BOP and Market Design Economics
Supervisor
Professor Dr. Peter Knorringa
Pourya Darnihamedani

Davood Midari
357269
Erasmus School of Economics

October 25, 2015

Contents

Acknowledgment

Abstract

Theory of the bottom of the pyramid without doubt is one of the most influential theories in the business literatures in the past decades. Prahalad suggested a new mechanism for poverty reduction; large-scale and widespread entrepreneurship is at the heart of the solution to poverty eradication (Prahalad, 2004, Page 28). This idea attracts attention of many scholars in different fields. This paper suggests that economic theories can contribute to BOP literature. This paper utilizes two influential economic theories; transaction costs and market design economics, to further enrich the BOP literature.

1 Introduction

Prahalad introduced a new framework for poverty reduction. In his book, "Fortune at the Bottom of Pyramid", he notified that the poor can and must involved in market as a customer and a part of production process (Prahalad, 2004, Page 28). This idea attracts attention of many scholars in different fields (Young, 2012; Pervez, Maritz, & De Waal, 2013; Halme, Lindeman, & Linna, 2012; Hall, Matos, Sheehan, & Silvestre, 2012; George, McGahan, & Prabhu, 2012; de Almeida Faria, Hemais, & Guedes,

2008). The poor not only should not be excluded from the market but they should be included in the market as a profitable customer class and active participants of value chain. In his book he provided examples of companies that successfully enter into the BOP market. The common feature among all of the examples is that companies approach the poor as consumers or part of their value chain. Furthermore, these companies create a win-win situation in which both companies and low incomes groups gain from economic transactions. One of the example is Casa Bahia that is a chain store in Brazil and by creating a sophisticated credit system makes appliances more affordable for the inhabitant of the BOP (Prahalad, 2004, Page 117-137). Casa Bahia gives credit to low and even unpredictable income streams. The other example is about third largest cement company in the world; CEMEX. CEMEX targets consumers with income $5-15 per day. It has revenue of $6.45 billion. By teaching the poor to save and invest, CEMEX enables them to purchase house and eases their access to credit (Prahalad, 2004, Page 147-160). The other story is about Hindustan Unilever Limited (HUL). HUL is the largest fast moving consumer goods company in India. In the same token, it is the largest soap producer in India. It has more than 60% of market share and has significantly contributed to health of the poor in India. In India more than 19 percentages of children suffer from diarrhea and each year 2.2 million people die from this disease. Washing hands with soap prevent this disease, however, it is difficult to educate the poor to consume soap more often (Prahalad, 2004, Page 207-227). HUL with the help of Indian government launch a campaign and educate the poor to improve their lifestyle. Therein, they educate and encourage the BOP inhabitant to use soap

more often. Furthermore, HUL creates soap in small packages that makes soap more affordable for the poor. Consequently, diarrhea is reduced in India, for illustration; in Thesgora diarrhea reduces from 36% to 5% through Lifebuoys Help a Child Reach 5 campaign [1]. Literatures that arise around Prahalad's book provide numerous examples of companies that make the products more affordable for the poor (Pervez et al., 2013; Hall et al., 2012; George et al., 2012; de Almeida Faria et al., 2008, Gewald et al., 2012; Halme et al.; 2012, Pea 2014)(Ponssard ,2014). There are two ways for making products more affordable; technological advancement and transaction costs reduction. Technological advancements decrease production costs and make products affordable for middle and low income classes. This has been the dominant mechanism of cost reduction since the industrial revolution, such as reduction of cars price, computers' price, real estates' price and many other products price. Recently, economists propose a new way for costs reduction by introducing transaction cost economics (Coase, 1937; Williamson, 2010)(North1992; Williamson1979). Transaction costs consist of three main components; search costs, contract costs, and costs of enforcing contracts [Page 6-9](North, 1994)(North & Wallis, 1994). Reducing transaction costs cuts products' price and make them more affordable for those who are excluded from the market. Besides that, transaction costs are higher for the poor. Hence, reduction of transaction costs has the same effect as technological advancement. That is, it makes the products more affordable for the consumers, especially for the BOP in-

_____
[1]http://www.hul.co.in/mediacentre/pressreleases/2014/Lifebuoy-Reduces-Diarrhoea-from-36-perc-to-5-perc-in-Thesgora.aspx

habitant. Moreover, transaction cost economics provides robust theoretical framework that enables producers to analyze production costs more thoroughly (Coase, 1937; Mitra, Mookherjee, Torero, & Visaria, 2013; North & through Time, 1995; North, 1994; Williamson, 2010, 1999, 1994; Smith, Venkatraman, & Dholakia, 1999).

Prahalad implicitly discussed transaction cost economics under the title of "Reducing Corruption: Transaction Governance Capacity" (Prahalad, 2004, Page 103-123). Economic theories discuss this topic extensively. For illustration, three Nobel prize winners in economics are transaction costs theorists, Ronald Coase, Douglas C. North, Oliver Williamson (Nobel,2009; Nobel 1993; Nobel, 1991).

Market design economics is an emerging field in economics that creates a rigorous mechanism for confronting with transaction costs. This field utilizes game-theory, mathematics, and IT to find solutions for market failures and transaction costs. This specialty has resuscitated several markets that severely suffered from transaction costs; kidney exchange market, high school admission, working position for new doctors and so on (Roth, 2008).

This paper links economics theories; explicitly transaction costs economics and market design economics, with BOP literature. This connection can further enriches both fields and contributes to life of the poor.

The structure of this paper is as follows; the first section of this paper is a brief review on BOP. Herein, barriers for entrepreneurial entrance and growth in BOP are discussed. In addition, Prahalad's solution to these barriers are elaborated. In the second section, different types of transaction costs are explained. Moreover, the mechanism that institutions change in favor of the poor is explained. The third section is introduction to market design economics. This section explain four different types of market failures and their market design economics solutions in form of real life examples. The final section aims at bridging market design economics and BOP. Therein, we provide an example of a market in a developing country that severely suffered from several sources of transaction costs and market failures. Furthermore, this example shows that private firms by redesigning the market can overcome market failures and contribute to life of the poor. At the end, conclusion of this paper is putted into words.

2 Bottom of Pyramid at a Glance

In 2002 Prahalad declared that, altruistic approaches to poverty and philanthropy cannot significantly contribute to the life of the poor (Prahalad, 2004, "Preface"). He proposed a new instrument for poverty reduction. In his article "The Fortune at the Bottom of the Pyramid",(January 2002), he noted; large-scale and wide-spread entrepreneurship is at the heart of the solution to poverty (Prahalad, 2004, "Preface"). He divided the world population to 4 economic classes with regard to their incomes. The last largest socio-economic class that entails 4 billion people, who earn less than $1,500 per year, is called the Bottom of the Pyramid (BOP) (Prahalad, 2004, Page 27-29). This theory suggests that, the BOP can and must be involved in the market as a customer and as a part of production process. The poor not only should not be excluded from the market but they should be included in the market as profitable customers and active participants of value chains. Moreover, large-scale entrepreneurs with help of

4

NGOs and local governments should approach the poor as consumers. A win-win relation between the inhabitant of the BOP and producers is needed in order to enrich the poor(Prahalad, 2004, Page 5-20).

Prahalad in his book, "the Fortune at the Bottom of Pyramid", introduced several cases that large companies target the BOP as their consumers, as a result, both companies and the poor gain significantly from transactions. Afterwards, large numbers of literatures arise around the topic of BOP (Pervez et al., 2013; Hall et al., 2012; George et al., 2012)(Gradl et al, 2010; UNDP, 2014). They further explore other examples of successful entrance of large companies into the BOP. In the introduction of this paper CEMEX and Casa Bahia cases are introduced. Herein, we discuss Annapurna Salt. Annapurna is a company that helps to eradicate Intellectual Developmental Disorders (IDD), by creating a new product, marketing, and distribution channel.

Iodine deficiency is the worlds leading cause of mental disorder (WHO, 2015). In India more than 200 million people are in the risk of IDD and 70 million are suffering from mental disorder (Prahalad, 2004, Page 260). Iodine prevent occurrence of IDD. Everyone including the poor use salt, hence, it is easy to prevent IDD by consumption of iodized salt. However, search costs are high in rural part of India, that is, there is little access to Internet, TV, Radio, and other source of information center. High search costs act as barriers for the poor to search and educate themselves about the impact of iodized salt. Consequently, majority of, the poor are not informed about the benefits of iodized salt and are not willing to pay extra margin for iodized salt, in comparison to usual salt.

