VECM, it is k-1. Now it is very important to determine the optimum lag length for further analysis. For determining the proper lag length, three main information criteria, viz., the Akaike Information Criterion (AIC), the Hannan-Quinn Criterion (HQC), and the Schwarz-Bayesian Criterion (SBC) are considered. To measure the optimal lag length in our model maximum lag of order four is used.

Table 6: VAR Lag Order Selection

Lag	LogL	LR	FPE	AIC	SBC	HQC
0	-849.1908	NA	1.33E+32	85.31908	85.51822	85.35795
1	-745.7844	155.1095*	2.22E+28	76.57844	77.57417	76.77282
2	-729.6297	17.77016	2.76E+28	76.56297	78.35529	76.91285
3	-692.8462	25.74848	7.14e+27*	74.48462*	77.07352*	74.99000*

Note: *indicates lag order selected by the criterion

Here, lag length of order three has been recommended by Final Prediction Error (FPE), AIC, SBC, and HQC (see Table 6). The next step is to find the long-run associations among them. To compute it, we consider the Johansen test of cointegration. The pre-condition of the Johansen test of cointegration is that the variable must be non-stationary at level but should become stationary after the first difference. The above condition is satisfied by the variables.

4.5 Cointegration Test

To check the existence of a long-run association among the selected variables unrestricted cointegration rank test is performed (Johansen, 1988). Trace statistic values are compared with the critical values at 5% level. A trace statistic value lower than the critical value indicates rejection of the null hypothesis and acceptance of the alternative hypothesis. The following hypotheses are considered to analyze the results:

H_0: Cointegration does not exist among variables;

H_1: Cointegration exists among variables.

Table 7: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen Value	Trace Statistic	Critical Value (0.05)	p-value
None*	0.953994	85.71734	47.85613	0.0000
At most 1	0.528443	24.13747	29.79707	0.1947
At most 2	0.325015	9.103179	15.49471	0.3559
At most 3	0.060206	1.241896	3.841465	0.2651

Notes: Trace test indicates 1 cointegrating equation at 0.05 level; *denotes rejection of the hypothesis at 0.05 level.

The unrestricted cointegration rank test results exhibit one cointegrating equation at 5% level (Table 7). Hence, it can be concluded that there exists a cointegration among the variables in the long run. The cointegrating equation is as follows:

$$ECT_{t-1} = 1.000NPA_{t-1} - 0.2030GDP_{t-1} + 4.3041FDI_{t-1} + 28348ER_{t-1} - 398554$$

Here, ECT is an error correction term that explains long-run associations among the variables.

NPA is the variable of main interest, whereas GDP, FDI and ER are explanatory variables. As seen, Johansen test exhibits one cointegrating equation at 5% level of significance; hence, we move further to perform Vector Error Correction Model (VECM).

4.6 Vector Error Correction Model

The adjusted R^2 of the model is 0.8568 (Table 8), meaning that 85.68% of the variability of NPA is explained by the lagged value of NPA, GDP, FDI, and ER. The F-statistic is 13.63 with a p-value of 0.000 (i.e., highly significant) which exhibits that our model is well fitted. The Durbin-Watson statistic reflects a value of 2.30 which is the permissible value as per the available literature for declaring the model to be free from serial correlation. AIC, SBC and HQC are often used to choose between competing models. Lower values of these parameters indicate the efficiency of the model.

Table 8: Vector Error Correction Model Parameters

Parameters	Values
R-squared	0.9246
Adjusted R-squared	0.8568
S.E. of regression	45438.95
Sum squared resid.	2.06E+10
Log-likelihood	-235.9298
F-statistic (p-value)	13.6340 (0.0001)
Akaike info criterion (AIC)	24.5929
Schwarz-Bayesian criterion (SBC)	25.0908
Hannan-Quinn criterion (HQC)	24.6901
Durbin-Watson statistic	2.3028

Table 9: Vector Error Correction Test Results for Short-Run Coefficients

Variable	Coefficient	Std. Error	t-statistic	p-value
ECT_{t-1}	-1.4765	0.4486	-3.2907	0.0081
NPA(-1)	-0.0376	0.2996	-0.1256	0.9025
NPA(-2)	-0.7240	0.1803	-4.0152	0.0025
GDP(-1)	-0.8093	0.2907	-2.7834	0.0193
GDP(-2)	-0.5354	0.2609	-2.0518	0.0673
FDI(-1)	-0.7828	2.2113	-0.3540	0.7307
FDI(-2)	-10.4724	2.4469	-4.2796	0.0016
ER(-1)	34032.3100	12757.9500	2.6675	0.0236
ER(-2)	9579.0900	4508.1200	2.1248	0.0595
C	1032316	336626.2000	3.0666	0.0119

The Vector Error Correction model is given below and the full estimation results are given in Table 9.

$$\Delta NPA = -1.4765 ECT_{t-1} - 0.0376 \Delta NPA_{t-1} - 0.7240 \Delta NPA_{t-2} - 0.8094 \Delta GDP_{t-1} - 0.5355 \Delta GDP_{t-2}$$
$$-0.7829 \Delta FDI_{t-1} - 10.4724 \Delta FDI_{t-2} + 34032.31 \Delta ER_{t-1} + 9579.09 \Delta ER_{t-2} + 1032316$$

Coefficient of error correction term is presented as λ which explains that previous period deviation from long-run equilibrium is corrected in current period data at an adjustment speed of 147.65%. It is also an indication of long-run causality running from independent variables to

NPA. GDP lag(1) coefficient is negative and significant, implying that GDP is negatively related to NPA. 1% increase in GDP brings about 0.8094% decrease in NPA. FDI coefficient is also negative and significant. 1% increase in FDI brings about 10.47% decrease in NPA. The exchange rate is positively related to NPA and the coefficient is significant at 5% level of confidence, exhibiting that aggravating exchange rate increases NPA and vice versa.

4.7 Wald Test of Short-Run Causality

Wald test checks the short-run causality running from the independent variable towards dependent variable (Granger 1986; 1987). Here, null hypothesis assumes that all the coefficients are zero against the alternative hypothesis indicating that the coefficient has a significant effect:

$$H_0 = \beta_1 = \beta_2 = ... = \beta_n = 0, \ H_1 \neq H_0.$$

Table 10: Wald Test for Short-Run Causality

Coefficients	Null Hypothesis	F-statistic (df)	p-value	Chi-square (df)	p-value	Observation
GDP [C(4), C(5)]	C(4)=C(5)=0	4.061654 (2,10)	0.0500	8.123309 (2)	0.0172	Rejected
FDI [C(6), C(7)]	C(6)=C(7)=0	9.599625 (2,10)	0.0047	19.19925 (2)	0.0010	Rejected
ER [C(8), C(9)]	C(8)=C(9)=0	4.594831 (2,10)	0.0384	9.189663 (2)	0.0101	Rejected

Table 11: Pair-wise Granger Causality Tests

Null Hypothesis	N	F-Statistic	p-value	Observation
GDP does not Granger Cause NPA	22	15.1102	0.0010	Rejected
NPA does not Granger Cause GDP		9.3743	0.0064	Rejected
FDI does not Granger Cause NPA	22	4.17692	0.0551	Accepted
NPA does not Granger Cause FDI		0.61004	0.4444	Accepted
ER does not Granger Cause NPA	22	6.39553	0.0205	Rejected
NPA does not Granger Cause ER		2.8592	0.1072	Accepted

See Table 10. The F-statistic (4.06) with a p-value of 0.05 and Chi-square value (8.12) with a p-value of 0.01 of the coefficient of GDP are found significant at 5% level, establishing clearly a short-run causality running from GDP to NPA. The F-statistic (9.59) with a p-value of 0.004 and Chi-square value (19.199) with p-value of 0.001 of the coefficient of FDI are found significant at 5% level, clearly establishing a short-run causality running from FDI to NPA. The F-statistic (4.59) with a p-value of 0.03 and Chi-square value (9.18) with a p-value of 0.01 of the coefficient of ER are found significant at 5% level, clearly establishing a short-run causality running from ER to NPA. The null hypotheses are rejected in all the above cases, meaning that there exists short-run causality running from GDP to NPA, FDI to NPA, and ER to NPA.

4.8 Pair-wise Granger Causality Tests

In the pair-wise Granger causality test, direction of causality is measured. As both pairs of the variables cause each other in the case of NPA and GDP, i.e., both the coefficients of the variables are significant, we conclude that there exists a bidirectional causality running from variable NPA to GDP and GDP to NPA at 5% level of significance (see Table 11). As the causality is running from only one direction in the case of FDI and NPA at 10% level of significance, it is argued that unidirectional causality runs from FDI towards NPA. Another unidirectional causality was also

observed; that was found to be running from ER towards NPA.

4.9 Diagnostic Checking

4.9.1 Heteroscedasticity Test

This test is important to find out whether the model has any heteroscedasticity problem or not. The following hypotheses are chosen for testing the heteroscedasticity:

H_0: There is no heteroscedasticity effect;

H_1: There exists a heteroscedasticity effect.

Table 12: Breusch-Pagan-Godfrey Test

Parameters	Values	Probability	
F-statistic	0.586635	p-value. F(12,7)	0.8011
R-squared LM statistic	10.02822	p-value. Chi-Square(12)	0.6135
Scaled explained SS	0.830567	p-value. Chi-Square(12)	1.0000

F-statistic value of 0.58 with a probability of 0.80—together with the value of observed R-squared (10.02) and with the probability of Chi-square (0.61)—of the heteroscedasticity test accepts the null hypothesis and confirms that the model does not have any heteroscedasticity problem (Table 12).

4.9.2 Serial Correlation Test Result

Test of serial correlation is important to check whether there exists any autocorrelation in the model. To test the Breusch-Godfrey Serial Correlation LM Test, the following hypotheses are chosen:

H_0: The model has no serial correlation;

H_1: The model has a serial correlation.

Table 13: Breusch-Godfrey LM Test

Parameters	Values	Probability	
F-statistic	0.486735	p-value. F(2,8)	0.6317
R-squared LM statistic	2.169663	p-value. Chi-Square(2)	0.338

Figure 1: Stability Test
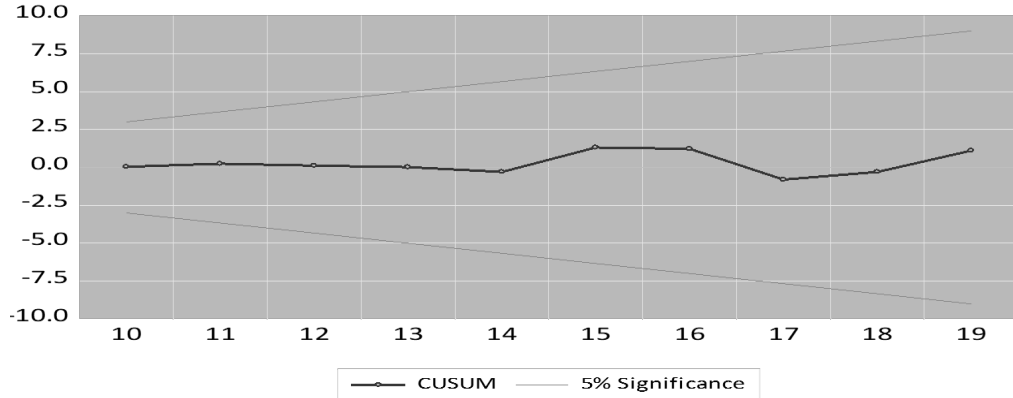
The F-statistic value is 0.4867 with a probability of 0.63 and the observed R-squared value is 2.16 with a probability of 0.338 of Breusch-Godfrey serial correlation LM test (Table 13). These confirm that the null hypothesis is accepted and thus prove that the model has no serial correlation.

4.9.3 Normality Test

A normality test is conducted to identify whether the developed model is under normal distribution or not. The probability of the Jarque-Bera test statistic (0.4567) confirms that residuals are normally distributed.

4.9.4 CUSUM Stability Test

For testing stability of a model, one important test, namely, the CUSUM test, has been conducted in this research. The result of the CUSUM test confirms that the model is stable at 5% significance level (Figure 1).

5. Implications of the Study

GDP lag(1) coefficient is negative and significant, implying that GDP is negatively related to NPA. 1% increase in GDP brings about 0.8094% decrease in NPA. A surge in the Gross Domestic Product of the country enhances the purchase and sales of goods and services; this enhances the repaying capacity of the firm. This leads to low default in the loan and subsequently reduces the NPA level. FDI coefficient is also negative and significant. 1% increase in the FDI brings about 10.47% decrease in NPA. Incoming FDI ensures manufacturing or infrastructure or technological growth. All these things generate revenues for the firm directly or indirectly. This enhances the repaying capacity of the firm and lowers the country's NPA level. Thus, government must monitor the country's GDP and inflow of FDI for a healthy financial system. Financial regulators must look into the above two indicators and regulate monetary policies accordingly. The exchange rate is positively related to NPA and the coefficient is significant at a 5% level, exhibiting that aggravating exchange rate increases NPAs and vice versa. Increase in the exchange rate deteriorates the repaying capacity of the firm and enhances the NPA level of the country. It is very important for the government to leave no stone unturned to restrict devaluation of home currency as it paralyses many important efforts of the country.

6. Concluding Remarks

ER, FDI and GDP are positively associated with NPAs. As the variables are non-stationary at level but become stationary after the first difference, the cointegration test is applied and the test result exhibits one cointegrating equation at 5% level. As the Johansen test exhibits one cointegrating equation, we perform Vector Error Correction Model (VECM). The adjusted R^2 of the model is 0.8568, meaning that 85.68% of the variability of NPAs is explained by the lagged value of NPA and also by GDP, FDI, and ER. The coefficient of error correction term explains that previous period deviation from long-run equilibrium is corrected in current period data at an adjustment speed of 147.65%. It confirms long-run causality running from independent variables to NPAs. The study found that 1% increase in GDP causes 0.81% decrease in NPA. FDI coefficient is also negative and significant. It is found that 1% increase in the FDI causes 10.47% decrease in NPAs. The exchange rate is positively related to NPAs and the coefficient is significant at 5% level of confidence. The surge in the exchange rate means the devaluation of the home currency. Thus, increase in the exchange rate deteriorate the repaying capacity of the firm and enhance the NPAs level of the country. Some short-run causalities running from GDP to NPA, FDI to NPA, and ER to NPA are also observed in the analysis. There exist bidirectional causalities running from variable

NPA to GDP and GDP to NPA at 5% level of significance. A unidirectional causality is observed running from FDI towards NPA and from ER towards NPA. As far as a diagnostic test is concerned, serial correlation and heteroscedasticity are not observed. Residuals are normally distributed and CUSUM confirmed model stability at 5% level of significance. The above analysis confirmed that macroeconomic variables have a tremendous impact on the NPAs of a country.

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HAS MALE OUT-MIGRATION INCREASED TIME POVERTY AMONG LEFT-BEHIND WIVES IN KERALA? EVIDENCE FROM GULF MIGRATION

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Abstract: Kerala has a long experience of Gulf migration. The repercussions of Gulf migration and the inflow of remittances are witnessed in every facet of the Kerala economy. The nature of Gulf migration from Kerala is predominantly gendered and temporary. In migrant households, the absence of male family heads demands more involvement of left-behind wives in housekeeping, decisions, household maintenance, and care work. It leads to a disproportionate allocation of their daily or weekly time between paid, unpaid domestic and non-work activities. Thus, the study's primary objective is to understand the time use pattern and extent of time poverty among left-behind wives in Kerala. The findings of the study indicate that, on average, the left-behind wives spent relatively more hours in a day on household maintenance and care work, and social and cultural activities than married women in non-migrant households. However, they spent less time on personal care and leisure activities than married women in non-migrant households. In migrant households, the absence of male family heads causes to increase the incidence of time poverty among left-behind wives. In addition to that, various individual and household level variables also influence the incidence of time poverty among left-behind wives.

Keywords: Migration, Left-behind wives, Time use, Discretionary time, Time poverty,

1. Introduction

Mobility of the workforce from developing countries to industrially advanced countries has some distinctive characteristics—temporary, selective, and gendered. While the number of settlement migrants from developing countries has increased in recent years, temporary migration is dominant and common in these countries. In temporary migration, the emigrant workers have to return to the source country when job contracts expire. Thus, return migration of the workforce is an inevitable long-run outcome of emigration from developing countries. Moreover, in temporary migration, the higher monetary cost of migration, living expenditure, and distinct socio-cultural conditions

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prevailing in destination countries make migration from developing countries selective—mainly, the male family heads are migrating. In the migrant households, remittances is the main part of household income, and in developing countries, the left-behind family members heavily depend on it to meet their economic needs. Therefore, dependent left-behind family members, particularly left-behind wives, are one of the important outcomes of temporary migration from developing countries.

Among the South Asian countries, India is one of the world's largest countries of origin of international migration, with a total stock of 17.5 million emigrants in 2019 (United Nations, 2019). However, the international migration from India is highly uneven and less diversified. The migrant workers from India are concentrated heavily in some specific locations in the world. Moreover, in India, the origin of emigrant workers is highly skewed—located in some states. The scenario of the diaspora of Indian workers indicated that migration has mainly originated from seven states, viz., Kerala, Andhra Pradesh, Punjab, Gujarat, Goa, Maharashtra and Tamil Nadu (Nair, 1986; and Titus, 2013); and a sizable portion of temporary workers from India has migrated to six Middle East countries, viz., Saudi Arabia, Kuwait, Bahrain, Qatar, the United Arab Emirates and Oman (Titus, 2013).

Among the Indian states, the Southern state of Kerala has a long experience of Gulf migration, which started before the state's inception on a linguistic basis on 1 April 1956. However, the intensity of workforce migration from Kerala to the Middle East has augmented since 1970, with the Gulf boom.[1] It enhanced the demand for unskilled and semi-skilled workers in Gulf Cooperation Countries (GCC) (Gulati, 1983). It led to the outflow of a large number of workers from Kerala to Gulf countries and enhanced the inflow of remittances to the state. Currently, out of the 2.12 million international migrants from the state, 1.8 million workers are in the Middle East countries (Rajan and Zacharia, 2018). The recent migration survey result shows an increasing trend of Gulf returnees in Kerala. The growth rate of return emigration outweighs the growth rate of migration from Kerala (Rajan and Zachariah, 2018). Thus, the growth rate of Gulf migration from the state has been showing a declining trend in recent years.

In Kerala, the repercussions of Gulf migration and the inflow of remittances can be witnessed in every facet of the economy. Migration of skilled and semi-skilled workforce partially helps to reduce the intensity of the unemployment problem in the state. Studies show that many young educated job aspirants choose migration as an escaping root from the unemployment problem prevailing in the state (Zachariah et al., 2002; and Zachariah and Rajan, 2012). On the distributional dimension, the inflow of Gulf remittances influenced consumption behaviour, poverty reduction, and income distribution in the state (Prakash, 1998). The inflow of remittances from the Middle East enhances the income levels and living standards of migrant households. It enables many migrant families who belong to the low-income category to climb into a higher income level (Prakash, 1998). It also leads to the growth of the middle-income class in society. They mostly used the remittances for consumption purposes, construction of new houses, or renovation of existing dwellings.

While temporary migration of the workforce helps to enhance household income, consumption, and living standard of migrant households, the absence of migrant workers creates some negative

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[1]By the 1970s, the identification and exploration of the large volume of underground oil resources lead to the flow of unlimited financial resources into the hands of Arabs. However, the lack of availability of trained and experienced human capital is an obstacle to efficiently utilizing the financial resources in the urgent task of nation-building. The Arab countries overcome this problem by importing the workforce from the developing countries in the world, especially from the import of human power from the Asian countries.

repercussions on left-behind family members in migrant households. International migration studies' findings indicate that the prolonged absence of male family heads increases the household maintenance and care responsibilities of left-behind wives in migrant households (Chang et al., 2011; Kakati, 2014; Handson, 2007; Itzigsohn, 1995; and Rodriguez and Tiongson, 2001). It necessitates them to spend a disproportionate amount of time on work and experience a time crunch to do discretionary and leisure activities, making them time deficit or time-poor (Bardasi and Wodon, 2006). It indicates that in source countries, while temporary migration helps left-behind families escape from income poverty, the absence of male family heads leads to increased time stress among left-behind wives, which impoverishes their physical and mental well-being. The socio-economic impact of migration and inflow of remittance on the Kerala economy has been extensively analysed and documented by many scholars (Banerjee et al., 2002; Prakash, 2000; Prakash and Abraham, 2004; and Prakash et al., 2017). However, the impact of solo male outmigration on the non-material well-being of left-behind family members, particularly left-behind wives, has received scant attention. One of the important variables determining an individual's non-material well-being is the availability and freedom he or she enjoys to use the discretionary time. In this context, the study explores the time use pattern of left-behind wives and the time poverty experienced by them in the absence of their male partners.

2. Analytical Framework of the Study

Individual's time allocation decision on various activities in a day—paid, unpaid works and discretionary activities—considerably varies with gender, and individual as well as household level characteristics such as age, educational status, marital status, occupation, household income, nature of family, presence of dependent family members, and absence of the family heads. The standard time use model analysed the time allocation decision of an individual by using the work leisure trade-off (Mincer, 1962). An individual's total time in a day is assumed to be fixed, and she has the freedom to spend it either on market work or leisure activities (Kalenkoski and Hamrick, 2013). In such models, time spent by an individual on all activities other than market work is considered leisure. Thus those models did not distinguish leisure activities from non-market works, and all non-market activities are considered as leisure. However, the distinction between non-market household works from leisure activities is pertinent in the case of married women (Alessie and Ree, 2008) because they spend more hours in a day on non-market household work than men (Bardasi and Wodon, 2006; and Qi and Dong, 2018). Thus, an analysis of the three-way allocation of an individual's time—in market work, non-market work, and discretionary activities—is needed to understand married women's time use pattern and time poverty.

In an individual's time allocation, how many hours an individual spends on market work, household work, and leisure activities in a day or week are pertinent because that influences their utility maximisation behaviour. Time is a scarce resource; thus, if an individual allocates more hours in a day to market work, they have to reduce the time spent on household work and leisure activities. The individual utility maximisation related to time used on market work, household work, and leisure activities depends upon the marginal value of time spent on market work (MVT_M), household work (MVT_H), and leisure (MVT_L). By assumption, the MVT of activity is inversely related to the time spent by an individual on that activity (Hoffman and Averett, 2010). Thus if an individual spends more hours in a day on market work leads to a decrease in the MVT_M and an increase in the marginal values of time on household work (MVT_H) and leisure activities (MVT_L). This inverse relationship between time and marginal values of time on various activities necessitates the individuals to reallocate their scare time between activities to reach an optimum welfare point

where all marginal values related to time use are equal $(MVT_M (M^*) = MVT_H (H^*) = MVT_L (L^*))$. At that point, time available to an individual in a day is also fully utilised $(M^* + L^* + H^* = 24)$ (Hoffman and Averett, 2010). When the exogenous variables that influence an individual's time use are changed, the relative marginal values of market work, household work, and leisure activities are also altered. In the case of married women, burden of household and care work necessitate them to reallocate time from leisure and discretionary activities to household work than from market work. The less time available to them for leisure and other discretionary activities enhance time stress and time poverty among married women.

3. Methodology

The findings of the study are based on primary data. A multi-stage stratified random sample design is used in the primary data collection to identify the sample units and units of inquiry. To locate sample units and the unit of enquiry, firstly, six districts in Kerala—Kollam, Pathanamthitta, Kottayam, Trissur, Malappuram, and Kannur—were selected based on the higher intensity of migrant households that is greater than the average state intensity. In the second stage, two districts—Kollam and Malappuram—were randomly selected from the six districts. In the third stage, from each selected district, one taluk was randomly selected. The selected taluks were Kollam taluk from Kollam district and Tirur taluk from Malappuran district. The selected taluks accounted for the first position in the number of migrant households among taluks in their respective districts (Rajan and Zachariah, 2018). After the taluks were selected, the sample sizes of migrant and non-migrant households were decided separately. Firstly, a sample size of 390 is decided for the migrant households with a confidence level of 95 percent and a confidence interval of 5 percent (the total number of migrant households in two taluks was 1,80,472 (Rajan and Zachariah, 2018).

For comparison purposes, the sample size of the non-migrant household is also decided as 390 by following the same procedure discussed above. Thus the total sample size is 780 households (390 migrant households and 390 non-migrant households). Then the total sample size of migrant and non-migrant households were allocated to each taluk in proportion to the total number of migrant and non-migrant households in respective taluks. In the fourth stage, each taluk was divided into rural and urban strata. Then the total number of migrant and non-migrant sample households was allocated to rural and urban strata in proportion to the number of rural and urban households in the respective taluks. In the final stage, one village and statutory town (Corporation or Municipality) from each taluk were randomly selected. Then from each selected village and town, certain wards (localities) were randomly selected to identify the sample households. From each locality, the number of sample households was decided in proportion to the total number of households in respective localities.

Then the proportion of migrant and non-migrant households within the total number of households in each locality was decided based on the proportion of migrant and non-migrant households in rural and urban strata in the respective taluks. After that, the sample households were located by the use of a systematic random sampling method with the help of the tax assessment

register of the respective locality following the inclusion and exclusion method[2] with the help of ward members, Asha workers, and political party leaders. An integrated approach[3] is used to collect the time use data from the sample respondents. The recall method was adopted to elicit time use data from the sample respondents. In recall method, stylised questions related to respondents' daily time allocation on paid work, unpaid work, personal care, leisure, social and cultural activities were asked. These questions were framed based on the results of the first national level time use survey conducted in India (CSO, 2000).

