Volume - 1

ISSN - 2664-0945;2664-0953

Multidisciplinary Journal of Social Science Research Council

Social Science Research Council (SSRC) Bangladesh
Planning Division
Ministry of Planning
Government of the People's Republic of Bangladesh

Social Science Research Council (SSRC) Bangladesh
Planning Division
Ministry of Planning
Government of the People's Republic of Bangladesh

Volume - 1

ISSN - 2664-0945;2664-0953

Multidisciplinary Journal of Social Science Research Council

Social Science Research Council (SSRC) Bangladesh
Planning Division
Ministry of Planning
Government of the People's Republic of Bangladesh

Social Science Research Council (SSRC)
Planning Division
Ministry of Planning

Year-1 **Volume -1** **2021**

Editor : Mohammad Jainul Bari
Secretary, Planning Division

Executive Editor : Kamruzzaman
Deputy Secretary, Planning Division

Published by : Social Science Research Council
Planning Division
Ministry of Planning
Sher-E-Banglanagar, Dhaka

Cover Design : Atik Aslam

Computer Compose : Md. Aktaruzzaman

Printed by : Bersha Pvt. Ltd.
8/3 Babupura, Nilkhet, Dhaka-1205
Phone : 01308626548, 01781950242
E-mail : bersha124 @gmail.com

Price : 100.00 (One Hundred) Taka

Contact : Social Science Research Council (SSRC)
Room 22, House 06,
Ministry of Planning
Sher-E-Banglanagar, Dhaka
Phone : 9180598
E-mail : ssrc.planningdivision@yahoo.com
website : ssrc.portal.gov.bd

Volume : 1 **Number : 1** **June 2021**

Multidisciplinary Journal of Social Science Research Council.

Board of Editors

Editorial Note

Multidisciplinary Journal of Social Science Research Council (MJSSRC) is an international journal published by Social Science Research Council, Ministry of Planning of the Government of the People's Republic of Bangladesh. It is a peer reviewed journal to promote multidisciplinary query on education of different disciplines, research, practice and development. MJSSRC encompasses all scientific academic fields dealing with life, society, culture, business, law, health, science and technology. The main mission of MJSSRC is to make multidisciplinary linkage that promotes in inter-locking the different disciplines in single thread. Consequently, it contributes to mitigate different problems in cross-cultural perspective across the globe. The MJSSRC acts as a catalyst to promote and exchange ideas, views, and knowledge of different disciplines that encourage the scholars to enhance their creative and innovative knowledge in global perspective. It also helps to contribute to the knowledge of academics, researchers, policy makers, planners, practitioners and development workers in order to formulate effective as well as pragmatic policies and planning for need based "holistic development."

Four research papers have been included for publication in this volume. The first one is on demographic dividend and opportunities of overseas employment. This paper reveals that there are many potential sources of overseas employment opportunities in about 40 countries, which include both blue color and white color jobs. The second paper explores the potentials of the introduction of a transport service by Community-based Mobility Scheme (CoMS), which will be designed and operated by community people and own by them. Findings suggest that careful planning and efficient mechanisms to handle the challenges are vital for the scheme's success. The third one deals with bio-chemical factors such as vitamin B6 and hypoglycemia, which lead to develop the criminal tendency. The main focus of this paper is to examine to what extend the biochemical factors can help understand the relationship of aggression and criminal behavior. This paper explores that there is a moderate correlation between criminality and biochemical factors ($r = -.263$, $P<0.05$). The last one analyzes the dynamics of the relationship between finance and growth in Bangladesh and India using time series econometric techniques for the period 1974-2015. The ECM results show that there is a bi-directional causal relationship exists between finance and growth in Bangladesh and India.

Mohammad Jainul Bari

Table of Contents

1. **Potentials of Introducing Community-based Mobility Scheme (CoMS) in Dhaka: An Exploratory Study** 9-28

   Md. Musleh Uddin Hasan[1], Afsana Haque[2], Ishrat Islam[3] Mohammad Shakil Akther[4]

2. **Demographic Dividend of Bangladesh and Opportunities for Overseas Employment** 29-46

   1. Md. AminulHaque,*PhD*2.Md. KamrulIslam,*PhD* 3.Md. RabiulHaque,*PhD*and 4.Sadiya Afrin[1]

3. **Bio-Chemical Aspects of Criminality: A Comparative Study between Violent Criminals and Non-Criminals in Bangladesh** 47-67

   Md. Omar Faruk[1], Md. Ishtiaq Ahmed Talukder[2], KaziAminul Hasan[3]

4. **Finance – Growth Nexus in Bangladesh and India: An Econometric Analysis** 69-93

   Dr. Md. Zahirul Islam Sikder[1], Dr. Md. Abdul Wadud[2] Dr. Md. Abu Hasan[3]

Potentials of Introducing Community-based Mobility Scheme (CoMS) in Dhaka: An Exploratory Study

Md. Musleh Uddin Hasan[1]
Afsana Haque[2]
Ishrat Islam[3] **Mohammad Shakil Akther**[4]

Keywords: Urban transport. Mobility. Community. Dhaka.

Abstract: This paper explores the potentials of the introduction of a transport service, viz. Community-based Mobility Scheme (CoMS), which is designed and operated by community people and owned by them. A survey was conducted on 370 households in Rampura, Dhaka to understand the community's mobility pattern and willingness to initiate and participate in the scheme. Along with their socio-economic characteristics, regular trip information of all household members has been collected. It has been found that 71% of outbound (from home) trips of a typical day start between 7.00 am and 10.00 am; of which at least 50% are school-bound in the very morning, with gradual increase of work trips as time passes. About 39.% trip makers reach their destinations within less than 21 minutes, while another 23% reach within 22-40 minutes. Of the total trips, highest share (30%) is carried by rickshaws, followed by public bus (30%) and that on foot (15%). For men, most outbound trips are work or office trips (44% of all trips made by all). In contrast, women make trips most for accompanying children to schools (16% of total trips), followed by office trips (8% of total) and university trips (7% of total). It has been found that, on an average, the cost for a trip remains between BDT 11 and BDT 40. It is understood that during peak hours, there is a tremendous demand for mobility services in the community, particularly for women and children, to cater to the need for regular trips. Through SWOT (Strength, Weakness, Opportunities and Threats) analysis, this research assesses the community's strengths and weaknesses in accepting and managing CoMS; government policy support, i.e., opportunities towards introducing CoMS; and the existence of external threats to the service. It is found that almost 80% of the respondents are interested in using the CoMS, if introduced. There are examples of community-based activities in the study area, and the government's policy statements are also supportive of CoMS. No major external threat is found other than mobilizing the scheme and facing the regular challenges to keep the service running, if introduced. Findings suggest that careful planning and efficient mechanisms to handle the challenges are vital for the scheme's success.

1. Department of Urban and Regional Planning (URP), BUET.
2. Department of Urban and Regional Planning (URP, BUET.
3. Center for Regional Development Studies (CRDS), BUET.
4. Center for Regional Development Studies (CRDS), BUET

1. Introduction

Despite several government attempts (GDSUTP, 2016; RSTP 2015; GoB, 2004), experience, news reports, and literature show (Hasan & Dávila, 2018; Ahmed et al., 2018) urban mobility in Dhaka is in crisis. Around the globe, there are many examples in the UK, USA, China, Sri Lanka, and in other countries where an entire community or a group of the community is served with dedicated transport services (Zwart and Welsby, 2006; FEHR and Peers, 2015; Silva, 2014). However, no such example is there in the cities of Bangladesh. In fact, to the best of the authors' knowledge, this is the first-ever research on community-based transport in Bangladesh.

In such a context, this paper explores the potential of a community based transport service in Dhaka. The service proposed is named as Community-based Mobility Scheme (CoMS). This research assesses whether a community can generate enough trips to sustain a community-based initiative. Does a CoMS have any extra attraction, and what can be a potential framework for CoMS in Dhaka?

II. Theoretical Framework

Community development activities are conducted by need-based or asset-based approach. In the Need-Based Community Development (NBCD) approach, local groups begin to deal more with external institutions than with groups in their community, reinforcing the notion that "only outside experts can provide real help" (Mathie & Cunningham, 2003). Here in NBCD, categories of needs determine how much will be received, which results in fragmentation of efforts to provide solutions, denies the basic community wisdom to solve own problems (Mathie & Cunningham, 2003). The provider's or rescuer's role of the development organizations, without taking inputs from the local population, has a "disempowering" effect on local populations "by doing things for people instead of helping

them do things for themselves" (Johar, 2017). This is evident and documented in the housing up-gradation program of the government of different countries (Johar, 2017). On the other hand, Asset-based Community Development (ABCD) gives control of decisions and resources to community groups, treats poor people as partners in the development process, building on their institutions and resources (Dongier et al., 2002). Thus, people in communities drive the development process by identifying and mobilizing existing (but often unrecognized) assets and social capital, including networks and particular talents (Mathie & Cunningham, 2003).

As propounded by the World Bank, Community Driven Development (CDD) is very close and complementary to ABCD. However, the basic difference is in focus: ABCD focuses on community mobilization, while CDD focuses on institutional reform (Mathie & Cunningham, 2003). Support to CDD usually includes strengthening and financing inclusive community groups, facilitating community access to information, and promoting an enabling environment through policy and institutional reforms (Dongier et al., 2002). Beyond the mobilization of a particular community, ABCD links community-driven initiatives to the macro environment and promotes a policy environment conducive to such initiatives (Mathie & Cunningham, 2003).

In the United States, several communities have mobilized to take action for their economic and social development. In Savannah, Georgia, neighborhood redevelopment had been going on for more than 25 years, initially through municipal agencies responding to problems identified in local neighborhoods. Over time, however, municipal agencies decided to "lead by stepping back" communities shifted from being consumers of services to designers of community programs, and, finally, producers of the community (Moore & Puntenney 1999).

III. Community Transport: Global Examples

Based on the discussion above, if the nature of traditional community transport services prevailing in different cities of the world is assessed, they are either need-based or asset-based; and they are supply or providers' driven in all cases. As prevailing in different parts of the world, community transport is defined as a service that provides flexible, accessible and responsive solutions to unmet local transport needs and often represents the only means of transport for certain user groups (CTA, 2014). The schemes run on a not-for-profit basis or as a social enterprise, often involving volunteers to manage and deliver the service (CTA, 2005).

Literature (FEHR and Peers, 2015; Zwart and Welsby, 2006) shows that target users of community transport projects are usually the people who are not served by conventional public transport. They may be women not using private vehicles, persons accompanying children to school or patients to hospitals, non-car owners, older people and people with disabilities. Of the 10 million[1] disabled people in the United Kingdom, many of them depend on community transports for their mobility and independence (CTA, 2005). At Tatiara District Council, Queensland, Australia, a single 24 seat, wheelchair accessible bus, driven by a single, full-time driver, serves school-goers in the morning and afternoon and provides medical and other community services in between (Zwart and Welsby, 2006:21). Similar service is available at Marin County in the City of Novato, California, USA, only for the disabled and senior citizens (FEHR and Peers, 2015).

In some other cases, community service is provided for other disadvantaged groups as well. For example, since 1979, there is a dedicated service for rural people with limited public transport facilities at the Meopham Parish Council (MPC), Kent, UK (MPC, 2016). Similar

service is available at Kosgala, Halpe, and Kithulpe villages in the Kithulpe Grama Niladhari (GN) division of Ratnapura district, Sri Lanka (Silva, 2014).

The community transport schemes, as discussed earlier, are mostly need-based and are provided by agents outside the community: in the United Kingdom, the United States, and Australia by local councils and voluntary organizations (CTA 2014 and 2005; MPC, 2016; FEHR and Peers, 2015; Zwart and Welsby, 2006); in Sri Lanka, these are initiated by Lanka Forum for Rural Transport Development (LFRTD), and financed by Intermediate Technology Development Group (ITDG) and Lanka Forum for Rural Transport Development (LFRTD) and initially financed by Intermediate Technology Development Group (ITDG), now known as Practical Action (Silva, 2014). However, an example was found at Xinqiao. Residents and owners' associations largely do Songjiang district of the southwest of Shanghai in China, where the service provider is car leasing companies and community mobilization at neighborhoods (Sun and Doulet, 2015). The service, provided as part of a Sustainable Transport System for Suburban China, is comprised of the bus, minibus, and microbus and has three main functions: providing shuttle service to employment centers - industrial park, company, or the city center; providing feeder/ interchange service to avail public transport; and creating a network of para-transit services if two or three operators serve an area. Shuttles operate between 6:30 am and 10:00 pm with high frequencies in the morning and evening. Neighborhood shuttles can carry around 3,600 trips during the morning and the evening every day. In the other parts of the day, about 1,700 trips are carried out by shared shuttles.

This case is close to Asset Based Community Development (ABCD) approach. Yet, Sun and Doulet (2015) identify some challenges and issues for further integration: there is a lack of integration and inter-modality between shuttle/community service and regular public transport, as well as a better adapted institutional framework to facilitate and integrate the service into the public transport system as a new bottom-up solution.

Some of these problems in this Chinese case could have been addressed if there were an active community control in route choice and the service design. This example could have been elevated to another height of community-based service to which this research is suggesting.

III.1 Community-based Initiatives in Dhaka

School van (try-cycle) service, a common practice in Dhaka, is arranged by few school authorities or by local entrepreneurs for students for some neighborhoods. Circular bus service "Dhaka Chaka" at Gulshan, Baridhara, and Banani areas in the capital, launched by local community clubs/ societies with support from Dhaka North City Corporation (DNCC) and Dhaka Metropolitan Police (DMP) (The Independent, 2016), maybe another example close to community transport service. Passengers often practice informal sharing of transport modes like rickshaw while they have a common destination. Successful examples of community-based solid waste management are evident in Dhaka. Initiated at the Kalabagan community in Dhaka in 1987, the door-to-door waste collection model was replicated by as many as 130 local civil societies or CBOs by 1999 (DCC and JICA, 2004). Kalabangan's model of the household solid waste collection reflects the core ideas of ABCD.

Concept of Community-based Mobility Scheme

In this paper, the Community-based Mobility Scheme (CoMS) is defined as a bottom-up solution, mobilized and designed by the community people with external facilitators' support, not 'rescuers,' for addressing multiple types of mobility problems and needs of people in the community. Having been defined in this way, CoMS goes beyond contemporary community transport schemes and falls in ABCD.

IV. Research Methodology

A structured questionnaire survey was carried out in 2017 on 370 households of Ward 22, Rampura, Dhaka to understand the residents' mobility pattern, their willingness to initiate and participate in the community-led initiative. Along with their socio-economic characteristics, detailed trip information of the last seven days of all surveyed households' members (numbering a total of 2667) was collected.

During the survey, an adult and informed member of the households requested to provide all the household members' trip details. Trips did do more than one activity were categorized based on the trips' main purpose or activity. For example, if someone has dropped her child at school while going to an office, the trip was categorized as "work trip," and the dropping child was recorded as other activities done during the trip. Similarly, all the modes used during a trip were recorded—however, the model used for the highest duration was recorded as the main mode.

Two focus group discussions (FGDs) were conducted with local community leaders, executive members of the CBOs, and local people . In these FGDs, participants gave their opinion regarding their interest to participate in the development, operation, and management of the CoMS. Besides, Key Informants Interviews (KIIs) were done where informants are selected from academia, Dhaka Metropolitan Police, Dhaka Transport Coordination Authority (DTCA), RAJUK, and an NGO promoting sustainable and active transport in Dhaka. Based on the data and information collected, a SWOT analysis was done to understand the potential of CoMS in the study area.

IV.1 Profile of the Study Area and Respondents

This exploratory research is conducted at ward no. 22, locally known as Rampura, of Dhaka North City Corporation (DNCC) (Figure 1). According to the latest census, The area of the ward (1.8 sq. km.)

accommodates 160,316 population (BBS, 2011). The population of the ward belongs to other income and professional groups. It is approximately located in the middle of the capital city and is accessible by all kinds of transit and para-transit modes available in Dhaka.

Among the respondents surveyed in the area, the ratio of male and female is 60:40 and of homeowners and tenants is 33: 67. One third (29.7%) of the responding households have a monthly income between BDT 30 and45 thousand, while one fourth (25.5%) has between BDT 45 and 60 thousand. Share of households having income below BDT 30 thousand and over BDT 60 thousand is 12.4% and 32.4%, respectively.

V. Findings from the SWOT Analysis

The research has assessed the community's strengths and weaknesses in accepting and managing CoMS; government policy support and pertinent opportunities towards introducing CoMS; and the existence of external threats like obstacles from existing service providers in introducing the service. The findings are discussed below.

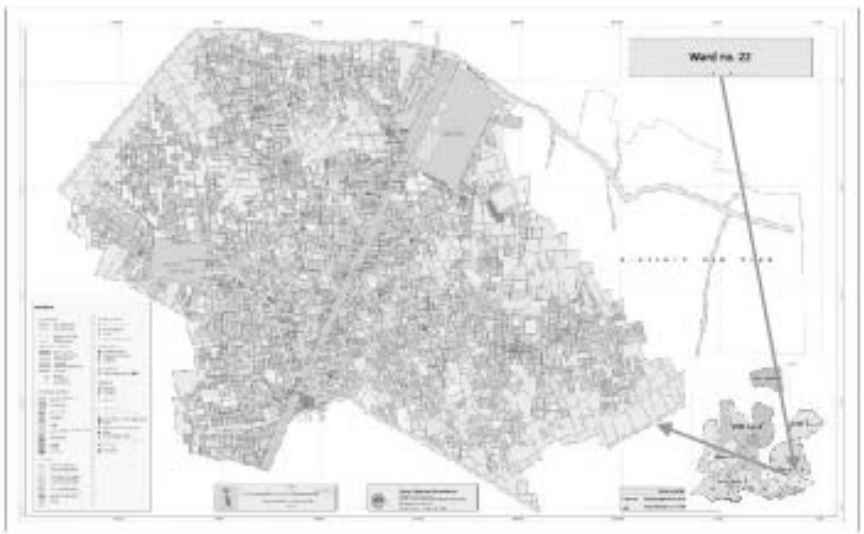


Figure 1: Map of the study area

Internal Strengths - Characteristics of Trips Made by Household Members

At Rampura, 51.2% of outbound (from home) trips start between 7.00 am and 9.00 am (Figure 2). The share rises to approximately 71% if a three-hour time range (7.00 am-10.00 am) is considered. Survey findings show that of the total outbound trips made between 6.00 and 6.59 am, 7.00 and7.59 am and 12.00 and 12.59 pm, 50% or more trips are school bound and are made by students and their accompanying guardians. Share of school trips exceeds 60% of all outbound trips in the period between 11.00 and11.59 am. Office goers are mostly on the road between 8.00 and10.00 am – 72% of the total outbound trips in between 8.00-9.00 am and 81% of the total outbound trips in between 9.00 and10.00 am are office-bound.

