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**Working Paper**

Designing fair compensation for compulsory acquisition of land:  
Empirical estimation of hope value, blight, and the negative impact of  
landowners' caste on the value of land in Bengaluru (India)

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## **ADB Working Paper Series**

### **DESIGNING FAIR COMPENSATION FOR COMPULSORY ACQUISITION OF LAND: EMPIRICAL ESTIMATION OF HOPE VALUE, BLIGHT, AND THE NEGATIVE IMPACT OF LANDOWNERS' CASTE ON THE VALUE OF LAND IN BENGALURU (INDIA)**

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**Abstract**

Public agencies often rely on their power of compulsory acquisition of privately owned land when it comes to procuring land for large infrastructure projects. Over the years, the process of compulsory acquisition has evolved to compensate the affected landowners better, to the extent of paying additional monetary compensation or solatium. For example, according to the most recent improvements made to the Indian legislature on compulsory acquisition of land, the acquiring agency should make an additional payment of two to four times the original market value of land to the affected landowner. This is the polity and law's indirect acknowledgment that fair compensation extends beyond the market value of land, although there is less clarity on the theoretical and empirical justification for the same. There is an existing body of literature, such as "Functionings of Land" by Rao (2018), that has applied Sen's capability theory to explain the value of land as a cumulative value of usefulness (or functionings) for its owner, of which the monetary value is only one functioning. While there are many non-monetary functions of land, which deserve compensation, this research limits the scope of the discussion to measurable monetary losses associated with land.

Advancing the discussion on adequate monetary compensation for the affected landowners, this research argues that compensation extends beyond the market value of land to include other forms of financial losses that compulsory acquisition imposes, such as (i) the loss of financial benefits accruing from improvement in land use in the future (or the "hope value" of land), which ranged between 39% and 527% in the case of the Bangalore-Mysore Infrastructure Corridor (BMIC) project; and (ii) the reduction in land value due to acquisition notification, which amounted to approximately 31% in the case of the BMIC project in India. In addition to these objective losses, which are common across all landowners, there are person-specific characteristics that influence the market value of land. For example, research has found that the landowners' lower caste negatively affected the value of land around the BMIC project. This reduction could be a joint outcome of the legal protection of ownership rights of Scheduled Caste/Scheduled Tribes (which curtails purchase by non-SC/STs) and the lack of bargaining power due to the lower social status of SC/ST landowners. The above findings suggest that a fair compensation model extends beyond the market value of land to take account of the comprehensive value of land to its owner, and it is possible to derive this as a joint function of personal and land characteristics.

**Keywords:** hope value, land value, compulsory acquisition, compensation, land functionings

**JEL Classification:** Q15, R32

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# 1. INTRODUCTION

The procurement of land for large infrastructure and development projects through market mechanisms involves huge transaction and information costs, which make the whole process expensive and time consuming. In India, the lack of accessible land records further extenuates the situation, as it is difficult for market participants to ascertain the ownership of land, complicating the negotiation. The consequence has been that the promoters of such projects have eschewed market negotiations for land procurement in favor of the use of compulsory acquisition powers of the state. These powers of the state, legally backed by the provision of enabling law, allow the government and its agencies to acquire a private interest in land (land rights of individuals) for public purposes.

The affected private landowners, however, strongly resist the process of compulsory acquisition. As Rao (2018a, 2018b, 2019) discussed, these landowners bear the loss of many functionalities associated with land for which the present mechanisms of compensation (or resettlement) are unable to compensate. Aggrieved landowners, who often bear losses exceeding the compensation that they receive (Ghatak et al. 2013; Grover 2014), seek opportunities for negotiation, giving rise to legal disputes between the landowners and the acquirers. There is ample empirical evidence from many parts of the world to suggest that the majority of legal disputes for compensation conclude in favor of the landowner, and an upward improvement in compensation is commonly observable (Newell, Chan, and Goodridge 2011; Singh 2012; Wahi et al. 2017). The landowners lose a significant amount of money and time in negotiating for their losses in the court given the arbitrary nature of many essential components of compensation, for example the market value determined under the no-scheme scenario; the hope value (or the value of land for the highest and best use in the near future); severance; injurious affection; disturbances; and blight, for which the legal debate in the court determines the final value (refer to Sams 2016, 2017; Rao 2018a for details of court cases in Australia and India). While it is important to give the opportunity to the landowner to access the judicial system and have a fair chance to negotiate, there is growing realization that there are losses other than the original market value of land that also deserve compensation (refer to Wahi et al. 2017 for legal disputes on compensation in India).