3.1 Estimation of Time Poverty

Time poverty is defined as the time available to an individual to do discretionary activities or discretionary time. An individual is considered time-poor if he or she does not has enough discretionary time (Kalenkoski and Hamrick, 2013). The discretionary time of an individual is defined as the residual time after he or she spends time on market work, unpaid domestic work and personal care activities (Kalenkoski et al., 2011). The relative time poverty of sample respondents is estimated based on the minimum threshold discretionary time (Kalenkoski et al., 2011) necessary for individual well-being. In this study, the median discretionary time[4] of sample respondents is set as the relative time poverty threshold. Based on this time poverty threshold, the sample respondents were categorised into time-poor (discretionary time is lower than threshold time) and not time-poor (discretionary time is greater than threshold). Then the incidence of time poverty among sample respondents was estimated using the headcount method like the method used to calculate income poverty. The headcount time poverty index is defined as:

$$H = \frac{q}{n}$$

where 'H' represents the time poverty index, 'q' represents the proportion of sample respondents who have discretionary time is less than the threshold discretionary time, and 'n' represents the total number of sample respondents.

The Probit regression model was estimated to examine the important determinants of the time poverty rate of left-behind wives. The Probit model be formed as follows:

$$P_i = \alpha_0 + \alpha_1 (MIGH_i) + \alpha_2 (X_i) + e_i$$

where P_i shows the binary dependent variable: time-poor or not time-poor. $MIGH_i$ shows the binary regressor variable of the Gulf migration status of husbands, and X_i represents all other regressors

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[2] In the inclusion and exclusion method, if the identified household did not exemplify the characteristics of the unit of enquiry of the present study (left-behind wives aged 18-to-56 years and whose husbands work in GCC countries for the last one year or married women in non-migrant households aged 18-to-56 years) the identified household was excluded and the next nearest household which satisfies the conditions of the unit of enquiry of the present study was included. This process was continued until the decided total number of sample households in each ward (locality) was identified.

[3] In an integrated approach, a time diary includes stylized questions related to respondents' weekly time allocation on market work, domestic household work, care work, personal care activities, leisure activities, and social and cultural activities. Integrated method is one of the methods used to conduct time use survey (United Nations, 2005).

[4] We use median discretionary time instead of mean for two reasons. First, we know that some activities have skewed distributions. Thus the median provides better result than mean in such circumstances. Secondly, we follow the practice of other researchers to measure time poverty (Kalensoski et al., 2011; and Bardasi and Wodon, 2006).

used in the study— i.e., age, children aged 0-5 years, children aged 6-14 years, family members aged above 65 years, household size, activity status and region in which the respondents live.

4. Results and Discussions

In households, traditionally, the unpaid domestic works are gendered. The unpaid domestic work is allotted disproportionately within the family, and most of the unpaid household and care work hangs on to the shoulders of women. In migrant households, in the absence of male family heads, most of the unpaid domestic work is considered the primary duty of the left-behind wives. It necessitates more involvement of left-behind wives in housekeeping, decisions, household maintenance, and care work than married women in non-migrant households. It demanded that left-behind wives disproportionately allocate their daily or weekly time to paid work, unpaid domestic work, and non-work activities. In Table 1 to understand the time allocation disparity between left-behind wives and married women in non-migrant households, the activities were classified into six broad categories— time spent on personal care, household maintenance work, care work, leisure activities, social and cultural activities, and working time.

Table 1: Average Time Spent by Sample Respondents on Various Activities in a Day

Activities	Respondents	N	Mean	SD	t-value (p-value)
Personal Care	Left-Behind Wives in Migrant Households	390	9.13	0.78	7.87
	Married Women in Non-Migrant Households	390	9.62	0.92	(< .01)
Household Maintenance Work	Left-Behind Wives in Migrant Households	390	6.21	1.07	10.03
	Married Women in Non-Migrant Households	390	5.44	1.05	(< .01)
Care Work	Left-Behind Wives in Migrant Households	390	2.34	0.98	5.056
	Married women in Non-Migrant households	390	2.00	0.88	(< .01)
Leisure Activities	Left-Behind Wives in Migrant Households	390	2.46	0.75	3.67
	Married Women in Non-Migrant Households	390	2.65	0.69	(< .01)
Social and Cultural Activities	Left-Behind Wives in Migrant Households	390	0.97	0.37	5.23
	Married Women in Non-Migrant Households	390	0.83	0.32	(< .01)
Working Time	Left-Behind Wives in Migrant Households	56	7.87	1.70	1.80
	Married Women in Non-Migrant Households	85	8.37	1.54	(> .05)

Source: Sample survey

It is observed that the difference in average time spent by left-behind wives and married women on paid work in a day was insignificant. However, the daily average time spent by left-behind wives on household maintenance work, care work, leisure, and social and cultural activities has significantly differed from married women in non-migrant households. On average, the left-behind wives spent relatively more hours in a day on household maintenance, and care work and social and cultural activities than the married women in non-migrant households, and the differences were statistically significant. However, the left-behind wives spent fewer hours on personal care and leisure activities in a day than married women in non-migrant households. It indicates that in the context of the upper time limit of the day is fixed and labour laws standardise the working time of formal contract works, in migrant households, in the absence of male family heads higher unpaid household maintenance and care work leads to disproportionate time allocation of left-behind wives on various activities. More time spent by left-behind wives on unpaid household maintenance and

care work means fewer residual hours are available for them to spend on various necessary and discretionary activities, including personal care, socialisation, and leisure activities. It indicates the time stress experienced by them in the absence of their male partners.

5. Incidence of Time Poverty: A Comparative Analysis

Time is scarce and valuable like any other economic resource (Najam-us-Saqib and Arif, 2012). Thus like income budget constraint, the time budget of an individual also affects their activities and utility maximisation behaviour (Vickery, 1977). The time budget of individuals varies with the individual and household characteristics such as marital status, occupational status, age, nature of family, household size, number of family members in dependence age, and household income. Generally, the incidence and intensity of time poverty were high among women and girl children as compared to men and boys (Bardasi and Wodon, 2006). Moreover, among married women, those who live without their partner and act as family heads experience more time stress than those who live with their companions and share their family roles and responsibilities (Lama et al., 2017).

Table 2: Incidence of Time Poverty Rate among Left-Behind Wives and Married Women

Region	Left-Behind Wives in Migrant Households		Married Women in Non-Migrant Households		All	
	N	%	N	%	N	%
Urban	96	53.3	98	48.6	194	47.3
Rural	136	64.8	103	64	239	64.6
All	232	59.5	201	51.5	433	55.5

Note: The time poverty threshold is median discretionary time (26 hours in a week)
Source: Sample survey

Table 2 shows that among the left-behind wives, 59.5 percent disproportionately allocated their time to work and experienced a lack of sufficient time to spend on discretionary activities closely associated with individual welfare. However, among married women in non-migrant households only 51.5 percent experienced the problem of lack of sufficient time to spend on discretionary activities. It indicates that the incidence of time poverty rate was higher among left-behind wives than married women in non-migrant households. As discussed above, the added household responsibilities and parental roles rest on the shoulders of left-behind wives due to the absence of male family heads in migrant households are the main reasons for time scarcity faced by them compared to married women in non-migrant households. In the long run, the higher incidence time poverty rate among left-behind wives leads to an increased prevalence of isolation, mental depression, and an increased incidence of various non-communicable diseases such as obesity, heart diseases, diabetes problems etc. The region-wise analysis of incidence of time poverty rate among respondents indicates that among left-behind wives and married women in non-migrant households, the incidence of time poverty rate was higher in rural areas than in urban areas. However, the time poverty gap between the two groups exists only in the urban areas. In rural areas, the time poverty rate is more or less the same among left-behind wives and married women in non-migrant households. The presence of a higher number of nuclear families and employed women prevailed among the sample respondents from urban areas compared to rural locations are considered the main reasons for this trend.

6. Determinants of Time Poverty among Left-Behind Wives

The estimated coefficients and the marginal effects of the Probit model indicate that the individual and household characteristics influence the higher incidence of time poverty rate of left-behind wives (Table 3). Regarding the age of left-behind wives, the marginal effect coefficient is negative. It indicates that when other variables are held constant, one unit increase in age leads to a 0.5 percent point decrease in the probability of left-behind wives being time-poor. For the dummy variables used in the analysis, the marginal effect shows the change in probability when the dummy variables change from 0 to 1.

The marginal effect coefficient of migration status indicates that the left-behind wives have a higher probability of being time-poor than married women in non-migrant households. When other determining variables are held constant, they were 7 percent more likely to be time-poor than married women in non-migrant households. The marginal effect of household size reveals that in migrant households, one unit change in household size leads to a 3 percentage point change in the probability of left-behind wives being time-poor. In addition to the household size, the presence of children aged 0-5 years is an influential household level variable determined the incidence of time poverty among left-behind wives.

Table 3: Determinants and Effects of Being Time Poor of Left-Behind Wives: Results of Probit Model

Dependent Variable	1 = Left Behind Wives are Time Poor 0 = Left-Behind Wives are Not Time Poor	
Explanatory Variables	**Coefficient**	**Marginal Effect (dy/dx)**
Age	-0.0191*	-0.0056*
	(0.010)	(0.0031)
Migration status[#] (1 = husband abroad)	0.232**	0.070**
	(0.105)	(0.031)
Household size	0.115**	0.0352**
	(0.0432)	(0.0128)
Children aged 0-5 years	0.3341*	0.1027**
	(0.1748)	(0.0531)
Children aged 6-14 years	0.1479	0.0456
	(0.1456)	(0.0450)
Family member aged above 65	0.221	0.0677
	(0.1607)	(0.0488)
Employed dummy	2.0437***	0.4205***
	(0.3528)	(0.0319)
Unemployed dummy	-1.3174***	-0.4056***
	(0.3050)	(0.0659)
Region dummy (1 = Rural)	0.4735***	0.1480***
	(0.1469)	(0.0454)
Pseudo R^2	0.1984	
Log-likelihood ratio	-211.037	
Number of observations	390	

Notes: [#]estimation is based on the total sample; The marginal effect is computed at the mean of regressors. For dummy variables, it is given for a discrete change from 0 to 1. Standard errors are in parenthesis; *significant at 10%, **significant at 5%, ***significant at 1%. Independent variables (reference categories): 1) married women in non-migrant households, 2) have no children aged 0-5 years, 3) no children aged 6-14 years, 4) no family members aged above 65 years, 5) not in labour-force, and 5) urban area.

Source: Estimated from primary data

The presence of children aged 0-5 years leads to a 10 percentage point change in the probability of left-behind wives being time-poor. The presence of children aged 6-14 years leads to a four percentage point change in the probability of left-behind wives being time-poor. However, the result was not statistically significant. The activity status of left-behind wives also acts as a powerful predictor of the time poverty rate among left-behind wives. The employed left-behind wives were more likely to be time-poor than the unemployed and not in labour-force categories. The employed left-behind wives were 42 percentage points more likely to be time-poor, and the unemployed left-behind wives were 40 percentage points less likely to be time poor than those not in labour force. The analysis also indicates that the left-behind wives who live in rural areas were more likely to be time poor (14 percent point) than those live in urban areas. Thus, the Probit model estimation results indicate that the variables such as age of left-behind wives, migration status of family heads, presence of children in dependent age group, and activity status significantly determined the incidence of time poverty among left-behind wives in Kerala.

7. Conclusions

In Kerala, migration studies are mainly focused on positive economic outcomes of migration in the family and society. These studies gave scant attention to the impact of solo male migration on non-monetary aspects such as the well-being and capabilities of left-behind wives. This paper tries to fill this research gap. This study involves an in-depth examination of the incidence of time poverty among left-behind wives in Kerala and its important contributing factors. The main findings of the study are based on primary data collected from two migration-intensive districts—Malappuram and Kollam in Kerala state. The time use pattern of respondents indicates that the time allocation of left-behind wives on paid, unpaid domestic work, personal care activities, leisure activities, and social and cultural activities differ from married women in non-migrant households. In the absence of male partners, left-behind wives spent more hours in a day on unpaid household maintenance and care work as compared to married women in non-migrant households. It reduces their time for discretionary activities, including leisure, education, and socialization, thereby increasing the incidence of time poverty. Probit regression analysis further indicates that, in addition to the migration status of husbands, variables such as age, household size, and presence of children aged 0-5 years in the family, activity status and locality also significantly influenced the time poverty rate among left-behind wives. The higher time poverty reduced leisure time, physical activities, and socialisation among left-behind wives. It leads to the prevalence of isolation and mental depression among them in the long-run.

The findings of this study pointed out the need for a comprehensive approach and policy attention to address the issue of time poverty among left-behind wives. In Kerala, a periodic time use survey and migration surveys are to be conducted to understand the time stress experienced by left-behind wives. Evaluation of time poverty is vital for the economic and social empowerment of left-behind wives. Moreover, the higher incidence of time poverty among left-behind wives emphasised the need for a greater role of the state in providing care services, particularly in high migration-intensive districts of Kerala. In addition to that, time poverty also emphasised the need to adopt flexible working time and work-from-home opportunities/facilities in public and private sector enterprises to enhance left-behind wives' work participation rate without generating additional time stress among them. The higher labour market participation of left-behind wives and less time stress are essential to ensure the long-term financial stability of migrant households in the context of an increasing trend of Gulf returnees in Kerala and the state facing the problem of their rehabilitation.

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EMPLOYMENT VULNERABILITY IN URBAN LABOUR MARKET: EVIDENCE FROM FORMAL ENTERPRISES IN UTTAR PRADESH

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Abstract: Gender inequality in labour markets is significant in terms of the sex distribution between formal and informal employment and within the informal economy. The distinction between formal and informal employment is of importance for policies related to gender issues. Therefore, an attempt has also been made for measuring gender inequality in formal labour markets through the analysis of multidimensional nature of vulnerability in formal and informal employment. The specific objectives of the paper are: firstly, to measure the risk of vulnerability related to employment in the urban formal market with the help of the multidimensional vulnerability index; secondly, to construct the multidimensional vulnerability index separately for formal and informal workers; thirdly, to assess the differentials in the vulnerability status of informal and formal workers in Uttar Pradesh; and lastly, to test the extent of vulnerability of female formal and informal workers in terms of nature and quality of employment, social security and job security compared to their male counterparts.

Keywords: Employment vulnerability, Formal enterprises, Vulnerability index, Female workers

1. Introduction

The labour force is dichotomized based on formal-informal employment status across two sectors, viz., organised (formal) and unorganised (informal). The formal labour market, which is monitored by the state agencies through routine regulations and taxation, employs workers who are salaried on regular basis and get chances to flourish under good working conditions; and such workers in organised business are bounded by an agreement related to terms and conditions. This segment comprises formal labour force and co-exists with another segment which is the informal labour market consisting of informal workers in the organized and unorganized sector comprising small traders (self-employed), small/petty business-people, and casual workers (Shonchoy and Raja Junankar, 2014). This unorganized sector refers to enterprises whose activities are not regulated under any legal provisions and hence are not restricted to maintain any regular accounts. An earlier

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study by Papola (1991) states that "the informal sector accounts for a sizeable percentage of the total workforce in India". NCEUS (2008) defines informal employment to include those individuals who are "...working in the unorganised enterprises or households, excluding regular workers with social security benefits, and the workers in the formal sector without any employment / social security benefits provided by the employers". In this way, while the informal sector and informal employment are distinct concepts, they are also complementary. Under the present scenario of market competition combined with limited resources there is emergence of an informal economy marked with employment vulnerability in the urban labour market.

Most of the women are constrained to do low productive and insecure jobs, either to supplement family income or owing to loss of job by the male wage earners (Adeleye et.al., 2019). Varied family responsibilities, flexible working hours, and low level of capital and skills are the reasons for concentration of women in vulnerable employment (ILO, 2009). Workforce vulnerability has come to the forefront in the recent policy discourse, as the economy strives for drivers of inclusive growth with the aim of protecting workers against adverse working conditions. The concept of labour market vulnerability is quite enormous, encapsulating workers who are unable to access their statutory rights, lacking access to social protection (Saunders, 2003). Standard (full-time, indefinite) but low-paid work is also one of the forms of the labour market vulnerability. Vulnerable employment refers to jobs devoid of secure contracts and workers' remuneration or social fortification. Regardless of whether in formal or informal enterprises, vulnerable employment encapsulates self-employment (or own-account workers), and informal wage employment (Adeleye et al., 2019).

In the informal sector of the economy, majority of workers are engaged in informal employment. Beside this, informal workers also work informally in the formal sector of the economy as maid, sweeper, *aaya* (nursing maid), guard and in other types of low paid jobs. The working environment is not favourable for them; most of the conditions of decent employment such as paid leave, pension, bonus, medical support and health insurance, maternity leave benefits, compensation against accident, etc. are almost non-existent (Mohapatra, 2012). A large proportion of the workers engaged as informal workers in the urban formal sector are rural migrants with less educational and technical skills. According to Chen (2006), "the distinction between formal and informal [status] is not strict, and we may also define various levels of informality". There are formal sector enterprises that use informal labour, and there are formally employed persons who besides their formal job also work informally. Currently, there is wide consensus that formal and informal works depend on each other, both nationally and globally (Guha-Khasnobis et al., 2006). Nevertheless, informal employment exists both in the formal and informal sectors of the economy. Manila (2015) stated in his paper that informal work could be used as an overarching term to cover both sector and employment aspects of informality.

2. Review of Literature

Doğrul (2012) examines the determinants of formal and informal sector employment in the urban areas of Turkey and found that the determinants of formal and informal employment vary by gender. According to his findings, sex, marital status and household (HH) headship determine the disadvantaged position of women in the labour market. Gunther and Launov (2012) test the existence of segmentation in the informal sector in their study and found that impact of education and experience are higher in the formal sector, however gender wage gap is wider in the informal sector. McCaig and Pavcnik (2015) examine work transitions between the formal and informal

sector in Vietnam using panel data and find that educated male workers in urban areas are more likely to switch to the formal sector from the informal sector than other workers. Similarly, Shapland and Heyes (2017) observed in their study that workers in the formal economy receive benefits from the state and their employers, whereas workers in the informal economy are not seen to be benefiting from the regulations applied by the state; so they do not mostly receive sick pay, holiday pay, good employment conditions (inspected by workplace regulators), pensions, etc.

The distinctions between formal and informal work have arisen economically and sociologically in the last half of the last century (Verhage and Shapland, 2013), a time when centralised forms of work organisation with predominantly formal (the so-called Fordist model of employment and work) characteristics were well established (Shapland and Heyes, 2017). Though informal workers, both men and women, were affected by the crisis in many of the same ways as formal workers; however, informal workers were affected more severely than formal workers because they had no social protection, had to contend with increased competition as retrenched formal workers entered the informal sector (ILO and ADB, 2011), and the process of informalisation of formal jobs was initiated. According to Chen (2006), many formal firms prefer informal employment because of the flexible specialized production, global competition, or reduced labour costs. Chen (2006) further found that the formal and the informal ends of the economic continuum are often dynamically linked. For instance, many formal enterprises hire wage workers under informal employment relations and many part-time workers, temporary workers and home workers work for formal enterprises through contracting or sub-contracting arrangements. Narayan's (2015) paper shows that the Indian labour market is segmented between formal and informal employment and observed that informal workers earn significantly less than formal workers. This segment of economy has in-built vulnerabilities.

In the workplace, severe physical, social, and economic adversities, unequal labour conditions, exploitation, and a total absence of social security for these workers further deepen their vulnerability. Employment vulnerability is imbedded in enduring forms (patterns) of inequality, social exclusion, and discrimination as well as deficiencies in labour market governance. Several aspects of workforce vulnerability are described in the literature. It can be defined in terms of lack of employment security, low level of earnings and exposure to professional risks (Weil, 2009). Workers in employment are more vulnerable when they are not able to develop their skills to adapt to technological changes and maintain their employability or when their working conditions do not allow them to remain in employment when they face personal challenges like family responsibility or health problems (Greenan et al., 2017). Bazillier et al. (2015) reveal that three main approaches are used to define employment vulnerability. The first one is developed by the ILO (2010) and focuses on the population of own-account and unpaid family workers; the second approach focuses on the low level of income and the third approach captures multidimensional aspects of vulnerability at work.

The most disturbing characteristic of the workforce structure in India is the links between gender, informality, and poverty (Unni, 2002). Moreover, gender-based inequities in the labour market persist, in part due to the expansion and feminization of informal employment (ILO and ADB, 2011). Yahmed (2016) examined how gender wage inequality differs across formal and informal jobs in Brazil and found that the raw gender wage gap is higher in informal jobs (13 percent) compared to formal jobs (5 percent). Similarly, Adeleye (2019) stated that the contributions of female informal workers to the economy are very high, but they are marginalized and remain as part of the working poor. Informal workers often encounter difficult working conditions with adverse overall consequences on the economy compared to female workers working as formal

workers in the urban formal labour market. Globalisation, changes in technology and changes in the forms of family and working life are commonly mentioned as the main reasons for this situation. In this connection, the present paper deals with the formal and informal nature of the labour market in Uttar Pradesh (UP) that arises from the activities of formal enterprises, and tries to examine the concept of vulnerability, informality, and gender inequality among workers. Gender inequality in labour markets is significant in terms of sex distribution between formal and informal employment and within the informal economy (ILO, 2012). The distinction between formal and informal employment is of particular importance for policies related to gender issues. Consequently, an attempt has been made to measure gender inequality in the mentioned labour market through the analysis of multidimensional nature of the vulnerability in formal and informal employment. In this manner, we have tried to examine various vulnerabilities faced by women in the urban labour market. The objectives of this paper are:

1. To measure the risk of employment related vulnerability in the part of the urban labour market linked to the activities of formal enterprises, with the help of the multidimensional vulnerability index;

2. To construct the multidimensional vulnerability index separately for formal and informal workers;

3. To assess the differentials in the vulnerability status of informal and formal workers in Uttar Pradesh;

4. To test the extent of vulnerability of female formal and informal workers in terms of nature and quality of employment, social security and job security compared to their male counterparts.

3. Data and Sample Design

The study is based on an empirical investigation into the formal enterprises. Some particular types of enterprises were selected in which formal as well as informal types of workers were found. Thus, we have selected the following two occupational categories for this purpose:

1. Nursing personnel (persons engaged in hospitals as nurses, compounder, ward boy, *aaya* (maid) and school staff (teacher, peon, and maid);

2. Persons engaged in private enterprises like mall, superstore, etc. as manager, accountant, cashier, receptionist, watchman and maid/sweeper for cleaning of the workplace.

A multistage stratified random sampling method has been designed: firstly, four districts (Lucknow, Jhansi, Varanasi, and Ghaziabad) from different regions of Uttar Pradesh were selected; secondly, the selection of urban areas in the selected districts to conduct survey on wage and salary workers were done; and thirdly, selection of the respondents was done randomly from the selected urban areas. The sample of women workers consists of 75 persons, generally distributed in accordance with the proportion of employment of women in different occupational categories. There were 44 male respondents—i.e., 119 respondents in total. This sample consists of 34 female informal workers, 18 male informal workers, 41 female formal workers, and 26 male formal workers. One point that needs to be noted in this connection is that a limited number of male workers in similar occupations to the women was also taken in the sample for the purpose of comparing male and female workers. This sample of 44 male workers (18 informal and 26 formal workers) is thus not representative of the male or total workforce of formal and informal sector; however this is only a 'control' sample occupationally comparable with sampled women workers. The purpose of a control group is to indicate what happens to an individual when he/she does not receive the

intervention under study. The control group is pivotal to a research protocol as in most of the cases the results cannot be predicted. The individuals that compose this group are selected from the same population frame as the study group that will receive the evaluated intervention, in a way that both groups will have similar characteristics, highlighting only the effects of the applied intervention.

4. Analytical Framework

A strong aspect in the vulnerability literature comes from international economics and more specifically from development economics. This is mainly done from the perspective of poverty and applied to developing countries (Hoddinott and Quisumbing, 2008; and Ligon and Schechter, 2003). The last decades have come with new risks at the workplace such as work intensification and job insecurity or mental stress, leading to the beginning of the concept of vulnerability in the labour studies literature (Greenan et al., 2017). Greenana et al. (2017) identify three components within this literature that conceptualizes vulnerability in terms of job-related risks. The employment vulnerability literature identifies low wages and non-unionism as threats to workers' well-being. Studies on measurement of vulnerability like Bocquier et al. (2010) developed various indicators of employment vulnerability for seven economic capitals of West Africa. Saunders (2003) proposes a multidimensional approach of market vulnerability in the Canadian context. According to O'Regan et al. (2005) and Taylor (2008), vulnerable workers are those with higher risk of exposure in terms of job quality, namely the work contract characteristics, the working condition or the work itself, and (lower) protection capacities. Diaz (2012) constructed a multidimensional index of decent work using Alkire and Foster's (2011)methodology. This index is multidimensional incorporating eight dimensions. They classified the labour status into four types: decent work, on decent work MEL (vulnerable por Minimos Estandares Laborales i.e., vulnerability by minimum labour standards) and wage vulnerable. Bazillier et al. (2015) were the first to construct an employment vulnerability index depending on several dimensions of work in Europe and to compare individual levels of employment vulnerability between migrants and local workers, using propensity score matching methods. Generally, at global level, there are numerous studies available on different employment vulnerability criteria, centered on various features of work-related hazards. But, in Indian economic literature, there is paucity of studies based on multidimensional approach on various work-related risks. Studies in context of multidimensional vulnerability of female workers are very few and far between. Hence, we have tried to construct the multidimensional vulnerability index in the present paper.