However, the time of returning home is not concentrated on some particular range. Most of the respondents return home between 11.00 am and 5 pm as they finish their activities in schools, colleges, universities by then (Figure 3). Another good chunk of residents (38.5%) return home, mainly from the office, by 5.00 pm to 8.00 pm.

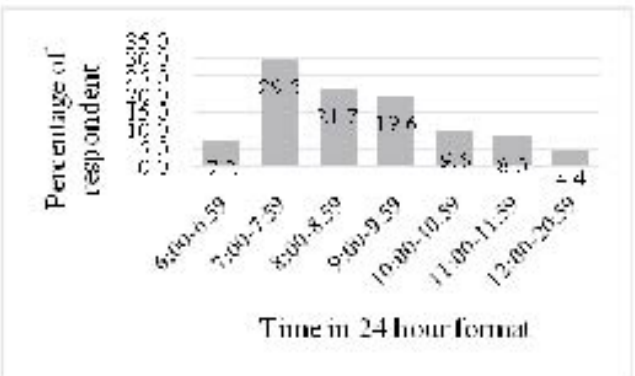


Figure 2: Distribution of respondents and their household members according to starting time of trips (starting from home)

In the case of outbound trips, 87.9% of people reach their destination within an hour (38.5% within less than 21 minutes, 22.9% within 22-40 minutes). It has been found that, in general, it takes more time to reach home. About 77% of homebound trips end in an hour (32.5% within less

than 21 minutes, 18.8% within 22-40 minutes). The share of homebound trips taking more than one hour is 23.3%, and it is double that of outbound trips (12.1%).

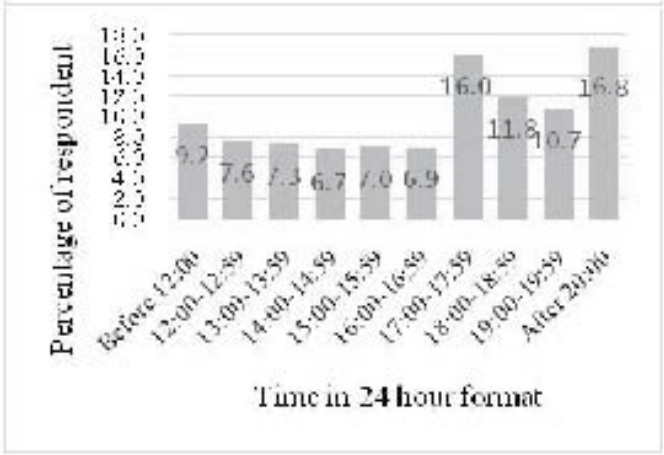


Figure 3: Distribution of respondents and their household members according to time of trips ending at home

Of the total trips, 30% is made by rickshaw; another 30% is by public bus, followed by 'walking' mode (15%) (Annex Table 1). The two most used modes are public bus (19% of all trips) and rickshaw (11%) for office trips. The two highest used modes are rickshaw (13%) and walking (9%) for school trips.

If the relationship between mode and duration of trips is considered, for short trips (requiring less than 21 minutes) and medium trips (requiring 21-40 minutes), highest used modes are rickshaws (44% and 28% of all trips made under the categories respectively). For the stated categories of trips, the second-highest trips are made by 'walking' (36% and 16% of all trips respectively). For long-duration trips (requiring more than 40 minutes), public bus is the highest used mode - 38% of all trips in this category.

When the cost of trip making is assessed, it has been found that, on average, the cost for a trip remains between BDT 11 and BDT 40: for one-

third of the trips (31.6% for outbound and 32.32% for homebound trips) the cost ranges from BDT 11 to BDT 20 and one-fifth trips (22.69% for outbound and 21.83% for homebound trips) between BDT 21 and BDT 30. BDT 40 plus per trip is the category having highest cost per trip. One-fifth trips (20.5% outbound and 18.62% homebound) are found in this most costly trip cost category. In other words, for one-fifth trips at least BDT 1,760 per month are spent if both way costs are considered for 22 working days in a month.

The gender-wise distribution shows that for men, most outbound trips are office-trips (44% of all trips made by all). In contrast, women make trips most for accompanying children to schools (16% of total trips), followed by office trips (8% of total) and university trips (7% of total). In fact, more women go to university than men (6% of total trips). Trips made by men for accompanying children to schools are 11% of all trips. So, there is potential for women-only service. Besides, to cater for the need of trips of the women who accompanied their children to schools service may be introduced in between regular peak hours, i.e., morning and evening peaks.

Based on the findings it can be said that at morning and evening peak hours, there is tremendous demand for mobility services in the community to cater to the need for regular trips to school and offices. Needless to say that the commuters, especially women, are in great distress to find the right mode to carry them to their destinations located in different parts of the city (See figures in the annexure for distribution of destinations). Hence, CoMS can fill in the gap. Moreover, the duration of trips shows that a good share of trips takes more time than 40 minutes, which could be much more if the waiting time is considered to calculate the journey time. Money spent is also significant.

In such a context, when respondents are asked about their willingness to avail of a new community-based mobility service, 77.5% of them have

responded positively. Even from the car-owning households, 58% of respondents expressed their willingness to use the service.

External Opportunities and Potential to Support CoMS

External opportunities considered in this section refer to any in-build process, dynamics that will facilitate or expedite the community-based mobility schemes. It has been found that, in the study area, there are many neighborhood-based organizations. They are formed by the permanent residents, i.e., home or landowners. All the organizations have arranged an efficient service for door-to-door collection of solid/kitchen wastes with a reasonable fee; for example, for Zaker Road Welfare Society (ZRWS), the charge is taka 400 per month per building (for all - owner and tenants). A collector and a van are arranged to collect wastes from all the buildings from a designated road. The collected waste is dumped into the nearby transfer stations. These organizations also play a vital role in local dispute resolution in consultation with the Ward Councilor. Survey shows that school vans make almost 2% of all outbound trips and 1% of all home bound trips. No doubt that these school van users are school children. Thus the community is already experiencing one form of community transport facility. Such might positively influence the development of CoMS in the study area.

Besides, there is also an association of drivers of private cars. Although the association is formed mainly to ensure the drivers' rights and welfare, if mobilized, they can also be an important stakeholder in providing CoMS. During FGDs at Councilor's office and ZRWS's office, both the Councilor and society officials expressed their willingness to mobilize the community so that the mobility scheme can work successfully. Community people, male and female, young and senior, present in the FGDs showed their excitement regarding the potential mobility solution (CoMS).

Moreover, as stated in the previous section, CoMS can also provide intermediate trips/services between regular peak hour services like school service, hospital/medical service, etc. In addition, it will add great comfort and a sense of security and reliability for old and female public transport users, especially in a context, as reported in the The Dhaka Tribune (2018)- citing a report produced by BRAC - where 94% of women public transport users in Dhaka are the victim of different types of harassments, and 20.5% stopped using public transport for this reason. So it is found that there is a supportive environment in the study area towards introducing community-based mobility scheme. Moreover, Strategic Transport Plan (STP, 2005) for Dhaka embarks on making more options for public transport to ease the mobility related tensions in the city by making suitable provisions for the sick and disabled, arranging school transport, etc.

Internal Weaknesses and External Threats

These are challenges that may make the scheme less attractive in terms of (internal) benefits or may impose an extra cost upon service, making it not viable to operate.

During FGD it is found that there is no reservation in using the service from the potential users' perspective if introduced. Only 22.5% of the respondents state that they or their household members will not use it. It should be noted that compared to 9% entirely car-based daily trips, the reluctance of 22.5% of respondents to shift to CoMS reflects that a section of non-car users may not instantly use community-based service. So a mentionable threat is the inertia of the people from shifting to another mode. Modal shift depends on many factors: in the case of non-car-users, it may include familiarity, customized service, etc.; in the case of the car owner, it may include compulsion or disincentives like parking restriction, fuel, or congestion tax extra.

As far as external challenges are concerned, lack of direct rules or policy guidelines to operate CoMS can be an initial obstacle. Additional Commissioner of Dhaka Metropolitan Police (DMP) highlighted it while interviewed. Experts from academia fear that the existing public transport service providers may be antagonistic to the service if introduced at a large scale without proper safeguard measures. However, both of them opine that with the help of policy stakeholders like Bangladesh Road Transport Authority (BRTA), Dhaka Transport Coordination Authority (DTCA), Regional Transport Committee (RTC), DMP, local ward councilor and respective City Corporation, these 'threats' can be addressed. A RAJUK official observed that in the case of large scale operation, the scheme may require adequate parking facilities, which is absent in unplanned residential areas. This potential problem can be addressed by local CBOs, ward councilor and large space occupying institutional land uses like BTV head quarters in the study area.

Potential Model for Operation of CoMS

If only a nominal share of 77.5% of respondents express willingness to use the service regularly, that will be enough to run the scheme on a break-even point. It has already been stated that many of the community transport services are single-vehicle based. Here in Dhaka, also CoMS can be demonstrated by one or two appropriate vehicles in a single route. If success is proven in terms of reliability and comfort, and if demand increases, the scheme's scale can be increased and replicated.

Unlike any transport infrastructure project, the community is the key for any Community-based Mobility Scheme (CoMS), as proposed. During the stakeholders' interview, it has been preliminarily explored if CoMS can be introduced following any PPP model. It is thought that opting for PPP can reduce dependence on any external donor including government and can keep the service financially sustainable. From the discussion, it has been found that among the different models of PPP, "Design Build Operate

Maintain" or "Design Build Finance Operate" model may fit CoMS services. However, it should also be remembered that no PPP project actually fits entirely in one model; there may be overlapping of different models. The same is true for CoMS as well. It has been learned from interviews that in such areas as design, construction, operation, maintenance, and policy making (fare fixations, etc.), community and community leaders have a significant role to play. Role of different stakeholders in ensuring successful PPP in CoMS is outlined below.

Design: CBO, ward commissioner, market committees, local residents' association (for the route, stoppage location, etc.), private investors/service provider (for mode).

Construction/service provision:

ivate investors/service providers (for mode), city corporation (roads), ward commissioner, city corporation and local associations (Passengers waiting kiosk).

Permission, Operation and monitoring: DMP, ward commissioner, city corporation, local associations, private service provider.

Maintenance: Private investor/service provider (for mode), city corporation (roads), ward commissioner and local associations (Passengers waiting kiosk)

Infrastructure provisioning: Ward commissioner, market committees, general public, local residents' association

Financing sauces: Private service provider (for mode), city corporation (roads), ward commissioner, city corporation and local associations (Passengers waiting for kiosk), community/users (transport cost), banks/government (initial financing)

Policy support: BRTA, line ministries, RAJUK

VI. Conclusion and Notes for Further Research

The initiative of community-based transportation can come in handy if it is operated and managed skillfully. This service can partially solve the transportation problems of the community people. It can provide safety and security while making trips and reduce traffic pressure of the main arterial road of the area. This practice is common in many developed and developing countries. If this service is successfully initiated in Dhaka, it can set a benchmark in the community initiative. Initiation of this service in Dhaka city's wards can act as a potential solution of the existing transportation problem in the long run. Further study can help understand the scenario of the effect of community based transportation initiative in Dhaka city in the case of transportation solution.

However, before rolling the service on the street, further research is required: location of stoppages to be determined based on the willingness of the users' to walk and on length of local rickshaw trips; ticketing options, pricing, and frequency of service should be examined more in detail; potential investors and terms and conditions for investments should be identified.

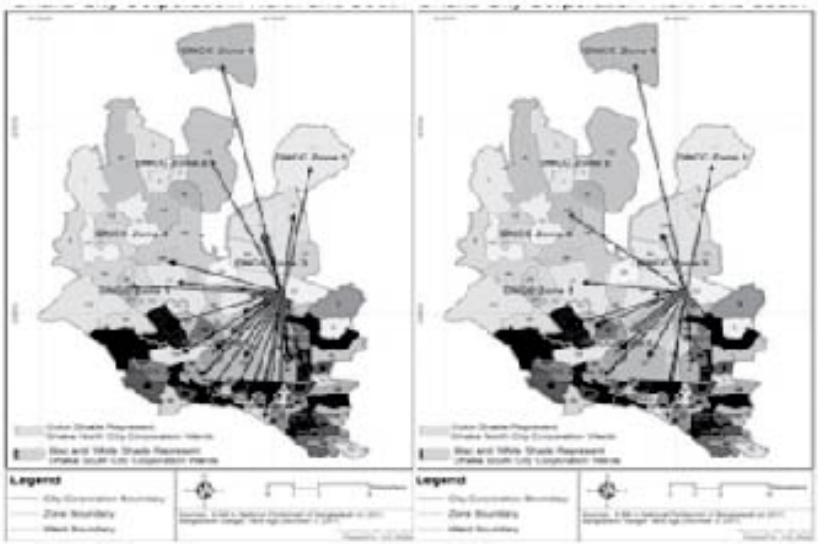
Annexure

Table 1

Distribution of Trip Making Modes other than Walking, Rickshaw and Public Bus

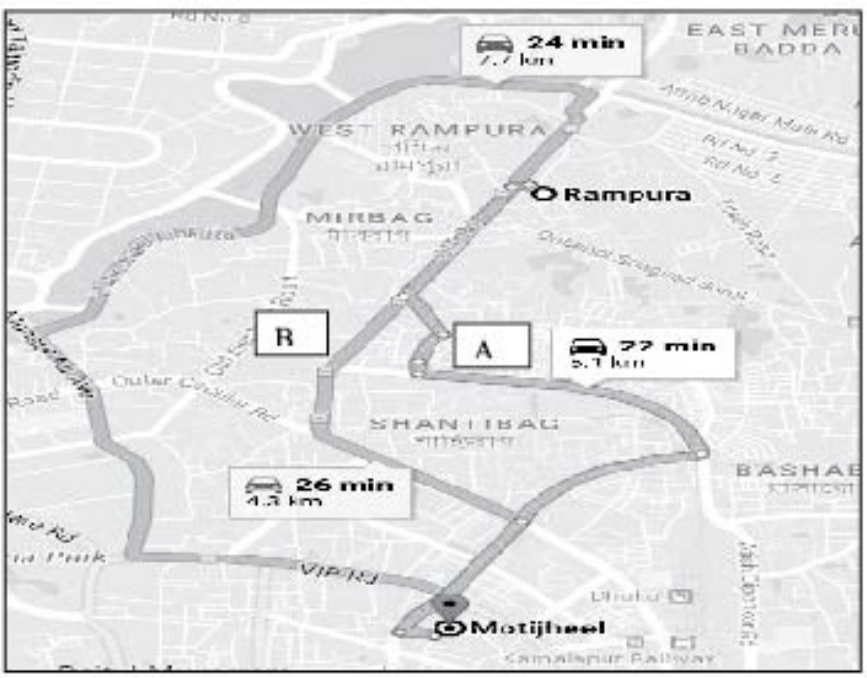
Mode	Starting from home (in %)	Ending at home (in %)
Rickshaw	30.07	30.62
public bus	29.18	29.06
walking	15.70	16.15
Bicycle	0.67	0.67
Motor-Rickshaw	0.22	0.22
Office Bus	3.79	3.79
Motorcycle	2.34	2.34
Private Car	9.24	8.46
Office Car	2.00	1.89
Microbus	1.89	2.78
CNG	1.45	1.34
University Bus	1.56	1.56
School van	1.89	1.00

Source: Field survey, 2017.

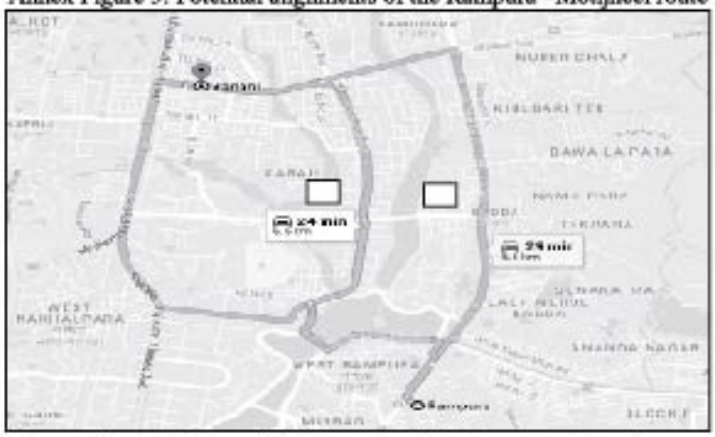


Male Female

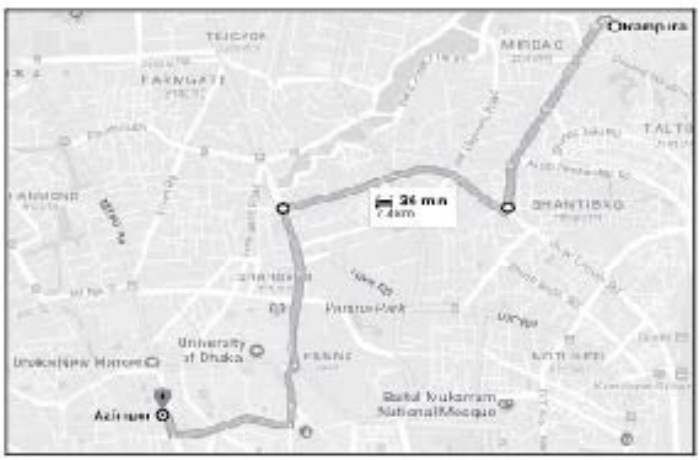
Annex Figure 1 & 2: Distribution of destination of male and female respondents and their household members throughout the Dhaka



Annex Figure 3: Potential alignments of the Rampura –Motijheel route



Annex Figure 4: Potential alignments of the Rampura –Banani route



Annex Figure 5: Potential alignments of the Rampura –Azimpur route

References

Ahmed, S., Nahiduzzaman, Kh. Md. and Hasan, M. M. U. (2017). City Profile: Dhaka, Bangladesh: Unpacking Challenges and Reflecting on Unjust Transitions; Cities, 77: 142-157

CTA (Community Transport Association) (2014). What Next for Community Transport? Insights and Ideas for Action, CTA UK

CTA (Community Transport Association) (2005). Guidance for Funders of Community Transport, CTA, UK

DCC (Dhaka City Corporation) and JICA (Japan International Cooperation Agency) (2004). Clean Dhaka Master Plan: Volume 2- The Study on the Solid Waste Management in Dhaka City. Prepared by Pacific Consultants International and Yachiyo Engineering Co., Ltd

Dongier, P., van Domelen, J., Ostrom, E., Rizvi, A., Wakeman, W., Bebbington, A., Alkire, S., Esmail, T., and Polski, M. (2002). Chapter 9- Community-Driven Development. In Jeni Klugman (ed) A Sourcebook for Poverty Reduction

Strategies- Vol 1: Core Techniques and Cross Cutting Issues, The World Bank FEHR and Peers (2015). Novato Community Based Transportation Plan. Prepared for: City of Novato County of Marin

Transportation Authority of Marin, California, USA

GDSUTP (2016). Transit Oriented Development and Improved Traffic Management in Gazipur City Corporation: Output 1 Report, 2016. Local Government Engineering Department (LGED), Dhaka.