Laws across countries legislate compensation on principles of “just compensation,” “fair compensation,” and “equity or equivalence” (Olanrele et al. 2017). However, an oversimplified interpretation of “just” and “fair” compensation equates compensation to the market value of land and other tangible losses (Olanrele et al. 2017). For example, the components of compensation in the UK, Denmark, the US, and New Zealand, though their descriptions are different, broadly include the market value of land and improvements, severance, disturbance, and injurious affection (refer to Olanrele et al. 2017 for details of the components of compensation across different countries). At times, the landowners receive an additional amount or solatium as compensation for the compulsory nature of acquisition. For instance, in India, the old legislature recommended the payment of an additional 30% solatium (under section 23(2), Land Acquisition Act of 1894), and the new act has further revised the solatium upward to up to 200% of the market value of land (refer to the first schedule of the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation, and Resettlement Act, 2013). The new law cumulates many losses in the solatium, such as severance, injurious affection, disturbance, and so on, hence the upward shift. Even though these headings cover a good range of financial losses, many remain uncompensated, as the next paragraphs discuss.

For a comprehensive understanding of the losses associated with the compulsory acquisition of land, Rao (2018a) used Sen's "capability theory" to explain the value of land to its owner. The concept of "functionings" lies at the heart of Sen's "capability theory," which argues against equating individuals' well-being with income and resources and instead proposes equality of "capability." He defined "capability" as the set of functionings that are accessible to an individual and "functionings" as the states of wellness and doings that add to his or her well-being. In other words, functionings are the usefulness derived from resources while capability is the set of functionings that are accessible to a person. Enhancing well-being would therefore mean strengthening the "capability" of a person or improving his or her access to a wider set of functionings that are valuable to a person. In the context of compulsory acquisition of land, the loss of land compromises a wide range of functionings of landowners. Through a series of studies involving a survey of affected landowners and analysis of secondary data, Rao (2018a, 2018b, 2019) identified a set of 27 fundamental functionings that are generally valuable to landowners and deserve compensation. Rao, Tiwari, and Hutchison (2017) argued that a fair compensation mechanism should satisfactorily replace or reconstruct all the fundamental functionings of land for each affected landowner. This paper contributes to the wider debate on fair compensation and focuses on two crucial financial functionings of land, as Rao (2018b) identified, which are:

1. Being able to generate financial benefits linked with the future development potential of land

Earlier studies on urban land markets suggested that continuous growth in the demand for urban land, coupled with its regulated supply, has led to land value appreciation over time (Cheshire and Hibler 2017). Landowners are therefore optimistic about the advancement of their land's development potential and the consequential improvement in its value. This research refers to this as the "hope value" of land. Referring to the formal definition of "hope value," which the Lands Tribunal for Scotland used, Rao (2018a) explained that "hope value" is the estimated improvement in the value of land due to its potential for development in the future.