5. Methodology

To measure the vulnerability of workers it is essential to examine the dimension-wise and sex-wise vulnerability among workers. We have used five dimensions and 23 variables to capture different facets of vulnerability. Vulnerability index has been computed separately for five different dimensions. A composite index of various dimensions has been then computed, using the binary vulnerability scores of individual workers separately for each sector i.e. informal and formal. Each indicator has been assigned the value of either 0 or 1 as a binary attribute, where 0 means that the attribute is absent, and 1 means that it is present. For the attribute called 'adverse working condition', it is defined as follows: 1 indicates that the worker's condition is adverse, while 0 indicates that the condition of the worker is not adverse. So, the value for positive (yes) response has been set to 1, and the value for negative response (no) has been set to 0 (here each of these variables was defined in a way to generate dichotomous variables with '1' indicating vulnerable condition of sample population and, contrary to this, '0' indicating non-vulnerability of sample population). We have used the sum

of positive binary attribute (i.e., 1) for all 23 variables (related to worker's condition) as vulnerability score. This index is an average of the sum of binary scores of all variables for each worker. These scores range between 0 and 1. For the computation of this index, a simple average formula has been used:

$$VI = (V1+V2+V3+………..Vn)/n$$

where VI is the composite 'vulnerability index'; V1, V2, V3…, Vn are respective binary values assigned to dichotomous variable; and *n* is the number of indicators used for computing the index of vulnerability of workers. Vulnerability index has been computed separately for five different dimensions, and finally average value of the five dimensions is defined as 'multidimensional vulnerability index' (MVI), which can be denoted as:

$$MVI \text{ (Multidimensional vulnerability index)} = \frac{D1+D2+D3+D4+D5}{5}$$

where D = dimension.

Finally, the vulnerability scores (or index) have been grouped in six categories of vulnerability. The maximum vulnerability is gauged by a highest vulnerability score and least vulnerability is measured by a lowest score. Further, to examine the extent of vulnerability of informal and formal female workers, the intensity of vulnerability is computed, which is the sum of selected vulnerability indicators. In other words, it is the total score of individual worker who is vulnerable in every dimension/variable. We have also assessed the intensity of vulnerability and percent contribution of each indicator/variable to the overall vulnerability of workers to facilitate policymakers to find points of interference.

6. Formal Sector: Vulnerabilities in Employment

The *formal sector*, in lucid terms, is what is not *informal sector* and is often characterized by the presence of conducive conditions of employment in the concerned work/job such as safe work environment, facilities of paid leave, availability of social security benefits like PF/pension, health care and maternity leave, among others (Mahapatra, 2012). In the era of globalization, migrated families in the state are facing stress to sustain a living. Over the years, the hiring of formal workers by the formal sector enterprises has declined. As an alternative, they increasingly hire informal workers under vulnerable, uncertain and temporary employment conditions, and creating a new form of informal employment in the formal sector (i.e., informalisation of formal sector). Labour laws in India have also implicitly facilitated the informalisation of the labour force (Chakraborty, 2015).

In this background, an attempt has been made in this paper to understand the employment vulnerability in urban labour market in Uttar Pradesh (UP) through the computation of multi-dimensional vulnerability index**.** Before explaining the emerging issues related to vulnerability of workers in formal sector, it is important to explain the term "informal employment (workers)" and "formal employment (workers)" as done earlier. *Formal employment* in this sector includes all jobs with specific working hours and regular/fixed wages and in which the worker's job is secure. They receive benefits like paid leave, sick leave, pension/P.F. and social security facility. Contrary to this, *informal employment* is understood to include all remunerative work (self-employment and wage employment) that is not recognized, regulated, or protected by existing legal or regulatory frameworks as well as non-remunerative work undertaken in an income-producing enterprise. Most informal workers are deprived of secure work, worker's benefits, and social protection (ILO, 2002). Therefore, informal employment which is employment without provisions of social security is visible both in formal and informal sector enterprises.

6.1 Difference in Vulnerability Status between Formal and Informal Workers

Although formal sector is still dominated by males, female workers account for over a quarter of the total formal sector workers. In urban India, National Sample Survey Organisation (NSSO) data in 2011-2012 showed that only about 20 percent of the working population above the age of 15 years were in formal employment; 80 percent were informally employed, either self-employed or with no social security cover from the employer. Even among those in the formal sector, 25 percent of men and 30 percent of women were informally employed, i.e., without any social security cover from the employer and often without access to paid leave or other benefits (Unni 2017). Here we attempt to gauge the extent and differences in vulnerabilities between informal and formal workers prevailing in the formal sector. Moreover, clearly there are differences in degree of vulnerability between (formal/informal) workers in formal sector; for example, informal workers usually have lower pay and less access to statutory benefits, whereas formal workers engaged in formal employment are covered by most statutory employment standards and have greater employment security.

Table 1: Difference in Vulnerability Status between Formal/Informal Workers (%)

Indicators/Dimensions	Informal Worker	Formal Worker	Difference
Nature and Quality of Job			
No written job contract	79.41	68.29	11.12
No improvement in job status	14.71	4.88	9.83
Part time employment	79.41	68.29	11.12
Irregular wages	79.41	56.1	23.31
Long working hours	29.41	41.46	-12.05
Small size of the enterprises	76.47	48.78	27.69
Adverse Working Condition			
No enough water availability	67.65	7.32	60.33
No toilet facility	67.65	14.63	53.02
No enough place to work	50	9.76	40.24
Being a Female			
Facing stress	73.53	43.9	29.63
Sexual harassment	14.71	9.76	4.95
Health problems	5.88	0	5.88
Social Security Variable			
No social security	85.29	70.73	14.56
No maternity leave facility	100	82.93	17.07
No weekly leave (paid)	32.35	17.07	15.28
Empowerment Variable			
No knowledge of employment laws	79.41	7.32	72.09
No knowledge of trade unions	41.18	24.39	16.79
No saving account in Bank/PO	79.41	24.39	55.02
No participation in voting	70.59	26.83	43.76
No *aadhar* card	20.59	0	20.59
No knowledge of FIR method	70.59	34.15	36.44
No family help/support in domestic chores	91.18	68.29	22.89

Source: Primary Survey, 2019.

Table 1 highlights key patterns of vulnerability that creates multidimensional vulnerability among workers in formal sector; i.e., it presents percentage of deprived/vulnerable workers for selected indicators that measure vulnerability. Four indicators—viz., contract of job, small size of enterprises, irregular and low wage and part-time workers—that measure quality of job of female workers contribute more towards vulnerability. The most striking point here is the percentage of workers not having written job contract: about 79.41 percent informal female workers and 68.29 percent formal female workers did not receive written job contract. This exhibits the fact that in urban labour market in Uttar Pradesh many contracts are verbal, meaning that a vulnerable employee receives the same annual compensation, work-hours and workload without having signed a new contract each year. The employee can negotiate for a raise or change in work circumstance, or the employer might offer a rise, bonus or promotion, but they (i.e., employer and employee) do not sign a new contract. As pointed out by Chen (2006), many formal sector enterprises use informal labour, and there are formally employed persons who, besides their formal job, work informally. Vulnerability of women in the formal labour market is thus evident due to growing informalisation. As many as 76.47 percent of informal workers were engaged in small enterprises (< 10 workers), and this percentage was 48.78 percent for female formal workers. Similarly, 79.41 percent of informal workers and 56.1 percent formal workers did not receive fixed wages.

Moreover, approximately 68 percent of female informal workers in formal sector do not have enough water availability and toilet facility. Proportion of workers vulnerable in terms of long working hours in formal sector accounted for 41.46 percent in case of formal workers and 29.41 percent in case of informal workers and they were not using LPG gas for cooking. More than 75 percent of female informal workers and only 24.39 percent of female formal workers do not have any saving account in bank / post office. As expected, 85.29 percent of informal workers are found to be vulnerable; and 70.73 percent of formal female employees were deprived of social protection. Likewise, percent of females who were getting maternal facility in formal sector is extremely low (Table 1), i.e., only 17.07 percent. Contrary to this, no informal female workers had ever availed maternal leave facility.

This indicates that the difference between formal and informal employment is not enough to examine workers vulnerabilities. The main attribute of vulnerability among informal workers in formal sector is unavailability of various types of social security, e.g., paid leave, maternity leave and other benefits like provident fund, pension, gratuity, etc. However, vulnerability in this dimension is slightly less for the formal workers than informal workers. And, 17.07 percent of formal workers are not found vulnerable in terms of selected indicators (Table 4 and Figure 3). In general, these results explain considerable difference prevailing between the formal and informal workers. All the informal workers (34) are vulnerable in terms of two or more indicators in formal private sector.

Table 2 shows the mean score of vulnerability for different dimensions of workers in the formal sector. Nature and quality of job affects adversely to 59 percent of informal workers in formal sector and 55 percent formal workers in formal sector.

Dimensions related to social security show that majority of informal workers (72.55 percent) are vulnerable, and 40.74 percent formal workers are vulnerable. About 60.29 percent of informal workers are vulnerable in terms of empowerment or awareness related dimension, whereas only 29.86 percent of formal workers are vulnerable. In the dimension related to adverse working condition, the condition of workers was not found much adverse. Being female enhances the vulnerability of female informal workers in terms of stress, health problems and problems related

to sexual harassment. These three variables reveal the disadvantageous position of women. In a nutshell, it can be asserted that in the formal sector the informal workers are more vulnerable than their formal counterparts in urban areas, suffering from various adversities related to written job contract, social security, awareness, health, stress, etc. Most are deprived in respect of social security such as maternity leave facility, paid leave facility, provident fund, pension, gratuity, etc. A significant proportion of the informal workers experienced deprivation in terms of indicators such as knowledge of employment laws, participation in trade unions, having saving account in bank and post office (PO), etc. This deprivation in almost every dimension is severe and contributes to vulnerability not only by reducing their socio-economic wellbeing and status but also by depriving them of fully utilising their potentials in the labour market.

Table 2: Mean Score

Dimensions	Informal Worker	Formal Worker
Nature and Quality of Job	59.80	55.56
Adverse Working Condition	26.69	20.86
Being a Female	31.37	7.41
Social Security Variable	72.55	40.74
Empowerment Variable	60.29	29.86
Total	58.18	36.71

Source: Primary Survey, 2019.

The intensity of vulnerability in the different dimensions among informal worker is 19.78 percent and among formal workers it is 13 percent (Figure 1).

6.2 Contribution of Different Indicators in Vulnerability

Table 3 shows the percent contribution of each indicator to Vulnerability score. The overall illustration shows that in case of informal workers' social security variable like unavailability of maternity leave facility had the highest contribution to vulnerability, i.e., 7.47 percent, followed by social security (6.37 percent), indicating the fact that social security variables are main contributors of vulnerability status of female informal workers.

Figure 1: Intensity of Vulnerability
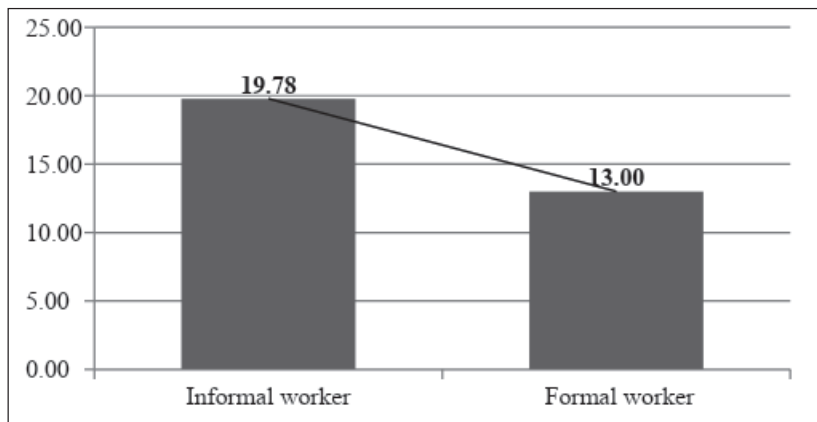
Source: Primary Survey, 2019.

Table 3: Percent Contribution of Each Indicator to Vulnerability

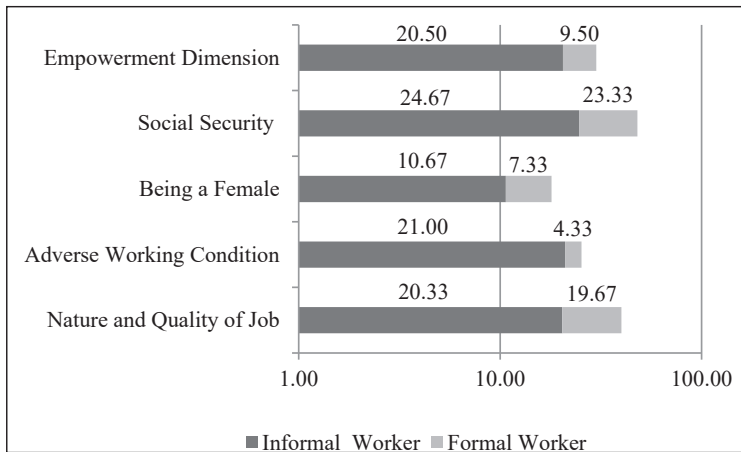|	Informal	Formal
Nature and Quality of Employment		
No written job contract	5.93	9.36
Part time employment	1.10	0.67
Irregular wage / not fixed wage	5.93	9.36
Long working hours	5.93	7.69
Size of the enterprises	2.20	5.69
No improvement in job status	5.71	6.69
Adverse Working Condition		
No enough water availability	5.05	1.00
No toilet facility	5.05	2.01
No enough place to work	3.74	1.34
Being a Female		
Facing stress	5.49	6.02
Sexual harassment	1.10	1.34
Health problems	0.44	0.00
Social Security Variables		
No social security	6.37	9.70
No maternity leave facility	7.47	11.37
No weekly leave (paid)	2.42	2.34
Empowerment Variable		
No knowledge of laws related to employment	5.93	1.00
No knowledge of trade unions	3.08	3.34
No saving account in bank / post office	5.93	3.34
No participation in voting	5.27	3.68
No *Aadhar* card	1.54	0.00
No knowledge of FIR method	5.27	4.68
No family help in domestic chores	6.81	9.36
Not using LPG gas for cooking	2.20	0.00

Source: Primary Survey, 2019.

Similarly, variables such as contract of employment, long working hours, stress, no support of family members in household chores, social security (in terms of PF and gratuity) and maternity leave contribute to the vulnerability index of formal workers in high magnitudes.

As highlighted in Figure 2, the dimensions related to empowerment and nature and quality of job contribute largely to vulnerability of informal workers, i.e., 20.50 percent and 20.33 percent, respectively. Indicators related to adverse working condition such as sanitation (toilet facility), access to safe drinking water and enough place for work play important role in explaining vulnerability, particularly among informal workers (21 percent). Social security factor contributes to vulnerability in case of both informal and formal employment. On average, 23.33 percent of the formal workers do not have access to social security facilities leading to low job security and high vulnerabilities in formal sector (Figure 2).

Figure 2: Contribution of Selected Dimensions in Overall Vulnerability

Source: Primary Survey, 2019.

Hence, there is a divide within the formal sector, where a growing proportion of regular salaried workers seem to be in informal employment without social security facility. This implies that the formal sector too continues to rely on the use of casual and contract labourers in high proportions. And majority of formal and informal workers were found to be deprived and vulnerable in various dimensions in this analysis. Classification of formal and informal workers according to Vulnerability Status in Various Dimensions has been shown in Table 4.

A worker is severely vulnerable if he/she is deprived in over 50 percent of the selected indicators. Table 4 provides the distribution of the vulnerability index for two types of samples — formal and informal. 17.07 percent of formal workers show no sign of vulnerability (score = 0.00 in index) and are categorized as non-vulnerable in Figure 3.

The presence of multidimensional vulnerability (one indicator in each dimension) is much higher in case of informal worker. The composite vulnerability index based on principal component score for informal workers is 0.816, while it is 0.795 for formal workers. 17.65 percent and 14.71 percent of the informal workers appear in the highly and extremely vulnerable categories. Over 80 percent of formal workers were found deprived and vulnerable in two or more indicators in formal sector.

7. Difference between Determinants of Vulnerability

An attempt has been made here to present the result of t-statistic to find out the significance of difference between formal and informal employees in terms of the selected socio-economic indicators. The main objective of this analysis is to find out the difference in socio-economic determinants of vulnerabilities of workers, working in formal sector as informal and formal employees. Inferential statistics presented in Table 5 bring out inferences about the sample under study (i.e., informal and formal female workers in our case).

In Table 5, t-tests have been computed, which have been used to find out the significance of difference between means of two independent samples. The two independent samples considered here are informal workers and formal workers with the hypothesis that: "There is no significant difference between female informal and formal workers with respect to the selected determinants

of vulnerabilities". For this, the significance of difference between the mean score of informal and formal workers with respect to the six indicators has been calculated. It has been observed from Table 5 that the p-values are greater than 0.05 for HH head (0.582), wages (i.e., less than minimum wages) (0.524), caste (0.951) and education (0.133), indicating the fact that there is no significant difference between these determinants in two groups (i.e., informal and formal workers). However, the null hypothesis is rejected in case of migration status (p = 0.00) and marital status (p = 0.088). Hence, there is significant difference found between informal and formal workers with respect to migration and marital status. Mean difference in migration status is found 0.604 between the workers, and this indicates that most of the informal workers had migrated from other area for work.

Table 4: Classification of Workers According to Vulnerability Status in Various Dimensions

Vulnerability Measures / Classification of Workers According to Vulnerability Status	Informal	Formal
Percentage of workers who are multidimensional vulnerable	100.00	82.93
Least vulnerable[1]	20.59	34.15
Moderately vulnerable[2]	5.88	14.63
Quite vulnerable[3]	2.94	9.76
Most vulnerable [4]	38.24	24.39
Highly vulnerable [5]	17.65	0.00
Extremely vulnerable [6]	14.71	0.00
Intensity of vulnerability	19.78	13.00
Multidimensional vulnerability index (MVI)[$]	0.816	0.795
Percentage of workers who are severely vulnerable*	70.59	24.39
Percentage of workers who are not vulnerable	0.00	17.07

Notes: *Severely vulnerable, if vulnerable in 50% or more indicators; [$]Computed by Principal Component Loading Range: [1](0.43 - 0.261), [2](0.304 - 0.391), [3](0.435 - 0.478), [4](0.522 - 0.696), [5](0.739 - 0.870), and [6](0.957 - 1.000).
Source: Primary Survey, 2019.

Table 5: Inferential Statistics for Determinants of Informal and Formal Employment

	Test for Equality of Variances (F-test)	t-test for Equality of Means			95% Confidence Interval of the Difference	
	F-value	t-value	Mean Difference	Std. Error Difference	Lower	Upper
Household (HH) headship	1.26(0.266)	0.55(0.582)	0.057	0.104	-0.149	0.264
Wages less than minimum wage	1.69(0.198)	0.64(0.524)	0.053	0.083	-0.112	0.218
Migration status	0.86(0.358)	6.43(0.000) ***	0.604	0.094	0.417	0.791
Caste	0.02(0.904)	0.06(0.951)	0.007	0.117	-0.227	0.241
Education	9.87(0.002) ***	1.52(0.133)	0.148	0.097	-0.046	0.342
Marital status	8.05(0.006) ***	1.73 (0.088) **	0.194	0.112	-0.030	0.417

Notes: *** Significant at 1 % level; **significant at 10 % level.
Source: Primary Survey, 2019.

This model assumes that a difference in the mean scores of the dependent variables, i.e., formal and informal workers, is found because of the effect of the independent variable that differentiates the two groups of informal and formal workers. Similarly, the F-test (Levene's test for equality) in column 1 of Table 5 observes that the differences in the two groups (formal and informal workers)

are equal, which is the one of the hypotheses of the independent t-test. However, in our analysis, this test (F) shows that the significant difference in the level of education (p = 0.002) and marital status (p = 0.006) between the informal and formal sector workers affects the difference in position and status of informal and formal workers in urban labour market. Contrary to this, in the cases of 'wages less than minimum wage', 'household head' and 'caste', we see t-values of 0.057, 0.053 and 0.007, respectively, for which the probabilities or levels of significance (p = .582, p = .524, and p = .951, respectively) are higher than 0.05. In such case, we cannot reject the null hypothesis of no differences between the two groups in these three variables and may conclude that there was no significant differences in variables (wages or salary, caste and HH head) related to vulnerability between formal and informal workers. Hence, these three factors affect women workers (formal and informal) equally. However, the difference between the two groups is found due to the difference in their education, marital status and migration status, i.e., respondent's education, marital status (married) and migration status emerge as the main determinants for differential status in the urban labour market.

8. Gender and Vulnerability

Informal employment is more common among women than men (ILO, 2012). Majority of females in the informal employment are illiterate or less educated than their male counterparts. Gender disparity has poorly affected the employment of female informal workers as well as formal workers in formal private sector of the economy. Discrimination exists not only in terms of salary but also in terms of access to employment. Often women are found to be concentrated in occupations where the wage rates as well as working conditions are poor and unsafe.

8.1 Extent of Vulnerabilities between Male and Female Workers

Female workers in the selected districts face multiple vulnerabilities as compared to male workers. Hence, identification and measurement of vulnerability and identifying the context leading to vulnerability are necessary for reaching the vulnerable workers. Table 6 reveals that almost all the female informal workers (100 percent) were found multidimensionally vulnerable, as the proportion of multidimensionally vulnerable was highest among informal female workers, followed by informal male (83.33 percent), formal female (82.93 percent) and formal male (76.92 percent), respectively.

Table 6: Percentage of Vulnerable Workers in Informal and Formal Employment

Workers	Sex	Percentage of workers who are multidimensionally vulnerable*	Percentage of workers who are severely vulnerable**
Informal	Female	100.00	70.59
	Male	83.33	38.89
Formal	Female	82.93	24.39
	Male	76.92	19.23

Notes: *Vulnerable in one variable of each dimension; **Extremely vulnerable if vulnerable in 50% or more indicators.
Source: Primary Survey, 2019.

It is also clear from Table 6 that proportions of workers who are severely vulnerable are higher among female workers (in both formal and informal employment) than male workers, indicating the fact that 'being female' enhances their chances to be vulnerable workers.

Figure 3: Distribution of Workers by Vulnerability Status (Index)
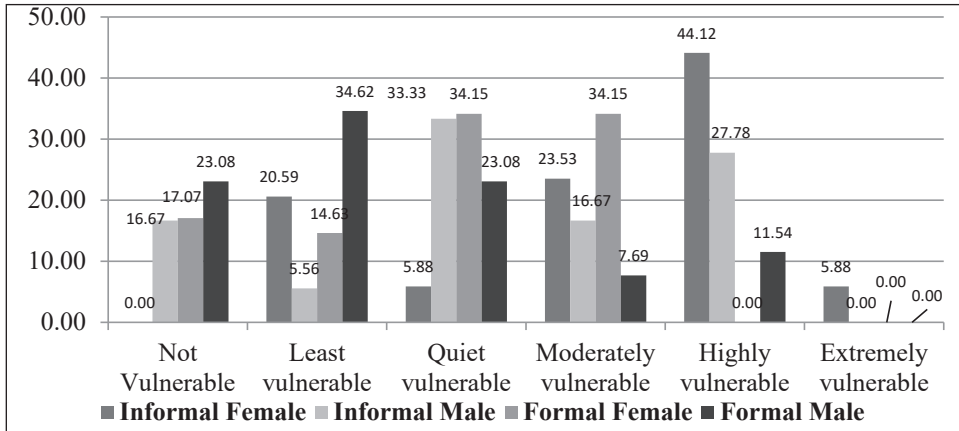
Figure 3 shows that female workers engaged in the informal employment are associated with higher levels of gender inequality in terms of their vulnerability score. It shows that vulnerability among female informal workers is considerably high compared to their male counterparts in formal sector. The highly vulnerable workers account for 44.12 percent for females and 27.78 percent for males. In fact, no male worker was found in the category of extremely vulnerable worker. On the contrary, the gender gap between male and female formal workers is high in the category associated with least vulnerable workers (14.63 percent females and 34.62 percent males) indicating that male formal worker is less vulnerable (in only one or two categories) than female workers. However, in the other vulnerability groups (quiet and moderately vulnerable), proportion of female workers is high compared to male (Figure 3). Moreover, gender inequality is higher in informal employment where women get lower pay despite long working hours and the fact that their condition of work is poor.