GoB (2004). National Land Transport Policy 2004. Government of Bangladesh, Ministry of Communications, Dhaka.

Hasan, M. M. U. and Dávila, J. D. (2018). The Politics of (Im)mobility: Rickshaw bans in Dhaka, Bangladesh. Journal ofTransport Geography, 70: 246-255.

Johar, N. (2017). Community Participation: A Cementing Process, Theorizing Various Dimensions and Approaches, Journal of Construction in Developing Countries. 22(Supp. 1): 47–61.

Mathie, A. and Cunningham, G. (2003). From Clients to Citizens: Asset-based Community Development as a Strategy for Community-driven Development. Development in practice, 13:5:474-486.

MPC (2016). Meopham Parish Council (MPC) website - http://www.meopham.org/news/meopham-community-bus, retrieved on

MPC (2016). Meopham Parish Council (MPC) website - http://www.meopham.org/news/meopham-community-bus, retrieved on Sun, T. and Doulet, Jean-Farancois (2015).

Community-based Mobility Services as Part of a Sustainable Transport System for Suburban China - The Example of Shared Shuttles (banche) in Shanghai. The Journal of Sustainable Mobility, 2(1):54-73

Silva, Ranjith de (2014). A Case Study on Establishing and Running a Community Bus Service in Rural Sri Lanka. Transport and Communications Bulletin for Asia and the Pacific, No. 84.

RASP (2012). Community Transport Scheme. Retrieved from http://www.cornwall.gov.uk/default.aspx?page=32332 on October 31, 2016.

RSTP (2015). Report on the Revision and Updating of the Strategic Transport Plan for Dhaka, 2015. Dhaka Transport

Coordination Authority (DTCA), Dhaka

STP (2005). The Urban Transport Policy– Final Report, Strategic Transport Plan for Dhaka. Prepared by LBG and BCL for DTCA, GoB, Dhaka

The Dhaka Tribune (2018). Study: 94% Women Victims of Sexual Harassment in Public Transport, Retrieved from

https://www.dhakatribune.com/bangladesh/crime/2018/03/07/study-94-women-victims-sexual-harassment-public-transport/ on April 21, 2018

The Independent (2015). Bus Service Introduced in Hatirjheel, Retrieved from http://www.theindependentbd.com/printversion/details/27805 on October 31, 2016.

The Independent (2015). Bus service introduced in Hatirjheel, Retrieved from http://www.theindependentbd.com/printversion/details/27805, on October 31, 2016.

Zwart, J., and Welsby, A. (2006). Community-based Transport Queensland Guidelines. Queensland: State of Queensland and Local Government Association of Queensland, Australia

Demographic Dividend of Bangladesh and Opportunities for Overseas Employment

1. Md. AminulHaque,*PhD*2.Md. KamrulIslam,*PhD* 3.Md. RabiulHaque,*PhD*and 4.Sadiya Afrin[1]

Abstract:The population of Bangladesh is characterized by a larger number of working population compared to l the total number of children aged below 15 and older people aged 60 and above. The larger working population compared to the dependent population, which is known as "demographic dividend," has created a window of opportunity for rapid economic growth. This paperexamines the emergence of demographic dividend andexplores overseas employment opportunities for Bangladesh, based on secondary data analysis. The study reveals that there are many potential sources of overseas employment opportunities in about 40 countries, which include both blue color and white color jobs.The government needs to explore overseas employment opportunities for its large and growing number of youth population. Information regarding overseas employment opportunities should be disseminated among students to facilitate adequate preparation. This will also help policymakers in taking effective measures to avail the overseas employment opportunities for the country.

Keywords:Demographics, Dividend, Employment, Opportunities, Overseas

I. Introduction

The demographic changes have created new dimensions and challenges for the development process in Bangladesh. More specifically, these demographic changes have led to the emergence of demographic dividend, a situation where the majority of the population are in the working-age group and consequently the percentage of the dependent population is smaller than the working population. This situation is a unique opportunity for a country to ensure rapid socio-economic development. Currently, more than 60 percent of the population in Bangladesh is in the working-age group. However, reaping the benefits of this demographic dividend will depend on the magnitude to which Bangladesh can ensure adequate

[1] Professor, Department of Population Sciences, 2. Associate Professor, Department of Population Sciences, 3. Professor, Department of Population Sciences and 4. Department of Population Sciences, University of Dhaka.

investment in education, economic sector governance, and healthcare for human resources development. Most importantly, Government needs to ensure employment opportunities for a large number of the working-age population in Bangladesh to harvest the benefits of demographic dividend. Due to resource constraints and limited opportunities in the domestic labor market, exploring overseas employment for a large number of working-age population can be a viable solution for Bangladesh for harvesting demographic benefits.

This paper examined the emergence of demographic dividend and explore overseas employment opportunities for Bangladesh.The paper is organized as follows. Section 1: Introduction, Section II: Methodology, Section III: Literature Review, Section IV: Result of the Study, Section V: Conclusion.

II. Research Methodology

This research was conducted using secondary data available online to explore the global demand of the labor force. More specifically, information was collected on the types of jobs that are available in the global labor market for the potential labor force of Bangladesh, A standard guideline was used to collect information on potential jobs in the global labor market.

Secondary data were collected from survey reports, annual reports of national and international organizations, research articles, and policy documents. In addition, data published by national institutions, in particular BBS or their equivalent, and data available in international databases were used. For information related to overseas employment opportunities,asystematic search was carried out in relevant service sectors in countries that receive a substantial number of immigrants each year. Besides, we carried out an extensive search in other countries' service sectors to explore new job markets and opportunities.

III. Literature Review

Bangladesh entered into demographic dividend in the 1990s with declined dependency ratio as a result of a decline in fertility in previous years. The opportunity of demographic dividend will come to end due to the increasing share of the dependent population compared to the working population. At this stage, the share of the working population will decline; however, the size of the total population in Bangladesh will continue to increase at least another two decades, which indicates that Bangladesh needs to invest more for increasing workers' productivity so that they can contribute to the economy to a greater extent to share the burden of the huge dependent population once the demographic window will be closed (Figure 1). Figure 2 depicts that the duration of the first demographic dividend is limited to certain years, ranging from 35 to 40 years.

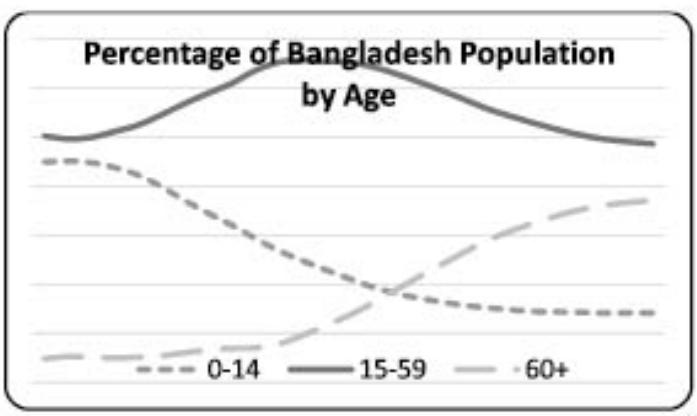


Figure 1: Percentage of Bangladesh population by age group

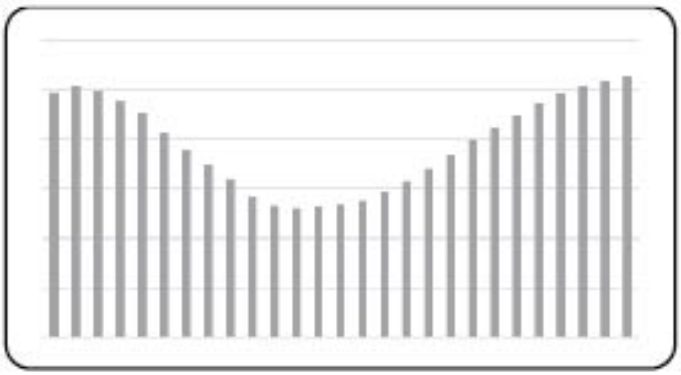


Figure 2: Total dependency ratio of Bangladesh population: 1970-2100 (0-14; 15-59; 60+)

Emergence of Second Demographic Dividend

The reason for the greater importance of achieving the benefits of the first demographic dividend is that it will bring opportunities for another demographic dividend known as the second demographic dividend. The idea of the second demographic dividend is based on the premise that achieving the benefits of the first demographic dividend provides enormous opportunities for people to work and save for their future. Due to the wide range of employment opportunities in the first demographic dividend people earn more and consume relatively less which essentially paved the way for large-scale accumulation of capital. This in turn leads to wider investment opportunities for countries and reap benefits from the savings and investment.

Labor Force Supply Dynamics

Table 1 presents the size of the total population,working-age population, and economically active population, and their share of the total population by sex. From Table 1 it appears that the total number of male population increased to 76.6 million in 2013 from 70 million in 2005. However, the number of females outnumbered males during the same period. Thus the total working-age population (15+) increased to 52 million in 2013 from 43 million in 2005. Among the working-age population,theeconomically active population (15+) increased to 42.5 million in 2013 from 37.3

million in 2005. It should be mentioned that the percentage of employed among the workforce is overwhelmingly high, which should be considered carefully by taking the definition of employment into account.

Table 1:**Share of Working Age Population, Labor Force and Employed Population (2005, 2010, 2013)**

Category of Population	2005		2010		2013	
	Male	Female	Male	Female	Male	Female
Total population million	70.04	67.36	74.15	73.59	76.64	77.51
Working age population (15+) million	43.01	41.58	47.85	47.74	52.06	54.21
Economically active (15+) or in the labor force million	37.3	12.1	39.5	17.2	42.5	18.2
% working agepopulation in total population	61.41	61.72	64.53	64.87	67.92	69.94
% labor force among working agepopulation	86.49	29.10	82.55	36.02	81.64	33.57
% employed among labor force	96.65	92.91	95.95	94.35	96.94	92.31

Source: LFS 2005-6, 2010, BBS, Ministry of Planning.

Projection of Working Population

Projection of Bangladesh Bureau of Statistics (2015) shows that, under the medium variant-the situation, which is most likely to happen,the number of the working population (15-59 years) will increase to 117.7 million in 2021 and 124.9 million in 2031. Out of the working population,the size of the youth population (aged 15-29) will be 49.3 million in 2021 and 48.1 million in 2031. Due to the increase in the number of working populations, the Government of Bangladesh will need to create millions of jobs each year for ensuring rapid economic growth on one hand and reaping the benefits of demographic dividend on the other. Projections of the Asian Development Bank and International Labor Organization (2016) show that the size of the labor force in Bangladesh 74.5 million in 2020 by adding a 1.95 million labor force each year. For this reason, ensuring jobs for allwill require to create 260,000 additional jobs per year. Also, thenumber of employments abroad per year is projected to be 400,000. Thus, there are 1.81 million jobs required per year even without taking into account the surplus-labor.

IV. Results of the Study

Sectors for Overseas Employment

The discussion above in previous sections indicates that there is a surplus of the labor force in Bangladesh as the local labor market is not sufficient enough to absorb all the potentially active population. In order to materialize the economic outputsfrom the large supply of demographically active population under these circumstances, Bangladesh needs to explore the overseas labor market and prepared its labor force based on the needs and sectors of the labor force destination countries.

Potential Sectors of Overseas Employment	
• Health and social care	• Carpenter, Pipe Fitter,Scaffolder
• Education	• Steel Fixer, Mason
• Social Housing	• Welder, Quality Control
• Risk and compliance	• Light Duty Driver, Rigger
• Internal Audit	• Waiter, Service Crew
• Insurance & Banking	• Aluminum Technician
• Credit Control	• Foreman, Plumber, Design Engineer
• Cashier/Sales and marketing	• Machine Operator
• Energy	• Iron Worker, Industrial Electricians
• Information Technology (IT)	• TIG Welder
• Human Resources	• Janitor/Janitress
• Construction	• Mechanical Design Engineer
• Electrical Technician	• Baker, Room Attendant

Source: Data analysis.

Employment Opportunities in Saudi Arabia

Saudi Arabia is another major source of employment opportunity for Bangladeshi workers. The Government of Saudi Arabia has taken differentinitiatives to diversify its economy and creating big cities which will open the door for millions of jobs. The proposed King Abdullah City is one of them. In the Long-term Vision 2024, the Government of Saudi Arabia has clearly outlined its future vision that by 2024, Saudi Arabia will work to an economy that is diversified, prosperous, private sector-driven, and will create large-scale job opportunities, deliver quality education, better health care, and appropriate skills to workers (Ministry of

Economy and Planning, 2004). The key challenge for Bangladesh is to prepare its labor force so that Bangladeshi workers can compete with others to obtain jobs in the expanded economy of Saudi Arabia.

Countries Having Available Jobs

The global economy is becoming so diverse and tech-dependent that the need for unskilled workers is decreasing over time with an increasing demand for skilled workers. Moreover, there are differences in the demand of skill set of workers across countries. For example, the UAE has an increasing demand for heating, ventilation, and air-condition (HVAC), and Duct Technicians. Jobs in areas of nursing and tourism are in high demand in Saudi Arabia. Other countries in the middleeast, such as Kuwait, Oman, Bahrain, and Qatar have a higher demand for workers in areas of refinery, agriculture, shipbuilding and repair, and mining. The goal of human development policies in Bangladesh should be tailored to the needs of workers in these countries for ensuring the greater success of our workers in getting global jobs.

In addition, there are job opportunities in countries other than the middle-east. For example, Canada and USA in North America, and many European countries such as UK, Germany, Italy, Netherlands, Spain, Greece, France, Norway, and Sweden have increasing demand for workers due to their decreasing trend in the internal labor force. However, the demand for workers in these developed countries ismostlyskilled-driven. Therefore, Bangladesh needs to assess country-specific needs in the labor market and design the labor force policies for getting access to this labor market.

Country-Specific Jobs in Global Market

In terms of country-specific potential jobs in the global market, agriculture labor, construction worker, cleaning labor, housekeeper, welder, carpenter, electrician, gardener, driver, private service, foreman, security guard, civil

engineer, maintenance engineer, and mason are country-specific potential jobs in Saudi Arabia. Country-specific jobs in Singapore are Shipbroker, plumber, engineers, painter, caregiver, fitter, quality assurance/control engineer, etc. Similarly,country-specific potential jobs in the United Arab Emirates are welder, crane operator, nurse, mason, accountant, electrician, and carpenter. Potential jobs in Malaysia are agriculture, factory worker, construction worker, machine operator, welder, and garments workers. Potential jobs in Lebanon are caregiver, mason, quality assurance/control engineer, cleaner, plumber, and manager. Barber, carpenter, construction worker,mason, seaman, tailor, electrician, pipe and tiles fitter, plumber, and salesman are potential jobs in Bahrain.

Similarly,manager, supervisor, mason,plumber, painter, machine operator, welder, and garments worker are potentials jobs in Jordan. Potential jobs in Kuwait are driver, electrician, air condition technician, construction worker, barber, welder, cook, mason, nurse, and engineer.

Required Skills for Workers to get Global Jobs

An analysis of potential jobs by region and country shows that there is a wide range of professional and technical jobs for Bangladeshi people. Some of these jobs require higher educationsuch as Master Degrees and or PhDs from the destination countries, while some other jobs require technical and vocational training and skill. However, in all aspects, the level of education and training should have to be equivalent to the standard of the destination countries. Almost all of the destination countries have some sort of professional (white color) jobs, as well as blue color (physical labor- intensive) jobs. However, professional jobs are mainly available in North American and European countries along with Australia and Japan, while the blue color jobs are mainly available in the countries of the Middle East and Asia.

Most of the potential overseas job sectors required technical and vocational training with certificates and licenses in parallel to the destination countries. More specifically, the quality of education, training,

and skills should be transferable. It is worthwhile to mention that Bangladesh has a large number of such potential labor forces, but they don't have proper vocational training, certification, and standardized license. Bangladesh, therefore, needs to focus on the quality of higher education and the quality of technical and vocational education to create an enabling environment for overseas employment. Eventually, the government also needs to focus on educating the young for sending them overseas for training and job.

Resources for Producing Skill Labor Force

An evaluation of potential jobs available in abroad and the required skills for availing these types of jobs further suggest examining the types of educational institutions available to create such kinds of human resources. I Table 2 shows the number of technical and vocational education institutions and students enrollment by gender in 2015. From the table, it appears that the available technical educational institutions (5,790) can train less than a million young people to transform them into the qualified labor force for the labor market, of which around 76% are male.

Table- 2: No. of Institutions and Students' Enrolment by Gender, 2015

Type of Institute	No. of Inst.	Students		
		Total	Female	% of girl
Polytechnic Institute	433	201704	28792	14.27
Technical School & College	172	64934	13756	21.18
Glass & Ceramic Institute	1	1048	55	5.25
Graphic Arts Institute	1	695	52	7.48
Survey Institute	4	1253	69	5.51
Technical Training Centre	134	33879	11965	35.32
Textile Institute	33	10134	791	7.81
Textile Vocational	50	5524	1317	23.84

Agriculture Training Institute	183	30096	6464	21.48
Marine Technology	1	916	106	11.57
S.S.C Vocational (Independent)	169	24433	6784	27.77
HSC Voc/B. Managemen (Independent)	675	134266	41314	30.77
Medical Technology	356	24732	7815	31.60
SSC Vocational (attached)	2487	199650	50416	25.25
HSC Voc/B. Management (attached)	1091	139394	39178	28.11
Total	5790	872658	208874	23.9

Source: BANBEIS, 2015

Table3: Number of technical and vocational institutions, teachers, and enrolment by management and gender, 2000-2015

Year	Management type	No. of	Teachers			Enrolment		
		Institutes	Total	Female	% of Female	Total	Girls	% of Girls
	Public	143	2277	293	12.87	45550	5434	11.93
2000	Private	994	4542	1103	24.28	70505	22692	32.18
	Total	**1137**	**6819**	**1396**	**20.47**	**116055**	**28126**	**24.24**
	Public	180	2939	372	12.65	47349	6050	12.77
2004	Private	2412	7864	1274	16.20	132932	26229	19.73
	Total	**2592**	**10803**	**1646**	**15.23**	**180281**	**32279**	**17.90**
	Public	335	4598	593	12.89	122854	14109	11.48
2008	Private	2781	16105	3585	22.26	330521	92985	28.13
	Total	**3116**	**20703**	**4178**	**20.18**	**453375**	**107094**	**23.62**
	Public	245	4862	656	13.49	173424	28279	16.31
2012	Private	3082	21460	4486	20.90	434752	137195	31.56
	Total	**3327**	**26322**	**5142**	**19.53**	**608176**	**165474**	**27.21**
	Public	252	4957	687	13.86	178085	29674	16.66
2015	Private	5538	25946	5557	21.42	694573	179200	25.80
	Total	**5790**	**30903**	**6244**	**20.21**	**872658**	**208874**	**23.94**

Source: BANBEIS, 2015

Table 3shows that the number of educational institutions has increased over time. However, the proportion of students' enrollment is still low compared to the supply of the young and energetic labor force that requires skill-building training to ensure greater productivity.