Hindustan Unilever Limited (HUL) is a subsidiary of Unilever that operates in India. It operates since 1930 and now it is the largest branch of Unilever, it has more than 52% of the total wealth of Unilever. HUL Research Centre innovates products that match to Indian demand. HUL feeled the gap of iodized salt in the Indian market. Hence, the research centre aimed at creating an iodized salt that match well to the kitchen of middle and low Indian economic classes. They found that in Indian cooking iodine vanishes. Consequently, the research centre aims at a salt that keep the iodine in the salt for longer period, be storable, as well as do not vanish in the Indian cooking. The result of the research was an iodized salt. Hindustan Unilever brands the new salt as "Annapurna Salt".

The difficulty of selling Annapurna Salt into market is educating the poor and convincing them to pay more for iodized salt. The Indian villages have difficulties in accessing to TV, Radio, Internet and other social network. Hence, it is extremely difficult to reach the poor via advertisement and social media. To overcome this problem, Hindustan Unilever introduced a new selling and advertisement method (Prahalad, 2004, Page 265).

In order to educate the poor and improve distribution channel in rural parts of India HUL introduced Shakti Ammas. Shakti Ammas are Indian ladies who are member of self-helping groups in rural area in India. Hindustan Unilever, gives them a fix salary for educating the poor about benefits of iodine salt as well as introducing and advertising the HUL products. Moreover, Hindustan Unilever, provides them with a commission for selling their products. Shaktis receive stocks from a rural distributor. HUL provides initial training to Shakti Ammas that educates them about selling techniques, knowledge about advantageous of products, bookkeeping,

and some others useful skills. Each Shakti is able to generate between net incomes of Rs.700-1000 (Balakrishna, 2011, Page 140).

The result of the new advertisement and distribution system is that more than 45,000 Shaktis are now working for HUL. Moreover, Shaktis create 10 percentage of total HUL's revenue (Balakrishna, 2011, 141). Furthermore, investigations suggest that Annapurna Salt is successful in reducing IDD in India. Due to the successes of this project in India, United Nations International Children's Emergency Fund (UNICEF) ask HUL to expand its business to other BOP countries such as Ghana and Nigeria (UNICEF, 2008, Page 22). "This really has been a win-win situation" says Raphael da Silva, former head of Unilevers Popular Foods team in Africa.

> Unilever has developed a successful business, and UNICEF and the Ghana Health Service have achieved much greater take-up of iodized salt. Mr. da Silva also declared that salt produced locally has also benefited local employment and manufacturing. Furthermore, in 2002, Panama was declared free of iodine deficiency disorders (UNICEF, 2008)
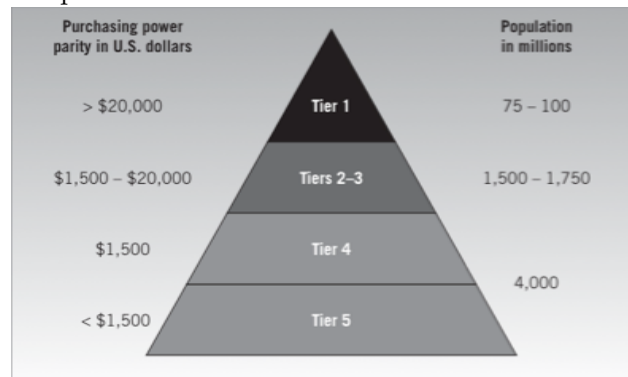
.

2.1 BOP Market

The term bottom of pyramid or base of pyramid or simply BOP was first introduced by Prahalad in his influential paper; The Fortune at the Bottom of Pyramid. He divided the world population to 4 economic classes with regards to their incomes. The last largest and poorest socio-economic class who are 4 billions and earn less than $1,500 per year are called the bottom of the pyramid (BOP), graph 2 (Prahalad, 2004, Page 28). This definition is the most common definition of the bottom of pyramid (Hall et al 2012). There are also other definitions of BOP, for instance Shah 2008 claimed that BOP are the 2.5 billion people who earn less than $2.5 per day (Pervez et al., 2013, Page 55). Some other researchers define people who earn less than $3,000 per year as BOP (Hammond et al., 2007, Page 147-158). Most of the people at the bottom of the economic pyramid are based in South Asia, Africa, Eastern Europe, the Caribbean and Latin America (Subrahmanyan et al, 2008).

In spite of the fact that individual purchasing power is low in the BOP the aggregate demand is extraordinary. Hence, large scale production is profitable and attractive for all companies. The GDP of nine of developing countries, which include many inhabitant of BOP, is about $12.5 trillion. This implies that the BOP is a large market for entrepreneurs (Prahalad, 2004, Page 34).

Graph2

Purchasing power parity in U.S. dollars		Population in millions
> $20,000	Tier 1	75 – 100
$1,500 – $20,000	Tiers 2–3	1,500 – 1,750
$1,500	Tier 4	4,000
< $1,500	Tier 5	

2.2 Entrepreneurship Barriers in BOP

Prahalad believed that transparency reduces transaction costs. In the same token, it is a necessity condition for entrepreneurship growth (Prahalad, 2004, Page 107). Nevertheless, majority of the BOP countries suffers from an opaque market with high transaction costs (Prahalad, 2004, page 105-106). For instance, for registering a land an Indian farmer has to first approach a broker. The broker lobbies with authorities and does the long bureaucratic process and eases the transaction. The cost of registering a land for a farmer is the registration cost plus unnecessary transaction costs; broker fees, corruption for bribing officers and etc (Prahalad, 2004, Page 107-109). As it is explained in detail in the next section, high transaction costs lead to market failures. In the case of high broker fee and high bribing cost a poor farmer cannot afford registration and this market fails. High transaction costs not only disincentivize the multinational companies to participate in the poor countries, but also they hinder local entrepreneurship growth (Zacharakis et al., 1997). C.K Prahalad declared that there are three requirements for creating a transparent market and reducing transaction costs: Firstly, access to information and transparency in all of transactions. Secondly, fast speed in transactions. Finally, high trust level in the system (Prahalad, 2004, Page 109).

Prahalad suggested that enforcing an appropriate rules is the main way for transparent market (Prahalad, 2004, Page 110). However, experiences in developing countries suggest that changing the formal rules and regulation if it is not impossible in the short time it takes long. The reason for that is powerful organizations that benefit from opaque market do not allow radical changes (North, 1992, Page 11).

A new field in economics that is called "Market Design Economics" or "Economic Engineering" provides other alternative for improving market's transparency in short run. In the section of "Market Design Economics" it is explained that how market design economics' solutions can fulfill the transparency conditions, which are proposed by Prahalad. Before we explain market design economics, different types of transaction costs are explained.

3 Transaction Cost Economics at a Glance

In 1937 for the first time Ronald Coase noted that the neoclassical results of efficient markets obtain only in the absence of any transaction costs (Coase, 1937). He showd that, institutions play a crucial role when there is a substantial transaction costs in a market. Moreover, the results of economic activities and entrepreneurial growth depend on the transaction costs in the market (Williamson, 2010, Page 217).

For each economic activities an agent has to bear two source of costs, the first one is transformation (production) costs; that is, all of the costs that incur for transforming raw materials into the final products. The other costs are transaction costs; search cost, contract cost, and cost of enforcing contract. Moreover, transaction costs are determined by quality of judiciary system, bureaucratic system, and in general term all components of business environment. (North,1994, Page 6-8). Most of participants in an economy do not produce any final goods. Examples of activities that are involved in transacting sectors are politicians,

brokers, accountants, judges, bureaucrats, and so on. Transaction costs depends on the complexity of an economic system (North, 1989, Page 666). The more complex and opaque an economy the higher transaction costs. In America, which is a developed country and has less complexity in comparison to developing countries, 45% of GDP in 1970 was spent on the transaction sectors. This number is by and large higher in developed countries (North, 1992, Page 6).

The powerful institutions determine economic structure of each country, and economic structure determines wealth distribution (Williamson, 2010). In contrast to what neo-classical economists believe, the competition among economic participants does not always leads to an efficient outcome. Those economic participants that have the power and information design the economic structure in such a way that they gain the largest share of wealth, even in the expense of others' losses. If rules do not restrict the powerful transacting sectors they strive for a structure in which majority of the wealth is allocated to transacting sector and tiny share to production. In other words, transacting sectors can hinder economic growth. That is, an inappropriate economic structure replaces the productive entrepreneurs to inefficient transaction sectors, consequently, most of a nations wealth spends on transaction costs (North, 1992, Page 6-8).