2. Being able to use the property as a financial asset at the time of need

Sometimes there is a time gap between the actual acquisition of land and its notification for acquisition, as occurred in the case of the BMIC project. Landowners may find it challenging to sell or mortgage land during this time, after the state has earmarked their land for acquisition. The reduction in property value due to the notification of the property for acquisition for a public purpose is termed "blight."<sup>1</sup> Blight is the buyer's response to the risk of receiving inadequate compensation payment at a later date (post-acquisition); time and costs involved in the settlement of compensation negotiations; restrictions on improving the property and associated financial and personal losses; uncertainty of the time duration for which the property will be under notification; and so on. Blight may pose serious financial challenges to the landowners and reduce the financial security arising from landownership, as the landowners that the BMIC project

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<sup>1</sup> The Scottish Government defined "blight" as the reduction in property value because the state has earmarked it for a public purpose, such as a new road (Scottish Government 2011). If owners find it challenging to sell their property because of the notification, then they may serve a blight notice to the acquiring authority and force the authority to buy their interest at its value before blight affected it (Scottish Government 2011). Unlike the Scottish Government, the Indian Government does not compensate for blight.

affected reported (refer to Rao 2019 for more details of blight and other functionings of land that landowners that the BMIC project affected identified).

While feeding into the bigger objective of designing a fairer compensation mechanism, this research estimates the economic value of two important financial functionings of land that remain uncompensated under contemporary methods of compensation,<sup>2</sup> that is, hope value and blight, as discussed above. The specific questions that the research asks are: (i) What has been the impact of the improvement of land use on its value? (ii) What has been the impact of land acquisition notice on the value of land? (iii) Are the effects on different social groups different? This research finds answers to the above questions in the case of the Bangalore–Mysore Infrastructure Corridor (BMIC) project, which is a typical example of a public–private partnership (PPP) road infrastructure project in India. The findings suggest that there is a significant positive impact of improvement of land use on land values. However, landowners whose land the project acquires compulsorily do not receive any share of the project-generated benefits, unlike other landowners in the region. The results indicate that there is “blight” or a negative effect of a compulsory acquisition notice on the value of the property. This adds to the financial hardships of those landowners who need to sell or mortgage property post-notification. In addition, the negative impact is stronger for marginalized segments (belonging to the scheduled castes and scheduled tribes), thus worsening the situation.

The structure of this paper aims to advance the discussion on “fair” compensation in two parts. The first part discusses the theoretical framework of Sen’s “capability approach” and its application to the complete range of losses associated with the compulsory acquisition of land. Sen’s economic theory allows us to include both financial and non-financial functions of land in the set of economically rational losses that deserve compensation. It is understandable that full compensation for all these losses, particularly non-financial losses, may be hard to achieve and is beyond the scope of the present research. However, there is an urgent need to examine those losses that are financial in nature and yet remain uncompensated. These uncompensated financial losses are the focus area of this research.

The second part of this paper is a natural extension of the first part and proposes a statistical solution for estimating the value of two important financial functions of land that landowners lose and that do not qualify for compensation in the contemporary approach to compensation in India. First is the loss of financial benefits arising due to an improvement in the use of land or its potential for development over time, which the study defines as the “hope value” of land. The hope value may be non-deterministic at the present time and yet landowners expect an improvement in value in the future. The second financial loss arises due to depreciation in the land value, or “blight,” due to the notification for compulsory acquisition. Given that the process of compulsory acquisition is often time consuming, the period for which land is under notification but not acquired may be long and uncertain. This is especially disadvantageous for those landowners who require their land for raising formal finance, say through sale or mortgage. This research estimates the depreciation in land value or “blight” due to acquisition notification and argues for its compensation.

Regarding the empirical estimations, this research takes its inspiration from the hedonic theory of land, which section 1.4 describes. Sen (1987) explains the connection between

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<sup>2</sup> Even though some countries, like Scotland, allow negotiation over “hope value” and “blight,” these are not explicit components of compensation and the onus lies on the landowner to prove his or her claim. Arbitration over these losses is expensive and discourages landowners from undertaking the negotiation. This research is a useful guide to applying the hedonic approach to the identification of economic value of some of these (obvious) losses that deserve compensation.



capability, commodities, and their characteristics, and sections 1.2 and 1.3 discuss it briefly. These discussions further clarify the definition of functionings and capabilities and form the foundation for later discussions on the estimation of the value of functionings using the hedonic model. The structure of the rest of the paper is as follows. Section 1.5 presents a brief overview of the BMIC project and its relevance to this research. Section 1.6 discusses the data sets that this research uses and elaborates on the characteristics of villages that have undergone acquisition in comparison with those that are in the project planning zone but have not undergone acquisition. Section 1.7 discusses the results of hedonic estimation. Lastly, section 1.8 concludes the above discussions and suggests the future direction for works in this area.