To examine the extent of gender gap between male and female workers, we have included various vulnerability indicators/dimensions for computation of composite index of vulnerability by sex and by type of employment, using principal component analysis (PCA). This index is an average of five dimensions, viz., quality and nature of employment, adverse working condition, being a female, social security, and empowerment/awareness. Figure 4 shows composite index of vulnerability for male/female and informal/formal workers. It has been observed that vulnerability index value (i.e., 0.816) is the highest for female informal workers, followed by female formal workers (0.795), male informal workers (0.633) and male formal workers (0.543), respectively. The intensity of vulnerability is high for informal female (19.78 percent) than informal male. Similarly, intensity of vulnerability among formal female workers is higher (13.0 percent) than formal male workers (Figure 5). As expected, the value of multidimensional vulnerability index is higher for female informal and formal workers than their male counterparts, exhibiting the fact that female workers are more vulnerable than their male counterparts in formal sector. Secondly, female informal workers are the most vulnerable segment of the formal labour market in urban areas. The intensity of vulnerability is also found high amongst female informal workers. Thus, it could be asserted that the higher levels of gender inequality (higher index values) are associated with high vulnerability of women in formal sector compared to men, paving the link between gender inequality and insufficient employment opportunities for women workers.

Figure 4: Gender Gap in Vulnerability Status
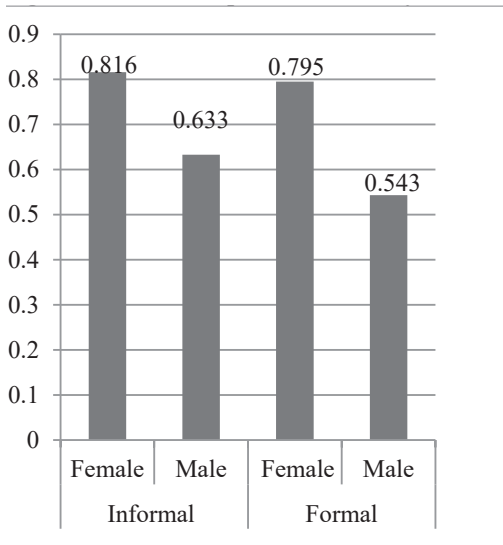
Figure 5: Intensity of Vulnerability
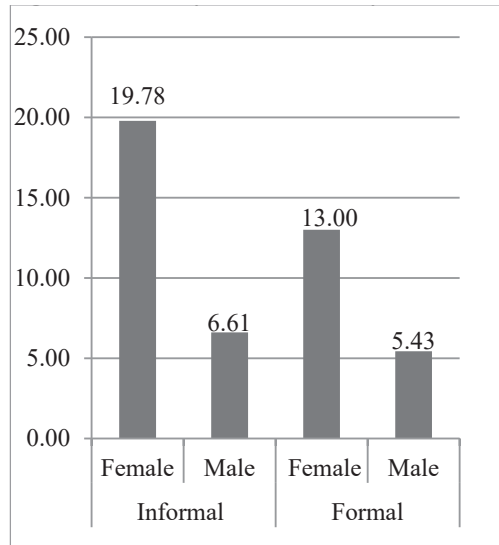
Source: Primary Survey, 2019.

8.2 Independent Samples t-test for Gender Difference

We could test the hypotheses: "any gender differences that might exist among informal and formal workers engaged as formal sector employees", using the t-test for showing that two groups (male and female) do not differ on gender issue in formal sector.

8.2.1 Informal Employment

The main purpose of the inferential statistics (independent t-test) is to find out whether the difference between two groups is statistically significant, or not. For this analysis. gender is considered to be a quasi-independent variable as we cannot control gender. A t-test has been used to explain differentials between male and female informal and formal workers on various dependent variables given in Tables 7 and 8. And to corroborate whether the differentials in vulnerability indicators between male and female workers is significant, a t-test for equality of means is shown in column 4 of Table 7. The mean scores for male worker derived was 0.389 and for women worker was 0.765 for size of enterprises with the mean difference of 0.376, indicating that women workers had significantly higher mean scores than men (Table 7) and thus establishing the fact that females are more likely to be vulnerable than males. We see t-value of 2.83 for variable, size of enterprises (in the Equal variances not assumed part of Table 7) for which the probability in the significance (p = .011) is lower than 0.05, meaning that we need to reject the null hypothesis of no differences between male-female informal workers. Thus, there was significant difference in the variable small size of enterprises, between male and female informal employees. Further, the results indicate that there was significant difference in facing stress and having no saving account in bank/post office between male and female workers (t = 4.00 and 4.14, p = .000). That is, the mean score of female workers (M = .794, .735; SD = .410, .448) was considerably different from that of male workers (M = .278, .222; SD = .461, .428).

The first two columns show Levene's Test for Equality of Variances which presents that the

difference in the two groups is similar. The F-test and its significance value present this.

Table 7: Significance of Difference between Male and Female Informal Workers with Respect to the Dimensions of Vulnerabilities

	F-test[#]	P-value	Mean Difference	t-test
No written job contract	.04	.834	-.013	-.104
Part-time employment	.07	.791	.016	.135
Irregular age	.07	.791	.016	.135
Long working hours	2.90	.095	-.261*	-1.870
No enough water available	.73	.397	.065	.463
No toilet facility	.73	.397	.288*	2.038
Facing stress	.46	.500	.513***	4.00
No social security	1.71	.196	.075	.671
No weekly leave (paid)	1.89	.176	-.121	-.851
No knowledge of employment laws	.47	.496	-.039	-.335
Having no saving account in bank/PO	1.23	.273	.516***	4.14
No participation in voting	3.53	.066	.206	1.469
No knowledge of FIR method Equal variances not assumed	2.90	.095	.150	1.075
No improvement in job status	4.36	.042	.092	.973
Small size of the enterprises	4.07	.049	.376***	2.828
No enough place to work	8.05	.007	.222	1.549
No knowledge of trade unions	9.31	.004	.190	1.365
No *Aadhar* card	32.71	.000	.206**	2.118

Notes: [#]Levene's Test; *Significant at 10 % level; **Significant at 5% level; ***Significant at 1 % level.
Source: Primary Survey, 2019.

Analysis of the equality of variances confirms that the differences between male and female informal workers are not equal in some variables. These variables are 'improvement in job status', 'enough place to work' and 'knowledge of trade unions' (the probabilities for the F-values are less than 0.05) (Table 7).

8.2.2 Formal Employment

Generally, involvement in the formal economy has been possibly the important path for the empowerment of women and increasing gender equality between women and men. In Table 8, Levene's Test of equality of variances for formal employment shows that the male and female workers have a similar dispersion of scores (equality of variance). In Table 8, there are six variables in which significant differences between two groups have been found. This particularly belongs to variables related to adverse working condition (not enough water available, no toilet facility, not enough place to work) and empowerment and awareness (no knowledge of employment laws, no knowledge of trade unions, and no knowledge of FIR method). The value of F is significant for these variables, exhibiting the fact that there are significant differences between male and female workers in variables related to adverse working condition and empowerment. Hence, the assumption of equality between them has not been satisfied and, in this case, variances cannot be assumed to be equal, as the F-value is significant (p = .000) for these (six) variables (Table 8).

<p align="center">**Table 8: Equality of Variances between Male and Female Formal Workers**</p>

	F-test[#]	P-value	Mean Difference	t-test
No written job contract	3.53	.065	.130	1.089
Part-time employment	2.34	.131	.106	.874
Irregular age	0.80	.375	.176	1.407
Long working hours	0.02	.895	-.008	-.067
Small size of the enterprises	2.15	.148	.103	.819
Facing stress	0.80	.375	.054	.434
No social security	1.29	.261	-.062	-.550
No weekly leave (paid)	0.19	.662	-.022	-.221
No saving account in bank/PO	0.06	.808	.013	.121
No participation in voting	0.48	.492	.038	.339
Equal variances not assumed				
No enough water availability	27.45	.000	-.115**	-2.278
No toilet facility	65.26	.000	-.192***	-3.077
No enough place to work	65.26	.000	-.192***	-3.077
No knowledge of employment laws	27.45	.000	-.115**	-2.278
No knowledge of trade unions	32.08	.000	.205**	2.263
No knowledge of FIR method	225.67	.000	.341***	3.616

Notes: [#]Levene's Test; *Significant at 10 % level; **Significant at 5% level; ***Significant at 1 % level.
Source: Primary Survey, 2019.

Similarly, t-tests for equality of means also show significant difference in these six variables (Table 8). For example, the cases of six variables belong to the equal variance not assumed part, the t-test is significant as the p-value is less than 0.05 ($p < .05$) and male workers who had no knowledge of trade unions had lower scores (M = .038, SD = .196) than female workers (M = .244, SD = .435) with Mean Difference to be .205. Hence, an independent t-test found this pattern to be significant, t (33.00) = - 2.26, p < 0.05(0.27) as shown in Table 8. Together these results suggest the significant difference between the workers by gender, supporting our hypothesis.

In majority of studies, researchers are more concerned about finding statistically significant results; however, sometimes the insignificant difference can be more meaningful for analysis, as we find in our analysis. Above findings point out that there is constant difference in vulnerability between male and female workers in different indicators (belonging to the category of equal variance assumed) in formal employment (Tables 7 and 8). This finding may be useful in determining the vulnerabilities of male workers in formal sector who are in better position in the labour market compared to their female counterparts.

9. Conclusions

In general, this analysis reveals important similarities and dissimilarities between the formal and informal employment and between the genders. This confirms that the urban labour market in Uttar Pradesh is diverse in nature. The study found that most of the workers in formal sector experience vulnerability at the medium level. In general, vulnerability of female informal workers is higher and also varies between the sexes (male and female).

In short, this analysis reveals that female informal workers in formal sector (private) of the economy are predominantly poor and vulnerable compared to formal workers. Vulnerability of women in the formal labour market is not limited to the informal workers but also extends to the

formal workers and growing informalisation is critical for policy formulators to tackle. Secondly, women are the larger workforce of the informal employment in Uttar Pradesh because they are more likely than men to undertake low paid (or even unpaid) economic activities. The widespread employment of women in vulnerable jobs characterizes a huge loss for an economy. Besides this, increased awareness of employment and social security policies/schemes among the workers and greater emphasis on females in the labour market are needed because the informal employment is widely neglected in public policies. Upadhyaya (2003) drafts four dimensions to reduce vulnerabilities in informal employment. He suggested that a mix of occupation-based, caste- or ethnicity-based, area-based and gender-based methods should be utilized when designing policies. These policies could be useful for women workers to establish formal enterprises, promote equal opportunities for women to access quality education and training, and help to reduce the gender inequality in labour markets (ILO, 2011). It is also suggested that policymakers have to focus on vulnerabilities between sectors (informal and formal) and gender, especially in the urban labour market (Kumar and Srivastava, 2021).

Acknowledgements

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DYNAMICS OF DEVELOPMENT PARTNERSHIP: A CASE STUDY OF INDIA

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Abstract: The turn of the new century witnessed India to be significantly expanding its development assistance—both in terms of volume and diversity—thereby, transforming itself into a donor. Today, India has been recognized as the new pole of growth in the world economy. While having a high incidence of poverty and hunger in its own country, India contributes to the development of other nations in need. As a result, India prefers to be referred to as "development partners" rather than "donors". While India's assistance distribution has climbed to levels equivalent to many smaller industrialised nations, this data is not comprehensibly available. Because India, along with other major southern donors, does not report its data to the OECD, the phenomenon of India's foreign aid remains little recognized and appreciated. This paper tries to make an important contribution to identifying India's approach to the development assistance programme. This paper will examine the positioning of India in the international development assistance framework, its volume, its sectoral allocation, and its geographical orientation which transforms its status to an emerging donor in the broader context of how the form and scale of India's development assistance influence the total scope of overall international aid.

Keywords: Foreign aid, India, Development cooperation, Bilateral assistance

Background

Many developing and underdeveloped nations have relied on inflows of external resources to bridge the domestic saving-investment gap and the import-export gap, as outlined in Chenery and Strout's Two-Gap model (Chenery and Strout, 1966). These flows are considered vital as they bring with them a skilled workforce and technical knowledge. The importance of foreign assistance is highlighted by the fact that it is considered a separate factor of production.

In the past, countries such as Greece, Taiwan, Israel and the Philippines have shown rapid growth based on investment financed mainly by external assistance in the form of grants and loans. Aid thus was supposed to help developing economies utilize their resources more efficiently and in a fuller way to accelerate growth. However, this external assistance flowing mainly from rich nations to poor nations was gradually becoming an instrument of foreign policy to control the weak nations and create an environment in which they could pursue their own social objectives. Griffin and Enos

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(1970), in their article, mention that "favours granted are favours asked" and "not all aid assists". Foreign aid coming from the developed nations may not always improve the well-being of the nations and may deter growth rather than encourage it.

In the light of the foregoing viewpoint, together with the well-documented fact that the developed countries were never able to achieve the targeted rate of 0.7% of GNI as official development assistance (ODA) to developing countries, this gap was compensated by foreign aid from the southern economies. Several developing nations began contributing to the development of their peers via development assistance. These donors are frequently described by the terms "new", "emerging", "non-traditional", "non-Western", and "non-DAC" (non-Development Assistance Committee) donors. Southern donors' dual role as aid providers and recipients sets them apart from traditional (Northern) donors. While these nations are themselves not wholly developed and still struggle with poverty and hunger, they are determined to help other developing countries escape poverty and underdevelopment. This is the reason the relationship between emerging nations is different from the one between traditional donors and developing nations.

There is a 'silent revolution' taking place in the international development landscape, as described by the Woods (2008), with an equal number of developing countries (30) (operating beyond the DAC) now sending help to the impoverished countries. This shifts the relative balance of power between the donor and recipient countries, with less developed countries emerging as the new economic powerhouse. There has been a growing amount of aid flowing from middle-income and transition economies strengthening South-South partnership and cooperation. Although obtaining an exact figure is difficult because these donors lack a standardised method of reporting their developmental flows, the available data suggests that non-DAC donors (which include small donors such as the UAE, medium donors such as Korea and Turkey, and large donors such as China, India, and the United Arab Emirates) provided approximately 15% of total aid flows in 2019. India's international development cooperation has been rising every year and totaled USD 1.6 billion in 2019.

India is significantly extending its development cooperation framework from one of the highest recipients of aid to one of the largest donors of aid among developing nations (especially, among the set of non-DAC donors).[1] However, India, along with other developing countries, prefers to be referred to as "providers of South-South Development Cooperation (SSDC)" rather than "non-traditional/emerging/re-emerging donors" (Zimmermann and Smith, 2011). These emerging nations provide technical and budgetary assistance to other developing countries to improve their economic and social well-being. India's development partnership model incorporates SSC (South-South Cooperation) in its approach to development, which is based on mutual respect, shared benefit, and long-term sustainability. It gives unconditional assistance based on the development partners' objectives.[2]

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[1]Manning (2006) divides non-DAC donors into four distinct groups: OECD member donors, new EU non-OECD members, Arab donors, and non-OECD members who are not in the EU or Arab region. India falls in the last category.

[2] See https://mea.gov.in/Overview-of-India-Development-Partnership.htm and this underlying South-South Cooperation (SSC) philosophy has also been stated in a Keynote address by Foreign Secretary (para 7) at the Conference of Southern Providers on South-South Cooperation: Issues and Emerging Challenges on April 15, 2013. Retrieved from https://www.mea.gov.in/Speeches-Statements.htm?dtl/21549/Keynote+address+by+Foreign+Secretary+at+Conference+of+Southern+Providers+SouthSouth+Cooperation++Issues+and+Emerging+Challenges.

In this paper, we will look at India's development partnership profile, both as a benefactor and as a beneficiary. However, it is hard to ascertain how much development assistance India delivers, where it ends up going, and with what intent because there is no separate collection of data on development cooperation flows and no official definition for foreign aid/development cooperation in this case (like the one defined by the OECD-DAC for ODA). This paper will thus investigate India's development cooperation phenomenon, i.e., where the money goes (who are the beneficiaries) and in what regions/sectors, as well as where the money comes from (the key contributors) and in what areas. This will help us in understanding whether development assistance is helping to achieve the goal of development in a true sense. We will start by looking at how India contributes to global development as a donor, and then we will see if the aid it receives is being used to its full potential. This will help us in positioning India in the global development assistance framework and determining how it contributes towards strengthening SSC and overall global development.[3]

Fundamentals of India's Development Cooperation

While some literature points to India as an emerging donor (Six, 2009), it is not really the case. India has long been a provider of development assistance (since independence) to its neighboring nations. Starting from the Colombo Plan in 1950, India was one of the largest donors of technical assistance among all the participating nations of South and South-East Asia, followed by various other projects like the Mekong river project in Cambodia and the Special Commonwealth African Assistance Plan.[4] India was also giving out aid to countries like Nepal and Bhutan, which continues even today (Mukherjee, 2015). It is worth noting that India has been administering these assistance packages despite having own 269.8 million people living in poverty in 2011-12 and battling other socio-economic problems too.[5]

India's policy towards development cooperation has been the responsibility of the Ministry of External Affairs. It has echoed the spirit of *Vasudhaiva Kutumbakam* in several of its annual reports and outcome budgets.[6] Inspired by Gandhiji, the term means that the "World is One Family", suggesting that India is committed to promoting international peace and harmony by sharing its limited resources.[7] The sentiment was also reverberated by Jawaharlal Nehru, the then Prime Minister of India, in his Constituent Assembly address on 15th August, 1947 as: "Let us help ourselves", encapsulating the vision that India had for 'what it wants to be' and 'what it wants the world to become'.

These statements align with the Indian policy of non-alignment and South-South solidarity. Thus, following these approaches, the Indian government has undertaken strategic initiatives such as the 'Neighbourhood First' policy, 'Act East' policy, 'Focus Africa', 'Focus LAC' (Latin America and the Caribbean), and 'Focus CIS' (Commonwealth of Independent States), among others.[8] The Indian government has also made clear its stance through various statements that its assistance will

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[3] This analysis is limited to bilateral assistance only.

[4] Speech of Shri Morarji R. Desai, the then Minister of Finance, Govt. of India, introducing "The Budget for the Year 1962-63 (Interim)", p. 4, para 13.

[5] https://www.rbi.org.in/scripts/PublicationsView.aspx?id=15283

[6] The phrase is mentioned in Govt. of India's Ministry of External Affairs (MEA) annual reports of 2018-19, 2019-20 and 2020-21 and in various MEA outcome budgets as well.

[7] https://mea.gov.in/Overview-of-India-Development-Partnership.htm

[8] https://www.eximbankindia.in/blog/blog-content.aspx?BlogID=12&BlogTitle=South-south%20 cooperation%20&%20trade

be non-conditional in nature and guided by the terms and conditions of the partner country such that it harnesses its potential. The principle of non-conditionality is supplemented with principles of non-interference and mutual respect and benefit.[9] These principles are believed to be drawn from the Panchsheel agreement (Katti et al., 2009), later incorporated into the Bandung Principles.

Data Sources and Methodology

It has been noted that most emerging countries lack credibility in their statistics when it comes to development cooperation. This is frequently accompanied by an ambiguity in the definition of development assistance and other associated concepts, as well as challenges of coordination and cooperation due to the multiplicity of numerous institutions involved.

Data Sources

In the case of India, there are no separate projections or estimates or reporting of development cooperation flows as the developed countries report to the OECD. The information/data has been mined from various annual reports and outcome budgets of the Ministry of External Affairs (MEA) of Govt. of India, previous Union Budgets, as well as from the EXIM Bank website and its reports. However, data from these publications should be interpreted with caution, as not all forms of assistance are included in budget reports. Agrawal (2007) uses the example of aid relief provided by the Indian military and paramilitary forces to victims of the 2004 Asian tsunami, which never made it into the budget section. Thus, the data is neither extensive nor precise, but due to the lack of availability of any maintained records, these reports serve the purpose of analysis.

Institutions

There is no official definition of development assistance provided by the Indian government. Nevertheless, from various official reports,[10] we can conclude that it comprises grants and loans to various countries (bilateral assistance), lines of credits (LOCs), and the ITEC (Indian Technical and Economic Cooperation) programme (Chaturvedi et al., 2014). The data for grants and loans is culled from MEA Annual Reports, MEA Outcome Budgets and the Union Budget of India for all the years under consideration. LOCs have been the responsibility of EXIM Bank and its data is available on its website. The ITEC programme has been in effect since 1964, and the number of projects and other related information is covered on its website as well as in MEA Annual Reports. These elements are presented in the following Figure 1 as tools of Indian development cooperation. The Development Partnership Administration (DPA) was created in 2012 with separate divisions to administer different elements of India's developmental aid projects efficiently.[11]

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[9] https://mea.gov.in/Overview-of-India-Development-Partnership.htm

[10] For example, MEA Annual report 2017-18, p. 190. Available at: https://www.mea.gov.in/annual-reports.htm?57/Annual_Reports

[11] The details can be accessed from https://www.oecd-ilibrary.org sites/ 18b00a44-en/ index.html?itemId=/ content/component/5e331623-en&csp_=b14d4f60505d057b456dd1730d8fcea3&itemIGO=oecd&it em Content Type=chapter&_ga=2.167681595.485820837.1625468128-1526753300.1620141746#section-d1e64805

Figure 1: Tools of Indian Development Cooperation
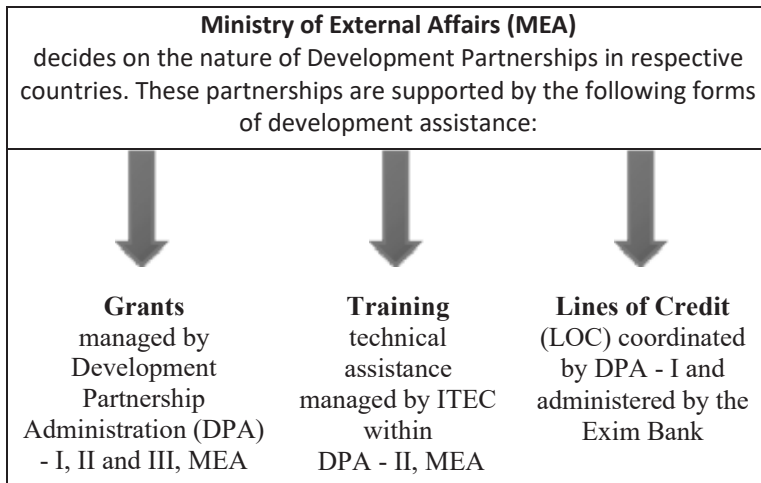
Source: Adapted from the Indian Development Cooperation Research (IDCR) report, 2014, Centre for Policy Research, New Delhi (available at http://idcr.cprindia.org/p/indias-development-partnerships.html).

Time Period

India's reliance on external donors was evaluated in the 2003-04 budget address, and fundamental modifications in India's external development cooperation policy were suggested.[12] As a result, our analysis will span the fifteen years 2004-05 through 2019-20.

Methodology

The motive for foreign aid comes from the fact that underdeveloped nations have a greater ability to invest to the tune of 12-15 per cent per year, while savings growth rate hovers around 6-8 per cent. This shortage is filled by the aid coming from the capital surplus countries. This is modeled by Chenery and Strout (1966) in their Two-Gap model solving for which gives us the level of capital inflow: $F_t = F_o + (\beta k - \alpha') (V_t - V_o)$, where $F_o = I_o - S_o$.

Here, V_t = Gross National Product, I_t = Gross investment, S_t = Gross domestic savings, F_t = Net inflow of foreign capital, $\overline{S}_t$ = Potential gross domestic savings, α' = Marginal savings rate ($\Delta S/\Delta V$), β = Maximum rate of growth of investment, and k = Incremental gross capital-output ratio ($I/\Delta V$).

India as a Benefactor: The Analysis

I. Grants and Loans[13]

In 2019-20, India disbursed roughly Rs. 7400 crores (1 crore = 100,00,000) in grants and loans to developing countries under various programs. Since 2004-05, India's budgeted allocations for aid

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[12] Indian Union Budget Speech 2003-04, para 126. Available at: https://www.indiabudget.gov.in/budget_archive/ub2003-04/bs/speecha.htm

[13] The analysis throughout is on the basis of revised budgetary estimates.

have risen steadily from nearly Rs. 1625 crores, with a slight decrease in the two years 2016-17 and 2017-18. However, in terms of the total MEA budget, the share of grants and loans has seen only a marginal rise from 41.83 per cent of the total MEA expenditure budget in 2004-05 to 42.73 per cent in 2019-20.

a) Geographical Allocation

The budget allocation of India's aid (in grants and loans) to other developing countries and under various programmes for the initial and final year is presented in Table 1. In other words, this table presents the geographical focus of India's aid programme. Furthermore, Table 1 (together with Table A-1 in Appendix) yields intriguing findings.