Potential Sectors for Employment in Bangladesh

A detailed analysis of the labor force shows that there are large numbers of the working-age population in Bangladesh in relation to the demand for workers in the labor market. This situation has been further aggravated by the fact that a large number of the working population are employed in agriculture and the informal sector where the demand for workers is decreasing over time due to the increasing use of technology. Thus the potential sectors for employment in Bangladesh are mostly the service sector, industrial sector, and telecommunication sector. A comprehensive list of sectors is presented below. These sectors have the capability of absorbing the labor force in large numbers.

A comprehensive list of sectors

• *ICT and electronics* • *Health sector* • *Service sector* • *Garments &textiles* • *Agriculture and forestry* • *Freelancing* • *Food and nutrition specialist* • *Leather technology/sector* • *Finance and business* • *Social services* • *Light engineering* • *Transport* • *Power plant, oil, and gas* • *Social business* • *Manpower export* • *Ship-building*	• *Handicrafts and home-made product* • *Food processing services* • *Science: Scientific research* • *Power plants* • *Solar energy* • *Banking* • *Interior design and landscape* • *Caregiving* • *Biotechnology,/green energy* • *Home delivery based social services for children and aging population* • *Pharmaceuticals* • *Software engineering* • *Frozen foods* • *Outsourcing on IT-based* • *Telecommunications* • *Education*

Availability and Future of Outsourcing Jobs in Bangladesh

With the diversification in the global job market, Bangladesh now has the opportunity of receiving benefits of job opportunities from multiple sources such as outsourcing jobs. In the labor market, the term "outsourcing" indicates providing services to other organizations using online technologies (Advance IT Center, 2021). This is a great opportunity for Bangladesh to gain valuable access to the global job market by utilizing its large pool of labor force. There isawide range of outsourcing jobs available for Bangladesh such as data entry, graphic design, software design, web designing, and multimedia (Advance IT Center, 2021). In addition to IT-related outsourcing, there are options for exploring jobs with multinational companies such IBM, Dell, and Intel.

Discussion

The issue of demographic dividend is widely discussed among researchers, academicians, and policymakers in Bangladesh and other countries experiencing a demographic transition. David Bloom and his colleagues (2015) argued that to understand demographic dividend, it is very important to know about the age structural changes, labor supply, and economic changes of a country. Bangladesh entered into demographic dividend in the 1990s with declined dependency ratio as an out outcome of decline infertility in the pastyears. The opportunity of demographic dividend might come to an end by 2035, indicating that Bangladesh would have about 16years from now for investing in human resource development and establishing a supportiveenvironment for rapid economic development. Proper human resource management planning and investment for their development in line with the needs of the global job market are critically important not only for achieving the highest benefits from the first demographic dividend but also for materializing the benefits from the second demographic dividend. Considering the huge employment opportunities, as shown in this study, Bangladesh needs to put the highest

efforts to prepare its labor force in view of the employment opportunities in abroad and engage them in the international labor market.

The total labor force in Bangladesh is increased over time from 40.7 million in 1999 to 60.7 million in 2013 and expected to grow more in the future. Rural areas consistently have a higher labor force than urban areas and in both cases, the labor force size has increased over time. The share of the male labor force to the total labor force has decreased over time from 79.0 percent in 1999 to 70.0 percent in 2013 and consequently, the share of the female labor force has increased over time from 20.9 percent in 1999 to 30.0 percent in 2013. The total number of employed population was 39.0 million in 1999 which has increased to 58.1 million in 2013. The proportion of the male labor force has consistently above 70.0 percent during the period, with a declining trend in the share ofthe total employed population, and female employment has consistently increased over time (LFS, 1999-2013). With this increased number of the working population, it is essential to find out the opportunities to engage them in economic activities and contribute to GDP.

Another important aspect of demographic dividend is that increased life expectancy and per capita income will inspire older people to invest more resources for post-retirement financial security. Mason and lee (2007) argued that the rising number of elderly population may increase funding for the development of the young population and contribute toupsurgesavings that will ultimately helptomeet costs of preparing young-workforce and raise the productivity of them.

However, in order to reap-up the economic outputsfrom the large supply of demographically active population under thesecircumstances, Bangladesh needs to explore the overseas labor market and prepared its labor force based on the needs and sectors of the labor force destination countries. There is a wide range of employment opportunities in technical sectors in abroad, suggesting that Bangladesh needs to create a generation of skilled workers to catch those jobs. Potential sectors of employment in

abroad includingbut not limited to health and social care, education, social housing, insurance &banking, cashier/sales and marketing, energy, information technology (IT), human resources, design engineer, construction, a technician for electrical and mechanical work, carpenter,pipe and tilesfitter,welding worker,plumber,mason, quality regulator, driver; restaurant waiter; crewman, foreman, machine operator, and so on.

In the case of Bangladesh, the potential sectors for employment in abroad are mostly the service sector, industrial, and telecommunication sector. There are also opportunities foremployment in such areas as agriculture and forestry, finance and business, hospitality, and tourism. The availability of a skilled labor force will create employment opportunities in the areas of pharmaceuticals, frozen foods, scientific research, solar energy, interior design, biotechnology, ship-building, and software engineering. Special emphasis should be given to creating employment opportunities in outsourcing, food processing services, power plants, banking, caregiving, and services sectors.

In the age of demographic dividend, it is very important to ensure the completion of secondary education and go beyond thatfortechnical and vocational training as per the need for the overseas jobHayes and Jones (2015). Considering the current state of education and employment scenario, thisstudyshows that the youth of Bangladesh need to be oriented themselves to technical and "science-based" education and training. The study found that the job requirements for the international labor market are technical which requires special skills.Animproved understanding ofscience and technology along with technical training would be one of the leading factors for securing well-paid jobs in the national and international labor market. Haider (2015) mentions that materializing the advantages of the demographic dividend would be difficult for Bangladesh unless we invest massively in education, health and nutrition, and infrastructure, and create a favorable environment for local and foreign

investment. The country needs to focus on the specialized education for its youth so that they can apply for the job in abroad. Four elements of the socioeconomic perspective of human resource development are included in the framework of demographic dividend, namely poverty eradication, ensuring employment, controlling fertility, and addressing problems of the elderly population. Although Bangladesh has achieved remarkable progress in poverty reduction, one-fourth of its population still lives below the poverty line. Addressing poverty through availing adequate overseas employment opportunities will exert a strong influence on rapid economic growth.

Consistent with the above arguments, Gribble and Bremner (2012) argue that achieving demographic dividend requires enabling social and economic conditions where the greater emphasis will be given to investing in education, economy, governance, and health.

It is also reflected in the study that themajor challenges of overseas employment creation in Bangladesh are ensuring quality education for human resource development, reducing dropout rate from all levels of education, eradicating poverty, and creating adequate employment opportunities for the working-age population. There are also challenges likethehigher prevalence of unskilled, semi-skilled workers, the lower rate of international migration among female workers, prevalence of mismatch in employment sector resulting in underemployment, low labor productivity of workers, eliminating child labor, and preventing child marriage.

There are employment opportunities in abroad. Bangladesh needs to circulate the employment opportunities among the youth and educational institutions, and equip individuals and the educational institutions to produce workers/professionals fit for the jobs in abroad. The procedural problems that Bangladeshi workers are facing in their countries of employment should be addressed properly. The application process, interview process, and necessary document verification systems need to be

improved at institutional levels for the greater interest of the huge number of youth who want to work abroad. It is needed to ensure the full implementation of the National Skill Development Policy.

V. Conclusion

This study shows that there are huge overseas employment opportunities thatare open for competent applicants. Exploring these overseas employment options would be a greater opportunity for alarge number of the youth population of Bangladesh. It is necessary to search the overseas jobs circulars from different sources such as online, ministries, and recruitment agencies and provide necessary training to the youth based on the required qualifications of the jobs. It isworthwhile to mention again that securing the benefits of demographic dividend is not automatic. An appropriate policy is needed at least in the areas of health, education, and governance of the country. The government initiatives to send youth abroad for training and education for overseas employment would be an effective strategy in this case.

Various recommendations have been given in these regards including ensuring qualityeducation and providing diversified technical and vocational education in the areas of need of the recruiting countries.A greater emphasis on hands-on-training and placement for practical work with locally available informal sectors for the technical and vocational education systems could strengthen the skills of young workers for potential well-paid jobs in abroad. New sectors for creating employment opportunities within the country focus on ICT, agro-processing industry, tourism. Particular emphasis should be given to availing more overseas employment opportunities.

Increasing international migration will increase the flow of remittance which in turn will contribute to the economy, as well as create employment opportunities for others. Emphasis should be given to forward linkage and backward linkage industries for creating more

overseas employment opportunities as well. Providing information on overseas employment should be made available to all college/university students by email and short messages through social media apps and mobile phones. Besides, providing appropriate skills and training to make youths competent for overseas employment is urgent.

References

Advance IT Center. (2021). Outsourcing in Bangladesh.Online resources available at https://advanceitcenter.com/outsourcing-in-bangladesh/

B.B.S. (2015). Population Projection of Bangladesh: Dynamics and Trends 2011-2061.

BANBEIS. (2015). Technical and Vocational Education- 2015.

Bloom, D., Canning, D., & Malaney, P. . (2000). Demographic change and economic growth in Asia *Population and Development Review, 26(Supplement)* 257-290.

Bloom, D. E., Humair, S., Rosenberg, L., Sevilla, J. P., & Trussell, J. . (2014). Capturing the demographic dividend: Source, magnitude and realization.

Bloom, D. E. W., J. G. . (1998). "Demographic transitions and economic miracles in emerging Asia,". *The World Bank Economic Review, 12*(3), 419-455.

Gribble, J. N. B., J. . (2012). Achieving demographic dividend *Population Reference Bureau Bulletin, 67*(2). doi: http://www.prb.org/pdf12/achieving-demographic-dividend.pdf

Haider, A. S. (2015). Demographic Dividend: A big challenge *The Financial Express*

Hayes, G. J., G. . (2015). The Impact of the Demographic Transition on Socioeconomic Development in Bangladesh: Future prospects and Implications for Public Policy

I.L.O., A. D. B. (2016). Bangladesh looking beyond garments, employment diagnostic study Asian Development Bank and International Labour Organization.

ILO. (2014). Skilling the workforce: Labour migration and skills recognition and certification in Bangladesh: Asia Pacific Decent Work Decade 2006-2015.

Lee, R. M., A. . (2010). Fertility, human capital, and economic growth over the demographic transition. *European Journal of Population 26*(2), 159-182.

Mason, A. L., R. . (2007). Transfers, capital and consumption over the demographic transition., from Pp. 128-162 in Clark R, Ogawa N and Mason A (Eds). Population Aging, Intergenerational Transfers and the Macro-economy. Cheltenham, UK: Edward Elgar.

Ministry of Economy and Panning. (2004). Long-term Strategy, Government of Saudia Arabi.

NSDP. (2011).

Schultz, T. (2003). Population Matters: Demographic Change, Economic Growth and Poverty in the Developing World. Edited by Nancy Birdsall, Allen C. Kelley, and Steven W. Sinding. Oxford: Oxford University Press, 2001. 57.50, cloth; 19.99, paper. *The Journal of Economic History, 63*(03), 889-890.

United Nations, D. o. E. a. S. A. (2015). World Population Prospects: The 2015 Revision, custom.

Bio-Chemical Aspects of Criminality: A Comparative Study between Violent Criminals and Non-Criminals in Bangladesh

Md. Omar Faruk[1]
Md. Ishtiaq Ahmed Talukder [2]
Kazi Aminul Hasan[3]

Keywords: Bio-chemical, Criminality, Comparative, Violent Criminals, Non-Violent Criminals.

Abstract: Biological theories of crime suggest that physiological and chemical factors can be caused criminality among individuals. In this study, bio-chemical factors such as vitamin B6 and hypoglycemia, which lead to develop the criminal tendency, are investigated. The study examines to what extend the biochemical factors can help understand the relationship of aggression and criminal behavior. The experimental research design has been used where 30 convicted prisoners and 30 respondents of non-criminal background with a similar socio-economic background to the criminals have participated voluntarily. The experiment reveals that a moderate positive relationship exists between biochemical factors and criminal behavior. The findings of this study also indicate that the criminals' health status were quite normal though the vitamin B6 level was unusual, which indicates a positive relationship between violent criminal behavior and vitamin B6 level ($r = 0.199$, $P<0.05$). However, this paper explores that there is a moderate correlation between criminality and biochemical factors ($r = -.263$, $P<0.05$).

I. Introduction

Crime is a social phenomenon. It is defined as a willful act or omission which is a violation of the statutory law and will be penalized by the state through a formal justice system (Bohm and Haley, 2002). Since the early beginning of human civilization and the development of the concept of society, crime has been an integral part of our life. But philosophers have a different explanation for the crime. Thomas Hobbes (1588–1679) for instance, blamed human nature which is evil to him, but society helps control it, whereas Jean-Jacques Rousseau (1712–1778) believed that humans as a gentle creature are forced to commit the crime or show aggression learned from the society (Jhangiani and Tarry, 2014).

The sociologists and criminologists like Rousseau have also advocated that aggressive behavior is the outcome of the social and cultural elements while the behavior is understood as a natural behavior, an outcome of human evolution (Boutwell, 2014). But with the passage of time and technological advancement, the study of crime moved towards more laboratory science-based analysis which gave birth to a new discipline, criminology, forensic analysis of crime. There is also another multidisciplinary criminological research-based journal which has been published since 2000; it initiated the concept of biosocial criminology (Barnes et al., 2015). Neurotransmitters like Dopamine, serotonin, noradrenalin and hormones responsible for stress have definitely had an important role for communication between neurons and brain (van der Gronde et al., 2014), which implies that it influences human behavior and thus requires advance study in identifying the risk factors for criminality. Therefore, in order to identify the biological risk factors relating to criminality, the study of the biochemical factors is of utmost importance.

This study is designed to explore the relationship between biochemical factors and criminality in the context of Bangladesh. As of now, this kind of study has not been done in this country. Therefore, this is a pioneer attempt to apply the scientific research method in the field of criminology in Bangladesh. The study is planned to use experimental research methodology while using the sociological context in order to understand the study subjects' criminal and socio-economic background. In this paper, an introduction is presented with a brief review of the field of bio-criminology, i.e., biochemical as well as socio-environmental and biogenetic contributions to human behavior. The study explored the relationship between bio-criminological factors and antisocial behavior among the offenders who were imprisoned and compare the biochemical data with a control group from the society with the similar socio-economic condition.

II. Conceptual Framework

Many factors can contribute to the activities linked to crime. Some criminologists turned to the biological basis of criminology, while some

other sociological or psychological study of criminality. Research efforts have been made to understand the biochemical and neurophysiologic factors that have been associated with crime in Bangladesh.

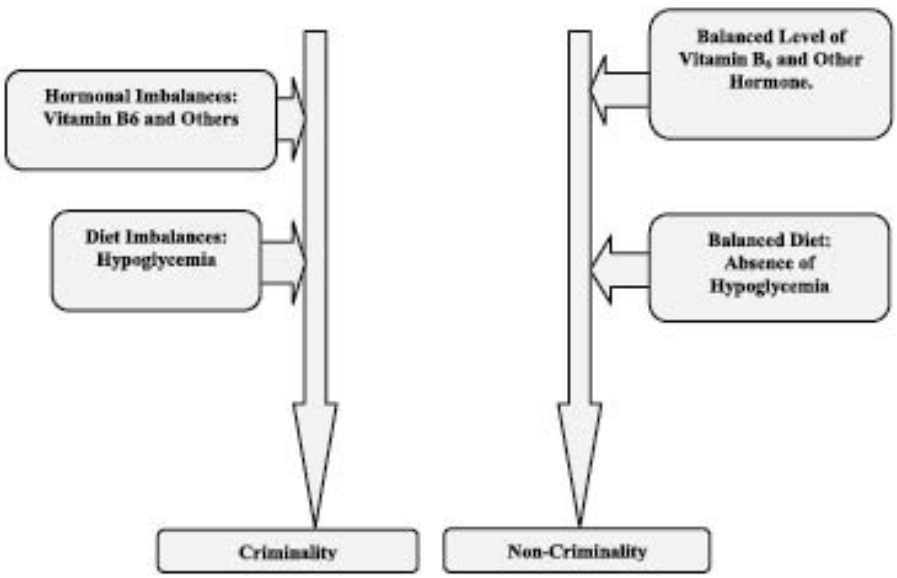


Figure 1: **Conceptual framework of the study**

From a number of studies, it is found that diet imbalance, hormonal imbalance and neurophysiological factors may affect criminality (Alper, 1995; Lefkowitz, 1975; Rappaport and Thomas, 2004; van der Gronde et al., 2014). Diet imbalance causes hypoglycemia which develops the criminogenic instinct among human beings. Again, balanced hormonal level, balanced diet and absence of Vitamin B6 abnormalities remove the criminogenic instinct from individual and make the individuals as law-abiding citizen.

At the beginning of the development of biological science, criminal behavior supposed to be the outcome of biological structure, which may be inherited genetically or may be induced from within the environment. Later scientists started discovering the code and studied different aspects of human biology and thus proclaimed that crime is not just an outcome of

biological problem rather it may increase the likelihood of a person to engage into aggressive behavior which may end up causing a crime. However, scientists still in search of a concrete answer digging into the complex web of human bio-information system. For instance, Sutherland thinks criminology is the scientific study of the entire process of law making, law breaking and law enforcing (Adlar, 2004). Criminologists therefore attempt to find out the etiology of crime by studying the sociological, biological, ecological, as well as environmental aspects of crime. With the development of medical sciences, scientists have been able to identify the biological risk factors which ultimately provoke the forensic assessment of the criminality through analyzing the neurobiological factors of violent criminal behavior (van der Gronde et al., 2014).