## 2. RELATIONSHIP BETWEEN COMMODITIES AND CAPABILITIES

This section explains the relationship between commodities, characteristics, and utility, which forms the basis for hedonic theory, as section 1.4 discusses later. More important discussions follow and explain the difference between utility and capability, using Sen (1987) as a key reference. Most discussions use the same notations as Sen (1987).

$x_i$  = the vector of commodities possessed by person  $i$

$c(.)$  = the function converting a commodity vector into a vector of characteristics of those commodities

$f_i(.)$  = a “utilization function” of person  $i$  reflecting one pattern of use of commodities that  $i$  can make (in generating a functioning vector out of a characteristic vector of the commodities possessed).

However, “the conversion of commodity characteristics into personal achievements of functionings depends on a variety of factors—personal and social” (Sen 1987, 17).

$F_i$  = the full set of utilization functions for person  $i$  to choose from

$h_i(.)$  = the happiness function of person  $i$  related to the functionings achieved by  $i$

Using the above notation, Sen (1987) explained functioning  $f_i(.)$  as a utility-generating function of commodities and their characteristics. If person  $i$  chooses the utilization function  $f_i(.)$ , then, with  $i$ 's commodity vector  $x_i$ , we can write the achieved or chosen functions as:

$$b_i = f_i(c(x_i))$$

$b_i$  may be interpreted as the person's being, for example being nourished, mobile, and so on. We can write the happiness that  $i$  would then enjoy from the functioning vector  $b_i$  as:

$$u_i = h_i(f_i(c(x_i)))$$

Sen (1987) argued that function  $h_i$  is a scalar-valued function and tells us “how happy the person is with the functioning vector  $b_i$  and it does not tell us how good that way of

living is" (8). Through his "capability" theory, Sen (1987) argued that happiness is not a plausible criterion for the goodness of life and certainly not the only criterion. Thus, the exercise of measuring happiness is not the same as the exercise of measuring the value of life. Regarding the valuation of the quality of life and  $i$ 's states of being  $b_i$ , Sen (1987) asserted that the valuation function to estimate the value of the vector of functionings  $b_i$  is:

$$v_i = v_i(f_i(c(x_i)))$$

The discussions above focus on a single utilization function  $f_i(.)$  from a set of functions  $F(.)$ , where  $F_i(.)$  is the set of feasible utilization functions given  $i$ 's personal features and command over commodities. The complete set of vectors of functionings feasible for person  $i$  with commodity vector  $x_i$  is the set  $Q_i(x_i)$ :

$$Q_i(x_i) = [b_i | b_i = f_i(c(x_i)), \text{ for some } f_i(.) \in F_i \text{ and for some } x_i \in X_i], \text{ where } X_i \text{ is the set of commodities.}$$