3.1 Search Cost

One of the transaction costs is search cost and there are two types of search costs; internal and external. Internal search cost is the cognitive effort buyers must engage into direct search inquiries, sort incoming information and integrate with stored information to form decision evaluations (Smith et al., 1999). The external search costs are the costs that are beyond the consumer direct control and consumers have to decide to bear the cost or not. There are two sorts of external costs; primo, cost of acquiring the information. Secundo, opportunity cost that is spent on searching rather than working. The example of external search cost is waiting time that is the time that a customer has to spend in order to achieve information. In addition, during the past decades the opportunity cost for the house hold has been increased, due to the increase in the women workforce and labour working hours (Jacoby et al, 1976).

Consumers make decision on level of their search based on the costs and benefits of searches. Moreover, consumers continue the searching process till the marginal cost of search be equal to the marginal benefit of search (Smith et al., 1999, Page293). Hauser et al. (1993) claimed that, buyers maximize the value of search subject to a budget constraint. This implies that, a buyer maximize the search with respect to the total time that he needs to allocate for a search, which sources to search, and how much time to spend at each search source.

Studies have shown that knowledgeable buyers incur lower search costs and therefore search more; less knowledgeable buyers incur higher search costs and search less (Srinivasan et al., 1991). High knowledge consumers have sophisticated decision-making structure. They analyze the information faster and; as a result, compare the quality of different products easier. In summary, high knowledge consumers have two advantages in comparison to low knowledge counterparts; first of all, the cost of analyzing information is lower for them. Moreover, they are more able in linking internal and external infor-

mation. Consequently, they can better manage the search level. If the external search costs, such as waiting time, be susbtantial, high knowledge consumers are able to combine the cognition with little external search. Moreover, in the situation where the external search cost is low they use more external searches (Smith et al., 1999, Page 293-296).

In comparison, low knowledge consumers suffer from higher search cost. Hence, they approach purchase decision with help of rules of thumb and heuristics (Betmenn et al., 1980).

There is a negative relation between search cost and search level. The relationship between prior category knowledge and search level is positive (Smith et al., 1999).

Consumer in BOP, the poor, faced with higher search cost in comparison to the middle and high class. The reason for that is, first of all the internal search cost is higher for the poor. That is, middle and high social classes enjoy high quality education system and this helps them to develop their cognition and information processing skill. The result is that internal search costs are lower for high-income class. Furthermore, the poor suffer from higher external costs. This can be explained by lower access to the Internet, TV, radio and other social communication among the poor in contrast to the people in the middle or top of the pyramid. Besides that, majority of the poor live in the rural area that restrict their access to the information and make external information less available.

3.2 Contract Cost

There are personal and impersonal transactions. In personal transactions family ties, friendship, loyalty and certainty of repeating transactions decrease opportunistic behaviors. Consequently the need for detail specification in contract decreases. Nonetheless, in impersonal transactions there is risk of opportunistic behaviors. The need for detail specifications in contract increase contract costs (North 1994; Wiliamson 1979; Williamson, 2010). Hence, there is a need for detailed and official contracts. This suggests, substantial costs have to be devoted for making contracts. Often, there is a need for employing a lawyer and registering a contract in an organization with power of punishment and enforcement (North, 1992, Page 8-10).

Costs of contract are higher for the poor in comparison to the rich counterpart. The reason for that is, the poor usually cannot afford lawyer and knowledge about the rules and regulations.

3.3 Enforcement Cost

In case of weak judiciary system shirking and cheating pay off. As a result, transactions are too costly and agents are less willing to participate in economic transaction. Strong judiciary system that enforce contract is essential for economic growth. The Western worlds courts, legal system, and strong judicial system guarantee economic specialization and permit development of complex systems. Efficient markets are the consequence of institutions that provide low-cost measurement and enforceable contracts (North, 1992, Page 8-10).

Because of the fact the judiciary systems are weaker in the developing countries enforcement costs are by and large higher, in comparison to developed countries. The low-income class has lower access to the judiciary system and deemed to bear higher enforcement cost.

3.4 Institutions and Institutional Changes

As it is mentioned before, the poor bear higher search costs, contract costs, and enforcement costs, in contrast to high income classes. The high transaction costs lead to market failures. High-income classes push their interests through changing the institutions, nonetheless, because of the fact that the poor do not have access to power they cannot take the same approach. This suggests that, markets are not automatically persuade the interests of the poor and markets fail for the low-income classes. Consequently, the main question is how to reduce transaction costs for those who are excluded from the market. In the bellow theories of instituitionalists about changing the institutions are explained. Instituitionalists do not explain a feasible method for changing the institutions. Nonetheless, market design economics is an emerging field that proposes feasible tools for changing the institutions and reducing transaction costs. This field redesigns several markets and substantially reduces transaction costs.

North defined institutions as the structures that human create in dealing with each other (North, 1992, 10). Furthermore, he claimed that institutions as well as the technological changes determine transactions and production costs. Ideally, institutions should provide transparency and information to market participants. However, powerful institutions can manipulate the information that they have and create an opaque market. Furthermore, Institutionalists define organizations as players that play in the game that its rules are determined by the institutions (Williamson, 1994, 1999).

Institutions determine opportunity sets in a society (North, 1989,665-667). Consequently, economic opportunities determine kinds of organizations that come into existence. Organizations aimed at maximizing their survival possibilities. They learned skills and knowledges that pay off under the institutional rules. North wrote that:

> If the highest rates of return in a society are from piracy, then organizations will invest in knowledge and skills that will make them better pirates; if the pay- offs are highest from increasing productivity, then firms and other organizations will invest in skills and knowledge that achieve that objective. (North, 1994, Page 10)

Two agents have power to change the institutions; economic entrepreneurs and political agents (North, 1992,11). Motivation of entrepreneurs for changing the institutions is margins and profits that they earn from changing the structure of the institutions. For example, entrepreneurs have incentives to change the institutions in order to reallocate the margin from middle mans to entrepreneurs.

4 Market Design Economics at a Glance

Market design economics is about understanding of how market works, why they are failed, and how to fix them (Roth, 2008). Alvin Roth investigates transaction costs and market failures in several markets. He proposes solutions for the market failures(Jackson, 2013, Page 620). Due to his significant contributions to different markets, the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel in 2012 was awarded to Alvin Roth, the founders of this field ("Nobel Prize", 2010).

Alvin Roth believes that market failed due to three main reasons: 1. Thinness: A market that does not attract sufficient proportion of potential market participants will fail. A successful market needs to be thick enough.

2. Congestion: In some cases of thick markets, there is a problem of congestion. That is, the market might not be able to make transactions fast enough so that market participants can consider enough alternative possible transactions to arrive at the satisfactory one.

3. Safeness: Make it safe to participate in the market as simply as possible

a. as opposed to transacting outside of the marketplace or

b. as opposed to engaging in strategic behavior that reduces overall welfare (Roth, 2008, Page 80).

A well functioning market fulfills the three transparency requirements that Prahalad proposed. Many policies and institutions aimed at solving the aforementioned forms of market failures. One mechanism that fulfills the requirements is centralized clearinghouse. An example of market with clearinghouse is exchange markets. In exchange markets buyers observe all of products and choose the best possible option.

He showed that an appropriate clearinghouse overcomes market failures (Roth, 2002). A clearinghouse is a centralized matching mechanism. In the same token, he elaborated that the crucial features of modern clearinghouse in creating a transparent market are (Roth, 2008; Niederle et al., 2008; Erev et al. 2010c):

1) Overcome Thinness problem: a market has to create the possibility of participation of many players in a virtual place. Furthermore, it should reduces cost of physically participation in the market. In other words, it aggregates demand and ensure that there are enough participants in a market (Coles et al. 2010).

2) Overcome Congestion in market: the processing ability of Internet makes it possible to process several transaction in a market without having congestion. Furthermore, it collects information and has faster decision process (Roth, 2008, Page 5-7).

3) Provides trusted intermediaries; it creates a safe process participant to participate and reveal their information truthfully. A middleman is trusted from both sides (Roth, 2002, Page 13).

4) Computers evolve auction markets into matching market. This means that the inefficiencies in the auction market will be replaced by certainty in the market (Roth, 2002, Page 13).

The majority of the markets that market designers have involved are two sided matching market. That is, an agent not only has to choose but it has to be chosen. The examples of these sorts of markets are marriage market, hospitals and residences that both have preferences about each other, and etc. A centralized clearinghouse has been used in order to solve market failures and reduce transaction costs.

The structure of this part of the paper is as follows, first of all, the introduction to two sided matching market is provided. After that, four different forms of market failures and their market design solutions are explained. These market failures and their solutions are examples of real markets that market design economists have involved in. Finally, it is explained that to overcome market failures it is sometimes necessary to utilize force.