Biological scientists have been taking attempts to identify the relationship between anatomical features of human being and crime. The biochemical research attempts to understand the role of petrochemical activities in the human body, which may include hormonal functions, brain chemical abnormalities, diet and drugs behavior, to influence criminal behavior (Heilbronner, 2004; Rappaport and Thomas, 2004). According to Encyclopedia Britannica, the biochemical researchers back in the 1980s and 1990s tried to identify the contributing factors in criminal behavior. The studies involved an analysis of the 'neurotransmitter imbalances in the brain (e.g., low levels of serotonin), hormonal imbalances (e.g., higher levels of testosterone), and slower reactions of the autonomic nervous system…' which might influence the causation of criminal activity, but these factors cannot conclusively provide any evidence of committing criminal actions, which largely depends on the circumstantial situation (Mannheim and Bernard, 2014). The researchers also found other corroborating factors to the criminality; the general causes of moral and ethical deterioration include drug abuse, alcoholism and other forms of dietary anomalies.

However, in the last few decades, scientists are found to be more interested in searching for the link between genetics and criminal behavior. For instance, in the behavioral studies, a positive correlation was

found between criminal and aggressive behavior in the identical and fraternal twins, though the rate was different (Tellegen et al., 1988). Researchers in their books and reviews have been presenting significant evidence showing a positive correlation between genetics and the origin of criminal behavior where they claimed that human behavior is shaped through inherited physiological traits (W. Buikhuisen, 1985). Similarly, other behavioral scientists tried to present their arguments for the connection between behavioral genetics and crime (Jones, 2006) and the researchers believe that there is a biological basis for criminality which promotes the studying of biology in predicting the people who are exposed to criminality (Alper, 1995; Mednick and Finello, 1983). Scientists have proved that there is 'a relationship between neurobiological dysfunctions and/or genetically determined deviant behavior and personality traits, as well as moral abnormalities' (Martens, 2002).

III. Research Questions

The focus of the study is to explore the biochemical factors of human which are responsible for criminality. Following research questions have been formulated for the current study:

I. Does diet imbalance or lack in nutrition has any impacts on violent criminality?

II. Does Vitamin B6 has impact on the development of criminality or aggressiveness?

III. What kind of connections are there between the abnormalities of neurophysiological factors and arousal of criminal instinct?

Hypothesis of this study is drawn on the basis of the above questions. The hypothesis of this study is:

H1=Vitamin B6 or Pyridoxine level (can affect the central nervous system) has significant relationship between aggressive behavior and violent offending.

IV. Objectives

In line with the research questions, the present study objectives have been developed which is to identify the biochemical causes of criminality. The study has been designed to collect biochemical information from the convicted criminals who are presently serving their terms in the Central Prison of Bangladesh. The following objectives, therefore, formulated to answer the research questions. The objectives of the study are:

1. To identify the role of diet imbalances or lack in nutrition for violent behavior.
2. To evaluate the impact of Vitamin B6level on the development of criminality.
3. To examine the connection between the abnormalities of neurophysiological factors and arousal of criminal instinct and
4. To provide policy recommendations that may help to reduce violent criminal behavior.

V. Research Methodology

To comply with experimental research method, this study consists of samples distributed into two groups, experimental group and control group, which have been selected from Dhaka City. For the study, the experimental group included the prisoners who are incarcerated at Dhaka Central Jail and the control group included the non-criminal respondents purposefully chosen which meet the similar socio-economic conditions of the experimental group and also their willingness to participate in the study through donating their blood samples voluntarily. The samples of this research were based on non-probability purposive sampling strategy. The blood samples were collected at a particular time of the day, which is fasting blood, early in the morning. They participated as experimental group voluntarily, and the control group participants were selected from the non-criminal background. The total size of the sample was 60, out of which 30 were prisoners and 30 were non-prisoners.

The study has used experimental design which basically investigated blood samples and looked for hormone, hypoglycemia and Vitamin B6 differences between experimental group and control group respondents. Interview technique wasused to collect information about socio-demographic characteristics and the criminal background of both the prisoners and non-criminal participants. A pre-tested interview schedule with both close-ended and open-ended questions was used for the interview. The blood samples of both of the groups were collected with the assistance of the Clinical Pathology Department of Bangladesh University of Health Science (BUHS). After collection of the blood samples, they were directly sent to the pathology department of BUHS for pathological tests. Standard operating procedure was maintained through the data collection and testing procedures. Biological and chemical experts were consulted to explain the test results. Criminological interpretation has been undertaken to comprehend interrelationships between biochemical test results, socioeconomic and crime data. The data processing was done with the help of Statistical Package for Social Sciences (SPSS) program. Cross-tabulation has been made for variables like age, education, urban-rural background, prior victimization, the cause of crime commission and types of crime committed.

VI. Results and Discussion

Socio-Demographic Background

The respondents were selected purposively both from the prison and from the BUHS hospital where the respondents voluntarily participated in the study. According to the study, the mean age of the experimental group is 37 years and for control group, it is 34 years. While majority of the respondents in the experimental group were 36-40 years of age, in the control group 26-35 years constituted around 53 percent. The experimental group had criminal records and had been convicted for committing grievous offence which were mostly violent in nature (Table 3).

Table 1: **Age Group of the Respondents**

Age Group	Experimental Group			Control Group		
	Frequency	Percent		Frequency	Percent	
Below 25	4	13.34	Mean = 37.43	2	06.66	Mean = 34.10
26-30	5	16.66		12	40	
31-35	5	16.66		4	13.34	
36-40	7	23.34		5	16.66	
41-45	1	03.34		3	10	
45-50	5	16.66		3	10	
50 and Above	3	10		1	03.34	
Total	**30**	**100**		**30**	**100**	

Due to budget limitation, time constraints as well as limited access to the prisoners and ministerial procedure for permission, the researcher could manage to get only 30 convicted criminals. among them except one all of them were happened to be Muslim. The study is designed to conduct the experiment on the convicted violent criminals who are serving their terms in different amount into the maximum-security prison of Bangladesh. Most of the registered offenders for these experiments found to have secondary to higher secondary level graduation who were involved in violent criminal activities. The control group, on the other hand, had higher secondary and upper-level education. The marital condition of both of the groups found quite similar where more than half of the respondents in both groups were married.

The occupation status among the experimental group found to have a varied number of areas; however, the maximum number of the respondents in the experimental group found to be involved in the business. According to the study, the respondents had a lower level of educational background which as of their confession have motivated them to get involved into business more and also as per their responses some of them found business to be more motivating factor for lesser level of education. Education has the power and influence which can contribute to increase social status and also helps bring conformity to develop norms

and values. On the other hand, aggression is a learned behavior and also genetic. Level of aggression has therefore been found to have a link with the lower education level of individual and profession like business as per this study.

The study also looked for the income level of the study groups. It reveals that the median income level is BDT 20,000 and above for the experimental group. Their mean income level was 34,320 taka only. The control group maintained the median income level (20,000 BD taka) as well. Urbanization and globalization have impact on the social development and change process in the society, which also affected family system and values (Lee & Vivarelli, 2006). The data, however, show an interesting picture where about 60 percent of the offenders found to be in a joint family, which is the exact opposite of the control group and current trends in our modern society. The type of family and the type of residence both have an interlink aspect in human life. The respondents were mostly from the urban areas and they have migrated to city for living.

Table 2: **Residence Settings of the Respondents**

Residence	Experimental Group		Control Group	
	Frequency	Percent	Frequency	Percent
Rural	6	20.0	14	46.7
Urban	24	80.0	16	53.3
Total	**30**	**100**	**30**	**100**

The respondents were selected purposively from among the convicted prisoners to serve the objectivity of the study. Most of the prisoners found to be convicted for murder, attempt to murder or for possession of illegal arms and explosives with an intention of murder or mass killing. Violence against women and children has also been found among them. The nature of the offenses was mostly violent in nature.

Respondents' socio-demography was basically studied to justify the selection procedure of both the control group and the experimental group. Similar socio-demography helps the researcher to study its subject from a distinct setting and sociological point of view which will help the researcher to bring the problem out of the respondents and compare them with a different set of respondents but similar life condition. Besides, the socio-demographic study actually helps understand their motivation towards different anti-social acts. Sex, age, urbanity, class, education and religion are the basic areas of socio-demography, which are always studied to understand the subject's social setting, mental and physical growth condition, surrounding environment, etc., which build the subject into a complete human being.

Table 3: **Respondents Registered for the Offences in the Prison**

Type of Offence	Frequency	Percent
Arms & Explosive	5	16.7
Drugs Case	1	3.3
Forgery	3	10.0
Murder	12	40.0
Murder and Arms Act	3	10.0
Nari O Shishu Nirjaton Domon Ain	3	10.0
Rape	1	3.3
Theft/Dacoity	2	6.7
Total	**30**	**100.0**

Among the purposively selected respondents (experimental group), about 50 percent were convicted for murder and the next highest number involved arms and explosive case (about 17 percent). The rest of the respondents were convicted for forgery, rape, women and children oppression etc., which are of grievous in nature.

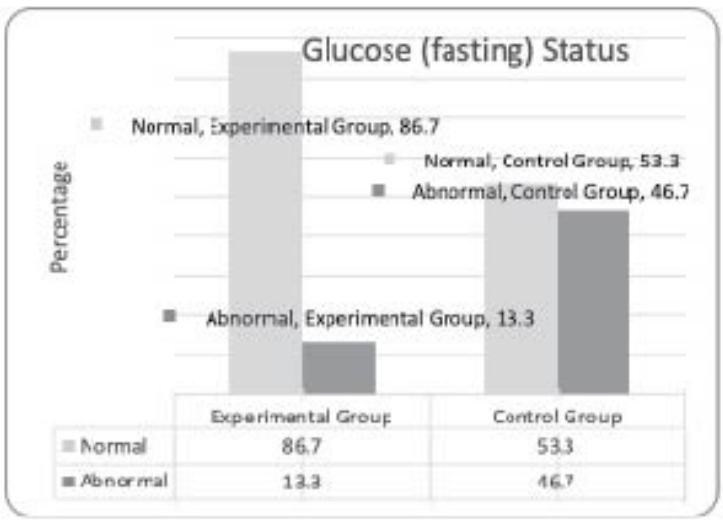


Figure 2: **Serum Glucose (Fasting) Status**

Role of Diet Imbalances for Violent Behavior

The study aimed to identify the relationship between biochemical factors and criminality, for this the respondents were selected specially to gather real-time data and study the impact of certain chemical components on human behavior. The respondents could not be accessed as planned to gather their blood samples and run the tests. However, to make a breakthrough in the field of bio-criminology in Bangladesh, the researcher decided to study the blood samples. It found that the offender had better (mostly normal in range) serum glucose (fasting blood results) level than the control group. The variation among them is significant. The subjects have been under close supervision and strict diet chart, which may have caused the result. The behavior of the violent criminals at the prison was amazingly polite and they responded with professional courtesy.

Role of Vitamin B6 for Violent Behavior

Vitamin B6 abnormalities have been considered to be responsible for cognitive malfunctioning irrespective of ages (Malouf & Evans, 2003; Soni, et al., 2012), mood depression, frustration and even increased

suicidal tendency (Kennedy, 2016; Marino et al., 2018). It has a direct impact on the body adrenaline level which might influence a person to get violent over others (Alsaadi et al., 2015; Lalonde, 2015; Mitchell et al., 2014).

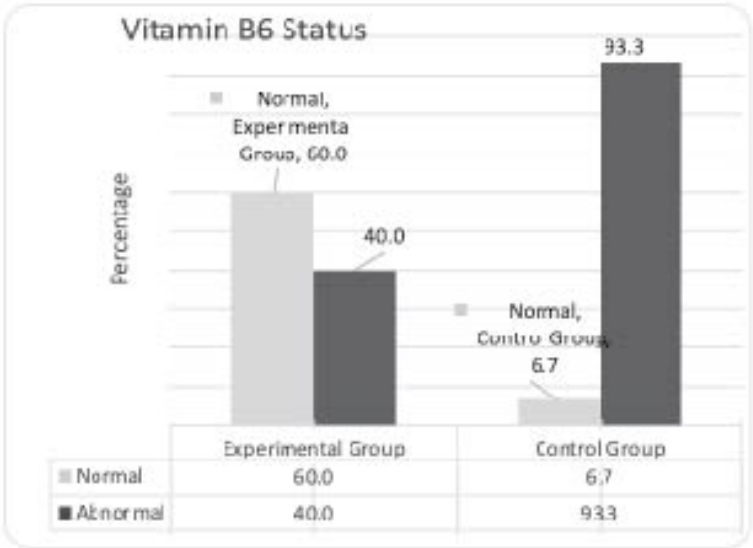


Figure 3: Comparison of Serum Vitamin B6 Status

Due to budget constraints and time limitation, significant number of samples could not be reached, and the result shown here is limited to a small sample size, thus have less generalizability. The study showed an extreme abnormal B6 level (normal range: 30-110 nmol/L) among the control group, while 40% of the experimental group showed abnormal level; thus the result could not establish a significant relationship between factors.

Correlation of Vitamin B6 with Criminal Behavior

In the behavioral studies, a positive correlation has been found between criminality and aggressive behavior in the identical and fraternal twins, though the rate was different (Tellegen et al., 1988). In order to evaluate the impact of vitamin B6 on the criminal's mentality and bad intention or bad action or on committing a crime, the researcher has run a few tests and

made few cross tabulations. The inferential statistics have been used to analyze and discuss the findings. The test did not conform to the assumption, but the violated assumption again was presented with a peculiar result, where the data is highly insignificant.

Table 4: **Offence Committed by the Respondents vs. Vitamin B6 Status**

Types of Offence			Vitamin B6 Status		Total
			Normal	Abnormal	
Offence Committed by the Respondents	Arms & Explosive	Count	2	3	5
		Expected Count	3.0	2.0	5.0
	Drugs Case	Count	1	0	1
		Expected Count	.6	.4	1.0
	Forgery	Count	1	2	3
		Expected Count	1.8	1.2	3.0
	Murder	Count	6	6	12
		Expected Count	7.2	4.8	12.0
	Murder and Arms Act	Count	3	0	3
		Expected Count	1.8	1.2	3.0
	Nari O ShishuNirjatonDomon Ain	Count	2	1	3
		Expected Count	1.8	1.2	3.0
	Rape	Count	1	0	1
		Expected Count	.6	.4	1.0
	Theft/Dacoity	Count	2	0	2
		Expected Count	1.2	.8	2.0
Total		Count	18	12	30
		Expected Count	18.0	12.0	30.0

In biological studies, it has been observed that violent aggression develops under specific genetic and environmental conditions (van der Gronde et al., 2014). Data presented in Table 5 represents the exact same idea about aggression and neurochemical relationship, which is in this case Vitamin B6 and violent behavior. Therefore, it can be implied that the violent criminal offenders have higher abnormal Vitamin B6 level than the non-violent criminal offenders.

Table 5: **Level of Offence vs. Vitamin B6 Status**

			Vitamin B6 Status		
			Normal	Abnormal	Total
Level of Offence	Violent	Count	14	10	24
		Expected Count	14.4	9.6	24.0
		% within Level of Offence	58.3%	41.7%	100.0%
	Non-Violent	Count	4	2	6
		Expected Count	3.6	2.4	6.0
		% within Level of Offence	66.7%	33.3%	100.0%
Total		Count	18	12	30
		Expected Count	18.0	12.0	30.0
		% within Level of Offence	60.0%	40.0%	100.0%

Table 6: **Chi-Square Tests**

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.139[a]	1	.709		
Continuity Correction [b]	.000	1	1.000		
Likelihood Ratio	.141	1	.707		
Fisher's Exact Test				1.000	.545
Linear-by-Linear Association	.134	1	.714		
N of Valid Cases	30				
a. 2 cells (50.0%, *** less than 20% is accepted) have expected count less than 5. The minimum expected count is 2.40.					
b. Computed only for a 2x2 table					

The amount of data in this case is not significant to fulfill the assumption for the test of Chi-Square as well. The increased sample size might have brought a different result. However, considering the violated assumption, it can be concluded that the null hypothesis (H0=P> α) is accepted, which indicates that the commission of the offence is independent of the level of Vitamin B6 and thus alternative hypothesis is rejected. In a nutshell, the types of violence and bio-chemical aspects of human are not correlated.

Violent Behavior and Abnormalities of Neurophysiological Factors

The connection between abnormalities of neurophysiological factors and criminal instinct has been examined with the help of serum glucose level, which was examined while in empty stomach status, and with the level of vitamin B6. But the results do not depend only on single factor as studies showed that violent behavior is also an outcome of the psychosocial factors which influence shaping it in a certain way (Portnoy, 2018). The test result is insignificant for serum glucose test but for the presence of abnormality in the pyridoxine, which is Vitamin B6, data show a noticeable relationship between violent criminal offences.

Table 7: **Comparative Picture of the Criminals and Non-criminals**

Level of Offence	Glucose Status		Vitamin B6 Status	
	Normal	Abnormal	Normal	Abnormal
Violent	21	3	14	10
Non-Violent	5	1	4	2
Non-Criminal	16	14	2	28

The relationship between the factors here found to be diverse, but the linear strength is moderate in a 0 to 1 scale of 'r'. The length of term served by the offender's shows that it has a negative linear relationship with serum glucose, while the strength is positive moderate with Vitamin B6. It seems the prison has an impact on their biochemical factors.

Table 8: **Correlations for Experimental Group**

Variables		Age of the Respondents	Income of the Respondents	Term Served (Months) by theRespondents	Serum Glucose Level of the Offender	Serum Vitamin B6 Level of the Offender
Age of the Respondents	Pearson Correlation	1	.139	.057	-.035	-.098
	Sig. (2-tailed)		.464	.800	.854	.605
	N	30	30	22	30	30
Income of the Respondents	Pearson Correlation	.139	1	-.511*	.063	.012
	Sig. (2-tailed)	.464		.015	.741	.949

	N	30	30	22	30	30
Term Served (Months) by the Respondents	Pearson Correlation	.057	-.511*	1	-.263	.199
	Sig. (2-tailed)	.800	.015		.237	.375
	N	22	22	22	22	22
Serum Glucose Level of the Offender	Pearson Correlation	-.035	.063	-.263	1	-.028
	Sig. (2-tailed)	.854	.741	.237		.882
	N	30	30	22	30	30
Serum Vitamin B6 Level of the Offender	Pearson Correlation	-.098	.012	.199	-.028	1
	Sig. (2-tailed)	.605	.949	.375	.882	
	N	30	30	22	30	30
*. Correlation is significant at the 0.05 level (2-tailed).						

The control group correlation represents that the age of the respondents and their level of glucose serum has a positive moderate relationship. Also, income of the respondents found to have a moderate but negative relationship with serum Vitamin B6 level.