Table 1: India's Budgetary Allocation of Aid (Grants and Loans) to Developing Countries 2004-05 and 2019-20 (Rupees in Crore)[#]

Country/Region/Programme	Grants		Loans	
	2004-05	**2019-20**	**2004-05**	**2019-20**
Bangladesh	3.3	150	18.87	
Bhutan	768.65	2048.28	280	626.23
Nepal	66.17	1200	0.01	
African Countries	106.84	450		
Maldives	3.2	150		176.45
Myanmar	6.21	170		
Sri Lanka	15.3	205		
Central Asia	8.5			
Other Developing Countries	348.22	150		
ITEC Programme	30	200		
Latin American Countries		10		
Afghanistan		400		
Multilateral Economic Relation (MER) Programme				
Disaster Relief		20		
SAARC Programme				
SCAAP Programme				
Investment Promotion and Publicity Programme				
Mongolia		2		
Eurasian Countries		45		
Energy Security				
TCS of Colombo Plan				
ASEAN Multilateral				
Chabahar Port				
Mauritius		1100		
Seychelles		50		
Support to International Training/Programmes		459.5		
Aid for Cultural and Heritage Project				
TOTAL	1356.39	6809.78	298.88	802.68

Notes: All these are revised estimates, and blank spaces indicate that no data is available for those particular years (or already included in aid to 'other developing countries'. Year-wise figures are included in Table A-1 in the Appendix. [#]1 crore = 100,00,000. ITEC - Indian Technical and Economic Cooperation; SAARC - South Asian Association for Regional Cooperation; SCAAP - Special Commonwealth African Assistance Plan; TCS - Technical Cooperation Scheme; ASEAN - Association of Southeast Asian Nations.

Sources: Various Union Budgets of India and MEA Annual Reports.

Bhutan has long been the largest recipient, but its proportion of total aid provided via grants and loans has decreased dramatically, from appropriating 63 per cent of the total grants and loans disbursed in 2004-05 to just 36 per cent in 2019-20. This decline is a recent occurrence, witnessed from 2015-16. Since then, the share has almost declined by half (fallen by 46 per cent, to be exact). Besides Bhutan, Nepal and Afghanistan are the primary recipients of India's aid accounting for approximately 7 and 8 per cent of total aid disbursed through grants and loans till now. Figure 2 illustrates the distribution of bilateral assistance by India to other developing countries through grants and loans from 2004-05 to 2019-20.

Figure 2: Distribution of Grants and Loans by India to Other Developing Countries 2004-05 to 2019-20
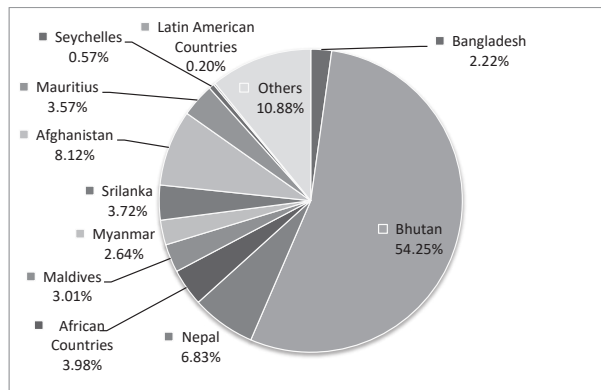
Source: Author's own calculations (based on Table A-1 in the Appendix).

The above picture of India's development assistance highlights the fact that the majority of the country's financing is directed towards its immediate neighborhood, most likely as a result of the country's 'Neighborhood First' policy. While Bhutan and Afghanistan witnessed declining proportions, Nepal has seen its share more than doubling only in the last three years. India also supports its close neighbors, the Maldives, Sri Lanka, Bangladesh, and Myanmar, although neither of these nations has seen a significant change in aid receipts.

Recent years also witnessed a rising share of funds going out to the African nations. While the total amount disbursed to the African countries increased from Rs. 107 crores to Rs. 450 crores, it accounted for only four per cent of the total grants and loans budget between 2004-05 and 2019-20. India is also extending its assistance to far and wide nations. Mauritius is a new entry to India's aid programme, with aid payments increasing to Rs. 1100 crores in 2019-20 from Rs. 410 crores in 2016-17. Seychelles is a recent addition to the list as well. India is also giving out funds to the Eurasian countries. Besides, India also dispenses aid to Latin American countries, but its contribution is minimal, accounting for only 0.2 per cent of overall aid. The region has not displayed a consistent pattern over time.

b) Sectoral Allocation

While the focus of India's grants and loan disbursements has shifted from its immediate vicinity to other far-flung countries, the principle approach remained the same that is, lending on the needs and priorities of recipient countries, without any conditions attached. The largest beneficiary,

Bhutan, has spent the majority of its aid on the development of hydroelectric power facilities, which have given India a source of power (through purchase) while simultaneously supporting Bhutan in producing revenues and thus reducing its financial dependence on India.[14] India's assistance to Bhutan has sustained progress on the front of development projects in all areas of partnership, including hydroelectric, transportation, communication, infrastructure, health, education, culture, the information technology (IT) industry, and agriculture (MEA 2016-17, p. 14).[15]

The second major beneficiary, Afghanistan, has focused its assistance received on building the country's vital civil infrastructure, human resource development and capacity building in areas of education, health, agriculture and rural development (MEA 2016, 2011 and 2012).[16] India's actions in Afghanistan are heavily focused on infrastructure development,[17] with the goal of encouraging the country's stability and economic progress.[18] The intentions of the Indian government for Afghanistan were clearly stated as:

> *Our vision is for Afghanistan to be a trade, transportation and energy hub connecting Central and South Asia by enabling free and more unfettered transport and transit linkages. Growing economic interdependence could catalyze peace and prosperity in the region at large and in Afghanistan in particular. Our interests in Afghanistan are thus, the same as that of the people of Afghanistan themselves* (Standing Committee on External Affairs 2012: 38).

India is working on infrastructure projects with Nepal to strengthen cross-border connectivity, trade and commerce.[19] India's assistance for Small Development Projects, which focuses on vital projects in health, education and community welfare, requires the involvement of local communities thus extending its public outreach (MEA 2010, 2013, and 2016).[20]

India's activities in other countries, such as Myanmar, are targeted at establishing transportation projects to give an alternate transit route to India's North-East. Construction of waterways along rivers and roadways to Indian borders will facilitate trade and integration in the country's North-East. These projects have enhanced India's profile and deepened ties with the nation. (MEA 2010-11).[21] The assistance towards Sri Lanka is mainly utilized for rehabilitation of internally displaced persons and reconstruction of sites post-conflict (MEA 2011 and 2012).[22]

Apart from its close neighbors, India is increasing its support to African countries. Areas of cooperation include agriculture, the SME sector, science and technology, and information technology. It also includes the Pan-African e-network Projects, tele-education and tele-medicine components (various MEA Outcome Budgets).

Latin American countries are mainly benefitting from the ITEC programme. The grants

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[14] MEA Outcome Budget 2013-14, p. 15.

[15] MEA Outcome Budget 2016-17, p. 14.

[16] MEA Outcome Budget 2016-17, p. 17; MEA Outcome Budget 2011-12, p. 10; and MEA Outcome Budget 2012-13, p. 11.

[17] MEA Outcome Budget 2010-11, p. 10.

[18] MEA Outcome Budget 2015-16, p. 14.

[19] MEA Outcome Budget 2016-17, p. 14.

[20] MEA Outcome Budget 2013-14, p. 15; MEA Outcome Budget 2010-11, p. 10; and MEA Outcome Budget 2016-17, p. 14

[21] MEA Outcome Budget 2010-11, p. 10.

[22] MEA Outcome Budget 2011-12, p. 10; and MEA Outcome Budget 2012-13, p. 11.

disbursed to the region would be used for setting up IT centres. India is also expanding its engagement with South-East Asian nations following their development priorities in agriculture, water management, energy, transmission lines and human resource development (MEA 2016-17, p. 14).

It has also been noted by the Standing Committee on External Affairs (2015-16) that there has been a considerable reduction in aid and loans to countries in the immediate neighborhood such as Bhutan, Afghanistan, Maldives, Sri Lanka and Bangladesh, contrary to its 'Neighborhood First' policy. However, such a transition is not seen as purposeful but rather as a result of changing political circumstances (p. 61). Furthermore, in light of China's rising initiatives in these countries, the situation has become much more alarming (p. 63). Overall, as we noted, while grants and loans under the heading 'Indian Technical and Economic Cooperation' (ITEC) is the largest expenditure head in the MEA budget, the increase over time has been relatively modest. To retain India's position as an emerging economic power and to compensate for the diminishing aid proportions, the government has been issuing Lines of Credits (LOCs) to various countries.[23] The amount of grants and loans becomes very small compared to the contribution made through LOCs. The following section provides us with an analysis of the LOCs extended by the Government of India.

II. Lines of Credits (LOCs)

Extending Lines of Credits (LOCs) on concessional terms is another element of the development assistance program operated by the Indian government. LOCs, also known as soft loans, are issued through the EXIM Bank 'to overseas financial institutions, regional development banks, sovereign governments and other overseas institutions to enable buyers in those countries to import developmental and infrastructure projects, equipment, goods and services from India, on deferred credit terms' (EXIM Bank of India).[24] The efforts are aimed at creating socio-economic benefits in the partner country[25] as well as forging long-term partnerships.[26]

At present, India offers a total of 306 LOCs to 65 countries in Asia, Africa, Latin America and the Caribbean, Oceania and the Commonwealth of Independent States (CIS) totaling US$ 30.59 billion.[27] Since 2003-04, the EXIM Bank has been in charge of LOCs rather than the Ministry of Finance. During our period of analysis (2004-05 to 2019-20), EXIM Bank extended LOCs worth US$25.88 billion, of which $14.63 billion have been extended to Asia (56.5% share of the total), $10.402 billion to Africa (40.18% share), $0.631 billion to the Latin American and the Caribbean (LAC) region (2.43% share), $0.155 billion to Oceania (0.6% share) and $0.05 billion to the CIS (0.21% share).

The majority of the LOCs in Asia have been extended to neighboring countries like Bangladesh, Nepal, Sri Lanka, Mongolia and Myanmar. The majority of LOCs in all four nations are focused on developing railway infrastructure (railroad tracks, corridors, and so on) in order to increase regional connectivity and thereby accelerate growth. Aside from that, LOCs between these countries has mainly been used to support road and air transportation projects, hence boosting connectivity between Bangladesh, India, and Nepal. Other infrastructure projects, such as bridges, highways,

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[23] Committee on External Affairs (2019-20), p. 63.

[24] https://www.eximbankindia.in/lines-of-credit

[25] https://www.eximbankindia.in/lines-of-credit

[26] Committee on External Affairs (2019-20), p. 60.

[27] https://mea.gov.in/Lines-of-Credit-for-Development-Projects.htm

and irrigation projects, aid in the removal of infrastructure bottlenecks and therefore increase trade prospects between countries.

Of all the countries, Bangladesh has received the most Indian LOCs, totaling $7.862 billion, which includes significant investments in railway projects, boosting connectivity with the North-Eastern regions through the rail route. Sri Lanka and Nepal follow second and third with nearly identical figures of $1.679 billion and $1.65 billion, respectively. LOCs in Sri Lanka is mainly geared towards post-civil war rebuilding works, such as road and rail transport rehabilitation and harbor restoration, in order to facilitate trade between the two countries by reducing the transit time (Mullen, 2014). No other country has been issued LOCs of such high value. Only Tanzania in Africa accumulated $1.11 billion in LOCs, which were used mainly for water supply schemes. However, a large number of African countries receive LOCs, regardless of the amount, bringing Africa's share to a staggering 40 per cent. The graph in Figure 3 shows a year-by-year breakdown of the share of LOCs by different regions. This suggests that LOCs are the primary route for development cooperation in the African region through which India is attempting to strengthen ties with the region.

Figure 3: Regional Distribution of LOCs, 2004-05 to 2019-20
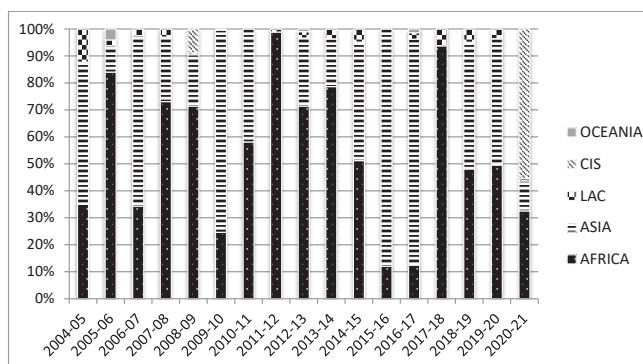
Source: Author's own calculations using data from the EXIM Bank (Available at: https://www.eximbankindia.in/lines-of-credit-GOILOC.aspx)

In 2019-20, the African region received 49.54 per cent (almost 50 per cent) of the total lending by the EXIM Bank, followed by Asia with 46.89 per cent of the total. The LAC region received just 3.54 per cent, with no LOCs extended to the CIS states or the Oceania region. In addition to the above-mentioned investments in physical infrastructure, India spends a large amount of money on human infrastructure development as well. It provides funding for capacity-building and skill-training initiatives under the Indian Technical and Economic Cooperation (ITEC) programme described next.

III. Indian Technical and Economic Cooperation (ITEC)

Another route through which India provides bilateral assistance to countries is the ITEC programme, which currently encompasses 160 countries. India provides civilian and defence training to its partner countries through this program, as well as deputations of Indian professionals overseas and study excursions.[28] Under the framework of south-south cooperation, these capacity-building

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[28] https://www.itecgoi.in/about

efforts and "soft investments" (as referred by Tilak, 2016) assist India in forging greater goodwill and partnership among its partner countries[29] as well as help in the socio-economic development of the nations involved. These efforts boost India's position and status internationally.[30]

India has increased its budget expenditure from Rs. 30 crores in 2004-05[31] for the ITEC programme to Rs. 200 crores in 2019-20[32] (as seen in Figure 4) and currently offering 14,000 slots for training, 383 courses across 98 institutions in 24 different disciplines ranging from agriculture and rural development to ICT and engineering, banking and finance, solar and renewable energy, women empowerment and others.[33]

Figure 4: India's Budget Expenditure on the ITEC Programme, 2004-05 to 2019-20
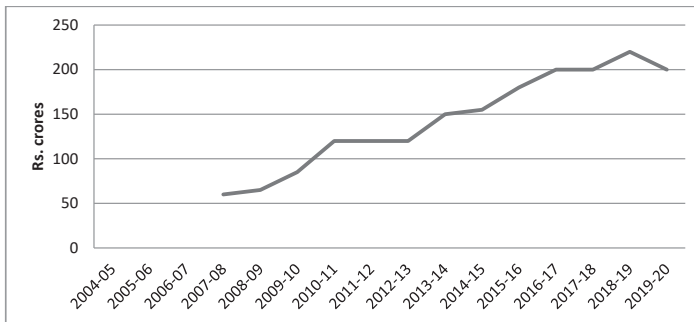
Notes: The data for 2007-16 is taken from Union Budgets (revised estimates) and the data for 2016-20 is obtained from the MEA detailed demand for grants (revised estimates). Expenditure in the year 2004-05 accounts for Rs. 30 crores (1 crore = 100,00,000). Gaps for the years such as 2005-06 and 2006-07 indicate unavailability of data.

Source: Various Union Budgets, and MEA detailed Demand for Grants.

The increased expenditure on the ITEC programme suggests that other developing nations value capacity-building and skill-training initiatives,[34] particularly when they are driven by their needs and priorities and without any prescriptive or exploitative conditions.[35]

India as a Beneficiary

India is hailed as the world's third-largest economy (in terms of purchasing power parity) with nearly home to one-fifth of the world's population. While the future growth prospects are promising, it is also being realised that more resources must be channeled towards investments in physical and social infrastructure in order to ensure that progress is inclusive for all.[36]

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[29] https://www.itecgoi.in/newsletter/5/index.html

[30] MEA Outcome Budget 2016-17, p. 62.

[31] MEA Annual Report 2004-05, p. 189.

[32] MEA detailed Demand for Grants 2019-20: item 17.00.32 under the Major Head 3605, p. 18.

[33] https://mea.gov.in/Capacity-Building-and-Technical-Assistance-as-Development-Partnership.htm

[34] MEA Outcome Budget 2016-17, p. 63.

[35] https://www.itecgoi.in/newsletter/5/index.html

[36] https://issuu.com/oecd.publishing/docs/active-with-india-2019; and http://www.dif.mp.gov.in/zoldweb/mannual.pdf

A part of the required investment comes from outside the economy in the form of assistance. The Indian government decided to receive assistance in the form of loans, grants, and technical assistance from eight bilateral partners: the United States, the United Kingdom, Germany, Japan, France, Italy, Canada, and the Russian Federation, as well as European Union members, as part of its development cooperation policy.[37] Other smaller bilateral partners were directed to NGOs in greater need of ODA in order to cut down on the administrative costs of managing aid and to effectively manage a greater amount of aid (Price, 2004).[38] However, because most assistance originates from multilateral agencies, the policy shift may not have had much of an impact. However, in recent years, this trend has slowed (as can be seen in Figure 5).

Trends

Furthermore, the majority of bilateral aid (in the form of loans) comes from only one or two of the largest contributors, of which Japan has been consistently the top contributor to India's development cooperation. Among the multilateral contributors, the International Bank for Reconstruction and Development (IBRD) and the Asian Development Bank (ADB) provide the maximum of the total assistance, and in some cases, they even fund the total amount. Figure 6 presents the major donors of bilateral assistance and Figure 7 presents the donors of multilateral assistance received by India.

Furthermore, the majority of aid is in the form of loans, with grants accounting for only a minor part of overall funds received (seen in Figure 8). As a result, the focus of this section will be on loans coming from ADB and Japan to understand the nature, magnitude and modalities of the aid received by India.

Figure 5: Sources of External Assistance Received, 2004-05 to 2019-20[39]
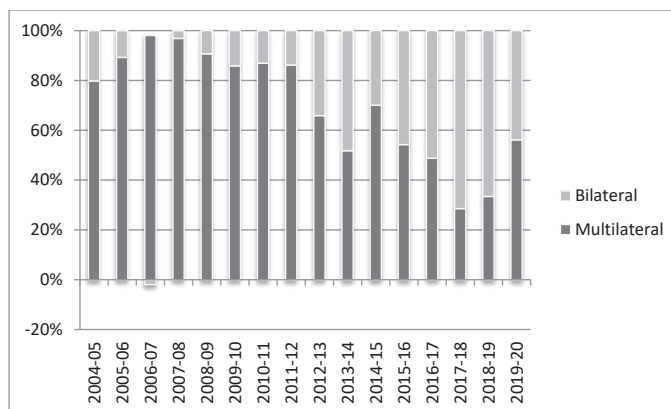
Source: Various Union Budgets (Annexure to Receipts Budget)

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[37] https://dea.gov.in/sites/default/files/7_GuidelineBDC_2_7%20Dec%202015.pdf

[38] Indian Union Budget Speech 2004-05, para 126. Available at: https://www.indiabudget.gov.in/budget_archive/ub2004-05/bs/speecha.htm

[39] 'External Assistance' here refers to only net loans (i.e., net of repayments). The bifurcation for grants is available only up to the year 2009-10.

Figure 6: Major Bilateral Donors of Assistance to India, 2004-05 to 2019-20
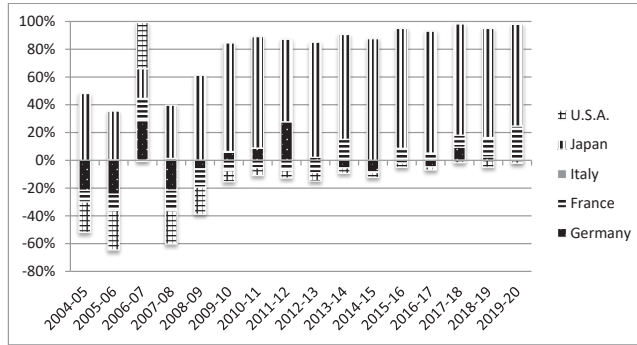
Source: Various Union Budgets (Annexure to Receipts Budget)

Figure 7: Multilateral Donors of Assistance to India, 2004-05 to 2019-20
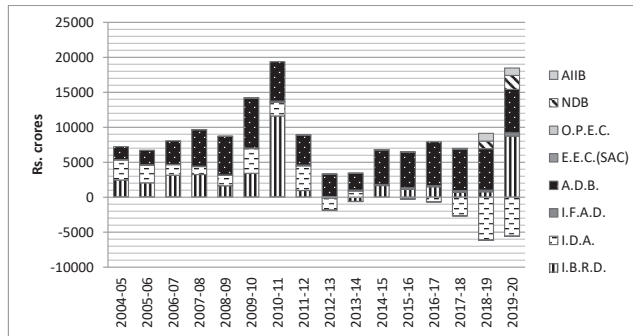
Notes: Full forms of the donors' names are given below Table A-3 in the Appendix
Source: Various Union Budgets (Annexure to Receipts Budget)

Figure 8: Loans and Grants Received by India, 2004-05 to 2019-20[40]
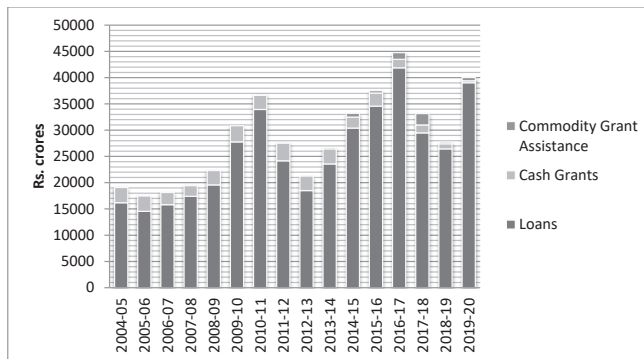
Source: Various Union Budgets (Annexure to Receipts Budget)

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[40] Here, the loans and grants are inclusive of bilateral and multilateral sources. The entire source list is included in Table A-2 in the Appendix.

The Analysis

I. Japan and India

Japan, the largest bilateral donor of assistance to India, has extended assistance since 1958.[41] For our analysis period (2004-05 to 2019-20), Japan has consistently accounted for the maximum share of total (net) loans provided to India (as can be seen from Table A-3 in the Appendix). Since 2015-16, a declining trend has been witnessed, with the share of France, though insignificant, is going up marginally. However, Japan continues to be the top contributor.

Japan has been extending aid through Japan International Cooperation Agency (JICA) to the government of India in the fields of transportation, energy, irrigation and water supply management, environment and climate change issues and investment promotion.[42]

Japan has made significant investments in India's transportation sector. India welcomes ODA loans for the development of high-speed railways, industrial corridors, and urban mass rapid transport systems, which have the potential to transform the country's transportation industry.[43] Following the success of the Delhi Metro, Japan's official development assistance (ODA) began funding metro projects in Chennai and Ahmedabad. In addition, ODA loans were granted to strengthen the road connectivity network in India's north-eastern states. Japan also strives to foster strategic connections linking South Asia and Southeast Asia through the interplay between the "Act East" policy and the "Expanded Partnership for Quality Infrastructure" (EPQI).[44] Through these investments, Japan enhances regional connectivity and strengthens our network infrastructure, thus assisting India in addressing infrastructure gaps that stifle investment and growth. EPQI, by connecting India's North-East with South-East Asia and the Indo-Pacific region, helps transform the region into a manufacturing hub. Japan has been helping in expanding the existing national highway network in and around the northeast states of Meghalaya and Mizoram under the 'North East Road Network Connectivity Improvement Project' (Phase I) (Basu, 2016). Thus, Japan has been instrumental in reshaping India's infrastructure.

An improved infrastructure system in place will facilitate industrial networks and regional value chains, transforming India into an international manufacturing hub. Japan is investing in energy and power projects to aid in the manufacturing development of India in alignment with the 'Make in India' initiative. JICA has provided a loan to Indian Renewable Energy Development Agency (IREDA) for investing in wind, solar and hydro-electric projects. Thus, JICA supports not only the distribution of power lines but also energy conservation through renewable energy projects.

Japan and India have also promoted human resource development through people-to-people interactions and cultural exchanges. Japan enhances its connectivity with North-East India not only by expanding its transportation network but also by expanding its people's network. The launch of the IRIS programme to promote youth talent from the North-East region is a step towards maintaining friendly relations with the region and promoting growth. Another step in this direction is the establishment of the Association for Overseas Technical Cooperation and Sustainable Partnerships (AOTS), an organization that promotes technical cooperation through personnel

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[41] Annex 13 to the Receipts Budget 2020-21.

[42] Annex 13 to the Receipts Budget 2020-21.

[43] https://www.mofa.go.jp/s_sa/sw/in/page3e_000432.html

[44] https://www.mofa.go.jp/region/asia-paci/india/data.html

training, expert dispatch and other programmes.[45] Various other programmes have been launched in order to incorporate successful Japanese manufacturing processes into Indian development projects by developing a professional and skilled workforce.

The support provided by Japan is not confined to the sectors mentioned above. It supports agriculture, forestry, and irrigation projects, as well as empowers women farmers in order to help India achieve more inclusive and sustainable development. It has also contributed to the healthcare sector, thus making a significant contribution to the overall socio-economic development of India. The two nations have also emphasized defence and security cooperation. Over the years, the two countries political, economic, and strategic interests have converged, resulting in a substantial strengthening of their bilateral relationship in recent years.[46] India was the first country to receive aid from Japan and is now one of Japan's most essential and long-standing development partners.

Now we will look at the leading multilateral agencies that aid India. The ADB is the most significant multilateral donor providing external assistance to India. We will now learn about its interactions with India.

II. ADB and India

Though India had the fourth-largest subscription to the bank's capital, it did not commence borrowing until 1986, when the need to diversify sources of external assistance was realized.[47] Since 1986, ADB has been at the forefront of supporting India's development process by lending the maximum amount to India. India is the largest borrower of ADB today, and ADB is the largest multilateral donor to India.