4.1 An Introduction to Matching Market: Marriage Market

W1	W2	W3
M1	M3	M1
M3	M1	M3
M2	M2	M2

Table 2. *Men's preference rankings*

M1	M2	M3
W2	W1	W1
W1	W3	W2
W3	W2	W3

This section explains two sided matching market structure. The simplest form of matching problem is Two Sided Matching, also known as marriage market. In the simplest form of this market there are two agents; one proposes a match and one either accepts or rejects the proposal. The marriage market refers to sets of men and women that want to marry to a preferred partner.

The assumptions of this market are; first, each woman can only marry to a man and each man can only marry to a woman. Each woman (man) has strict preferences over men (women). Each participant prefers to match rather than being unmatched.

The main question in this market is how to find a match that is stable. Gale and Shapely defined stable match if no pairs of agents have incentive to change the current match (Roth, 2008, Page 3). The emphasize is on the pair, because a single participant might want to change the match, however, there is no pair that are willing to change the match. The other question, for creating an efficient matching market, is how to find a stable match that is also a dominant strategy for all pairs of players. Gale and Shapely (1962) proved that differed acceptance algorithm always leads to stable matches and is dominant strategy for pairs. The marriage market example help to better understand the matching market and its solution. Imagine a country with three men and three women. Table 1 explain the preferences of participants:

The two stable matches are (M1,W1), (M2,W3), (M3,W2) and (M1,W2), (M2,W3), (M3,W1).

The mechanism that each agent achieves this result is that, in the first place a man propose marriage proposal to woman, or other way around. The proposer propose to the most preferred choice. Receiver select the most preferred proposer. In a case that receiver receives a proposal from his most preferred proposer, he or she accepts and there will be a match. Otherwise, there would be no match and receivers remain single. Each proposer who is not in a match in the first round proposes to the most preferred choice, which is still available, in the second round. If there is no choice available a proposer remain single. This process repeat till the point where proposers either run out of acceptable receivers or are engaged.

To illustrate the effects of algorithm in the aforementioned example, at the first round M1 proposes to W2, and M2 and M3 is propose to W1. The consequence of first round will be (M1,W2) and (M3,W1), and M2 proposal is rejected. Hence, the result will be the stable matching of (M1,W2), (M2,W3), (M3,W1). This algorithm can be extended to a market with many participants and still leads to the stable match result. If we were to reverse the roles of women and men in the algorithm, we

would actually find the other stable matching of (M1,W1), (M2,W3), (M3,W2). In case that women be the proposer the stable match will be (M1,W1), (M2,W3), (M3,W2).

Suppose rather than differed acceptance algorithm, the algorithm of (M1,W1), (M2,W2), (M3,W3) be used. This match will be blocked by the pair (M1, W2), that is M1 and W2 have incentive to break the current match and match together. Then the match will be changed to (M1,W2), (M2,W1), (M3,W3). The current match block by (M3, W2), by rematching the partner the match will be (M1,W3), (M2,W1), (M3,W2). The achieved match is again block by (M3,W1), as a result the match will change to (M1,W3), (M2,W2), (M3,W1). As this match is blocked by (M1,W1) the match will be change to (M1,W1), (M2,W2), (M3,W3).

The difference between stable and unstable match can be found in aforementioned examples. In the first example there is stable match, this implies, there is no pair of match that have an incentive to break the match. Although W3 match with her least preferred match, but there is no man who is willing to break his relation and start a new relation with W3. Nonetheless, as we can see in the second algorithm there is always possibility of finding a pair that changes the match.

In summary there is always exists a stable match in matching market and the stable match(es) can only be found by deferred preferences algorithm. Moreover, a random algorithm might leads to endless cycle. In other words, in a decentralized matching market there is no guarantee that the market achieve stable match. A centralized clearinghouse is necessary condition for a market to achieve stable match. Furthermore, a decentralized match can increase the cost of transactions in market. That is,

participants faced with high risk of unsuccessful match and high cost of transactions. Hence, they might show reluctant to involve in a market with decentralized matching system. In case of marriage market, a boy face with the risk of not finding his perfect match and he might not marriage at all. However, if a market guarantees that the match mechanism leads to the best possible result boys are more willing to participate in this market (Jackson, 2013, Page 620-630).

4.2 Unraveling and Market Design Economics: Market for New Doctors

This example elaborates the problem of unraveling in job market for new doctors and accordingly the solution for this problem.

Alvin Roth is the first one who found application of Gale and Shapely in real world market. The first time that he found Gale and Shapely algorithms application was in 1984 in the job market for new doctors. He proved that since 1951 deferred acceptance algorithm has been used in matching new doctors to hospitals.

New doctors have to pass two years of internship after their graduation, which is called residency. Residency provides a crucial workforce for hospitals and is considered as an important period that influence medical students' future job career. Hence, there is a fierce competition among hospitals to hire medicine students graduate. From 1900 to 1945, there had been competition among hospitals for hiring residences. As a result hospitals offered positions to students two years before students graduation.

Today we know that this market suffered from unraveling, which is a common and costly form of market failure. This implies that, students

had to make decisions before being well informed about their preferences and hospitals quality. Hence, students were not able to make the best possible decision.

Market design economists have discussed problem of unraveling and have proposed several solutions for it. For instance, Roth and Xing (1994) noted that as in thirteenth century unraveling can be eradicated by not allowing transactions before goods are offered in a market. After 1945, in order to avoid unraveling, American medical schools released students information just one year before graduation. Consequently, a new problem arised; if most preferred students rejected hospitals offer, the other candidates might accepted offers of other hospital. That is, the market did not guarantee that the hospitals and students find their most preferred matches. Moreover, there was a risk of not finding enough residences for hospitals. Hence, hospitals proposed to increase numbers of students. The reason for that was hospitals wanted to ensure that they reach as many number of students as possible. This leaded to congestion that is another forms of market failure.

Markets difficulties and failures brought hospitals, students, and schools together to solve the current market failures. Therefore, they designed a centralized clearinghouse to improve market coordination. The clearinghouse system works in the following manners, in the first round students apply and hospitals interview with the students. Afterwards, students rank the hospitals that they have interviewed and hospitals also rank the students that they have interviewed. Finally, a centralized clearinghouse, which is called today National Resident Matching Program (NRMP), matches hospitals and students. In 1984 Roth proved that the National Resident Matching Program (NRMP) employs deferred preference algorithm, which was created by Gale and Shapely (1962), and it always results in a stable match. This suggests, under the current match system there are no student and hospital that prefer mutually to match together but they do not. In other words, there is no pair of student and hospital that can break the resulted match. Roth further showed that 95 percentage of matches in this market were done by clearinghouse and particularly by deferred acceptance algorithm.

One might suggests that the successful matches can be the result of any algorithm and not merely deferred acceptance algorithm. Roth 1990 and 1991 launched a study in England and compared the different region that apply different algorithm. He found that the centers that apply deferred acceptance algorithm produced stable matching and keep the algorithm for a long period. In contrasts, the other centers that use other kinds of algorithm created instable match. In the same token, Kagel and Roth, in lab experiment, proved the hypothesis that deferred acceptance algorithm eliminate unraveling, however, other algorithm produce unraveling matches.

This examples suggests that, centralized clearinghouse is a solution for unraveling, which is one of the costly form of market failure. Furthermore, deferred acceptance algorithm leads to stable match (Roth, 2008, Page4-10).

4.3 Thinness and Market Design Economics: Kidney Exchange

The kidney exchange market is the example of markets that has been failed for several years due to market thinness. Kidney transplantation is the final remedy of patients with diseases related to kidney. Moreover, the life of many kidney patients depend on kidney transplantation.

Healthy people can live with one of their kidneys and donate the other one. However, due to rules and regulation kidney purchasments and sells are forbidden (Roth, 2006, Page 2-6). Moreover, the main problem for kidney donation is that the blood type and the immune system of patients might be incompatible with their donors. Alvin Roth with respects to market limitations designed a mechanism that facilitate transactions in this market.

In the Unites States of America, more than 70,000 patients are in waiting list for a deceased donor. Nevertheless, only 11,000 receive a kidney. The result is that above 5000 patients died while they are in the waiting lists for a compatible kidney. The same situation holds in other parts of the worlds. For illustration, in UK 6000 renal patients are in waiting list for a transplantable kidney, nonetheless, only 1240 have a chance to operate a transplantation surgery.

Healthy people also can donate one of their two kidneys to renal patients. Moreover, kidney transplantation from a healthy body is by and large more helpful for the patients than cadaver kidney transplantation. However, the donation of kidney requires compatible blood type and immune system.

There is excess of demand in kidney market, however, due to legal system of all countries, it is illegal to purchase and sell kidney. That is, most of the societies show repugnant toward transaction of some specific goods (Roth, 2008, Page 10-12).