Following Sen's (1987) theory,  $Q_i(x_i)$  represents "capabilities" or the freedom that a person has in terms of various alternative bundles of feasible functionings given his or her personal features  $F_i$  (the conversion function of characteristics into functionings) and his or her command over commodities  $X_i$  (entitlements). Then, the set  $V_i$  gives the value of well-being that a person can achieve:

$$V_i = [v_i | v_i = f_i(b_i) \text{ for some } b_i \in Q_i]$$

The well-being of a person is then an evaluation of  $b_i$  (beings) or an index of the person's functionings. Sen (1987) explained that the evaluation exercise will be similar to ranking the set of  $b_i$ , in which a scalar value is attached to each  $b_i$  to represent "how good is that set of functionings—that particular achievement of doings and beings" (8). While Sen (1987) acknowledged the need for valuing vectors of functionings, his theory is silent on what determines this value. The valuation exercise is further made difficult because, according to Sen (1987), people do not always choose the highest value of  $v_i$  in  $V_i$ , because maximizing one's well-being may not be the only motivation for the choice of functionings. There could be other "deontological" reasons for people's choice of functionings, for instance their obligations toward others. A simple interpretation of this non-maximizing behavior of individuals in the context of land would probably mean that landowners do not aim to maximize their welfare derivable from land. Sen (1987) justified this non-maximization behavior based on a landowner's concern regarding another individual's welfare. Thus, non-maximization behavior might result in a higher level of joint well-being for the landowner and others and a lower level of personal well-being for the landowner. This research avoids the complication of joint well-being and limits the scope to the personal well-being of the landowner. For simplicity, we assume strict individualistic behavior of the landowner, who would be motivated to maximize his or her personal well-being.

While research has recognized capability theory as one of the most satisfying and comprehensive approaches to well-being, it is methodologically demanding and thus has received less empirical application so far (Chiappero-Martinetti et al. 2015). Continuous methodological developments are happening in the area, and an avid reader may refer to Chiappero-Martinetti et al. (2015) for an elaborate discussion on the operationalization of the capability approach. The UNDP has successfully applied capability theory in the

development of the Human Development Index<sup>3</sup> (HDI), and many economists, such as Anand et al. (2009), have used this theory to study a wide range of developmental issues. In this research, we use hedonic theory to study the implicit value of functionings of land, which add to the well-being of the owner and are therefore crucial from the compensation point of view in cases in which public projects compulsorily acquire private land. We limit the scope of this research to identifying the value of two crucial functionings of land, which are hope value and blight, as section 1.1 discussed earlier.

In the light of the above discussions on how converting commodity characteristics into useful functions can derive capability, the next section explains the theoretical framework of hedonic theory and its application in estimating the value of land-based functionings.

### 3. WHY IS LAND MORE VALUABLE THAN ITS MARKET VALUE?

Section 1.2 above explained how people associate value with commodities for the functionings that commodities offer (Sen 1987). Taking the discussion forward, this section explains, within the capability theory framework, why some landowners are reluctant to sell land and/or are dissatisfied with receiving the market value of land as compensation for the compulsory acquisition of land.

For an easier understanding, we assume a simple case in which land is the only commodity that a person possesses and all the functionings come from the land alone. The level of well-being of person  $i$  would be the cumulative value of the functionings derived from the land. As discussed earlier,  $v_i$  is the function to estimate the value of the vector of functionings of land:

$$v_i = v_i(f_i(c(\text{land})))$$

where

$c$  is a function that converts land, as a commodity, into a vector of characteristics. In addition,  $c$  is independent of the personal characteristics of the landowner, which means that each individual will associate the same level of characteristics with a land parcel. In the words of Rosen (1974), characteristics are objectively measurable, which means that all buyers and sellers would read the same level of characteristics that each good embodies and their personal characteristics would not affect their reading.

$f_i(.)$  is the utilization function that converts land characteristics into functions by using the personal characteristics of the owner  $i$ . Thus,  $f_i(.)$  will vary for individuals with different personal characteristics. As mentioned earlier,  $f_i(.)$  is a single selection from the set of feasible utilization functions  $F(.)$  for the given personal features of person  $i$ .