Table 10: **Correlations for Control Group**

Variables		Age of the Respondents	Income of the Respondents	Serum Glucose Level of Control	Serum Vitamin B6 Level of Control
Age of the Respondents	Pearson Correlation	1	.358	.394*	-.063
	Sig. (2-tailed)		.052	.031	.741
	N	30	30	30	30
Income of the Respondents	Pearson Correlation	.358	1	.148	-.297
	Sig. (2-tailed)	.052		.435	.111
	N	30	30	30	30
Serum Glucose Level of Control	Pearson Correlation	.394*	.148	1	.005
	Sig. (2-tailed)	.031	.435		.979
	N	30	30	30	30
Serum Vitamin B6 Level of Control	Pearson Correlation	-.063	-.297	.005	1
	Sig. (2-tailed)	.741	.111	.979	
	N	30	30	30	30
*. Correlation is significant at the 0.05 level (2-tailed).					

The correlation of different factors among both of the study group helped understanding most of the research questions, though the relationship among the variables did not lead to any viable findings. In this case, the true reason could not be pictured as the insignificant number of sample size could not come up with significant result. But the serum Vitamin B6 level seems to be critical as the correlation among the experimental group and the control group had moderate strength of relationship with age of the offender and also termed served at the prison, which indicates the presence of the relationship between biochemical factors with criminality.

VII. Conclusions and Policy Implications

After considering all the facts and data, which are collected through the study from violent criminal offenders who were residing inside the maximum-security prison, this study has at least managed to accomplish the experiment on the convicted criminal offenders, which is a very new to its idea and an attempt in the context of research inside Bangladesh. After processing through all the secretarial and administrative stages, it took almost a year to get the clearance for conducting the experimental study. Though the study could not come up with significant outcome, it showed a moderate and positive relationship exists between the biochemical factors and criminality. However, this study actually required a considerable number of respondents, which was not available and even hard to get as it required high government official permission and also time and ethical disclosures.

The study found that the respondents who were registered for different violent criminal charges and convicted to the prison were enjoying a life with three times meals. As a result, their biochemical factors were found comparatively normal to the control group who were selected purposively from the Dhaka City. The experimental group had a history of multiple counts of violent criminal activities, and the study shows that the criminal with murder and explosives charges to have more abnormalities in their biochemical tests.

The sample size was too small, making any inference and or prediction on human behavior will be quite critical as the generalizability depends on empirical evidence. However, the research tried to focus and bring new ideas about the causality of violent behavior. The costing of the laboratory tests and complexity in accessing the respondents resulted in the small sample size which otherwise could provide more statistically significant result. In particular, in the case of the non-parametric test, the minimum assumptions for conducting any test could not be achieved. Therefore, this study needs to be conducted on a large-scale basis and more on a strictly defined population with relatively more defined way to get the standard data.

The biochemical factors have always had influence over the human body, basically on psychological behavior. The study has tried to reveal the connection between these factors over criminality. The results are indicative and also essential in understanding cognitive behavioral function. The health status of the criminals found to be quite normal though the vitamin B6 found unusual. A true claim cannot be established based on this finding. But the moderate positive relationship between biochemical factors and criminality has been observed in the data encouraged the researcher to promote for further work in this filed and investigate more into the relationship. Comparing the factors between the control group and experimental group, following recommendations could be suggested:

I. The serum blood glucose and vitamin b6 for both of the groups found to be standard normal level. As it has been known from different studies that the abnormality in these factors might cause depression and aggression which lead to unusual behavior like criminal behavior as well, , strategies should be taken to ensure the normal health condition through maintaining standard Vitamin level.

II. The authorities who deal with the suspects and offenders should collect routine blood samples for their behavior analysis and can recommend effective treatment and ensure correctional programs

properly while the suspects and offenders are at prison and other forms of correctional facilities.

III. The control group results are also very upsetting as their glucose and vitamin B6 level found to be pretty abnormal which may lead them to depression and fatigue. Thus, they may end up in expressing aggressive behavior and harm people around them. Therefore, the government should take more stringent and research-based awareness program both at the workplace and educational institutions which may improve the condition of the public health and help build a progressive nation.

References

Adler, F; Mueller, G.O.W & Laufer, W.S (2004). *Criminology and Criminal Justice System*. McGraw- Hill Ins: New York.

Alper, J.S. (1995). Biological influences on criminal behavior: how good is the evidence? *BMJ 310, 272–273*. Retrieved from https://doi.org/10.1136/bmj.310.6975.272.

Alsaadi, T., El Hammasi, K. & Shahrour, T.M. (2015). Does pyridoxine control behavioral symptoms in adult patients treated with levetiracetam? Case series from UAE. *Epilepsy & Behavior Case Report*. vol 4, pages 94–95. Retrieved from https://doi.org/10.1016/j.ebcr.2015.08.003

Barnes, J.C., Boutwell, B.B. & Beaver, K.M. (2015). Contemporary Biosocial Criminology: A Systematic Review of the Literature, 2000-2012, in: Piquero, A.R. (Ed.), *The Handbook of Criminological Theory*. John Wiley & Sons, Inc, Hoboken, NJ, pp. 75–99. Retrieved from https://doi.org/10.1002/9781118512449.ch5

Bohm, R.M & Haley, K.N (2002). *Introduction to Criminal Justice*. McGraw- Hill Ins: New York.

Boutwell, B.B. (2014). Aggression and Crime, in: Miller, J.M. (Ed.), *The Encyclopedia of Theoretical Criminology*. John Wiley & Sons, Ltd, Chichester, UK, pp. 1–9. Retrieved from https://doi.org/10.1002/9781118517390.wbetc156

Heilbronner, R. (2004). A Status Report on the Practice of Forensic Neuropsychology. *The Clinical Neuropsychologist,* 18:2, 312-326, DOI: 10.1080/13854040490501574 Retrieved from https://doi.org/10.1080/13854040490501574

Jhangiani, R., Tarry, H. (2014). Principles of Social Psychology-1st International Edition Retrieved from https://opentextbc.ca/socialpsychology/chapter/the-biological-and-emotional-causes-of-aggression/ (accessed on 2.7.19).

Jones, O.D. (2006). Behavioral Genetics and Crime, in Context. *Law Contemporary Problem*. 69, 81–100.

Kennedy, D.O. (2016). B Vitamins and the Brain: Mechanisms, Dose and Efficacy--A Review. *Nutrients* 8, 68–68. Retrieved from https://doi.org/10.3390/nu8020068

Lalonde, R. (2015). The effects of B vitamins on behavior and neurochemistry. pp. 1–42.

Lefkowitz, R.J. (1975). Identification of adenylate cyclase-coupled beta-adrenergic receptors with radiolabeled beta-adrenergic antagonists. *Biochemistry Pharmacology*. 24, 1651–1658.

Lee, E., & Vivarelli, M. (2006). The Social Impact of Globalization in the Developing Countries. *International Labour Review, 145*(3), 167-184.

Malouf, R., & Evans, J. (2003). Vitamin B6 for cognition. *Cochrane Database of Systematic Reviews*(4).

Mannheim, H., Bernard, T.J. (2014). Criminology. *Encyclopedia Britannica*. Retrieved from https://www.britannica.com/science/criminology (accessed on 2.7.19).

Marino, S., Vitaliti, G., Marino, S.D., Pavone, P., Provvidenti, S., Romano, C. & Falsaperla, R. (2018). Pyridoxine Add-On Treatment for the Control of Behavioral Adverse Effects Induced by Levetiracetam in Children: A Case-Control Prospective Study. *Annals of Pharmacotherapy*. 52, 645–649. Retrieved from https://doi.org/10.1177/1060028018759637

Martens, W.H.J. (2002). Criminality and Moral Dysfunctions: Neurological, Biochemical, and Genetic Dimensions. *International Journal of Offender Therapy and Comparative Criminology*. 46, 170–182. Retrieved from https://doi.org/10.1177/0306624X02462004

Mednick, S.A. & Finello, K.M. (1983). Biological factors and crime: Implications for forensic psychiatry. *International Journal of Law and Psychiatry*. 6, 1–15. Retrieved from https://doi.org/10.1016/0160-2527(83)90003-1

Mitchell, E.S., Conus, N. & Kaput, J. (2014). B vitamin polymorphisms and behavior: Evidence of associations with neurodevelopment, depression, schizophrenia, bipolar disorder and cognitive decline. *Neuroscience & Biobehavioral Reviews*. Rev. 47, 307–320. Retrieved from https://doi.org/10.1016/j.neubiorev.2014.08.006

Portnoy, J. (2018). Biosocial Bases of Aggression and Antisocial Behavior. Edited by Vazsonyi, A.T., Flannery, D.J. & DeLisi, M. (Eds.), *The Cambridge Handbook of Violent Behavior and Aggression*. Cambridge University Press, pp. 125–135. Retrieved from https://doi.org/10.1017/9781316847992.008

Rappaport, N. & Thomas, C. (2004). Recent research findings on aggressive and violent behavior in youth: Implications for clinical assessment and intervention. *Journal of Adolescent Health*. 35, 260–277. Retrieved from https://doi.org/10.1016/j.jadohealth.2003.10.009

Soni, M., Kos, K., Lang, I. A., Jones, K., Melzer, D., & Llewellyn, D. J. (2012). Vitamin D and cognitive function. *Scandinavian Journal of Clinical & Laboratory Investigation, 243*, 79-82.

Tellegen, A., Lykken, D.T., Bouchard, T.J., Wilcox, K.J., Segal, N.L. & Rich, S. (1988). Personality similarity in twins reared apart and together. *Journal of Personality and Social Psychology*. 54, 1031–1039. Retrieved from https://doi.org/10.1037/0022-3514.54.6.1031

Van der Gronde, T., Kempes, M., van El, C., Rinne, T. & Pieters, T. (2014). Neurobiological Correlates in Forensic Assessment: A Systematic Review. *PLOS ONE 9, e110672*. Retrieved from https://doi.org/10.1371/journal.pone.0110672

W. Buikhuisen (1985). Crime, Genetics, and the Criminal Justice System. *Political Life Science*. 4, 103–107.

Finance – Growth Nexus in Bangladesh and India: An Econometric Analysis

Dr. Md. Zahirul Islam Sikder[1]
Dr. Md. Abdul Wadud[2]
Dr. Md. Abu Hasan[3]

Key words: Finance, Growth, Econometric Analysis, Bangladesh, India.

This paper analyzes the dynamics of the relationship between finance and growth in Bangladseh and India using time series econometric techniques for the period 1974-2015. Johansen based cointegration results reveal the presence of a long term relationship between finance and growth in both countries. The long run impact of financial development on economic growth is also examined. We find that DCBS is the largest positive determinant of economic growth in the case of Bangladesh. On the other hand, M2 is the most effective financial development variable to boost the economic growth for India. The ECM results show that there is a bidirectional causal relationship exists between finance and growth in Bangladesh and India.

The study suggests that financial development has a significant effect on economic growth and vice versa in Bangladseh and India . Hence, the contribution of financial development to economic growth is considerable. Therefore, policies ought to be directed to accelerate improvements in the financial sector. Future researches should focuse on the impact of financial liberalization on financial development and thus economic growth.

I. Introduction

Financial development and economic growth are the two most important components for economic development. In recent years, the relationship between finance and growth has become an issue of extensive analysis. The theoretical relationship between finance and growth goes back to the study of Schumpeter (1911) who identified the services provided by financial intermediaries and argues that these are essential for innovation and development. Patrick (1966) identifies two possible directions of causality between financial development and economic growth. These relationships are labeled as the supply-leading and demand-following hypothesis. The demand-following view postulates a causal relationship

[1] 4Professor and Principal, Dhaka City International College, Dhaka, Bangladesh; Email: sikder67@yahoo.com
5Professor, Dept. of Economics Rajshahi University; Email: wadud68@yahoo.com
6Assistant Professor of Economics, BCS (General Education), Bangladesh; Email: hhafij@yahoo.com

from economic growth to financial development. In contrast, the supply-leading view postulates a positive impact of financial development on economic growth, which means creation of financial institutions and markets increases the supply of financial services and thus leads to economic growth.

Goldsmith (1969) finds a positive relationship between financial development and GDP per capita. Khan et al (2005) investigates the linkage between financial development and economic growth in Pakistan over the period 1971-2004. The study shows a positive impact of real deposit rate on economic growth. Guryay et al (2007) examine the link and causal relationship between financial development and economic growth in Northern Cyprus. Applying Ordinary Least Squares (OLS), the authors use time series data for 18 years, covering the period 1986-2004. Their findings reveal an insignificant positive relationship between financial development and economic growth. Sanusi and Salleh (2007) examine the relationship between financial development and economic growth in Malaysia covering the period 1960-2002. Three measures of financial development are used, namely, broad money to GDP, domestic credit provided by the banking system, and domestic credit to private sector to GDP. Using the autoregressive distributed lag approach, the study finds that ratio of broad money to GDP, and credit provided by the banking system have a positive and statistically significant impact on economic growth in the long run. Chakranorty (2010) investigates the financial development and economic growth nexus in India using different indicators of financial development and reports that stock market capitalization (financial development indicator) adds in economic growth. Using rolling regression, Hye (2011) investigates the relationship between financial development and economic growth in case of India over the period of 1973-2008. He notes that financial development impedes economic growth. Hye and Islam (2013) investigate the relationship between financial development and economic growth in Bangladesh using time series data over the period of 1975-2009.

It is seen that different studies have used different indicators of financial development, as well as different econometric techniques. Empirical results are also mixed. Therefore, this study is basically an empirical investigation. To the best of our knowledge there are no studies explore this issue combindly for Bangladesh and India using cointegration and error correction modeling approach.

The relationship between financial development and economic growth is important for economic development in Bangladesh and India . Bangladesh and India experience an average rate of 4.76 percent and 5.86 percent GDP growth rate respectively over the period 1974 to 2015 (World Bank, 2016). The trend of financial development indicators also conclusively implies that Bangladesh and India are performed well over the 42 years from 1974 to 2015 relative to other countries in this region. Though India has experienced higher average rate of growth in GDP and financial development from 1974 to 2015, Bangladesh is performing better than any other South Asian countries from the 1990s. The above growth scenario motivates us to explor the cointegrating and casual relationship between finance and growth in Bangladesh and India.

Objectives the Study

The specific objectives of this study are as follows:

i. To investigate the short-run and long-run relationship between various indicators of financial development and economic growth;
ii. To assess the causality and direction of causality between indicators of financial development and economic growth.

This paper is organized as follows- After the introduction, section II discusses the theoretical framework, while section III provides the reasearch methodology. Section IV presents the empirical results and findings and section V concludes the paper with policy implications.

II Theoretical Framework

This section describes how finance and growth are interlinked. The relationship between finance and growth has received a great deal of attention in recent decades, particularly in the empirical growth literature. Economists' views vary about the relationship between financial development and growth. The link between financial development and growth was first explore by Bagehot in 1873 (Levine, 2003) who opined that industrialization of England was possible due to the use of financial system mobilizing financial capital for production. A large and growing number of theoretical and empirical work has emerged following the pioneering work of Schumpeter (1912), who points out the productivity and growth enhancing effects of the services provided by a developed financial sector. He argues that financial intermediaries play a crucial role

in fostering technological innovation and economic growth by providing basic services, such as, mobilizing savings, monitoring managers, evaluating investment projects, managing and pooling risks, and facilitating transactions. Several other studies, such as, Robinson (1952), Patrick (1966), Goldsmith (1969), Gurley and show (1967), Mckinnon (1973), Shaw (1973), Romar (1987) and Rebelo (1991) also examined the link between financial development and growth.

II. 1 Finance - Growth as Demand-Following and Supply-Leading Hypothesis

There is a growing body of theoretical and empirical literature on relationship between financial sector development and economic growth. Patrick (1966) identifies two possible directions of causality between financial development and economic growth. These relationships are labeled as the supply-leading and demand-following hypotheses.

The demand-following view postulates a causal relationship from economic growth to financial development. Robinson (1952) mentions that "where enterprise leads, finance follows". This view is classified as the demand-leading hypothesis where economic development creates demands for particular types of financial arrangements and the financial system responds automatically to these demands (Levine, 1997). Robinson (1952) points out that finance does not exert a causal impact on growth. Instead, financial development follows economic growth as a result of higher demand for financial services. As such, an increasing demand for financial services might induce an expansion in the financial sector as the real economy grows (i.e., financial sector responds positively to economic growth). This line of reasoning is also supported by Gurley and Shaw (1967), Goldsmith (1969) and Jung (1986). In fact, this is a counterview to the supply-leading hypothesis proposed by Schumpeter (1912), who says that economic growth induces financial development. Patrick (1966) argues that the creation of modern financial institutions, their financial assets and liabilities and related financial services play an important role in economic growth and development. Patrick (1966), taking the indication from Goldsmith's analysis, further expanded the Gurley and Shaw (1960) and states that, "the causal nature of this relationship between finance and growth has not been fully explored either theoretically or empirically". Moving away from the neo-classical state equilibrium analysis to a highly developed financial system, consisting of financial intermediaries leads to a 'demand-following' phenomena

(Patrick, 1960). Under this, in response to the demand from real economy, there is the creation of modern financial institutions, their financial assets and liabilities and related financial services. The demand for financial services is a function of growth of real output, commercialization, monetization of agriculture and other traditional subsistence sectors. The faster the growth in real national income, the greater is the demand for external funds by enterprises. Financial intermediation plays a vital role, as internal funds generated are not sufficient for firms to finance expansion. Thus, finance is passive and permissive to the growth process.

In contrast, the supply-leading view postulates a positive impact of financial development on economic growth, which means that creation of financial institutions and markets increases the supply of financial services and thus leads to economic growth. Patrick (1960) also advocates for a supply-leading strategy that ensures the creation of financial institutions and the supply of their assets, liabilities and related services in advance of demand for them. The supply-leading finance performs two functions, (a) transfer resources from traditional (non-growth) sectors to modern high-growth sectors, and (b) promote and stimulate an entrepreneurial response in these modern sectors. Patrick argues that supply-leading finance would exert a positive influence on capital by improving the composition of the existing stock of capital, allocating efficiently new investments among alternative uses, and raising the rate of capital formation by providing incentives for increased saving and investment. The supply-leading finance causes economic development through the transfer of scarce resources from savers to investors the highest rates of return on investment. According to Patrick (1960), in the linkage between financial growth and economic development, one of the most important relationships is the stock of financial assets and liabilities to the real capital stock, separately from their optimal composition, rate of growth, their efficient allocation and utilization. Thus, the financial system influences the capital stock in three different ways. First, financial intermediaries through intermediation among various types of asset holders encourage more efficient allocation of a given amount of tangible wealth. Second, by intermediating between savers and investors, they can bring in allocative efficiency in new investments, i.e., additions to capital stock from lesser to more productive uses. Third, by providing increased incentives to save, invest and work, they can induce an increase in the rate of capital. While recognizing the important role played by financial intermediaries and also the differences in the distribution of saving and

investment in both developed and underdeveloped countries, Patrick opened that with the perfection of financial markets, near optimum allocation of investment is possible and the financial system accommodates economic growth. On the contrary, if the financial system is underdeveloped or inefficient, the growth is restricted. The McKinnon-Shaw hypothesis supports the supply-leading argument of Patrick (1966). McKinnon (1973) suggests a complementary relationship between the accumulation of money balances (financial assets) and physical capital accumulation in developing countries. McKinnon considers an outside model of money demand. He argues that due to underdeveloped financial markets in most developing countries, there are limited opportunities for external finance and all firms are confined to self-finance. Given that investment expenditures are lumpier than consumption expenditure; potential investors must first accumulate money balances prior to undertaking relatively expensive and indivisible investment projects. The 'debt-intermediation' view proposed by Shaw (1973) is based on an inside money model. Shaw (1973) argues that high interest rates are essential in attracting more saving. With more supply of credit, financial intermediaries promote investment and raise output growth through borrowing and lending.