Alvin Roth indicates that the task of economists as a market designer is to create a mechanism that facilitate and increase transactions, given present legal restrictions and social repugnance in the market.

There are two possible ways to increase number of transactions in this market, given the current legal rules; firstly, the exchange of kidney between donor-patient pairs [2]. To understand it, assume two patient-donor pairs, donor A want to donate his kidney to patient A, and donor B wants to donate his kidney to patient B. Kidney of donor A is not compatible with patient A and the same hold for donor-patient B. Nevertheless, donor A has a compatible kidney with patient B and donor B has a compatible kidney with patient B. It is possible that a donor A donate his kidney to the patient B in exchange for donor B donate his kidney to patient A.

Secondly; the other possible exchange is between a donor-patient pair and a patient who is early in the waiting list of a cadaver kidney. Again, assume donor-patient pair of A and patient B who is early in the cadaver kidney waiting list. Donor A donates his kidney to patient B, and cadaver kidney is given to the patient A.

In spite of the fact that both forms of exchange are feasible and are in aligned with social norms these sorts of exchange are rarely happen. For example, only 5 exchanges had been occurred in 14 transplant centers in New England.

There are several factors that explain why exchange has been so rare, or the kidney market has failed to exchange kidneys. The most dominant cause of market failures is that the market is thin. That is to say, there are not enough incompatible patient-donor candidates for exchanges in the market. Furthermore, when a compatibility test reflects that donor kidney does not match to his patient, doctors send a way donor without recording the information of donors. Besides that, in case that donors information is available, due to medical regulations and privacy rules it is not possible to have an access to the informa-

---

[2] patient-donor pair, a donor who wants to give his kidney to a patient

tion.

Roth, Sonmez, and Unver (2004a) proved that a centralized clearinghouse that gather database of incompatible donor-patient pairs make kidney transactions more feasible. This means, the more information about different donor-patient pairs the easier to find match between different patients and donors. Furthermore, they showed that there is no restriction in sizes of pairs. That is, the system has potential to match as many pairs as possible. The reason for that is, there is a cycle of kidney exchange where a first pair gives to the second pairs and a second pairs give to the third and third give to the fourth and so on. This cyclel continue till the cycle closed, and last pair donate to the first.

Roth and his colleagues sent this idea to many kidney surgeons. As a result, one of the surgeons (who was the medical director of the New England Organ Bank) accepted the idea and brought the idea to 14 kidney transplant centers in New England. In these centers they started to use the matching software that is designed by Roth and his colleagues. After years, the matches extended to several transplantation centers and they applied the software clearinghouse.

In summary, the kidney market was failed due to the lack of market thickness. The market failed to bring what Jevons called double coincide of wants (Jevons, 1876). A centralized clearinghouse that entail database of donor-patient pairs increases the numbers of kidney exchange.

4.4 Congestion and Market Design Economics: School Choice

This is an example of markets that suffered from congestion and money does not influence transactions. The school select annually number of students based on sets of criteria. Stu-dents have some specific preferences and there are also admission requirements from schools' side. Market thickness is not a problem here, since government provides supply side in according to number of students. The performance of school choice systems depends on two factors; firstly, quality of dealing with congestion; secondly, makes it safe for participants to reveal true preferences. New York City (NYC) education system suffered from congestion. Formerly, Boston education choice system did not make it safe for students to reveal their true preferences and Roth had successfully redesigned the system and solved the problem (Chen et al., 2006; Erginet al., 2006; Pathak et al.,2008). Hence, NYC education department asked Roth and his colleagues to redesign the education choice system. A centralized clearinghouse solved the problem of NYC education system.

In the following it is explained that how an inappropriate structure of a system leads to congestion and make it risky for participants to reveal their preferences. Furthermore, the solution for these problems are explained.

In NYC around 90,000 students have to assign to 500 high school program. The old system matched students with schools in the following manner; First, students filled out a rank order list and only mentioned the top five schools that they prefered them the most. Second, the preferences list was sent to the five schools. Third, schools made three decisions; accept, reject, and put the students in a waiting list. Fourth, the result was sent to the students. Fifth, students accepted one choice and inserted one of the choices in waiting list. Sixth, Schools that still possessed empty positions sent new offers. This process repeated only three times and afterwards those students who did not get admission from any schools were assigned to zoned schools or as-

signed in an administrative process.

The market suffered from several sever problems. First of all three rounds of process were not sufficient to allocate 90,000 students, who made 5 choice over 500 potential options. This suggests that, market failed due to the congestion (Roth 1997). Consequently, only 50,000 received offers and top 17,000 students secured with several offers. Moreover, more than 30,000 students assigned to the school that were not in their preference list.

Three issues motivated NYC education department to call Roth for redesigning the choice system; primo, 30,000 students who were assigned to the schools that they were not prefer it. Secundo, students ranked the schools strategically. That is to say, students filled in preferences list untruthfully. Students ranked the schools that were most likely got admission from and not preferred it the most. The reason for that was, students thought that schools considered the preferences lists for assigning the admissions. Tertio, schools played strategically and did not revealed their actual capacity to NYC department of education. The reason for that was schools afraid that students who were rejected from the other schools filled their positions and studied unwillingly.

Exercising centralized clearinghouse contributes to the quality of choice system. First of all, it overcomes congestion: specifically, NYC education department reduced the number of administratively assigned students from 30,000 to 3,000. Secondly, schools learned that it is not profitable to hide the capacity. That is to say, the new system guarantee that schools positions are filled in by students who prefer schools the most. In other words, the new system ensures that the match is the best possible match. In the same token, Roth and his collogue proved that deferred acceptance and top trading cycles algorithms, which are discovered by Shapely and Scarf in 1974, are strategy-proof. In the case of schooling problem this implies that, for families it is dominant strategy to reveal their true preferences. The last but not the least benefits of clearinghouse is that, as the preferences lists are filled in honestly and truthfully; the NYC schools data are used for several political researches and decision-making process. For instance, it has been used to identify the low quality schools. (Abdulkadiroglu et al., 2007).

This example can illustrates that computers are a trusted intermediaries, consequently, both parties have incentive to provide true information.

4.5 Adverse Selection and Market Design Economics; Market for New Economists

Job market for new PhDs is a decentralized and open market. This means that, PhD graduates apply for several institutes separately and institutes consider the applications independently. Moreover, the market for PhD graduate is not geographically concentrated.

In the North America this market suffered from two sources of market failures. The main problem was adverse selection, this implies, institutions that offer jobs were not certain that applicants considered the position certainly. Usually, applicants considered some positions as their default options and were not interested on the position. The other problem was congestion; the system in North America was designed in a manner that it triggered congestion in the market.

In the following, first the structure of the job market and its problems are explained, afterwards, it is elaborated that how a central signaling system solve the adverse selection problem

17

and a centralized market overcome the congestion.

The job market for new PhDs is decentralized, however, there are some centralized institutions that operate in this market such as American Economics Association (AEA). The job market structure is as following: in the early fall job seekers can see the advertisement of institutions in economic associations magazine (for example see (http://www.aeaweb.org/joe/). PhDs students send their application and reference letter to institutions. As a result, department receives hundreds of application in late fall. They have to go through all details of the applications and make a selection for 30 minutes interview that hold in large meeting in early January. This meeting consists of 51 associations and takes place in a hotel and applicants have an interview with department in suites. Department have to reserve suites two months in advance. Recruiting teams interview candidates one after another and candidates up and down the flours and have several meeting in a day.

After the meetings in early January some of the candidates are selected for the fly out. That is, a day where candidate will meet faculty member and dean.

The consequence of this system is that by the end of March market faces thinness problem. For instance, departments interview with 20 applicants, and invite 6 of them to fly out day and offer two of them the position. In case that the two applicants reject the offers, departments have to look at all of the applicants and start all of the procedure again to find a suitable candidate. The same problems hold for applicants, if they were rejected in the last step they have to search for new department. This indicates how costly is adverse selection for the institutions.

AEA by creating a central signaling house over-come partly the adverse selection problem. Students have to send a list of their preferred departments and their profile to AEA. AEA transmits only two recommendation letters to two departments. Due to the fact that the signals are limited they provide valuable information. Furthermore, it overcomes the congestion problem, because of the fact that only limited numbers of applicants are sent to the interview.

4.6 Force; a Solution for Market Failure: Gastroenterologists Example

This example illustrates that in some cases legislation and enforcement of rules are necessities for operation of a successful clearinghouse. Moreover, the solution for market failures can only be achieved if several powerful players in a market cooperate.