The notation below explains a situation in which the owner's level of well-being associated with land is greater than or equal to what she/he can achieve from selling the land, that is:

$$v_i(f_i(c(\text{land}))) \geq v_i(f_i(c(\text{monetary value})))$$

In this case, the landowner prefers to continue owning the land and does not exchange it for money or does not sell it. This is probably the case for all those landowners who

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<sup>3</sup> Technical notes on calculating the human development indices are available at [http://hdr.undp.org/sites/default/files/hdr2018\\_technical\\_notes.pdf](http://hdr.undp.org/sites/default/files/hdr2018_technical_notes.pdf).

are not in the market. This also explains why landowners are dissatisfied when the government (or its agencies) compulsorily acquires their land in exchange for money. To explain this simply, many affected landowners are dissatisfied with receiving the market value of land as compensation, because they find it challenging to reconstruct the same level of well-being from money as from their land.

Investigating the explanation for why some landowners value land ownership more than its monetary equivalent further, it is because many functionings derived from land are valuable to the landowner alone, given his/her personal and social circumstances, and may not have the same value for everyone else. These may be termed “subjectively valuable functionings” for the landowner, say  $f_{i_s}$ . For example, a Dalit<sup>4</sup> landowner may value land for the financial security, like any other landowner, but additionally for the consequential social independence or the freedom to break away from a society that non-Dalit exploiters dominate (Deshpande 2011). All landowners would value financial security equally or it would be objectively valuable  $f_{i_o}$ , while a Dalit landowner would probably consider social independence to be subjectively valuable. Another simpler example of a subjectively valuable functioning could be the emotional well-being associated with the possession of an ancestral property that has been in the family for many years or generations. The original owner attaches emotional well-being to this land, which is otherwise not observable by others. Thus, it is possible to convert objectively valuable characteristics into both objective and subjective functionings, and the value of land to its owner is the cumulative value of all these functionings. A landowner is reluctant to sell land when the cumulative value of these functionings exceeds the monetary equivalent of land, that is:

$$v_i(f_{i_s}(c(land))) + v_i(f_{i_o}(c(land))) > v_i(f_i(c(monetary\ value)))$$

A rational assumption here is that the subjective functionings of land are non-substitutable with money and other commodities. If the value of subjective functionings is too large, the landowner would prefer to hold onto land in perpetuity and would choose to sell only when he/she either has made alternative arrangements for the subjective functionings or is prepared to give these away and the monetary value that the market offers for land either exceeds or matches the value of the objective functionings, that is:

$$\text{Condition 1: } v_i(f_{i_s}(c(land))) = 0$$

$$\text{Condition 2: } v_i(f_{i_o}(c(land))) \leq v_i(f_i(c(monetary\ value)))$$

The first condition means that landowners prepare over time and make alternative arrangements for their subjective functionings or willingly part with them. Regarding objective functionings, a landowner would sell land for a (monetary) value that allows him/her to regenerate the same or a greater level of functionings as the land. Thus, the monetary value of land equates to the value of objective functionings, while the landowner willingly surrenders subjective functionings. This is a typical case of willing sale. On the contrary, if land undergoes compulsory acquisition, the landowner is often neither prepared nor willing to part with subjectively valuable functionings, and the payment of the market value of land is merely compensation for objectively valuable functionings.

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<sup>4</sup> A person belonging to a scheduled caste and scheduled tribe, as Articles 341 and 342 of the Indian constitution list, which people consider to be the lowest caste in the Indian social hierarchy (Deshpande 2011).

It is important to mention here that, when estimating the monetary equivalent of land, a landowner tries to maximize his/her profit and takes account of the most valuable set of functionings derivable from the land, which may not necessarily match his/her own set of functionings. As discussed earlier, the maximization of value (of personal well-being) may not be the only motivation for a landowner when choosing his/her set of functionings  $f_i(\cdot)$ , but, when estimating the value of land for transaction purposes, the landowner takes account of the highest and best possible uses of each characteristic of the land and thus the highest achievable level of well-being. A landowner decides to sell when the value offered by the market matches or exceeds his/her estimated value of the best set of functionings:

$$v_{max} \leq p(c)$$

where  $v_{max}$  is the maximum achievable well-being from using land with characteristics  $c$  and  $p(c)$  is the price of land in the market.