ADB defines its strategy such that it supports India's goal of rapid transformation and vision for faster, inclusive and sustainable growth. It strives to achieve these objectives by focusing on three priority areas: (a) improving economic and regional connectivity through investments in the transportation sector, that is, expanding road networks and building corridors; (b) achieving inclusiveness by investing in rural infrastructure, focusing on lagging regions, and creating employment opportunities; and (c) environmental sustainability by addressing climate change issues, water supply management and other concerns.[48]

The total lending by ADB during our analysis period 2004-05 to 2019-20 has increased from Rs. 1929.49 crores to Rs. 11180 crores respectively (or in net terms, the respective figures are Rs. 1862.17 crores and Rs. 6196.33 crores). The sector-wise break-up of ADB's cumulative lending is presented in Table 2.

Transport is the most significant component of ADB's developmental assistance funding. The ADB invests primarily in road connectivity projects, with the SASEC[49] Road Connectivity Investment Programme (SRCIP) being one of the most critical projects connecting South and Southeast Asia. This scheme will connect India with Bangladesh, Bhutan, Myanmar, Nepal, and ASEAN member nations by expanding highways in the North Bengal and North-Eastern regions

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[45] https://www.aots.jp/en/about/profile/

[46] https://www.mea.gov.in/bilateral-documents.htm?dtl/28946/IndiaJapan_Joint_Statement_during_ visit_of_ Prime_Minister_of_Japan_to_India_September_14_2017

[47] Annex 2 to Receipts Budget 2008-09.

[48] ADB Country Partnership Strategy: India, 2018-2022—Accelerating Inclusive Economic Transformation, September 2017.

[49] SASEC stands for South Asia Subregional Economic Cooperation.

of the country. There is also a Rural Connectivity Investment Programme, which supports India's rural road network improvement plan. To begin with, expanding road networks and establishing corridors generate job opportunities for residents in the area, and enhanced connectivity will aid in the development of economic centers in and around the area.[50]

Table 2: Sectoral Allocation of Cumulative Lending by ADB to India, 2020[51]

Sector	No. of Projects	% Share in Total Amount
Agriculture, Natural Resources and Rural Development	54	2.98
Education	18	1.00
Energy	208	27.39
Finance (Projects and Technical Assistance)	87	11.25
Health	11	0.61
Industry and Trade	18	0.96
Information and Communication Technology	3	0.28
Multi-sector	30	4.01
Public Sector Management	75	6.77
Transport	181	33.33
Water and Other Urban Infrastructure and Services	100	10.21
Finance (Trade and Supply Chain Finance and Microfinance)	765	1.17
Industry and Trade	184	0.04
Total	1734	100

Source: Adapted from Asian Development Bank and India Fact Sheet (April, 2021)

Energy is the second most important sector in the ADB's development aid programme, accounting for 27% of the bank's funding. Modernizing power distribution, transmission, and generation are among the ADB's initiatives, with a focus on renewable energy sources. Building 'green energy corridors' and 'solar parks' are an initiative in this direction. In addition, the Asian Development Bank invests in India to improve regional power transmission links with other nations.[52]

ADB also extends its support to sustainable urban development in smaller states. In India, the ADB is involved in over a hundred projects focusing on water supply management, sewage treatment, and urban tourism infrastructure development. Local communities were also involved in conservation activities in order to encourage tourism, contributing to long-term, inclusive growth.[53]

The operations of the ADB are not confined to the areas specified above. It works extensively in the agricultural sector, supporting skill development, health, and education, and therefore developing human resources while leveraging financial resources. It also emphasises gender equality

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[50] *ADB Development Effectiveness Brief.* "India and ADB: Three Decades of Enduring Partnership", December 2018.

[51] Lending includes loans, grants and technical assistance. Loans constitute at least 95 percent of the total lending for all the sectors.

[52] *ADB Development Effectiveness Brief.*

[53] *ADB Development Effectiveness Brief.* See also https://www.adb.org/countries/india/overview.

and social inclusion while navigating the obstacles of functioning in a constrained capacity and varied demand environment.

Conclusions

India seeks to maintain strong, cooperative, and mutually beneficial relationships with other developing nations. India's development cooperation policy has been at the forefront in achieving these objectives. India has provided aid depending on the needs and priorities of the partner nations, in accordance with the principles of non-conditionality. India has a long history of development assistance, and in this paper, we have tried to understand how it has changed over the last fifteen years (2004-05 to 2019-20). This paper addresses the question of whether India's aid should be allocated where it is most needed or will have the greatest impact. Also, how well is India handling the aid that it receives? And is the development assistance coming in actually helping India overcome its barriers and leading to growth and development? Thus, in what capacity and how much is India contributing to the final objective of strengthening SSC?

Figure 9 shows a comparison of India's development assistance received and disbursed over the last fifteen years. The analysis shows how India transitions from being a recipient initially to a donor of development assistance in the intermediate years of our analysis. Thus, India's aid spending outweighs the amount of aid it receives.

Figure 9: Aid Received[54] and Disbursed[55] by India, 2004-05 to 2019-20[56]
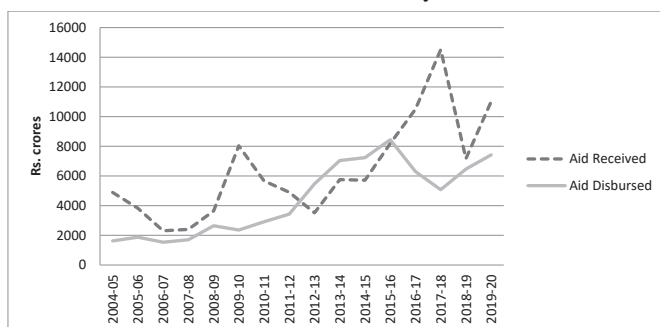
Source: Various Union Budgets and MEA Annual Reports

India is investing in a lot of developmental projects in the areas of infrastructure, power and energy transmission, skill development and others in the neighborhood countries of South Asia, in alignment with its 'Neighborhood First' initiative. Simultaneously, it is investing in improving cross-border connectivity in order to better link north-eastern states to the rest of the world and boost growth in those regions. The issue of regional connectivity has also been addressed by the bilateral and multilateral donors to India, where they have predominantly focused on improving transport infrastructure and thus taking a step towards removing trade bottlenecks, which act as an impediment to progress. At the same time, there is enough focus on capacity building and skill development of labor by India through its training programmes (under ITEC). As a result, India's

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[54] "Aid Received" consists of net bilateral loans, multilateral cash grants and commodity grant assistance.

[55] "Aid Disbursed" comprises bilateral loans and bilateral grants.

[56] Because the entire grant/loan ratio is modest, inclusion of multilateral grants (rather than bilateral as taken throughout the entire study) in the case of aid received will not have a substantial impact on the overall study.

development cooperation fosters both physical and people infrastructure. However, this does not eliminate the challenges that are faced by India.

The development cooperation framework necessitates coordination between many ministries at various levels which poses a challenge for the economy. A central agency might potentially cut administrative costs while also increasing transparency in the process (Purushothaman, 2021). Aside from that, India must ensure that the development flows it receives are non-extractive and do not hurt local resources or local people. This is critical for inclusive growth to prevail. India, through its development cooperation framework, is contributing to the South-South development Cooperation and carving out a position for itself in the global South.

Acknowledgements

About the author

Shelly Gupta is a Ph.D. student at the Centre for Economic Studies and Planning, Jawaharlal Nehru University (JNU), New Delhi, India.

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Appendix

Table A-1: India's Budgetary Allocation (Revised Estimates) of Aid (Grants and Loans) to Developing Countries, 2004-05 to 2019-20 (Rupees in Crore)#

Grants and Loans	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Bangladesh	22	22.17	52	20.01	60	6	3.76	3
Bhutan	1000	1048.65	1131.11	599.51	731	1091.32	1301.98	1723
Nepal	60.01	66.18	66.01	210	100	113	150	150
African Countries	71.62	106.84	60.98	20	50	95	125	150
Maldives	3	3.2	13.2	6	19.5	504.7	3.5	11
Myanmar	4	6.21	22	44.57	20	35	55	90
Srilanka	15	15.3	25	28.02	28	30	80	90
Central Asia	5.29	8.5	9	17	20	18.82	0	0
Other developing countries	172.05	348.22	494.83	591.63	180.08	50.95	36.55	34.35
ITEC-Programme	0	0	0	0	60	65	85	120
Latin American Countries	0	0	0	0	1.53	2	2	4
Afghanistan	0	0	0	0	434	418.5	287	310
Multilateral Economic Relation (MER) Programme	0	0	0	0	0	3	8	13
Disaster Relief	0	0	0	0	0	70	40	155
SAARC Programme	0	0	0	0	0	20	22	8
SCAAP Programme	0	0	0	0	0	6	9	15
Investment Promotion and Publicity Programme	0	0	0	0	0	0.8	5	4.21
Mongolia	0	0	0	0	0	0	125	0
Eurasian Countries	0	0	0	0	0	0	20	30
Energy Security	0	0	0	0	0	0	0	0.79
TCS of Colombo Plan	0	0	0	0	0	0	0	6
ASEAN Multilateral	0	0	0	0	0	0	0	0
Chabahar Port	0	0	0	0	0	0	0	0
Mauritius	0	0	0	0	0	0	0	0
Seychelles	0	0	0	0	0	0	0	0
Support to International Training/ Programmes	0	0	0	0	0	0	0	0
Aid for Cultural and Heritage Project	0	0	0	0	0	0	0	0
TOTAL	1352.97	1625.27	1874.13	1536.74	1704.11	2530.09	2358.79	2917.35
MEA Budget	3410	3885	4182	4095.05	4783	6868.42	6333	7120
Share of Grants and Loans in Total MEA Budget (%)	39.68	41.83	44.81	37.53	35.63	38.51	37.25	40.97

Table A-1 contd…

Grants and Loans	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	TOTAL
Bangladesh	8	280	280	198	213.79	75	65	120	150	1578.73
Bhutan	2030	1871.06	4391.06	4871.59	5612.69	3867.9	2579.74	2510	2674.51	39035.12
Nepal	150	270	270	300	300	320	375	750	1200	4850.2
African Countries	124	237.5	237.5	145	200	290	165	330	450	2858.44
Maldives	283	30	30	25	213	80	125	440	326.45	2116.55
Myanmar	111.82	60	240	130	154	120	225	370	170	1857.6
Srilanka	133	290	290	500	500	155	75	165	205	2624.32
Central Asia	0	0	0	0	0	0	0	0	0	78.61
Other developing countries	35	30	30	56	83.44	110	100	125	150	2628.1
ITEC-Programme	120	120	120	155	180	0	0	0	0	1025
Latin American Countries	0.5	27.61	27.61	10	15	10	20	10	10	140.25
Afghanistan	290	486.16	536.16	710	682.94	315	350	470	400	5689.76
Multilateral Economic Relation (MER) Programme	36	23	23	12.04	12	0	0	0	0	130.04
Disaster Relief	45	25	25	25	25	15	20	30	20	495
SAARC Programme	12	11.5	11.5	8	10	0	0	0	0	103
SCAAP Programme	15	20	20	30	35	0	0	0	0	150
Investment Promotion and Publicity Programme	4.11	10	10	15	60	0	0	0	0	109.12
Mongolia	2	1	1	2.5	7.5	2	2.5	2	2	147.5
Eurasian Countries	30	30	30	10	20	10	30	25	45	280
Energy Security	0.44	0.5	0.5	0.53	0.53	0	0	0	0	3.29
TCS of Colombo Plan	3	4.6	4.6	8.6	8.6	0	0	0	0	35.4
ASEAN Multilateral	0	36	0	0	0	0	0	0	0	36
Chabahar Port	0	0	0	0	0	100	0.1	0	0	100.1
Mauritius	0	0	0	0	0	410	335	660	1100	2505
Seychelles	0	0	0	0	0	50	200	100	50	400
Support to International Training/ Programmes	0	0	0	0	0	360.9	412.15	369	459.5	1601.55
Aid for Cultural and Heritage Project	0	0	0	0	0	0	0	0	0	0
TOTAL	3432.87	3863.93	6577.93	7212.26	8333.49	6290.8	5079.49	6476	7412.46	70578.68
MEA Budget	7836	10062	11793.65	12620	15041.08	13426	13690	15582	17372.27	
Share of Grants and Loans in Total MEA Budget (%)	43.81	54.38	59.68	57.32	56.14	46.93	37.07	41.50	42.73	

Notes: #1 crore = 100,00,000; ITEC - Indian Technical and Economic Cooperation; SAARC - South Asian Association for Regional Cooperation; SCAAP - Special Commonwealth African Assistance Plan; TCS - Technical Cooperation Scheme; ASEAN - Association of Southeast Asian Nations; MEA – Ministry of External Affairs (Govt. of India).
Source: Various Union Budgets of India and MEA Annual Reports

Table A-2: External Assistance Received by India

	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
A. Loans	16192.86	14540.58	15812.95	17402.6	19578.35	27765.93	33947.05	24176.74
B. Cash Grants	2896.7	2969.84	2321.09	2051.16	2745.52	3077.59	2715.63	3394.99
C. Commodity Grant Assistance	167.5	48.87	147.87	40.02	2.49		40	81.6
D. Total (A+B+C)	19257.06	17559.29	18281.91	19493.78	22326.36	30843.52	36702.68	27653.33
E. Repayment of Loans	7158.22	7026.26	7921.33	7432.59	9975.15	11230.49	11683.24	13865.68
F. External Assistance (Net of Repayments) (D-E)	12098.84	10533.03	10360.58	12061.19	12351.21	19613.03	25019.44	13787.65
G. Interest Payment on Loans	2797.41	3172.96	3867.73	3889.53	4158.8	3686.08	3150.86	3607.95
H. External Assistance (Net of Repayments and Interest Payments) (F-G)	9301.43	7360.07	6492.85	8171.66	8192.41	15926.95	21868.59	10179.7

	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
A. Loans	18490.86	23,564.75	30407.47	34580	41875	29480	26446.88	39043.12
B. Cash Grants	2761.62	2885.63	2086.49	2506.36	1624	1513	969	361
C. Commodity Grant Assistance	...	249.21	724.6	430.39	1258	2168	301	613
D. Total (A+B+C)	21252.48	26699.59	33218.56	37517.36	44757	33161	27716.88	40017.12
E. Repayment of Loans	16276.46	18124.26	20702	23095.35	27002	27066	31340	34110
F. External Assistance (Net of Repayments) (D-E)	4976.02	8575.33	12516.56	14422.01	17755	6095	-3623.12	5907.12
G. Interest Payment on Loans	4073.23	3987.41	3838.09	3873.85	5154	5792	7870	10537
H. External Assistance (Net of Repayments and Interest Payments) (F-G)	902.79	4587.92	8678.47	10548.16	12601	303	-11493.12	-4629.88

Source: Various Union Budgets (Annexure to Receipts Budget)

Table A-3: Net Loans Received by India, by Agency

	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Multilateral								
I.B.R.D.	2466.29	2052.9	3139.98	3244.86	1644.95	3418.3	11620.88	963.42
I.D.A.	2866.03	2538.54	1515.9	1133.61	1501.08	3538.23	1960.46	3528.46
I.F.A.D.	37.88	48.48	23.28	59.4	34.32	78.29	163.29	100.56
A.D.B.	1862.17	2082.73	3384.47	5219.57	5524.84	7155.17	5621.12	4293.76
E.E.C. (SAC)	-6.2	-6.46	-6.44	-6.16	-6.93	-7.38	-6.66	-7.46
O.P.E.C.	-18.21	-10.64	-3.82	7.67	9.62	16.04	-7.44	8.29
NDB								
AIIB								
Total (Multilateral)	7207.96	6705.55	8053.37	9658.95	8707.88	14198.65	19351.65	8887.03
Bilateral	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Germany	-517.38	-389.41	-363.96	-302.29	-106.88	197.11	341.05	863.14
France	-202.35	-185.92	-204.26	-208.35	-228.19	-257.28	-209.13	-226.32
Italy	0	5	10	20	4	23.22	0.9	
Japan	1150.46	558.56	-272.89	538.86	1054.24	2682.85	3111.56	1852.25
Switzerland	-1.41	-5.03	-1.55	-1.6	-2.83	-3.22	-3.22	-4.02
U.S.A.	-522.22	-451.82	-423.07	-338.08	-335.38	-274.61	-215.93	-172.58
Russian Federation	2076.62	1277.39	1093.98	602.52	510.36	-31.28	-113.06	-888.44
Belgium	-152.76							
Czech and Slovakia	-4.28							
EIB								
Total (Bilateral)	1826.68	808.77	-161.75	311.06	895.32	2336.79	2912.17	1424.03
Grand Total	9034.64	7514.32	7891.62	9970.01	9603.2	16535.44	22263.82	10311.06

Table A-3 contd…

	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Multilateral								
I.B.R.D.	-147.98	-612.28	1663.3	1112.96	1494.05	702.85	782.23	8743.59
I.D.A.	-1698.76	886.57	47.4	-255.36	-637.58	-2637.68	-6145.69	-5580.27
I.F.A.D.	98.24	140.19	115.06	254.59	171.07	241.67	227.9	477.99
A.D.B.	3205.4	2389.28	4930.03	5086.98	6249.52	5886.48	5935.73	6196.33
E.E.C. (SAC)	-7.94	-8.73	-9.38	-8.37	-8.12	-8.25	-9.21	-8.69
O.P.E.C.	9.86	22.64	56.74	40.15	-12.31	-11.83	-15.86	-15.66
NDB						100	1083	2000
AIIB						50	1108	1050
Total (Multilateral)	1458.82	2817.67	6803.15	6230.95	7256.63	4323.24	2966.1	12863.29
Bilateral	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Germany	53.92	-241.42	-415.89	-127.38	-396.58	870.76	86.2	37.89
France	-223.22	669.02	-20.78	551.75	433.09	794.66	498.54	1982.78
Italy								
Japan	2083.81	3333.7	4340.39	5490.68	7226.47	7357.6	2800.41	5976.19
Switzerland	-4.33	-4.83	-4.76	-4.67	-1.98	-0.35	-0.16	
U.S.A.	-152.88	-174.42	-177.19	-194.92	-183.07	-165	-178.96	-172.41
Russian	-1001.72	-959.23	-819.45	-461.76	238.44	1218.88	1852.87	1718.26
Federation								
Belgium								
Czech and								
Slovakia								
EIB					300	750	844	500
Total (Bilateral)	755.58	2622.82	2902.32	5253.7	7616.37	10826.55	5902.9	10042.71
Grand Total	2214.4	5440.49	9705.47	11484.65	14873	15149.79	8869	22906

Notes: I.B.R.D. - International Bank for Reconstruction and Development; I.D.A. - International Development Association; I.F.A.D. - International Fund for Agricultural Development; A.D.B. - Asian Development Bank; E.E.C. (SAC) - European Economic Community (Special Area of Conservation); O.P.E.C. - Organization of the Petroleum Exporting Countries; NDB - New Development Bank; AIIB - Asian Infrastructure Investment Bank; EIB - European Investment Bank.

Source: Various Union Budgets (Annexure to Receipts Budget)

IMPACT OF RURAL LIVELIHOOD VULNERABILITY ON MIGRATION: A META-ANALYSIS

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Abstract: Globalization has both beneficial and detrimental effects on our contemporary lives. The era of globalization has witnessed increasing vulnerability and migration. The relationship between the two will hold the key to the understanding of increased migration as the viability strategy to mitigate or reduce vulnerability and the contribution of vulnerability to migration. In this context, the study aimed to determine the nature and extent of the relationship between vulnerability and migration. The study used systematic review and meta-analysis under the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) convention. In this study, the odds ratio (OR), i.e., the odds for migration, was taken as the effect size for the meta-analysis and the vulnerability was identified in terms of household livelihood vulnerability indicators. After analyzing the pooled effects sizes of the odds ratio of migration by different vulnerability indicators at the household level, the study has found that the livelihood vulnerability significantly influences migration.

Keywords: Migration, Livelihood, Vulnerability, Rural household, Meta-analysis

I. Introduction:

Globalization brought with it the promise of development for global economies (Aslam and Azhar, 2013), but it also brought with it rising income as well as wealth disparities, a degrading environment, changing climate, rising national sentiment, rising polarization of societies, rising geographic mobility, and rising urbanization (WEF, 2018). These adverse developments have increased the risk, uncertainties, and vulnerabilities of individuals/communities in multiple domains, including economic, social, and environmental ones (Kaplinsky, 2008). Globalization forces have been found to generate a significant number of both intentional and involuntary migrations, which are aided by a variety of pull and push forces across countries and within countries, particularly in underdeveloped and poorer regions (Akokpari, 2000). According to Ellis (2006) and Henderson (2003), the adverse effects of globalization and liberalization—viz., global economic meltdown—denied access to natural resources; led to environmental deterioration, climate change, and urban bias in development; and encouraged migration. According to the World Migration Report 2022,

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international migration has surged from roughly 174 million in 2000 to 281 million in 2019. This was 183 million in 1990, and in 2009, there were 740 million domestic migrants across the globe (UNDP, 2009).

Globalization has generated several types of unpredictable events threatening individual and community livelihoods and causing livelihood vulnerability, including among the rural households of developing countries (Nguyen et al., 2015). Osawe (2013) reported that, in Africa's Sub-Saharan countries, a high degree of rural livelihood vulnerability and a continuous rise in migration (internal and international) are observed together. In this context, the literature points out that migration decision is often determined by the vulnerability situation (De Jong, 2000). Migration is critical for securing livelihoods and achieving adaptation goals (Adger et al., 2014). Literature has classified household vulnerability reduction / coping strategies into two different categories, namely, managing risk (ex-ante strategy) and coping with risk (ex-post strategy) to avoid or overcome the vulnerability condition (Osawe, 2013). The risk mitigation strategy of the household before it occurs is known as the ex-ante strategy. In this strategy, a planned migration decision is made to pursue or improve employment prospects so as to reduce income risk. In contrast, the ex-post strategy is the risk mitigation strategy of the household after the risk situation has struck. In this case, the decision to migrate is made under duress. Ex-post coping methods are always used to deal with households that are now experiencing adverse risk conditions (Ellis, 2003; and Hulme et al., 2001). In both cases, migration plays a critical role in lowering household vulnerability and perhaps facilitating virtuous asset accumulation cycles that might offer households escape routes from poverty (Ellis, 2003). Blaikie et al. (1994) and Ellis (2000) noted that the relationship between vulnerability and migration will explain the decision-making process that underlies the households' livelihood strategies. Further, the association between household vulnerability and migration would help to understand the diversity of household vulnerability (Osawe, 2013). It also assists in the resolution of concerns about household vulnerability as they arise on a local level (WorldFish Centre, 2010). Hence, understanding the nature and extent of the association between vulnerability and migration is critical for understanding migration linkage dynamics.

Conceptually, vulnerability is a broad concept; livelihood vulnerability is manifested in multiple individual, household, and social characteristics. For example, Moser (1998) and Whitehead (2002) have taken household heads with a low level of education, female-headed household, families with high proportion of dependants, aged heads of household, low pay jobs of heads, and poor households. Osawe (2013) noted that factors like size of the household, gender, and ethnicity are linked to vulnerability, migration decisions, and income/assets inclination. In this study, household livelihood vulnerability is captured in terms of the socio-demographic composition of the households, particularly size of the household/family, age of head of the household, household's dependency ratio, gender of the household head and education of the household head. The present study has made an attempt to find whether weather vulnerability influences migration or not through the synthesis of several similar studies, namely, systematic literature review and meta-analysis. This paper has five sections. The second segment illustrates the PRISMA methodology for systematic and meta analysis of included literature; the third segment offers the systematic review results; and the fourth segment describes the meta-analysis results; and the last segment concludes the study.

II. PRISMA Methodology for Systematic Review and Meta-analysis

This section illustrates the methodology to access the previous literature that explores the relationship between rural livelihood vulnerability and migration. To perform an unbiased and systematic review of literature, the study has used PRISMA method. PRISMA stands for "preferred reporting items for systematic reviews and meta-analyses" which sets the standard for the systematic

review (Bigonnesse et al., 2018; and Adi Syahid et al., 2021). PRISMA guides the procedure to retrieve, review, abstract, and analyze articles. This procedure is used for the exhaustive and unbiased search for literature associated with the topic. PRISMA method consists of multiple stages, viz., identification of articles from articles database with appropriate search terms/keywords relevant to the study, screening of records using titles and abstracts, selecting eligible full-text articles, and review and meta-analysis of selected articles.

Resource: Data Sources

In this study, 10 major databases have been used, out of which only two of the databases, i.e., Web of Science (WoS) and Scopus, offer inbuilt advanced search filter options that have helped to make effective and comprehensive searching. Other databases, including Science Direct, SpringerLink, SAGE, Oxford Journals, Emerald Insight, Taylor & Francis, JStor, and Wiley Online Library, aided in the collection of all relevant studies for the thorough review as well as meta-analysis.