American medical students who aimed at becoming a gastroenterologist have to pass three years of residency in internal medicine and then apply for a gastroenterology fellow position. From 1986 to 1990 a stable clearinghouse had been used to assign residents to gastroenterology fellows. Nevertheless, at the beginning of 1991 this centralized system was replaced by a decentralized matching market. The consequence was the emergence of unraveling in the market. The gastroenterology institutions offers were scattered in the year and they shorten the period of response. Furthermore, gastroenterology institutions offer to students two years before student enter into the job market. These caused thinness of market and most of the students continue to work as a gastroenterologist in the hospitals where they were residences.

These issues created a common consensus, among various organizations that involved in gastroenterology market, that the clearinghouse

should exist one year before accomplishment of residency period.

The problem that raised was that program directors who ask for recreation of clearing house afraid that the other gastroenterology organizations do not use the clearinghouse and offer students, again, in two years in advance. As a result, they discussed their concerns with Roth and his colleagues. Alvin Roth proposed that some regulations have to be enforced in order to disincentivize applicants and employer to transact outside of the clearinghouse. Roth and Niederle 2008, in lab experiments, tested the impact of rules on the time of agents offers and applicants response. They propose that the matching should be occurred in 15th of April. Moreover, they proposed to enforce the following policy; any working agreements with residence before the 15th of April can be terminated. Nevertheless, residences are responsible for the working agreement that are made after 15th of April and no party can break an working contract without having agreement of both sides [3].

Four major gastroenterology professional organizations accept to implement the policy; American Gastroenterological Association, the American College of Gastroenterology, the American Society for Gastrointestinal Endoscopy, and the American Association for the Study of Liver Diseases. The resolution ensures that the applicants and position are filled only after the 15th of April and there is no need for early contract.

Resolution aimed at: make it unattractive for program director to offer in advance. Moreover, nudge applicants to do not accept early offers.

_____
[3]http://www.cgsnet.org/ portals/0/pdf/CGSResolutionJune2008.pdf

As a result, 79% of fellowship programs participate in the matching clearinghouse. Form the participants 98% match through the clearinghouse. This implies, the new rules make it safe for players in the market to participate in the match. Furthermore, the problem of timing, dispersed offers through the year, and congestion have been solved by clearinghouse.

This example illustrates that, for clearinghouses to work effectively sometimes there is a need to impose rules and implement force. In many cases, clearinghouse is a solution for market failures. However, there are agents who benefit from decentralized and opaque market. These agents are not willing to participate in clearinghouse or other mechanisms that transparent the market. In this situation, a physical clearinghouse by itself would not make a great change in the market. There is a need for using force and regulating the market. In these cases professional Gastroenterology organization seat together and enforce the rules.

5 Market Design and BOP: A Case Study of Agricultural Sector in India

In this section it is explained that high transaction costs in Indian agricultural industry lead to several source of market failures. In the same time, an Indian private firm creates a semi-clearinghouse and reduces transaction costs in that market. Consequently, income of more than one million Indian farmers substantially increased and the firms gain large profit (Kumar,

2004,Page 47-60). [4]. This section explains in detail how this change has happened.

In the below the structure of Indian agricultural sector in post-colonial era is explained. Afterwards, the market failures and their causes in this market are elaborated. Besides that, the impact of a semi-clearinghouse on the agriculture market is discussed.

5.1 Indian Agricultural Industry

Backward farming technology and inability in weather prediction leaded to shortage of food in post independence India. Consequently, politicians aimed at implementing policies that solve the food shortage, insecurity, and in the same time increase the welfare of the poor farmer. The result was a green revolution in India. As part of this plan, the Indian government decided to distribute farms to the end cultivators. The ideology besides this was to make farms more productive and redistribute wealth to the poor. Nonetheless, the farms became too small to be profitable and farmers became extremely poor.

5.1.1 Mandis

Agricultural Products Marketing Acts created a governmental agency that is called Mandi with the aim of more equitable distribution of grains among consumers, and traders. Each Mandis approximately covers 700 square kilometers. Farmers bring their productions to Mandis and traders purchase products in Mandis place. Hence, they are the key in bridging demand and supply of oilseed, especially for Soya where the main use is for crushing company.

There were three ways for farmers to sell their products: Mandis, traders that distribute the product to the crushers, direct sale to crushers. Selling through Mandis and traders account for 90% of the transactions in the market (Prahalad, 2004, Page 341).

In each Mandis there are two commission agents that are responsible for lunching the trades.

---

[4]It seems too simplistic that an innovation contribute significantly to life of more than one million poor farmers. However, this innovation has been so influential that it attracts attention of several development awards. Some of those awards are; United Nations Industrial Development Organisation (UNIDO) Award 2008, Ashoka - Changemakers 'Health For All' Award 2006, the Stockholm Challenge 2006, Innovation for India Award 2006, Social Innovations category for business organizations, Development Gateway Award 2005 (previously known as the Petersberg Prize) for the trailblazing e-Choupal initiative. Moreover, ITC is the first Indian company and the second in the world to win this prestigious award. The 'Golden Peacock Global Award for Corporate Social Responsibility (CSR) in Emerging Economies for 2005'. The Corporate Social Responsibility Award 2004 from The Energy and Resources Institute(TERI) .The inaugural 'World Business Award', instituted jointly by the International Chamber of Commerce (ICC), the HRH Prince of Wales International Business Leaders Forum (IBLF) and the United Nations Development Programme (UNDP). This award recognises companies who have made significant efforts to create sustainable livelihood opportunities and enduring wealth in developing countries.The 'Enterprise Business Transformation Award' for Asia Pacific (Apac), instituted by Infosys Technologies and Wharton School of the University of Pennsylvania. PC Quest's IT Implementation Award in the 'Best Project' category. The Golden Peacock Innovation Award 2004. The NASSCOM award for 'Best IT User in FMCG' in 2003. The Award is a recognition of ITC's successful integration of its IT usage with its business processes. The Seagate Intelligent Enterprise of the Year 2003 Award, for the most innovative usage of Information Technology

5.1.2   Mandi Value Chain

Graph 3: Agricultural Value Chain at time of Mandi

1.Inbound Logistic: Farmers choose one of the nearest Mandis and transport their products to Mandi's Place.

2. Display and inspection: There is no technical method of estimating quality of the products. At first, a buyer inspects a product with eyes and set a random price. Based on that price the auction is started and determined the final price.

3. Auction: After a potential buyer inspects a product, a commissioner starts the auction. The auction is incermental biding.

4. Bagging and Weighing: After the price is determined famers have to pay the cost of weighing and bagging. The cost is pay by product. That is laborers will take some of the products as the cost of the weighing.

5. Payment: A trader gives money to a Mandi and Mandi transfer the money to farmers. Mandi pay the money to farmer with delay and in several payments.

6. Outbound Logistic: Bags are loaded to end buyer after auction takes place

5.2   Transaction Costs and Market Failures in Indian Agricultural Sector

This market suffers from four types of market failures: a) Congestion and Thinness b)Asymmetric Information c)Unraveling d)Asymmetric bargaining power.

Congestion: Costs of searching price of products and their trends in rural part of India are substantial. There is limited access to Internet, TV, Radio, and other communication tools. This implies, farmers face with difficulty in finding best times and the best places (different Mandis and other places) to sell. Hence, farmers sell the products to the nearest Mandi whenever fruits ripe. Consequently, the market faces with congestion. That is to say, because farmers do not have information about prices in other Mandis and other places, all of farmers in a village sell their products to the nearest Mandi in the same time. In order to ensure that they sell the products they have to stay in queue a night before.

Asymmetric Information: Due to lack of advance technology, cost of searching quality of products is high. That is to say, traders detect quality of products by eye, rather than advance technology. This means, traders at Mandi place are not sure about the quality of farmers' products. This implies, there is asymmetric information about products between farmers and traders.

Unraveling: Because of current inappropriate structure of the market farmers sell their products to traders without having information about price of products in other places. Today this is known as unraveling which is costly form of market failure. This is market failure because if farmers do not have information about prices in other places that they can sell their fruits for the optimal price. Moreover, information in other places creates the possibility of arbitrage.

Asymmetric Bargaining Power: In the current system Mandis pay farmers' money with long delay, after several months. Moreover, Mandis and traders do no pay any interest to farmer for the delay. This implies, there exists an asymmetric bargaining power between farmers

and traders. That is, traders and Mandis enjoy higher bargaining power, in comparison to farmer. As a result traders pay farmers' payment with a long delay. Substantial enforcement costs in this market causes asymmetric bargaining power. The Indian judiciary system is weak and traders are not punished for delay in the payment. That is, it is difficult for the farmers to enforce the contract cost.