III. Reseach Methodology

IV. 1Data and Data Description

The study used time series data ofreal GDP grwoth rate , domestic credit provided by the financial sector (as percentage of GDP) – DCBS, domestic credit provided by the private sector (as percentage of GDP) – DCPS, and as broad money (M2) covering the period 1974 - 2015. While the data of real GDP grwoth was used as dependent variable and as proxy for economic growth, the data of DCBS, DCPS, and were used as independent variable and as indexes of financial development. These data were collected from World Development Indicators (WDI 2016) of the World Bank.

Figure 1 shows the trends of GDP growth rate of Bangladesh and India. As can be seen from figure 1, GDP growth rate of Bangladesh fell from 9.56 per cent in 1974 to -4.09 in 1975. This is perhaps because of the effect of famine, heavy rainfall, and massive flooding in 1974. The GDP growth started increasing sharply and reached 5.66 percent in 1976. Till 1990 from 1984 there was a remarkable ups and downs in GDP growth rate.

After that till 2004 the growth rate was fluctuating slowly with an average rate of growth rate of around 5 percent. In 2007 the GDP growth rate reached a peak at 6.4 percent. After 2011 the GDP growth rate was almost stable. GDP growth rate of Bangladesh shown an upward positive trend till 2015.

India has performed with an average 5.85 percent annual growth rate over the 42 years. GDP growth rate of India was -5.24 percent in 1979 as agricultural production in 1976-77 declined by 6 percent, and production of commercial crops, foods and industrial production was low at an average rate of 10.5 percent. From the 1980s, beginning of every decade India has introduce a new set of economic reforms targeting different aspects of the economy and as a result, India has experienced a higher average rate of growth than Bangladesh over the years.

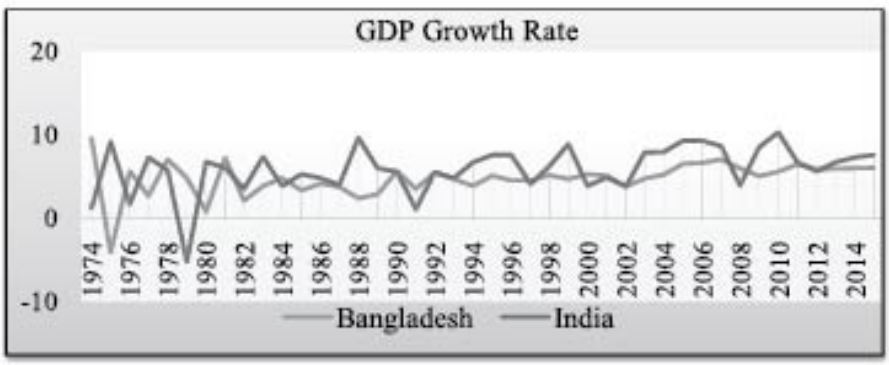


Figure 1: GDP Growth Rate of Bangladesh and India

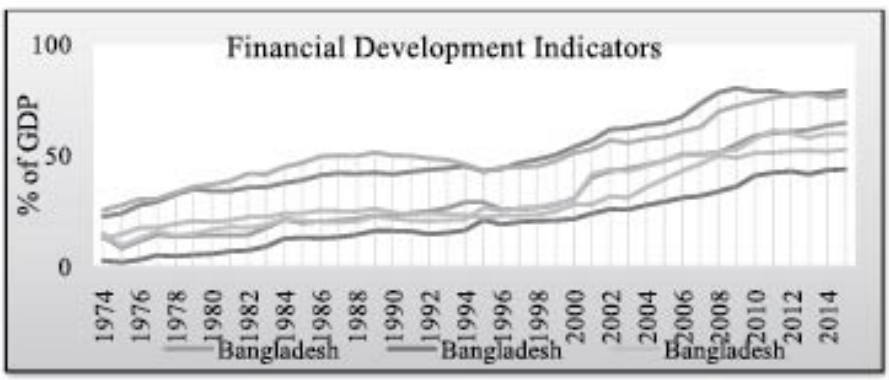


Figure 2: Financial Development Indicators Growth Rate of Bangladesh and India

Figure 2 shows financial development indicators growth rate of Bangladesh and India . Trends of M2, DCPS and DCBS a percentage of GDP conclusively suggest that the growth rate increased continuouusly from 1974 to 2015 in Bangladesh and India . Average rates of growth of M2 in Bangladesh and India is 32.09 and 50.75 percent respectively, while DCPS of Bangladesh and India grew at 20.30 and 30.14 percent respectively over the same piriod. India also provides more DCPS over the years relative to Bangladesh.

Methods

There are many methodologies developed in recent years for econometric analysis of time series data. In this section, the dynamic relationships between finance and growth are modeled through relevant econometric modeling, such as, unit root tests, Johansen cointegration test and vector error correction mechanism.

A. Unit Root Test

A test of stationarity or non-stationarity that has become widely popular over the past several years is the unit root test. There are several unit root tests to examine the stationarity of the time series. The first unit root test was introduced in econometrics by Dickey and Fuller (1979). In statistics, the Dickey–Fuller (DF) test examines the null hypothesis of whether a unit root is present in an autoregressive model. The alternative hypothesis is different depending on which version of the test is used, but is usually stationarity or trend-stationarity. The Dickey Fuller test is based on linear regression. Serial correlation can be an issue, in which case the Augmented Dickey-Fuller (ADF) test can be used. The most famous test is the augmented Dickey–Fuller test (ADF). Another test is the Phillips–Perron (PP) test. Both these tests use the existence of a unit root as the null hypothesis. ADF and PP test have been used in this study to fulfill the precondition of cointegration analysis for the data series of the variables.

Dickey and Fuller (1981) have developed an augmented version of DF test, known as the Augmented Dickey Fuller (ADF). This test is conducted augmenting the preceding three equations by adding the lagged values of the variable ΔY_t. To be specific, Augmented Dickey Fuller (ADF) unit root test is based on the following regression equations.

$$\Delta Y_t = \gamma Y_{t-1} + \delta_i \sum_{i=1}^{m} \Delta_{t-i} + \varepsilon_t \quad \text{(no trend, no intercept)} \qquad (1)$$

$$\Delta Y_t = \alpha + \gamma Y_{t-1} + \delta_i \sum_{i=1}^{m} \Delta_{t-i} + \varepsilon_t \quad \text{(intercept only)} \qquad (2)$$

$$\Delta Y_t = \alpha + \beta T + \gamma Y_{t-1} + \delta_i \sum_{i=1}^{m} \Delta_{t-i} + \varepsilon_t \quad \text{(trend and intercept)} \qquad (3)$$

where α is a interecpt (constant), β is the coefficient of time trend T, γ and δ are the parameters where, $\gamma = \rho - 1$, ΔY_t is the first difference of Y_t series, m is the number of lagged first-differenced term, and ε_t is the error term.

The test for a unit root is conducted on the coefficient of Y_{t-1} in the regression. If the ' t' statistic is less than the critical ' t' values, the null hypothesis of a unit root can not be rejected for the time series and hence, one can conclude that the time series is non-stationary at their levels.

This study also uses Phillips-Perron (PP) unit root test due to the some drawbacks of the ADF Test. Phillips -Perron (1988) develops a non-parametric unit root test. The PP test is modified from DF test so that serial correlation does no longer affect their asymptotic distribution. Whilst the ADF test addresses lags of ΔY as regressors in the test equation, the PP test makes a non-parametric correction to the t-test statistic. The PP tests correct for any serial correlation and heteroscedasticity in the errors ε_t of the test regression by directly modifying the test statistic.

B. Test of Cointegration

In economics, cointegration is most often associated with economic theories that imply equilibrium relationships between time series variables. Finance-Growth theory implies cointegration between GDP growth and financial development indicators. The equilibrium relationships implied by these theories are referred to as long-run equilibrium relationships, because the GDP growth and financial

development indicators that act in response to deviations from equilibrium may take a long time to restore equilibrium. As a result, cointegration is modeled using long spans of low frequency time series data measured monthly, quarterly or annually. Once variables have been classified as integrated of order I(0), I(1), I(2) etc., it is possible to set up models that lead to stationary relations among the variables, and where standard inference is possible. The necessary criteria for stationarity among non-stationary variables are called cointegration.

Two formal approaches are commonly employed to observe the presence of cointegration among included series in the model. These approaches are the augmented Dickey-Fuller residual-based test approach proposed by Engle and Granger (1987) and the Johansen's Full Information Maximum Likelihood (FIML) approach (Johansen and Juselius, 1990). We apply Johansen's muitivariate cointegration procedure to test the long run relationship. Johansen's muitivariate cointegration test is based on VAR model. Gujrati (2007) argues that 'according to Sims, if there is true simultaneity among a set of variables, they should all the treated on an equal footing; there should not be any priory distinction between endogenous and exogenous variables. It is in this spirit that Sims developed his VAR model'.

Johansen methods allow us to determination of the number of cointegrating vector. These tests directly investigate the integration in VAR model. Johansen and Juselius approach based on VAR model can be expressed mathematically as:

$$Y_t = \alpha + A_1 Y_{t-1} + A_2 Y_{t-2} + \cdots + A_\rho Y_{t-\rho} + \varepsilon_t \quad (4)$$

where Y_t is a vector containing n variables of I(1) at time t, α is an $(n \times 1)$ vector of constants, A_ρ is an $(n \times n)$ matrix of coefficients, ρ is the maximum lag included in the model and ε_t is an $(n \times 1)$ vector of error terms. As in Enders (2004), equation (4) can be written in the form of the error correction model assuming cointegration of order ρ as:

$$\Delta Y_t = \alpha + (A_1 - I)Y_{t-1} + A_2 Y_{t-2} + \cdots + A_\rho Y_{t-\rho} + \varepsilon_t \quad (5)$$

or in a final broad form as:

$$\Delta Y_t = \alpha + \Gamma_1 \Delta Y_{t-1} + \cdots + \Gamma_{\rho-1} \Delta Y_{t-\rho+1} + \Pi Y_{t-\rho} + \varepsilon_t \quad (6)$$

where, $\Gamma_i = (A_1 + A_2 + \cdots + A_{\rho-1} - I)$ represents the dynamics of the model in the short run. In equation (5.21), $\Pi = (A_1 + A_2 + \cdots + A_\rho - I)$ represents the long run relationship among the variables included in the vector Y_t, and I is the identity vector. The key idea of the Johansen and Juselius approach is to determine the rank of the matrix Π, which represents the number of independent cointegration relationship.

Johansen (1988) suggests two test statistics named trace and eigenvalue test statistic for estimating the number of cointegrating vectors or equations. According to the Trace test, the null hypothesis (H_0) is that the number of distinct cointegrating vector is less than or equal to r against the alternative hypothesis of more than r cointegrating vectors. The trace statistic is computed from the following equation:

$$\lambda_{trace}(r) = T \sum_{i=r+1}^{n} \ln(1 - \lambda_i) \quad (7)$$

According to the maximum eigenvalue test, the null hypothesis (H_0) is that the number of cointegrating vectors is r, against an alternative of (r+1) vectors. The maximum eigenvalue statistics is computed as:

$$\lambda_{max}(r, r+1) = -T ln(1 - \lambda_{r+1}) \quad (8)$$

where, λ_i denotes the estimated values of the characteristic roots obtained from the estimated; T is the number of observations. In order to perform the Johansen cointegration test, the first step is to calculate the trace and maximum eigenvalue statistics and then compare these to the appropriate critical values.

C. Error Correction Model (ECM)

Having verified if the variables under study (GDP, DCBS, DCPS and M2) are cointegrated, vector error correction model can be formulated to determine the direction of causality among the variables in the case of Bangladesh and India. According to Granger representation theorem, the relationship among GDP, DCBS, DCPS and M2 can be expressed in the error correction mechanism as follows:

$$\Delta GDP_{i,t} = \alpha_1 + \sum_{i=1}^{\rho} \alpha_i \Delta GDP_{t-i} + \sum_{j=1}^{\rho} \alpha_j \Delta DCBS_{t-j} + \sum_{k=1}^{\rho} \alpha_k \Delta DCPS_{t-k} + \sum_{s=1}^{\rho} \alpha_s \Delta M2_{t-s} + \theta_1 ECT_{t-1} + \varepsilon_i \quad (9)$$

$$\Delta DCBS_{i,t} = \beta_1 + \sum_{i=1}^{\rho} \beta_i \Delta GDP_{t-i} + \sum_{j=1}^{\rho} \beta_j \Delta DCBS_{t-j} + \sum_{k=1}^{\rho} \beta_k \Delta DCPS_{t-k} + \sum_{s=1}^{\rho} \beta_s \Delta M2_{t-s} + \theta_2 ECT_{t-1} + \varepsilon_i \quad (10)$$

$$\Delta DCPS_{i,t} = \gamma_1 + \sum_{i=1}^{\rho} \gamma_i \Delta GDP_{t-i} + \sum_{j=1}^{\rho} \gamma_j \Delta DCBS_{t-j} + \sum_{k=1}^{\rho} \gamma_k \Delta DCPS_{t-k} + \sum_{s=1}^{\rho} \gamma_s \Delta M2_{t-s} + \theta_3 ECT_{t-1} + \varepsilon_i \quad (11)$$

$$\Delta M2_{i,t} = \delta_1 + \sum_{i=1}^{\rho} \delta_i \Delta GDP_{t-i} + \sum_{j=1}^{\rho} \delta_j \Delta DCBS_{t-j} + \sum_{k=1}^{\rho} \delta_k \Delta DCPS_{t-k} + \sum_{s=1}^{\rho} \delta_s \Delta M2_{t-s} + \theta_4 ECT_{t-1} + \varepsilon_i \quad (12)$$

where, difference operator is indicated by Δ while ECT shows residual or error correction term resulted from long run cointegrating equation represents the deviation from the equilibrium in time period *t*, ($-1 < \theta_i < 0$). The short run parameter represents the response of dependent variable in each period starts from equilibrium. The constant terms are denoted by α_1, β_1, γ_1 and δ_1 in VECM equations and the residual terms ε_i (i=1, 2, 3, 4) is assumed to be normally distributed.

The difference from Granger causality test of VAR model is that, in this case, we can test for different type of causality. While applying t-test of the error correction term, we can observe the results about long run causality. The second test for joint significance of the lagged variables indicates the short run causality. And finally the t-test for joint significance of both the lagged variables and the error correction term shows if this causality is strong or not.

IV. Empirical Results and Discussion

This section provides the empirical results of the study. It starts with presenting the results of unit root test to check the stationary properties of the data. Results of cointegration show the long run relationship between economic growth and index of financial development, while of ECM based causality usual relationship between finance and growth in Bangladesh and India.

Financial systems vary across different countries, but in different countries financial institutions play different roles. Some countries have the market based financial system; others have the financial system that is oriented to the financial institutions. The country selection in this research is based on different forms of financial system. There are no generally adopted rules for defining the bank-based and the market-based financial system. In this case, it is necessary to provide measures, which can partly show the form of the financial system.

Results of Unit Root Tests

We perform ADF and PP unit root tests on all four series in levels and first differences in order to determine the univariate properties of the data employed in the analysis. To investigate the stationary properties of the variables we run the regression analysis with an intercept term, and with intercept and trend term, and none. ADF unit root results of Bangladesh and India are shown in Tables 1and 2 respectively.

Table 1: Results of ADF Unit Root Test for Bangladesh

	Levels			First Differences		
	Intercept	Intercept & Trend	None	Intercept	Intercept & Trend	None
GDP	-8.7811 (0.00)	-13.5468 (0.00)	0.2649 (0.76)	-8.3093 (0.00)	-8.2160 (0.00)	-8.3130 (0.00)
M2	1.12207 (0.99)	-2.0615 (0.55)	3.6832 (0.99)	-6.1552 (0.00)	-6.1238 (0.00)	-4.5526 (0.00)
DCPS	0.7766 (0.99)	-1.7239 (0.72)	4.2527 (1.00)	-6.2821 (0.00)	-6.3057 (0.00)	-4.2749 (0.00)
DCBS	0.4598 (0.98)	-2.0393 (0.56)	-2.5973 (0.99)	-6.5816 (0.00)	-6.4937 (0.00)	-5.4076 (0.00)

Source and Note: MacKinnon (1996); one-sided p-values are shown in parentheses.

Table 2: Results of ADF Unit Root Test for India

	Levels			First Differences		
	Intercept	Intercept & Trend	None	Intercept	Intercept & Trend	None
GDP	-6.7202 (0.00)	-7.8743 (0.00)	-1.0336 (0.27)	-11.5263 (0.00)	-5.1595 (0.00)	-11.6816 (0.00)
M2	-0.4671 (0.88)	-1.9221 (0.62)	2.1041 (0.99)	-4.1186 (0.00)	-4.0641 (0.01)	-3.0369 (0.00)
DCPS	-0.0632 (0.95)	-2.6659 (0.25)	1.0677 (0.92)	-2.4899 (0.12)	-2.6475 (0.26)	-2.1879 (0.02)
DCBS	-0.7621 (0.82)	-2.2798 (0.43)	1.0134 (0.91)	-2.4826 (0.13)	-4.6196 (0.00)	-2.1012 (0.03)

Source and Note: MacKinnon (1996); one-sided p-values are shown in brackets.

It is evident from Table 1 and 2 that all of the variables are nonstationary in their level forms with all three terms as the calculated ADF statistics are smaller than the critical values except for GDP with intercept, and with intercept and trend forms. But, GDP of Bangladesh and India are also non-stationary in level without intercept and trend terms in the calculated values, which are smaller (in absolute form) than the critical values.