Eligibility and Exclusion Criteria

The present study used convenient eligibility requirements such as (i) retrieving sole journal articles because they are more comprehensive and incorporate more viable and trustable documentation (Bar-Ilan 2010; and Montesi and Mackenzie, 2008), and case studies represent contemporaneous phenomena in an actual context (Yin, 1994), (ii) only considering English publications to facilitate literature search and analysis, and (iii) only articles which put the spotlight upon the relationship among rural household livelihood vulnerability and migration. Table 1 summarizes these criteria.

Table 1: Inclusion and Exclusion Criteria

Criterion	Eligibility	Exclusion
Type of Literature	Journal articles (including case studies)	Chapter in book, review articles, conference proceedings
Language	English	Other than English
Study's primary emphasis	Rural livelihood vulnerability, migration	Other than rural livelihood vulnerability and migration

Note: Adapted from Adi Syahid et al. (2021)
Source: Table created by author

Systematic Review Criteria

A systematic review is generally advised by investigators and information specialists to prefer multiple databases that would enable the identification of all relevant literature on the area of interest (Bramer et al., 2017). To perform a systematic review the study used ten databases. The searches were conducted during August 2021, and there were four stages; the selection of the multiple databases helped to eliminate the risk of bias. The procedure began with the selection of a keyword for the search. Several keywords related to rural household livelihood vulnerability and migration were identified based on synonyms found in the thesaurus.

Table 2 shows that 20,628 articles were identified from 10 databases. During this process, 2,347 duplicate articles were found and eliminated. At the screening stage, from 18,281 articles 17,960 were excluded on account of relevance using the above-mentioned keyword, based on the title and abstracts. After crossing the screening stage, the process moved to the eligibility stage with 321 full studies. And after reviewing the full studies, only sixteen (16) articles were selected since they were completely engaged in the study's theme for systematic review and, finally, thirteen studies were retained for Meta-analysis. Figure 1 illustrates the PRISMA flow diagram.

Table 2: Number of Identified Results by Data Bases and Keywords Used

Journal Database	Keywords Used	Number of Identified Results
Web of Science	(Rural OR village OR farm OR non-farm OR agrarian OR non-agrarian OR agricultural OR non-agricultural) and (household-livelihood-vulnerability) OR (adaptation) OR (sensitivity) OR (exposure) and (migration)	437
Scopus		414
Taylor Francis		2942
Science Direct		3537
SAGE		2696
SpringerLink		2986
Emerald Insight		2093
Oxford Journals		1638
Jstor		1809
Wiley Online Library		2076
Total		20,628

Source: Table created by author based on the search results

Figure 1: PRISMA Flow Diagram of the Four Stage Study Data Abstraction and Analysis
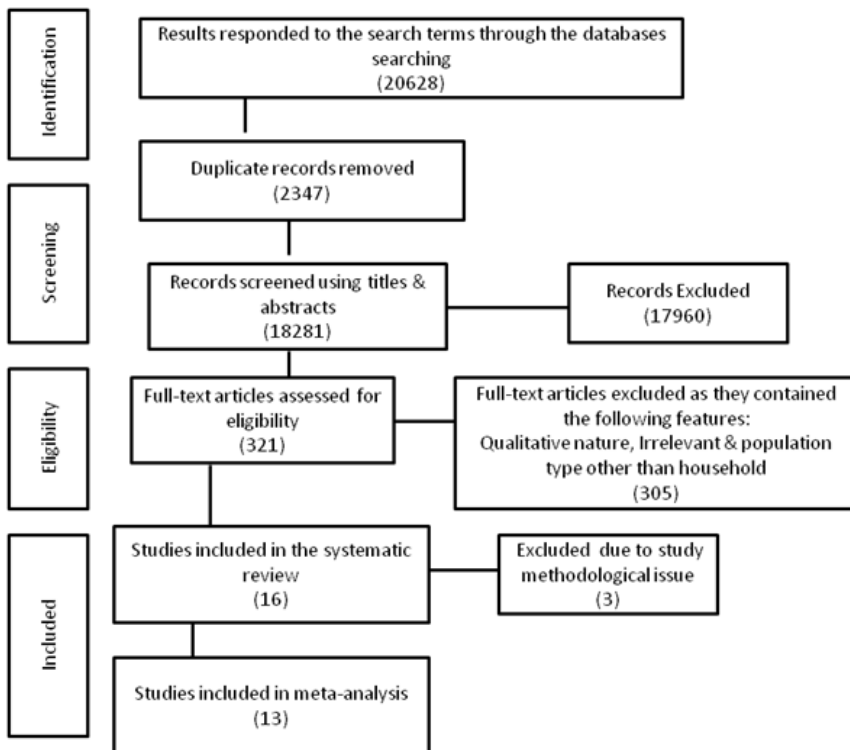
Note: Adapted from Moher et al. (2009)
Source: Chart/diagram created by author based on the search results

Systematic Review Methodology

A summary preparation exercise of the included studies, a descriptive overview of the studies, and an analytical assessment of the association between household vulnerability and migration are carried out. Based on these, the nature of the association between vulnerability indicators and migration is studied.

Meta Analysis Methodology

The first step in the meta-analysis is the identification of the effect size that measures the relationship between rural livelihood vulnerability and migration, together with its standard error (SE). This study found the odds ratio (probability of migration / migration decision) as the most suitable effect size measure. This measure was observed from Logit/Probit regressions for variables relevant to household vulnerability. The vulnerability was indicated by the various household characteristics. In the case of logit models, the regression coefficient is simply a log of odds and so odds ratio (OR) is exponential (or anti-logarithm) of those coefficients, i.e., $OR_i = Exp(\beta_i)$. In the case of categorical independent variables, the single effect size was calculated as the weighted average of individual categories, i.e., $\beta = \sum w_i \beta_i$. For deriving the Standard Error of the ORs, we use the formula $SE(OR) = OR*SE(\beta)$. In the case of probit models, the coefficient of the probit multiplied by a constant value of 1.81 would fetch the equivalent value of the logit coefficient and so $OR_i = Exp(1.81*\beta_i)$ (Gujarati, 2003). Now, $1.81* SE(\beta)$ would provide the standard error of the logit coefficient. Like in the case of the logit model, using the proper formula, the standard error for OR is computed. Thus the odds ratio (OR) and the associated SEs were computed from various included studies. The study used descriptive measures to summarize the OR from multiple studies in terms of household vulnerability indicators. Further, heterogeneity analysis on OR was carried out using the funnel and forest plots, and statistical inference measures, viz., Begg's test and Egger's test. In this study, the results of more robust non-parametric Begg's test results were considered to estimate and test heterogeneity measures (Shi et al., 2017).

For computing the pooled estimates of effect size, i.e., OR, there are two approaches, viz., Fixed Effects Model (FEM) and Random Effects Model (REM). The FEM in meta-analysis assumes that all studies in the meta-analysis have a common effect size, say δ, while each observed effect size, say $\hat{\delta}_i$, could vary among studies because of the random errors from each study, say ϵ_i. It is assumed further that all factors, which influence the effect size, are the same in all the studies.

Now, $\hat{\delta}_i = \delta + \epsilon_i$, where $\epsilon_i \sim N(0, \hat{\sigma}_i^2)$, and $\hat{\delta}_i \sim N(\delta, \sigma_i^2)$.

The common effect size δ is estimated as the weighted average of the individual observed effect, i.e., $\hat{\delta} = \sum_{i=1}^{K} \omega_i \hat{\delta}_i$ and the estimated variance $\hat{\delta}$ is taken to be:

$$\hat{\sigma}^2 = var(\hat{\delta}) = \sum_{i=1}^{K} \omega_i^2 \sigma_i^2 .$$ A popular weight scheme is inverse variance:

$$\omega_i = \frac{1}{\hat{\sigma}_i^2} \times \frac{1}{\omega}, \text{ where } \omega = \sum_{i=1}^{K} \omega_i .$$

The overall effects size obtained from FEM model has limited validity beyond the studies included in the analysis. FEM would be reasonable when the studies are homogeneous.

The REM in meta-analysis assumes the effect size for each study, say $\hat{\delta}_{iR}$, is varying with mean δ_{iR} and variance σ_i^2. This model further assumes that δ_{iR} follows a random distribution with mean

δ and variance τ^2, and the between-study variability around the global effect size δ. Hence, the random-effects model is written as $\hat{\delta}_{iR} \sim N(\delta_{iR}, \sigma_i^2)$, $\delta_{iR} \sim N(\delta, \tau^2)$. Further, the random-effects model can be written as: $\hat{\delta}_{iR} = \delta + \nu_i + \epsilon_i$, where $\nu_i \sim N(0, \tau^2)$, and $\epsilon_i \sim N(0, \sigma_i^2)$ where ν_i and ϵ_i are independent. Here, $\hat{\delta}_{iR} \sim N(\delta, \sigma_i^2 + \tau^2)$.

The global effect size δ is estimated as the weighted mean.

Here, $\hat{\delta}_R = \dfrac{\sum_{i=1}^{K} \omega_{iR} \hat{\delta}_{iR}}{\sum_{i=1}^{K} \omega_{iR}}$ with $\mathrm{Var}\,(\hat{\delta}_R) = \dfrac{1}{\sum_{i=1}^{K} \omega_{iR}}$.

Here, the weighting scheme is based on inverse variance, $\hat{\omega}_{iR} = \dfrac{1}{\sigma_i^2 + \tau^2}$. The most commonly used estimate for τ^2, say $\hat{\tau}^2$, was suggested by DerSimonian and Laird (1986), also referred to as the Cochran-DerSimonian-Laird procedure. Both τ^2 and τ are measures of the dispersion of true effect sizes between studies in terms of the scale of the effect size. τ^2 is an estimate of the variance and a measure of the heterogeneity of the true effect sizes (see Borenstein et al., 2009, for the estimation). This estimate is given as

$$\hat{\tau}^2 = \frac{Q - (K - 1)}{U} \quad \text{if } Q > K - 1, \text{ otherwise, } \hat{\tau}^2 = 0.$$

Here, $Q = \displaystyle\sum_{i=1}^{K} \omega_i (\hat{\delta}_i - \hat{\delta})^2$ and $U = \displaystyle\sum_{i=1}^{K} \left(\omega_i - \frac{\sum_{i=1}^{K} \omega_i^2}{\sum_{i=1}^{K} \omega_i} \right).$

Also, ω_i is the weight from the ith study, the inverse-variance for each study, $\hat{\delta}_i$ is the ith study effect size, and $\hat{\delta}$ is the summary effect. Conceptually, the results of the REM model are generalizable. RE does not presume a common overall effect size. REM is more appropriate when the studies are heterogeneous. The selection of the model is based on the degree of heterogeneity in the effect size of included studies. To assess the heterogeneity, τ^2 measure and the significance test based on Q statistic are used. It is observed that $Q \sim \chi^2$ with (K-1) degrees of freedom (Cochran, 1952; 1954). Further, Higgins and Thompson (2002) and Higgins et al. (2003) proposed the I^2 index which is defined as $I^2 = \left(\dfrac{Q - (K - 1)}{Q} \right) \times 100\%$. This index represents the ratio of excess dispersion to total dispersion and is similar to the well-known R^2 in classical regression. Higgins et al. (2003) consider a value of the I^2 index around 25%, 50%, and 75% as low, moderate, and high heterogeneity, respectively. When I^2 is higher than 75%, the REM is considered for the meta-analysis. Based on the level of heterogeneity the pooled effect size is computed. When the heterogeneity measure (I^2) $\geq 75\%$, the study, as per the convention, considers the pooled measure from the random effects model, and otherwise used the common/fixed effects models. For all the computation, the study used the R 'meta' package.

III. Results of the Systematic Analysis

This section presents a review of articles through the themes, study description, and nature of migration described in the respective studies, discussing the association between socio-demographic profile variables and migration, based on empirical findings provided by 16 individual studies retained in this systematic review.

Table 3: Summary of the Study Characteristics of the Included Studies

Study Reference	Setting	Study Year/ Period	Sample Size	Regression Model	Types of Migration	Vulnerability Indicators Used	Nature of Mitigation
Alam et al. (2016)	Bangladesh	2014	380	Multinomial logit model	I	A,G,S	EP
Sucharita & Rout (2020)	Jharkhand	2007-08	1000	Logistic regression	I	S,A,G,E	EP,EA
Pradhan & Narayanan (2020)	Semi-Arid Tropics region of India	2013-14	850	Logistic regression	I	S,A,D,G,E	EP,EA
Carrico & Donato (2019)	Bangladesh	2014	1695	Logistic regression	I&II	A	EP
Ezra & Kiros (2001)	Ethiopia	1984-1994	2000	Discrete time hazard model	I	A,G,E	EP
Lewin et al. (2012)	Malawi	2004-05	9790	Probit regression	I	A,G	EP
Jha et al. (2018)	Bihar, India	2015	700	Logistic regression	I	A,E	EP,EA
Kabir et al. (2018)	Bangladesh	Not specified	75	Logistic regression	I	S	EP
Khangher et al. (2012)	Bangladesh	2006-07	480918	Probit regression	I&II	S,A,D	EP
Kumar & Bhagat (2017)	Bihar, India	2013	450	Multinomial Analysis	I&II	S,G,E	EA
Nguyen et al. (2015)	Vietnam	2007-10	2200	Probit Regression	I	A,D,G	EP
Shonchoy (2015)	Bangladesh	Not specified	290	Bivariate probit	I	S,A,G,E	EP,EA
Song & Liang (2016)	China	2002-03	78212	Discrete time survival model	I&II	A,G,E	EA
Sabates-Wheeler et al. (2007)	Ghana and Egypt	1997-1998	1290	Probit regression	I	A	EP,EA
Thiede & Gray (2016)	Indonesia	2000 & 2007-2008	27149	Multinomial logistic regression	I&II	A,G,E	EP
Pradhan & Narayanan (2019)	India	2005-2014	210	Logistic regression	I	A,D,G,E	EP,EA

Notes: 1) Nature of migration is denoted as I = Internal, II = External
    2) Vulnerability indicators are denoted as S = Size of the household, A = Age of the household head, D = Dependency ratio, G = Gender of the household head, E = Education of the household head.
    3) Natures of migrations are denoted as: EA = Ex-ante and EP = Ex-post
Source: Table created by author based on the search results

Table 4: Nature of the Relationship between Household Livelihood Vulnerability Indicators and Migration, by Studies

Sl. No.	Studies	Size of the Household/ Family	Age	Dependency Ratio	Gender	Education
1	Alam et al. (2016)		(−)		(−)	(+)
2	Sucharita (2020)	(−)	(−)		(+)	(N)
3	Pradhan & Narayanan (2020)	(+)	(−)	(−)	(+)	(−)
4	Carrico & Donato (2019)*		(+)			
5	Carrico & Donato (2019)*		(−)			
6	Ezra & Kiros (2001)		(+)		(−)	(−)
7	Jha et al. (2018)		(+)			(+)
8	Kabir et al. (2018)*	(+)				
9	Kabir et al. (2018)*	(−)				
10	Khandker et al. (2012)	(+)	(−)	(+)		
11	Kumar & Bhagat (2017)*	(N)			(+)	(+)
12	Kumar & Bhagat (2017)*					(N)
13	Lewin et al. (2012)		(−)		(−)	
14	Nguyen et al. (2015)		(+)	(−)	(−)	
15	Shonchoy (2015)	(N)	(N)		(+)	(−)
16	Song & Liang (2016)*		(+)		(+)	(+)
17	Song & Liang (2016)*		(−)			(N)
18	Song & Liang (2016)*		(N)			
19	Thiede & Gray (2016)		(−)		(+)	(+)
20	Thiede & Gray (2016)*				(−)	(N)
21	Pradhan & Narayanan (2019)*		(+)	(−)	(N)	(−)
22	Pradhan & Narayanan (2019)*			(N)		
23	Sabates-Wheeler et al. (2008)		(+)		(+)	
24	TOTAL	07	17	05	13	13

Notes: *The existence of more than one relationship in an individual study shows that multiple experiments were taken place in that particular study. (+) sign indicates a positive relationship, (−) sign indicates a negative association, and (N) indicates insignificant.

Source: Table created by author based on the search results

In sum, Table 3 shows that this study included approximately 31.25 percent of articles from India and Bangladesh, with the remainder coming from China, Ethiopia, Malawi, Vietnam, Indonesia, Ghana-Egypt, and Syria. All retrieved articles have similar features concerning the population type, study design, type of paper, and discussion relevant to livelihood vulnerability and migration on the basis of statistical evidence. This section provides a brief summary of each of the articles included in the review. The study covered the period from 1984 to 2014. The sample size ranged from 75 to 480000. The regression models included in the study are namely logit, probit, linear probability, and discrete-time survival models. Of 16 studies, 8 studies have shown that rural households used migration as an ex-post strategy, 2 studies have found migration as an ex-ante strategy, and the remaining 6 studies indicated migration as both ex-post and ex-ante.

From Table 4, it may be inferred that the association between the size of the household/ family and migration is positive and significant in the majority of the studies. Of 8 studies, 4 studies show a significant positive link between the size of a household and migration (Abdelali-Martini and Hamza, 2014; Pradhan and Narayanan, 2020; Kabir et al., 2018; and Khandker et al., 2012). In other words, the larger the household size, the more likely the rise in the rate of migration or the decision to migrate. Another two studies revealed a significant negative association between the size of the household and migration (Sucharita, 2020; and Kabir et al., 2018). Migration is less common in households with more members than the households with fewer members. The remaining two studies show no significant association.

Also from Table 4, out of 15 studies, 7 studies support the positive relationship between age and migration (Carrico and Donato, 2019; Ezr and Kiros, 2001; Jha et al., 2018; Nguyen et al., 2015; Song and Liang, 2016; Pradhan and Narayanan, 2019; and Sabates-Wheele et al., 2008). This indicates that the propensity for migration significantly rises with the rise in the age of the household heads. On the other hand, a negative association was also supported by 9 studies (Abdelali-Martini and Hamza, 2014; Alam et al., 2016; Sucharita, 2020; Carrico and Donato, 2019; Pradhan and Narayanan, 2020; Khandker et al., 2012; Lewin et al., 2012; Song and Liang, 2016; and Thiede and Gray, 2016), and such association explains that with a rise in the age of the household heads, the propensity to migrate declines. Two other studies found no significant association between the age of the head of the households and migration. De Haan (1999) and Castro and Rogers (1984) have observed that the relationship between migration and the age of the household head has an inverse U-shaped association; i.e., the likelihood reaches its pinnacle in the initial adult years then starts to decline with age after that. While considering the dependency ratio of a household and migration, out of 4 studies, 3 studies found a significant negative relationship between the dependency ratio of a household and migration (Pradhan and Narayanan, 2020; Nguyen et al., 2015; and Pradhan and Narayanan, 2019). That is, when a household has a larger dependence ratio, the likelihood of any member migrating from that home is lower than the household has fewer dependents. Only one study revealed a significant positive association between dependency ratio and migration (Khandker et al., 2012). Hence, all the studies mentioned a significant link.

On the association between education and migration, out of 11 studies, 6 studies revealed a significant positive association (Alam et al., 2016; Jha et al., 2018; Kumar and Bhagat, 2017; Song and Liang, 2016; Thiede and Gray, 2016; and Pradhan and Narayanan, 2019) which implies that an increase in the year of household heads' educational attainment increases the probability of the migration decision. Here, the inverse U-shaped association is observed between the household head's education and migration, i.e., the likelihood reaches its peak at a threshold level in years of schooling then starts to decline with increasing years of education beyond the threshold level. The
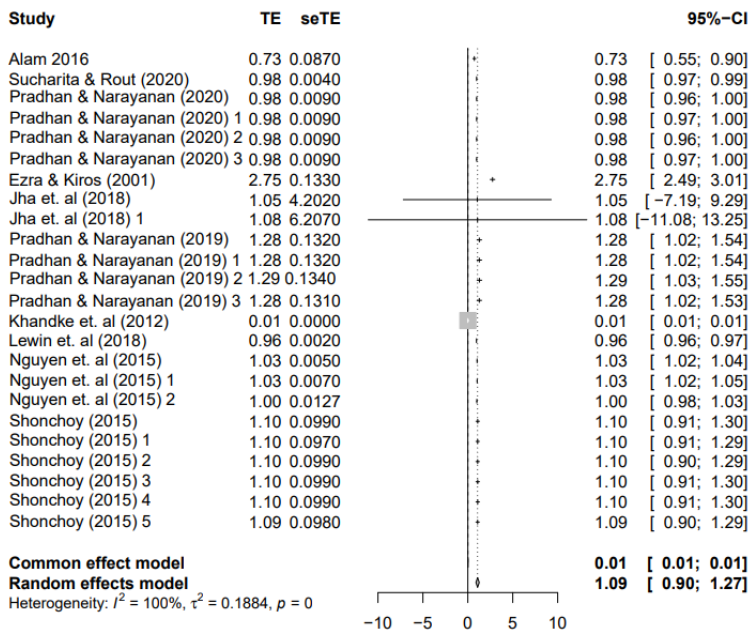
other 5 studies showed significant negative relationships (Abdelali-Martini and Hamza, 2014; Pradhan and Narayanan, 2020; Ezra and Kiros, 2001; Shonchoy, 2015; and Pradhan and Narayanan, 2019). All the 11 studies found a significant relationship between education and migration.

Of 12 studies that made an attempt towards finding the likelihood by gender of household head and migration, 6 studies took male gender as a study variable (Alam et al., 2016; Sucharita, 2020; Shonchoy, 2015; Ezra and Kiros, 2001; and Sabates-Wheeler et al., 2008). And out of these 6 studies, only 4 studies found that the male-headed household probability of migration was higher than the female-headed households, and the remaining 2 studies showed that the female-headed households have a larger propensity to migrate than male-headed households. On the other hand, another 6 studies took the female gender as a study variable (Pradhan and Narayanan, 2020; Kumar and Bhagat, 2017; Lewin et al., 2012; Nguyen et al., 2015; Thiede and Gray, 2016; and Pradhan and Narayanan, 2019) and out of these 6 studies, only 3 studies found that female-headed households are more likely to migrate than male-headed households, and 2 other studies showed that the probability to migrate is larger among male-headed households than the female-headed households. The remaining study was found to be insignificant.

IV. Meta-analysis

The effect size for the Meta-analysis was the odds ratio (OR) for migration. The odds ratio was summarized for each of the vulnerability indicators to demonstrate the nature and extent of impact of the indicators. The heterogeneity of the impact was assessed using graphical and statistical methods. Based on this assessment pooled effect size was estimated and the results were interpreted.

Table 5: Forest Plot for OR of Migration by Age of the Household Heads

Study	TE	seTE	95%-CI
Alam 2016	0.73	0.0870	0.73 [0.55; 0.90]
Sucharita & Rout (2020)	0.98	0.0040	0.98 [0.97; 0.99]
Pradhan & Narayanan (2020)	0.98	0.0090	0.98 [0.96; 1.00]
Pradhan & Narayanan (2020) 1	0.98	0.0090	0.98 [0.97; 1.00]
Pradhan & Narayanan (2020) 2	0.98	0.0090	0.98 [0.96; 1.00]
Pradhan & Narayanan (2020) 3	0.98	0.0090	0.98 [0.97; 1.00]
Ezra & Kiros (2001)	2.75	0.1330	2.75 [2.49; 3.01]
Jha et. al (2018)	1.05	4.2020	1.05 [−7.19; 9.29]
Jha et. al (2018) 1	1.08	6.2070	1.08 [−11.08; 13.25]
Pradhan & Narayanan (2019)	1.28	0.1320	1.28 [1.02; 1.54]
Pradhan & Narayanan (2019) 1	1.28	0.1320	1.28 [1.02; 1.54]
Pradhan & Narayanan (2019) 2	1.29	0.1340	1.29 [1.03; 1.55]
Pradhan & Narayanan (2019) 3	1.28	0.1310	1.28 [1.02; 1.53]
Khandke et. al (2012)	0.01	0.0000	0.01 [0.01; 0.01]
Lewin et. al (2018)	0.96	0.0020	0.96 [0.96; 0.97]
Nguyen et. al (2015)	1.03	0.0050	1.03 [1.02; 1.04]
Nguyen et. al (2015) 1	1.03	0.0070	1.03 [1.02; 1.05]
Nguyen et. al (2015) 2	1.00	0.0127	1.00 [0.98; 1.03]
Shonchoy (2015)	1.10	0.0990	1.10 [0.91; 1.30]
Shonchoy (2015) 1	1.10	0.0970	1.10 [0.91; 1.29]
Shonchoy (2015) 2	1.10	0.0990	1.10 [0.90; 1.29]
Shonchoy (2015) 3	1.10	0.0990	1.10 [0.91; 1.30]
Shonchoy (2015) 4	1.10	0.0990	1.10 [0.91; 1.30]
Shonchoy (2015) 5	1.09	0.0980	1.09 [0.90; 1.29]
Common effect model			**0.01 [0.01; 0.01]**
Random effects model			**1.09 [0.90; 1.27]**
Heterogeneity: I^2 = 100%, τ^2 = 0.1884, p = 0			

−10 −5 0 5 10

Notes: i) TE = Odds ratio, seTE = Standard error of the Odds ratio, CI = Confidence Interval; ii) Numerals such as 1,2,3,4, and 5 in the study column show multiple experiments in the same study.