The implication of the above market failures is that, beside production cost there are other costs that farmers have to take into account. First of all, they have to bear the congestion cost, that is, staying in a queue a night before selling the products. Moreover, there is risk of being late in the selling's queue and do not selling the products. Secondly, farmers have to take into account cost of asymmetric information, that is, the risk of facing with buyers who estimate products' quality lower than their real quality. Thirdly, farmers have to consider the opportunity cost of selling to the Mandis. That is, selling in Mandis place for lower price in comparison to selling in the other places. Finally, there is a substantial delay cost in the payment of the products into account.

After considering transaction costs into account, a simple-cost benefit analysis suggests that the cost of operating in agricultural sector is by far higher than what is expected. Consequently, the agriculture sector in India declined. For instance, in Khasrod, from 100% of farmers planting soya only 50% continue farming (Prahalad, 2004, Page 342).

5.3 e-Choupal: Impacts of Semi-Clearinghouse in the Agriculture Sector

In the market design economics section it is explained that how clearinghouses overcome several market failures in different sectors. Herein, we explain how a semi-clearing house overcomes the market failures in the agriculture industry in India, which is a market of the poor farmer [5].

5.3.1 ITC e-Choupal

ITC is an Indian conglomerate that recently diversified into agribusiness and information technology. ITC called its mangers to utilize the new technology in a way that they overcome to the problems in the current agriculture market. Consequently, mangers and IT men came up with e-Choupal.

e-Choupal is the a semi-clearingouse and provides a centralized information centre for farmers about price of products, its trend, and price of agricultural inputs. Farmers can decide where to sell their products in according to the information that they have. e-Chouple are in distance of max 5 kilometers to the farmer. It covers more than a million farmers and in 11,000 villages and 2000 kiosk across 4 states (Prahalad, 2004, 343). In the following, the value chain of ITC is explained. Afterwards, how the clearinghouse solve the market failure is discussed.

---

[5]It is called semi-clearinghouse because it contains many features of clearinghouse but not all of them. It is centralized information centre, however, it does not apply S&G algorithm to match supply of the products with the demand.

5.3.2 e-Choupal Value Chain

Graph 4: e-Choupal Value Chain

| Price and Dssemination | Inbound Logestics | Inspection and Grading | Weighing and Payment | Logestics and Storage |

1.Price Setting and Dis-semination: The process takes place in 4 steps;

A- Bench mark Price: Mandi closing price of previous day is used for the fair average quality price at e-Choupal

B- A commissioner in Mandi send the price list to e-chouple

C- Farmers send their products to e-Choupal and Snachalak inspect products and decreases the price according to the bench mark

D- If farmer chooses to sell his produces to ITC, Sanchalak gives him a document that declares the quality, village, approximate quantity and conditional price.

2.Inbound Logistics:

Farmers bring the notes from Sanchalak to nearest ITC hub.

3. Inspection and Grading: The inspection that determines a price is inspection that farmers can evaluate it and understand it. There are two inspections: 1) Sanchalak estimations that determines prices 2) Sample of the products send to a lab. Therein, quality of products are checked, this test will not affect the price and it is done to double check the inspection of Sanchalaks' estimation. In order to motivate farmers to produce higher quality ITC give bonus to the farmers that produce higher quality in comparison to the previous products' quality. The bonus give farmers free inputs sources.

4.Weighing and Payment:

Weighing method: In ITC first an entire trolley is weighted then trolley without the products is weighted. The difference is the weigh of the products.

Payment: Farmers give the note and get the money back.

A copy of the lab report, agreed rate, and receipt for farmers' records will send to the farmers.

5.Logestics and Storage: Farmers transport the products to ITC.

5.3.3 Impact of Semi-Clearinghouse in Market Failure

Introducing semi-clearinghouse in this market partly solve 1. Congestion 2. Asymmetric Information 3. Unraveling 4. Asymmetric Bargaining Power.

1. Congestion: In the new system farmers communicate with ITC and appoint an exact time for transporting the product. Consequently, there was no problem of congestion and farmers do not need to come a night before and sleep in a queue.

2. Asymmetric information: In this system ITC utilizes new technology to determine the quality of the products. As a result the information about the quality of the products reveals for both sides.

3. Unraveling: e-Choupal reduces search costs for the farmers and they can easily investigates the prices and their trends. As a result they sell their products while they have better information about the prices in different places.

4. Asymmetric Bargaining Power: ITC is a famous company, hence, it has incentive to keep its reputation and it avoids rent seeking behaviours (Mueller, 2003, Page 333-350). Consequently, farmers trust ITC easier than other purchaser. Consequently, there is not so much needs of specifying details in contract and enforcing contracts. The result is contract costs and enforce-

ment costs decreases substantially. Moreover, e-Choupal partially solves asymmetric bargaining power, which is a discriminatory and common form of market failure.

6   Conclusion

Prahalad notified that extension of market into the BOP is crucial for poverty eradication. Management science has been dominant in BOP literature. This paper try to utilize economic theories to further enrich BOP literature.

In this paper it is discussed that, active involvement of the poor in the production value chain and approach the poor as consumer is a powerful tool for poverty eradication. Institutionalists rise the point that in the case of high transaction costs entrepreneurial growth is unlikely. Moreover, companies show reluctant to enter in a market with high transaction costs. There is a common consensus that transaction costs are substantial in BOP markets. This implies, it is more costly for companies to enter into the BOP markets in comparison to their counterparts in developed countries. Market design economics is an emerging field in economics that proposes solutions for transaction costs and market failures. This paper provides cases that show clearinghouses successfully overcome market failures. This article ends by a section that tries to link market design economics and transaction costs economics with BOP literature. Therein, by an example, it is suggested that using market design economics' solutions trigger entrepreneurial engagement in BOP market and contributes to life of the poor.

This paper suggests that market design and transaction costs can provide robust theoretical framework to further enrich BOP studies. Con-

necting these two fields can contribute to both specialties. In the same token, Roth believes that the maturity of market design economics requires accumulation of experience in several markets. Market design economists have to further investigate other markets and explain in detail complexities, results, and failures of different markets. He suggests that, the next generation of authors should not focus on game theory and absolute mathematical models, the development of this field requires transferring audiences from scientific journals to societies and participants of several markets. Furthermore, in spite of the fact that poverty eradication requires multidisciplinary approach, management view is dominant in BOP literature. Hence, there is a need for further engagement of the other sciences into this field.

Long steps have to be taken in order tolabel; analyze the implication of market design economics into the BOP field. This paper is a small brick for the bridge that link market design economics and BOP literature. As Roth said the evolution of markets are from auction to matching market. Development of algorithm that can transfer BOP market from auction to matching market might significantly improves structure of BOP markets. Furthermore, market design economics maybe able to faster the pace of the poor involvement into the production value chain and customer.

References

Coase, R. H. (1937). The nature of the firm. *economica*, *4*(16), 386–405.

de Almeida Faria, A., Hemais, M. W., & Guedes, A. L. M. (2008). Responsabilidade social corporativa: Construindo uma per-

Bereby-Meyer, Y., & Roth, A. E. (2006). The speed of learning in noisy games: Partial reinforcement and the sustainability of cooperation. *The American Economic Review*, *96*(4), 1029–1042.

Besanko, D., Dranove, D., Shanley, M., & Schaefer, S. (2000). Economics of strategy. john wiley&sons. *New York*.

Bradley, S. W., McMullen, J. S., Artz, K., & Simiyu, E. M. (2012). Capital is not enough: Innovation in developing economies. *Journal of Management Studies*, *49*(4), 684–717.

Busch, L.-A., & Horstmann, I. J. (1997). Bargaining frictions, bargaining procedures and implied costs in multiple-issue bargaining. *Economica*, *64*(256), 669–680.

CANON, C., FRIEBEL, G., & SEABRIGHT, P. (2013). Market design and market failure. *The Handbook of Rational Choice Social Research*, 473.

Cees van Beers, P. K. . A. L. (March 2013). Understanding frugal innovation in africa: Schumpeter revisited discussion paper for the international workshop 'the (mis)fortune of frugal innovation. *Grenoble*.

Chataway, J., Hanlin, R., & Kaplinsky, R. (2014). Inclusive innovation: an architecture for policy development. *Innovation and Development*, *4*(1), 33–54.

Christina Gradl, C. K. (2010). *endeva* (Tech. Rep.). German Federal Ministry for Economic Cooperation and Development.

Coase, R. H. (1937). The nature of the firm. *economica*, *4*(16), 386–405.

Coase, R. H. (1960). Problem of social cost, the. *JL & econ.*, *3*, 1.

Dahlman, C. J. (1979). The problem of externality. *Journal of law and economics*, 141–162.

de Almeida Faria, A., Hemais, M. W., & Guedes, A. L. M. (2008). Responsabilidade social corporativa: Construindo uma perspectiva pró-governo. *Revista de Administração FACES Journal*, *7*(3).