Results reveal that all the variables are stationary in their first difference form with intercept, and with intercept and trend, and without intercept and trend at 1percent level of significance. Results also show that first differences with trend for the DCPS and first differences with intercept for the DCBS are non-stationary in the case of India; however, all the variables are stationary in their first difference form without intercept and none term.

Table 3: Results of PP Unit Root Test for Bangladesh

	Levels			First Differences		
	Intercept	Intercept & Trend	None	Intercept	Intercept & Trend	None
GDP	-8.2436 (0.00)	-12.7544 (0.00)	-2.2371 (0.03)	-25.7730 (0.00)	-22.9279 (0.00)	-23.0284 (0.00)
M2	1.1852 (0.99)	-2.1265 (0.52)	3.7904 (0.99)	-6.1552 (0.00)	-6.1487 (0.00)	-4.6814 (0.00)
DCPS	1.4978 (0.99)	-1.6877 (0.74)	4.5851 (1.00)	-6.3393 (0.00)	-6.8085 (0.00)	-4.2161 (0.00)
DCBS	0.6420 (0.98)	-2.0298 (0.57)	2.9846 (0.99)	-6.6365 (0.00)	-6.5816 (0.00)	-5.4343 (0.00)

Source and Note: MacKinnon (1996); one-sided p-values are shown in parentheses

The PP unit root results of Bangladesh and India are presented in Tables 3 and 4. From the tables, it appeared that all of the variables are non-stationary in their level forms with all three terms as the calculated PP statistics are smaller than the critical values except for GDP. GDP is found to be stationary at level as we accept the null hypothesis of non-stationary. When we first differences the levels forms with all terms, the results show that all the variables are stationary in their first difference form. The combined results from the entire test therefore suggest that all the variables are I(1) in the levels but I (0) in first differences.

Table 4: Results of PP Unit Root Test for India

	Levels			First Differences		
	Intercept	Intercept & Trend	None	Intercept	Intercept & Trend	None
GDP	-6.7001 (0.00)	-9.3585 (0.00)	-1.4344 (0.14)	-29.9742 (0.00)	-30.0325 (0.00)	-28.3544 (0.00)
M2	-0.3954 (0.90)	-1.6229 (0.76)	3.3815 (0.99)	-4.1077 (0.00)	-4.0527 (0.01)	-3.0369 (0.00)
DCPS	-0.0095 (0.95)	-1.0026 (0.93)	2.5688 (0.99)	-5.4887 (0.00)	-5.5019 (0.00)	-4.3903 (0.00)
DCBS	-0.6827 (0.84)	-1.6842 (0.74)	2.5732 (0.99)	-4.8261 (0.00)	-4.7678 (0.00)	-3.7388 (0.00)

Source and Note: MacKinnon (1996) one-sided p-values are presented in first brackets.

Results of Cointegration

Having established that all variables are integrated of the same order, we proceed with the Johansen multivariate cointegration tests which allow us to test for long-run relationship between financial development and economic growth. The initial step for establishing the presence of a long-run relationship among the variables is to determine the optimal lag length for the VAR system. Lag-length misspecification for the VAR model often generates autocorrelated errors (Lütkepohl, 2005). To perform this step, five different criteria including the sequential modified likelihood ratio (LR) test statistic, final prediction error criteria (FPE), Akaike information criterion (AIC), Schwarz information criterion (SIC) and Hannan-Quinn information criterion (HQ) are used to determine the lag lengths used in the VAR. These criteria are widely used in the literature (Lütkepohl, 2005; Enders, 2007). We proceed for each criterion with a maximum of 4 lags. Residual Serial Correlation Lagrange Multilplier (LM) Test is also performed to find out if there is mutual statistical independence for the different error terms. If the residuals do not fulfill the condition, then linear dependencies exist among the residuals and hence, they are said to be autocorrelated. The presence of residual serial correlation makes the result less efficient. Thus, we proceed to conduct LM tests for each suggested lags up to maximum 4 lags. Using 1 lag produces no autocorrelation in the VAR model for up to

4 lags. So, we accept VAR (1) model for cointegrating analysis. Tables 5 through 6 present the Johansen cointegration test results.

Table 5: **Cointegration Results of Bangladesh**

Variables	H_0	H_A	Trace statistics	5% critical value	Maximum eigenvalue statistics	5% critical value
No deterministic trend						
GDPM2 DCPS DCBS	r = 0	r=1	42.0932*	40.1749	25.2951*	24.1592
	r=1	r=2	16.7981	24.2760	11.7010	17.7973
No deterministic trend (restricted constant)						
GDP M2 DCPS DCBS	r = 0	r=1	65.2283*	54.0790	33.0968*	28.5881
	r=1	r=2	32.1315	35.1928	22.7231	22.2996

Note: Both trace and Maximum-eigenvalue test indicate 1 cointegrating equation at the 5 percent level.

Table 6: Cointegration Results of India

Variables	H_0	H_A	Trace statistics	5% critical value	Maximum eigenvalue statistics	5% critical value
No deterministic trend						
GDP M2 DCPS DCBS	r = 0	r=1	46.89187*	40.17493	29.11982*	24.15921
	r=1	r=2	17.77205	24.27596	11.86805	17.79730
No deterministic trend (restricted constant)						
GDP M2 DCPS DCBS	r = 0	r=1	57.85348*	54.07904	30.05043*	28.58808
	r=1	r=2	27.80306	35.19275	17.72633	22.29962

Note: Both trace and maximum-eigenvalue test indicate 1 cointegrating equation at the 5 percent level.

Tables 5 and 6 show the cointegration results among the variables for Bangladesh and India respectively . As shown in tables, both trace and maximum eigenvalue test indicates the rejection of null hypothesis of no cointegrating relationship at 5 percent level of significance as the calculated statistics are greater than the critical values and hence accept

the alternative hypothesis that there is cointegrating relationship among the variables. This indicates the existence of one cointegrating relationship among the variables in Bangladesh and India. It also suggests the presence of a long term relationship among the variables – GDP, DCBS, DCPS and M2 in Bangladesh and India.

The long run impact of financial development on economic growth in Bangladesh can be explained with the equation13 which is derived from Table 7.Equation 13 indicates that GDP is positively related to M2 and DCBS, while it is negatively related to DCPS.

$$GDP = 3.33 + 0.01\ M2 - 0.10\ DCPS + 0.12\ DCBS \quad (13)$$

Table 7: Long Run Relationship between Finance and Growth in Bangladesh

Cointegrating Equation	Coint. Eq1
GDP(-1)	1.000000
M2(-1)	-0.013696 (0.10676) [-0.12829]
DCPS(-1)	0.096128 (0.08287) [1.16003]
DCBS(-1)	-0.121212 (0.08191) [-1.47978]
C	-3.326912 (0.41583) [-8.00071]

Note: Standard errors are in parentheses and t-statistics are in [ ].

The long run impact of financial development on economic growth in India can be explained with the equation 14 which is derived from Table 8. Equation 14 for India shows that GDP is positively related to M2 and DCBS, while it is negatively related to DCPS in long run.

$$GDP = 2.14 + 0.09\ M2 - 0.09\ DCPS + 0.04\ DCBS \quad (14)$$

Table **8**: Long Run Relationship between Finance and Growth in India

Cointegrating Equation	Coint. Eq1
GDP(-1)	1.000000
M2(-1)	-0.085741 (0.07490) [-1.14480]
DCPS(-1)	0.089086 (0.10043) [0.88704]
DCBS(-1)	-0.041159 (0.09281) [-0.44345]
C	-2.143706

Note: Standard errors are in ( ) and t-statistics are in [ ].

Results of ECM

Results of Granger causality based on error correction models for Bangladesh and India are presented in Tables 9 and 10. In Table 9 shows that, results of Granger causality based on error correction models for Bangladesh are presented. Coefficient of the error correction term for the cointegrating equation $GDP = f(DCBS, DCPS, M2)$ is negative and significant. It indicates that the causal relationship is running from M2, DCPS and DCBS to GDP. Moreover, error correction term of $M2 = f(DCBS, DCPS, GDP)$ and $DCPS = f(DCBS, GDP, M2)$ are significant and negative. Thus, the causal relationship is running from economic growth (GDP growth) to financial development (M2 and DCPS). This result reveals plies that bi-directional causality exists between finance and growth in Bangladesh, suggesting. Results imply that the finance-led growth and growth-lead finance hypothesis exists for Bangladesh.

Table 9: Vector Error Correction Estimates for Bangladesh

Error Correction	D(GDP)	D(M2)	D(DCPS)	D(DCBS)
Cointegrating Equation 1	-0.840770	-0.704534	-0.473048	-0.499146
	(0.19793)	(0.30922)	(0.19376)	(0.36700)
	[-4.24792]	[-2.27845]	[-2.44143]	[-1.36006]
D(GDP(-1)	-0.182209	0.229388	0.186682	0.147113
	(0.11889)	(0.18574)	(0.11639)	(0.22045)
	[-1.53259]	[1.23499]	[1.60398]	[0.66733]
D(M2(-1)	-0.146111	0.600152	0.509898	0.622243
	(0.15598)	(0.24369)	(0.15270)	(0.28923)
	[-0.93672]	[2.46279]	[3.33926]	[2.15139]
D(DCPS(-1)	-0.240663	-0.131934	0.110760	0.075588
	(0.21500)	(0.33589)	(0.21047)	(0.39866)
	[-1.11936]	[-0.39279]	[0.52624]	[0.18960]
D(DCBS(-1)	0.096571	-0.349600	-0.358603	-0.385294
	(0.16183)	(0.25282)	(0.15842)	(0.30007)
	[0.59675]	[-1.38278]	[-2.26359]	[-1.28401]
R-squared	0.742675	0.017778	0.167651	0.052922
Adj. R-squared	0.713267	-0.094476	0.072526	-0.055316
Sum square residuals	63.29968	154.4990	60.66291	217.6398
S.E. equation	1.344828	2.101014	1.316520	2.493648
F-statistic	25.25372	0.158369	1.762420	0.488943
Log likelihood	-65.93756	-83.78371	-65.08660	-90.63678
Akaike AIC	3.546878	4.439185	3.504330	4.781839
Schwarz SC	3.757988	4.650295	3.715440	4.992949
Mean dependent	0.254250	1.404000	1.045250	1.253750
S.D. dependent	2.511468	2.008286	1.367026	2.427415

Note: Standard errors are in ( ) and t-statistics are in [ ]

Table 6.10: Vector Error Correction Estimates for India

Error Correction	D(GDP)	D(M2)	D(DCPS)	D(DCBS)
Cointegrating Equation 1	-1.561185	0.301748	0.171390	0.376419
	(0.26106)	(0.15850)	(0.14849)	(0.18233)
	[-5.98017]	[1.90375]	[1.15426]	[2.06448]
D(GDP(-1))	0.234051	-0.021589	0.093799	-0.020139
	(0.16461)	(0.09994)	(0.09363)	(0.11497)
	[1.42181]	[-0.21601]	[1.00181]	[-0.17517]
D(M2(-1))	-0.354413	0.513031	0.308792	0.318752
	(0.30943)	(0.18787)	(0.17600)	(0.21611)
	[-1.14538]	[2.73081]	[1.75454]	[1.47494]
D(DCPS(-1))	0.677052	0.248868	0.232965	-0.154963
	(0.39315)	(0.23870)	(0.22361)	(0.27458)
	[1.72213]	[1.04260]	[1.04182]	[-0.56435]
D(DCBS(-1))	-0.271664	-0.188078	-0.222925	0.297482
	(0.32494)	(0.19728)	(0.18482)	(0.22694)
	[-0.83605]	[-0.95334]	[-1.20620]	[1.31082]
C	0.095129	0.669575	0.560057	0.566617
	(0.52940)	(0.32142)	(0.30111)	(0.36975)
	[0.17969]	[2.08315]	[1.85996]	[1.53244]
R-squared	0.661422	0.386112	0.319861	0.289309
Adj. R-squared	0.611632	0.295835	0.219841	0.184796
Sum square residuals	207.1121	76.34723	67.00274	101.0292
S.E. equation	2.468103	1.498501	1.403805	1.723788
F-statistic	13.28402	4.276943	3.197957	2.768159
Log likelihood	-89.64515	-69.68579	-67.07462	-75.28814
Akaike AIC	4.782258	3.784289	3.653731	4.064407
Schwarz SC	5.035590	4.037621	3.907063	4.317739
Mean dependent	-0.039750	1.382500	0.948500	1.227500
S.D. dependent	3.960421	1.785747	1.589334	1.909197

Note: Standard errors in ( ) & t-statistics in [ ]

Table 10 shows the, results of Granger causality based on error correction models for India presented Coefficients of the error correction terms for the cointegrating equation $GDP = f(DCBS,\ DCPS,\ M2)$ and

$DCBS = f(GDP, M2, DCPS)$ are significant. It reveals that the causal relationships exist between financial development and economic growth. We also find that M2, DCBS and DCPS stimulate economic growth, while GDP stimulates DCBS. Results imply the finance-led growth and growth-lead finance hypothesis for India.

Findings

i. In this study, Johansen and Juselius (1990) multivariate cointegration test has been employed to investigate the long run relationship between economic growth and financial development of South Asian two countries. The findings are stated below:

   - According to the trace and maximum eigenvalue test of cointegration, we find 1 cointegrating equation at the 5 percent level for Bangladesh. It suggests the presence of a long term relationship among the variables GDP, M2 (as percent of GDP), DCPS (as percent of GDP) and DCBS (as percent of GDP) in Bangladesh. In other words the results, suggest a long term relationship between Finance - Growth in Bangladesh and India.

   - The long run impact of indicators of financial development on economic growth is also reported. We find that DCBS (as percent of GDP) is the largest positive determinant of economic growth in the case of Bangladesh. On the other hand, M2 (as percent of GDP) is the most effective financial development variable to increase the economic growth for India.

ii. Finally results of ECM based causality are given to show the causal relationship and the direction of causality between finance and growth in Bangladesh and India. The major findings are stated below:

Taking into consideration the results of Johansen cointegration test and ECM test, it is appeaesis that the selected financial variables have an impact on the economic growth of Bangladesh and India either in the short run or long run or both.

V. Conclusion and Policy Implications

This paper attempts to analyze the dynamics of the relationship between finance and growth in Bangladseh and India using time series econometric techniques for the period 1974 to 2015. The study suggests that financial development has a significant effect on economic growth in Bangladesh and India. Hence, the contribution of financial development to economic growth is considerable. It may therefore be suggested that policies ought to be directed to accelerate improvements in the financial sector. In developing economies, the financial sector is mainly dominated by banks with stock markets playing very minor roles. Therefore to speed up the financial development of such economies, efforts should be directed towards more improvements in the financial sector.

Financial indicator of Bangladesh, i.e., broad money-M2 as a percentage of GDP, is lower than other countries. Since financial development is regarded as a positive factor for economic development, Bangladesh should strengthen in financial sector.

Empirical results of the study show that there are significant relationship between finance and growth in Bangladesh and India. Therefore, effective policies are essential to strengthen the linkage between in finance and growth in this region. In this context, we suggest the following measures:

- Governments in Bangladesh and India need to develop their financial market and maintain stability for economic growth.
- Both public and private sector credit distribution should be proper and justifiable.
- Management of financial sector should be neutral in their decision making with proper field inspections.
- No political management body should be in the financial sector.

Scope of Further Research

The study examines the relationship between finance and growth in Bangladesh and India. Further research is needed in the following areas.

- Determinants of financial development to capital market.
- Impact of legal systems, regulations, macroeconomic policies on financial development.
- The link between financial developments, risk sharing, specialization and economic growth.
- Study relating to finace-growth nexus may be expanded in all seven South Asian countries.

References

Goldsmith, R. W. (1969), *Financial Structure and Development*, New Haven, CT: Yale University Press.

Gujarati, D. N. (2007), *Basic Econometrics*, The McGraw-Hill Companies, New Delhi.

Enders, W. (2004), *Applied Econometric Time Series*. 2nd ed., John Wiley & Sons Inc, New York.

Chakranorty, I. (2010), *Financial Development and Economic Growth in India: An Analysis of the Post-reform Period. South Asia Economic Journal*, 11: 287-308.

Dickey D. A., and Fuller, W. A. (1979), Distributions of the Estimators for Autoregressive Time Series with a Unit Root, *Journal of American Statistical Association*, 74: 427- 431.

Dickey D. A., and Fuller W. A. (1981), Likelihood Ratio Statistics for Autoregressive Time Series With a Unit Root, *Econometrica*, 49: 1057 – 1072

Engle, R. F., and Granger, C. W. J. (1987), Cointegration and Error Correction: Representation, Estimation and Testing, *Econometrica*, 55: 251-276.

Guryay, E., Safkli, and O.V., Tuzel, B. (2007), Financial Development and Economic Growth: Evidence from Northern Cyprus, *International Research Journal of Finance and Economics*, 8(27).

Johansen, S. (1988), Statistical Analysis of Cointegrating Vectors. *Journal of Economic Dynamics and Control*, 12: 231- 54.

Levine, R., Loayza, N., and Beck. T. (2000), Financial Intermediation and Growth: Causality and Causes, *Journal of Monetary Economics* 46: 31-77.

Hye, Q. M. A. (2011), Financial Development Index and Economic Growth: Empirical Evidence from India. *The Journal of Risk Finance*, 12: 98-111.

Khan, M. A., Qayyum, A., and Saeed, A. S. (2005), Financial Development and Economic Growth: the Case of Pakistan, *The Pakistan Development Review*, 4(2): 819-837.

Rahman, H. M. (2004), Financial Development-Economic Growth Nexus: A Case Study of Bangladesh. *The Bangladesh Development Studies*, 3: 113-128.

Patrick, H. T. (1966), Financial Development and Economic Growth in Underdeveloped Countries, *Economic Development and Cultural Change*, 14:174-189.

Phillips, P. C. B., and Perron, P. (1988), Testing for a Unit Root for a Time Series Regression, *Bio-metrika*, 75: 335-346.

Pradhan, R. (2009), The Nexus between Financial Development and Economic Growth in India: Evidence from Multivariate VAR Model. *International Journal of Research and Reviews in Applied Sciences*, 1: 141-151.

Sanusi, N. A., and Sallah, N. H. M. (2007), Financial Development and Economic Growth in Malaysia: An application of ARDL approach.

World Bank. (2016), World Development Indicators, *New York: Oxford University* Press.

Ang, J. B., and McKibbin, W. J. (2005), Financial Liberalization, Financial Sector Development and Growth: Evidence from Malaysia, *Centre for Applied Macroeconomic Analysis (CAMA) Working Paper 5,* Australian National University.

Johansen, S., and Juselius, K. (1990), Maximum Likelihood Estimation and Inference on Cointegration with Applications to the Demand for the Money, *Oxford Bulletin of Economics and Statistics*, 52: 169 - 210.