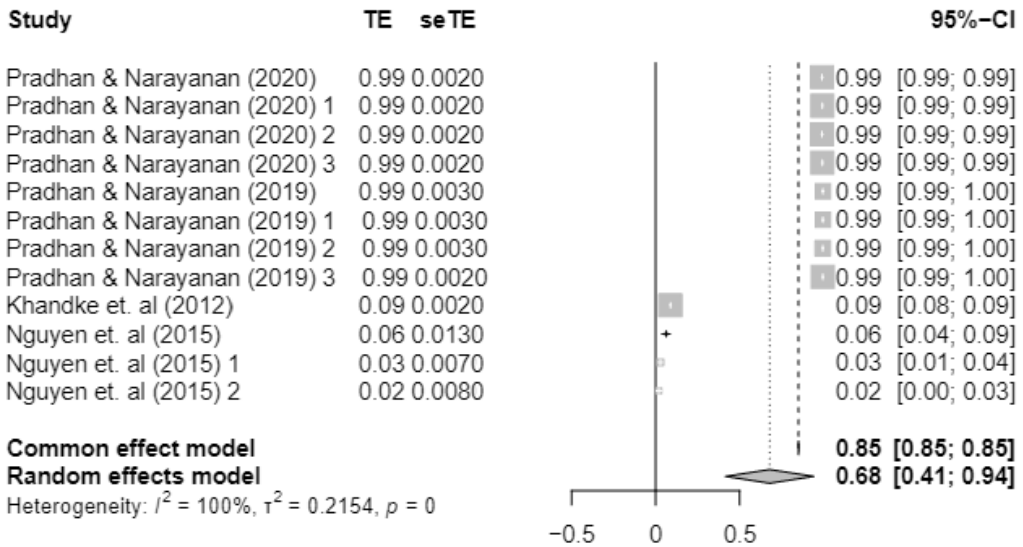*Source:* Table created by author through estimations

Figure 2: Funnel Plot for OR of Migration by Age of the Household Heads
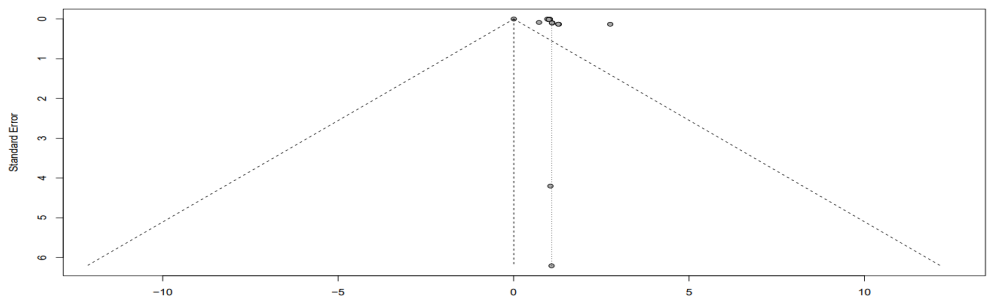
Source: Figure created by author through computations

In the funnel plot shown in Figure 2, an asymmetric pattern has been observed; this implies that there is an association between effect size and standard error. It is further confirmed by Begg's test (z = -4.42, p < 0.05). The results presented in Table 5 indicated that heterogeneity among the studies is equal to or more than 75% and is significant ($\tau^2 = 0.1884$, p<0.05, $I^2 \geq 75\%$). Therefore, the pooled effect estimation based on the random effect model is considered for this particular analysis. The meta-analysis estimated pooled effect in this study as 1.09. This pooled estimation indicates that the probability of migration significantly rises with the increase in the age of the household heads (pooled odds ratio=1.09; CI [0.90, 1.27]).

Table 6: Forest Plot for OR of Migration by Dependency Ratio of the Household

Study	TE	seTE		95%−CI
Pradhan & Narayanan (2020)	0.99	0.0020		0.99 [0.99; 0.99]
Pradhan & Narayanan (2020) 1	0.99	0.0020		0.99 [0.99; 0.99]
Pradhan & Narayanan (2020) 2	0.99	0.0020		0.99 [0.99; 0.99]
Pradhan & Narayanan (2020) 3	0.99	0.0020		0.99 [0.99; 0.99]
Pradhan & Narayanan (2019)	0.99	0.0030		0.99 [0.99; 1.00]
Pradhan & Narayanan (2019) 1	0.99	0.0030		0.99 [0.99; 1.00]
Pradhan & Narayanan (2019) 2	0.99	0.0030		0.99 [0.99; 1.00]
Pradhan & Narayanan (2019) 3	0.99	0.0020		0.99 [0.99; 1.00]
Khandke et. al (2012)	0.09	0.0020		0.09 [0.08; 0.09]
Nguyen et. al (2015)	0.06	0.0130		0.06 [0.04; 0.09]
Nguyen et. al (2015) 1	0.03	0.0070		0.03 [0.01; 0.04]
Nguyen et. al (2015) 2	0.02	0.0080		0.02 [0.00; 0.03]
Common effect model				**0.85 [0.85; 0.85]**
Random effects model				**0.68 [0.41; 0.94]**
Heterogeneity: $I^2 = 100\%$, $\tau^2 = 0.2154$, $p = 0$				

Notes: i) TE = Odds ratio; seTE = Standard error of the odds ratio; CI = Confidence Interval; ii) Numerals such as 1,2,3,4, and 5 in the study column show multiple experiments in the same study.
Source: Table created by author through estimations

Figure 3: Funnel Plot for OR of Migration by Dependency Ratio of the Household
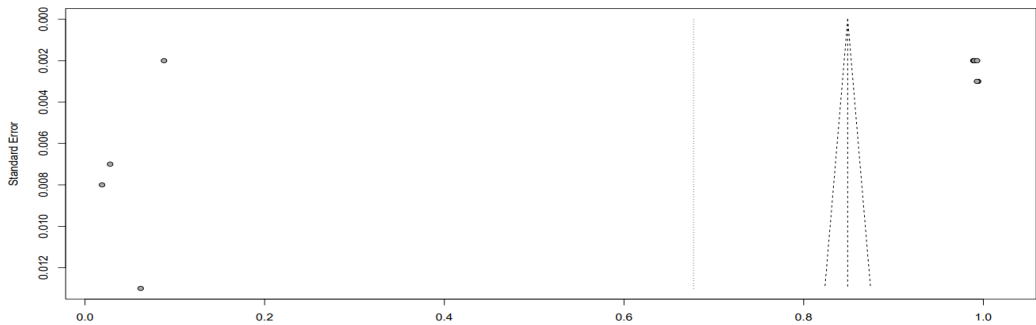
Source: Figure created by author through computations

In the funnel plot shown in Figure 3, an asymmetric pattern has been observed, indicating that there is a relationship between effect size and standard error. It is further confirmed by Begg's test (z = -2.25, p < 0.05). The results presented in Table 6 indicated that heterogeneity among the studies is equal to or more than 75% and is significant ($\tau^2 = 0.2154$, p<0.05, $I^2 \geq 75\%$). Therefore, the pooled effect estimation based on the random effect model is considered for this particular analysis. The meta-analysis estimated pooled effect in this study as 0.68. This pooled estimation indicates that the propensity of migration significantly decreases with the increase in the household dependency ratio (pooled odds ratio = 0.68 CI [0.41, 0.94]).

The impact of the education of household heads on migration has been discussed in two sub-sections. The estimation of the association between education and migration differs across the all included studies, some studies used illiterate as a reference variable to estimate the association, and other studies estimated the association with the years of the education of the household.

Table 7: Forest Plot for OR of Migration by Education of the Household Head (Illiterate as Reference Category)

Study	TE	seTE		95%−CI
Ezra & Kiros (2001)	5.28	0.6350	5.28	[4.03; 6.52]
Song & Liang (2016)	7.94	7.8770	7.94	[−7.49; 23.38]
Song & Liang (2016) 1	2.55	0.4840	2.55	[1.60; 3.50]
Shonchoy (2015)	0.36	0.1430	0.36	[0.08; 0.64]
Shonchoy (2015) 1	0.37	0.1470	0.37	[0.08; 0.66]
Shonchoy (2015) 2	0.37	0.1480	0.37	[0.08; 0.66]
Shonchoy (2015) 3	0.37	0.1470	0.37	[0.08; 0.66]
Shonchoy (2015) 4	0.36	0.0790	0.36	[0.20; 0.51]
Kumar & Bhagat (2017)	0.44	224.0000	0.44	[−438.59; 439.47]
Kumar & Bhagat (2017) 1	0.88	0.5300	0.88	[−0.16; 1.92]
Common effect model			0.43	[0.33; 0.53]
Random effects model			1.28	[0.14; 2.43]

Heterogeneity: $I^2 = 89\%$, $\tau^2 = 2.6218$, $p < 0.01$

Notes: i) TE = Odds ratio; seTE = Standard error of the odds ratio; CI = Confidence Interval; ii) Numerals such as 1,2,3,4, and 5 in the study column show multiple experiments in the same study.
Source: Table created by author through estimation

Figure 4: Funnel Plot for OR of Migration by Education of the Household Head (Illiterate as Reference Category)
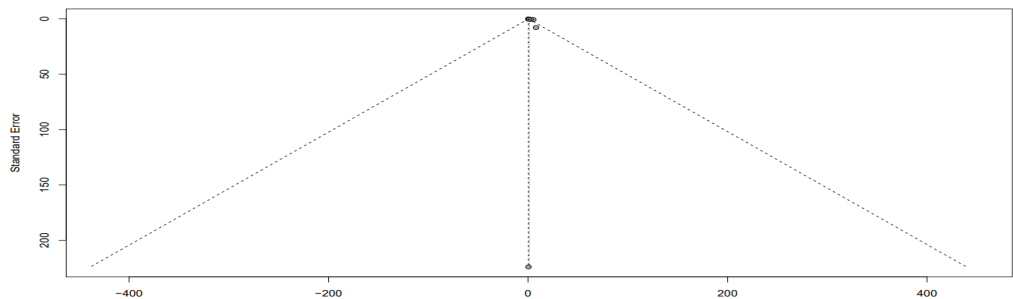
Source: Figure created by author through computations

In the funnel plot shown in Figure 4, an asymmetric pattern has been observed, which implies that there is an association between effect size and standard error. It is further confirmed by Begg's test ($z = 2.69$, $p < 0.05$). The results presented in Table 7 indicated that heterogeneity among the studies is equal to or more than 75% and is significant ($\tau^2 = 2.6218$, $p<0.05$, $I^2 \geq 75\%$). Therefore, the pooled effect estimation random effect model is considered for this particular analysis. The meta-analysis estimated pooled effect in this study as a 1.28 pooled odds ratio. This pooled estimation indicates that the propensity of migration significantly rises with the increase in the household heads' education compared to the illiterate household heads (pooled odds ratio=1.28 CI [0.14, 2.43]).

Table 8: Forest Plot for OR of Migration by Years of Education of the Household Head

Study	TE	seTE		95%-CI
Alam 2016	1.07	0.0340		1.07 [1.01; 1.14]
Pradhan & Narayanan (2020)	0.95	0.0270		0.95 [0.89; 1.00]
Pradhan & Narayanan (2020) 1	0.90	0.0240		0.90 [0.85; 0.95]
Pradhan & Narayanan (2020) 2	0.95	0.0270		0.95 [0.89; 1.00]
Pradhan & Narayanan (2020) 3	0.90	0.0240		0.90 [0.85; 0.95]
Jha et. al (2018)	1.17	5.9670		1.17 [−10.52; 12.87]
Jha et. al (2018) 1	1.16	5.1730		1.16 [−8.98; 11.30]
Pradhan & Narayanan (2019)	0.78	0.1010		0.78 [0.58; 0.98]
Pradhan & Narayanan (2019) 1	0.86	0.1040		0.86 [0.66; 1.06]
Pradhan & Narayanan (2019) 2	0.78	0.1050		0.78 [0.58; 0.99]
Pradhan & Narayanan (2019) 3	0.86	0.1090		0.86 [0.64; 1.07]
Common effect model				**0.93 [0.91; 0.96]**
Random effects model				**0.92 [0.87; 0.98]**
Heterogeneity: $I^2 = 62\%$, $\tau^2 = 0.0041$, $p < 0.01$				

Notes: i) TE = Odds ratio; seTE =Standard error of the odds ratio; CI = Confidence Interval; ii) Numerals such as 1,2,3,4, and 5 in the study column show multiple experiments in the same study.
Source: Table created by author through estimations

Figure 5: Funnel Plot for OR of Migration by Years of Education of the Household Head
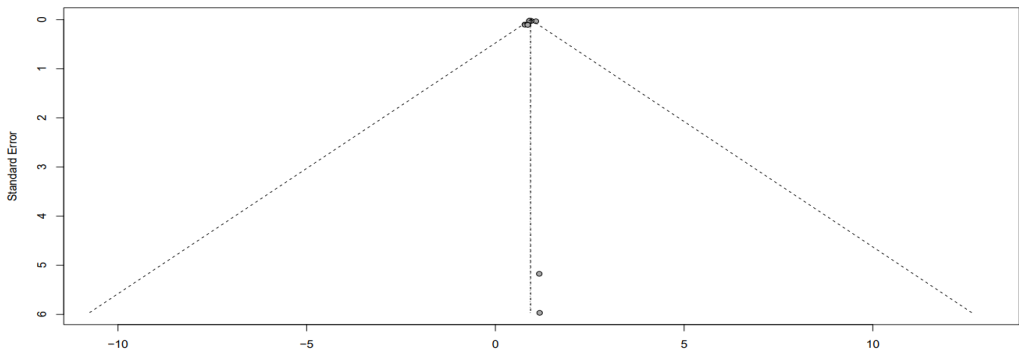
Source: Figure created by author through computations

In the funnel plot shown in Figure 5, a symmetric pattern has been observed, which implies that there is no association between effect size and standard error. It is further confirmed by Begg's test (z = 1.02, p > 0.05). The results presented in Table 8 indicated that heterogeneity among the studies is less than 75% and is significant (τ^2 = 0.0041, p<0.05, I^2 < 75%). Therefore, the pooled effect estimation common effect model is considered for this particular analysis. The meta-analysis estimated pooled effect in this study as a 0.93 pooled odds ratio. This pooled estimation indicates that the propensity of migration significantly decreases with the increase in the household heads' years of education (pooled odds ratio = 0.93 CI [0.91, 0.96]).

Table 9: Forest Plot for OR of Migration by Gender of the Household Head
(Female Head as Reference Category)

Study	TE	seTE		95%−CI
Alam 2016	0.88	0.0359		0.88 [0.81; 0.95]
Sucharita & Rout (2020)	14.03	1.8970		14.03 [10.31; 17.75]
Ezra & Kiros (2001)	0.46	0.0340		0.46 [0.39; 0.53]
Ezra & Kiros (2001) 1	0.46	0.0350		0.46 [0.39; 0.53]
Ezra & Kiros (2001) 2	0.46	0.0350		0.46 [0.39; 0.53]
Ezra & Kiros (2001) 3	0.46	0.0350		0.46 [0.39; 0.53]
Shonchoy (2015)	5.31	3.7160		5.31 [−1.98; 12.59]
Shonchoy (2015) 1	5.21	3.6210		5.21 [−1.89; 12.31]
Shonchoy (2015) 2	5.14	3.5940		5.14 [−1.90; 12.19]
Shonchoy (2015) 3	5.14	3.5940		5.14 [−1.90; 12.19]
Shonchoy (2015) 4	5.16	3.6260		5.16 [−1.94; 12.27]
Shonchoy (2015) 5	5.56	3.9350		5.56 [−2.15; 13.27]
Pradhan & Narayanan (2020)	0.34	0.1110		0.34 [0.12; 0.56]
Pradhan & Narayanan (2020) 1	0.38	0.1100		0.38 [0.17; 0.60]
Pradhan & Narayanan (2020) 2	0.45	0.1550		0.45 [0.14; 0.75]
Pradhan & Narayanan (2020) 3	0.45	0.1330		0.45 [0.19; 0.71]
Pradhan & Narayanan (2019)	0.62	0.4580		0.62 [−0.27; 1.52]
Pradhan & Narayanan (2019) 1	1.13	0.6950		1.13 [−0.24; 2.49]
Pradhan & Narayanan (2019) 2	0.61	0.4480		0.61 [−0.27; 1.49]
Pradhan & Narayanan (2019) 3	1.12	0.6980		1.12 [−0.25; 2.48]
Lewin et. al (2018)	1.58	0.1350		1.58 [1.32; 1.85]
Nguyen et. al (2015)	1.30	0.2870		1.30 [0.74; 1.86]
Nguyen et. al (2015) 1	1.21	0.3130		1.21 [0.60; 1.82]
Nguyen et. al (2015) 2	1.20	0.4450		1.20 [0.33; 2.07]
Kumar & Bhagat (2017)	0.07	0.0280		0.07 [0.02; 0.13]
Kumar & Bhagat (2017) 1	0.09	0.0330		0.09 [0.02; 0.15]
Common effect model				0.39 [0.37; 0.42]
Random effects model				0.70 [0.47; 0.93]
Heterogeneity: I^2 = 96%, τ^2 = 0.2044, p < 0.01				

Notes: i) TE = Odds ratio; seTE = Standard error of the odds ratio; CI = Confidence Interval; ii) Numerals such as 1,2,3,4,and 5 in the study column show multiple experiments in the same study.
Source: Table created by author through estimations

**Figure 6: Funnel Plot for OR of Migration by Gender of the Household Head
(Female Head as Reference Category)**
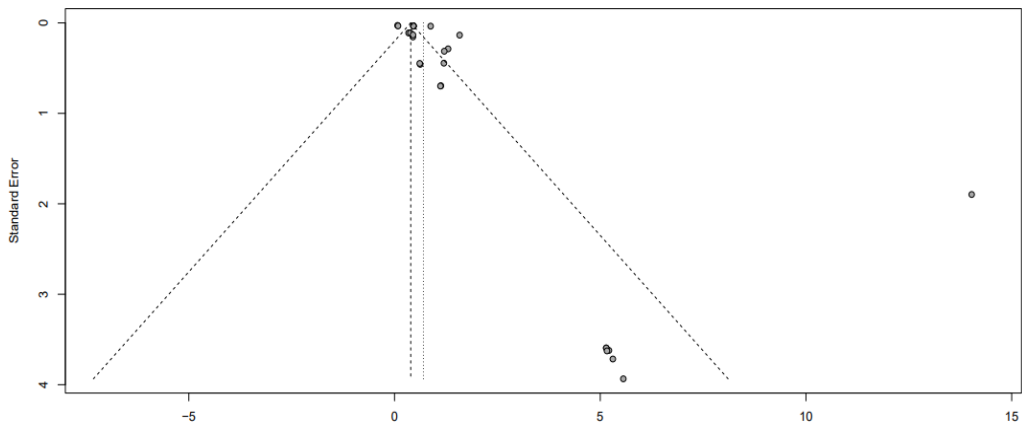
Source: Figure created by author through computations

In the funnel plot shown in Figure 6, a symmetric pattern has been observed, which shows that there is no association between effect size and standard error. It is further confirmed by Begg's test (z = 0.46, p = 0.6429). The results presented in Table 9 indicated that heterogeneity among the studies is equal to or more than 75% and is significant (τ^2 = 0.2044, p<0.05, $I^2 \geq 75\%$). Therefore, the pooled effect estimation random effect model is considered for this particular analysis. The meta-analysis estimated pooled effect in this study as a 0.70 pooled odds ratio. This pooled estimation indicates that the propensity of migration is significantly high for female-headed households compared to the male-headed households (pooled odds ratio = 0.70 CI [0.47, 0.93]).

**Table 10: Forest Plot for OR of Migration by Size of the Household**

Study	TE seTE		95%-CI
Sucharita & Rout (2020)	0.96 0.0160		0.96 [0.93; 1.00]
Pradhan & Narayanan (2020)	1.32 0.0690		1.32 [1.18; 1.45]
Pradhan & Narayanan (2020)1	1.22 0.0510		1.22 [1.12; 1.32]
Pradhan & Narayanan (2020)2	1.32 0.0690		1.32 [1.18; 1.45]
Pradhan & Narayanan (2020)3	1.22 0.0510		1.22 [1.12; 1.32]
Kabir et. al (2018)	2.11 0.9600		2.11 [0.23; 3.99]
Khandke et. al (2012)	0.01 0.0000		0.01 [0.01; 0.01]
Shonchoy (2015)	1.14 0.1670		1.14 [0.82; 1.47]
Shonchoy (2015) 1	1.16 0.1670		1.16 [0.83; 1.48]
Shonchoy (2015) 2	1.15 0.1680		1.15 [0.82; 1.48]
Shonchoy (2015) 3	1.16 0.1680		1.16 [0.83; 1.49]
Shonchoy (2015) 4	1.56 0.1670		1.56 [1.23; 1.89]
Shonchoy (2015) 5	1.14 0.1670		1.14 [0.81; 1.46]
Common effect model			0.01 [0.01; 0.01]
Random effects model			1.11 [0.89; 1.34]
Heterogeneity: I^2 = 100%, τ^2 = 0.1475, p = 0			

Notes: i) TE = Odds ratio; seTE = Standard error of the odds ratio; CI = Confidence Interval; ii) Numerals such as 1,2,3,4, and 5 in the study column show multiple experiments in the same study.
Source: Table created by author through estimations

Figure 7: Funnel Plot for OR of Migration by Size of the Household
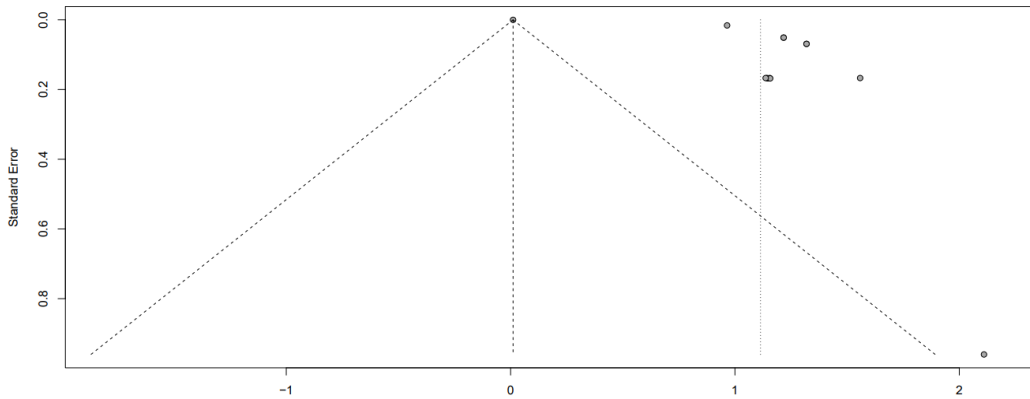
Source: Figure created by author through computations

In the funnel plot shown in Figure 7, an asymmetric pattern has been observed, which indicates that there is a relationship between effect size and standard error. It is further confirmed by Begg's test (z = -2.44, p < 0.05). The results presented in Table 10 indicated that heterogeneity among the studies is equal to or more than 75% and is significant ($\tau^2 = 0.1475$, p<0.05, $I^2 \geq 75\%$). Therefore, the pooled effect estimation random effect model is considered for this particular analysis. The meta-analysis estimated pooled effect in this study as 1.11. This pooled estimation indicates that the probability of migration significantly increases with the increase in the Size of the household (pooled odds ratio = 1.11 CI [0.89, 1.34]).

In sum, in the meta-analysis on the association between vulnerability indicators and migration, the odds ratio between each vulnerability indicator on migration is summarized separately. The study has found a significant association between each indicator of vulnerability and migration. The male-headed household has a low likelihood of migration. The pooled migration odds ratio for a male-headed household is 0.7. This indicates that the probability of migration is significantly lower for a male than for a female-headed household. In the education indicator, the literate household heads have higher odds of migration with a pooled OR of 1.28. The probability of migration significantly increases with the increase in household education compared to the illiterate. On the other hand, a 0.93 pooled odds ratio is found for the number of years of education that the household heads have, which indicates that the probability of migration significantly decreases with the increase in the household year of education. The next size of the household on migration has found a 1.11 pooled odds ratio that indicates the probability of migration significantly increasing with the increase in the household size. Finally, years of education of the household heads have an estimated 1.09 pooled odds ratio, which indicates that the probability of migration significantly rises with the increase in the age of the household heads. Dependency ratio on migration, i.e., 0.68 pooled odds ratio, indicates that the propensity of migration significantly decreases with the increase in the household dependency ratio. Followed by a female-headed household on migration, a 0.70 pooled odds ratio indicates that the propensity to migrate is significantly low for female-headed households compared to male-head households.

The study discovered that four of the six indicators have a significantly positive association with migration after analyzing the pooled effect sizes of OR for different vulnerability indicators at the household level. Therefore, the higher vulnerability has contributed to increased migration.

V. Conclusion

This study attempted to determine whether or not household livelihood vulnerability influences migration by carrying out a systematic review and meta-analysis. The study also aimed to find the extent of migration as a mitigation strategy in response to household livelihood vulnerability. The analysis based on PRISMA has revealed a significant positive effect of household livelihood vulnerability household on migration. The odds for migration by different household vulnerability indicators were observed from select meta-studies. The meta-analysis revealed that the Odds for migration measured as Odds Ratio (OR) in four of the six household vulnerability indicators had a significantly positive association with migration. Therefore, the study concluded that the higher vulnerability has contributed to increased migration.

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