Ensminger, J. (1994). Transaction costs through time: The case of the orma pastoralists in east africa. *Anthropology and Institutional Economics*, 69–85.

Erev, I., Ert, E., & Roth, A. E. (2010). A choice prediction competition for market entry games: An introduction. *Games*, *1*(2), 117–136.

Ezequiel Reficco, P. M. (2009). Inclusive networks for building bop markets. *SAGE Publication*.

George, G., McGahan, A. M., & Prabhu, J. (2012). Innovation for inclusive growth: Towards a theoretical framework and a research agenda. *Journal of management studies*, *49*(4), 661–683.

Gewald, L. I. P., Jan-Bart. (2012). *Transforming innovations in africa: explorative studies on appropriation in african societies* (Vol. 11). Brill.

Gordon, R. J. (2012). *Is us economic growth over? faltering innovation confronts the six headwinds* (Tech. Rep.). National Bureau of Economic Research.

Gradl, C., & Jenkins, B. (2011). Tackling barriers to scale: From inclusive business models to inclusive business ecosystems. *CSR Initiative, Harvard Kennedy School, Cambridge MA*.

Hall, J., Matos, S., Sheehan, L., & Silvestre, B. (2012). Entrepreneurship and innovation at the base of the pyramid: a recipe for inclusive growth or social exclusion? *Journal of Management Studies*, *49*(4), 785–812.

Halme, M., Lindeman, S., & Linna, P. (2012). Innovation for inclusive business: Intrapreneurial bricolage in multinational corporations. *Journal of Management Studies*, *49*(4), 743–784.

(2014). Retrieved from http://www.hul.co.in/mediacentre/pressreleases/2014/Lifebuoy-Reduces-Diarrhoea-from-36-per

(n.d.). Retrieved from http://www.worldbank.org/en/topic/poverty/overview

Ian Ayres, J. B. (1991). Trpartism: Regulatory capture and empowerment.

Jackson, M. O. (2013). Economic engineering and the design of matching markets: The contributions of alvin e. roth. *The Scandinavian Journal of Economics*, *115*(3), 619–639.

Jacoby, J., Chestnut, R. W., Weigl, K. C., & Fisher, W. (1976). Pre-purchase information acquisition: Description of a process methodology, research paradigm, and pilot investigation. *Advances in consumer research*, *3*(1), 306–314.

Jenkins, B., Ishikawa, E., Barthes, E., & Giacomelli, M. (2008). Supporting entrepreneurship at the base of the pyramid through business linkages. In *International finance corporation, international business leaders forum, and the csr initiative at the harvard kennedy school.*

Kharas, H. (2007). Trend and issues in development aid. *Wolfensohn Center for Development*.

Luo, X., & Bhattacharya, C. B. (2006). Corporate social responsibility, customer satisfaction, and market value. *Journal of marketing*, *70*(4), 1–18.

Malla, S., & Timilsina, G. R. (2014). Household cooking fuel choice and adoption of improved cookstoves in developing countries: a review. *World Bank Policy Research Working Paper*(6903).

Milgrom, P., & Roberts, J. (1990). Bargaining costs, influence costs, and the organization of economic activity. *Perspectives on positive political economy*, *57*, 60.

Mitra, S., Mookherjee, D., Torero, M., & Visaria, S. (2013). *Asymmetric information and middlemen margins: An experiment with west bengal potato farmers* (Tech. Rep.).

Mosley, P., et al. (1987). *Overseas aid: its defence and reform.* Wheatsheaf Books.

nations development Programme, U. (2014). Barriers and opportunities at the base of the pyramid. *United nations development Programme*.

Niederle, M., Proctor, D. D., & Roth, A. E. (2008). The gastroenterology fellowship match—the first two years. *Gastroenterology*, *135*(2), 344–346.

Niederle, M., Roth, A. E., & Ünver, M. U. (2013). Unraveling results from comparable demand and supply: An experimental investigation. *Games*, *4*(2), 243–282.

North, D. C. (1992). Transaction costs, institutions, and economic performance. *ICS Press San Francisco, CA*.

North, D. C. (1994). Economic performance through time. *The American economic review*, 359–368.

North, D. C., & through Time, E. P. (1995). *Douglass c. north.* Lives of the Laureates, 3rd edn. Cambridge, MA: MIT Press.

North, D. C., & Wallis, J. J. (1994). Integrating institutional change and technical change in economic history a transaction cost approach. *Journal of Institutional and Theoretical Economics (JITE)/Zeitschrift für die gesamte Staatswissenschaft*, 609–624.

OECD. (2012). *Innovation for development a discussion of the issues and an overview of work of the oecd directorate for science, technology and industry* (Tech. Rep.). Author.

OECD. (2014). Reviews of innovation policy colombia 2014. *OECD*.

Pereira, P. (2005). Do lower search costs reduce prices and price dispersion? *Information Economics and Policy*, *17*(1), 61–72.

Pervez, T., Maritz, A., & De Waal, A. (2013). Innovation and social entrepreneurship at the bottom of the pyramid-a conceptual framework. *South African Journal of Economic and Management Sciences*, *16*(5), 54–66.

Peša, I. (2014). Frugal'innovation'in'africa' technology,'entrepreneurship'and'development'in'innovation'processes. *Centre of Frugal Innovation*.

Peter Coles, P. B. L. M. N. A. E. R., John Cawley, & Siegfried, J. J. (2010). The job market for new economists: A market design perspective. *Journal of Economic Perspectives*.

Prahalad, C. K. (2004). *The fortune at the bottom of the pyramid*. Wharton School Publishing.

Programme, U. N. D. (2008). *Creating value for all: Strategies for doing business with the poor*. Author.

Rao, B. C. (2013). How disruptive is frugal? *Technology in Society*, *35*(1), 65–73.

Roth, A. E. (2002). The economist as engineer: Game theory, experimentation, and computation as tools for design economics. *Econometrica*, 1341–1378.

Roth, A. E. (2006). *Repugnance as a constraint on markets* (Tech. Rep.). National Bureau of Economic Research.

Roth, A. E. (2008). What have we learned from market design?*. *The Economic Journal*, *118*(527), 285–310.

Roth, A. E., Prasnikar, V., Okuno-Fujiwara, M., & Zamir, S. (1991). Bargaining and market behavior in jerusalem, ljubljana, pittsburgh, and tokyo: An experimental study. *The American Economic Review*, 1068–1095.

Simester, D., & Knez, M. (2002). Direct and indirect bargaining costs and the scope of the firm*. *The Journal of Business*, *75*(2), 283–304.

Smith, A., Fressoli, M., & Thomas, H. (2014). Grassroots innovation movements: challenges and contributions. *Journal of Cleaner Production*, *63*, 114–124.

Smith, G. E., Venkatraman, M. P., & Dholakia, R. R. (1999). Diagnosing the search cost effect: Waiting time and the moderating impact of prior category knowledge. *Journal of Economic Psychology*, *20*(3), 285–314.

Solaiman, M. (n.d.). Branding in bottom of pyramid (bop): Case of grameen bank (gb).

Soto, D. (2000). *The mystery of capital: Why capitalism triumphs in the west and fails everywhere else*. NewYork:BasicBooks.

Spulber, D. F. (2009). *The theory of the firm: Microeconomics with endogenous entrepreneurs, firms, markets, and organizations*. Cambridge University Press.

Stiglitz, J. E. (2002). Information and the change in the paradigm in economics. *American Economic Review*, 460–501.

Teece, D. J. (2010). Forward integration and innovation: transaction costs and beyond. *Journal of Retailing*, *86*(3), 277–283.

van Tubergen, K. (2013). Partnering up in

base of the pyramid (bop) projects — an overview of the current academic stances and research gaps from literature complemented with insights from bop practitioners.

Williamson, O. E. (1979). Transaction-cost economics: the governance of contractual relations. *Journal of law and economics*, 233–261.

Williamson, O. E. (1994). Transaction cost economics and organization theory. *Organization Theory: from Chester Barnard to the present and beyong*, 207–256.

Williamson, O. E. (1999). Public and private bureaucracies: a transaction cost economics perspective. *Journal of Law, Economics, & Organization*, 306–342.

Williamson, O. E. (2010). Transaction cost economics: The natural progression. *Journal of Retailing*, *86*(3), 215–226.

Wooder, S., & Baker, S. (2012). Extracting key lessons in service innovation. *Journal of Product Innovation Management*, *29*(1), 13–20.

Young, A. (2012). *The african growth miracle* (Tech. Rep.). National Bureau of Economic Research.

Philips. (2013). Unlocking new markets.