It is important to note that the price function  $p(c)$  is independent of the personal characteristics of the original owner  $i$  and the market decides it according to the land characteristics  $c$ . Price  $p(c)$  is an indicator of the highest level of well-being  $v_{max}$  derivable from land with characteristics  $c$ . To put it another way,  $v_{max}$  is the maximum level of well-being achievable from land with characteristics  $c$  assuming that the owner-user, decided through market competition, would have the personal and social characteristics that allow the efficient conversion of the land's characteristics into the optimal set of functionings  $f_{max}(\cdot) \in F_i$ . Later, in section 1.7, we discuss further the influence of landowners' personal characteristics or caste on the monetary value of land.

From the above discussions, we conclude that the transaction value of land in the market  $p(c)$  is a measurable indicator of the highest-valued set of functionings achievable from land, which may not necessarily be the chosen set of functionings of the original landowner. In addition, according to the hedonic hypothesis, the price of land that a market transaction reveals reflects the implicit price of each characteristic of land when put to its best use. A further discussion on the implicit price of land's characteristics and the impact of personal characteristics on this price follows in section 1.4.

At this stage, it is important to clarify that this research applies hedonic theory in the traditional way to estimate the implicit price of each characteristic of land. Capability theory explains how these characteristics generate functionings, and research has acknowledged that it is empirically challenging to estimate the value of a functioning itself, because: firstly, each functioning is an outcome of a combination of personal and land characteristics for which the functional form is unknown; secondly, personal characteristics vary at the individual level, thus leading to the generation of differential "levels" of functioning for each individual, even though the set of commodity characteristics remains the same. For example, having livelihood security would be a crucial functioning for an owner and comes from the utilization of many characteristics of land, such as its area, productivity, and so on. As a functioning, livelihood security associated with a land parcel would be different for, say, an agriculturist and an industrialist, and it is difficult to measure the "level" of security and the "value" attached to it objectively. However, it is still possible to measure the characteristics of land, that is, its area and productivity. Hedonic theory makes it possible to identify the empirical relationship between the well-being associated with land (for which the monetary transaction value is a measure) and each of its characteristics. In addition, knowing the stages of transformation of a commodity (or land) into characteristics and functionings,

which eventually create well-being of different levels, helps in building a comprehensive definition of the “value” of land. At this stage, we explain the aim of this research again, which is to estimate the implicit value of the future development potential of land and blight, which are both important characteristics of land that contribute to the financial well-being of the owner and therefore deserve compensation in the case of compulsory acquisition of land. In addition, this research studies the impact of landowners’ caste on the transaction value of their land.

## 4. HEDONIC THEORY AND LAND VALUES

Hedonic theory is applicable in a willing sale scenario in which a landowner enters the market and the transaction value of land with characteristics  $c$  reveals the monetary measure of the highest-valued set of functionings  $f_{max}(\cdot)$ .

In his seminal paper, Rosen (1974) defined hedonic prices as the implicit prices of attributes that are “revealed to economic agents from observed prices of differentiated products and the specific ‘amount’ of characteristics associated with them” (34). The hedonic hypothesis states that people value commodities for their utility-bearing attributes or characteristics (Rosen 1974). In reference to “capability theory,” it is possible to reinterpret the hedonic hypothesis to mean that commodities derive value from functioning-bearing characteristics. We re-emphasize that the hedonic model estimates the value of characteristics of land, although the interpretation of value is theoretically different from the traditional utility theory and instead adopts Sen’s (1987) capability theory. Even though the two theories differ in their interpretations of the market value of land as meaning utility and capability, respectively, these theoretical differences do not affect the empirical application of hedonic theory. We may draw theoretically different conclusions when interpreting the value attached to each characteristic of land and its impact on the personal well-being of the owner.

Advancing the discussion on hedonic theory, we describe a land parcel as a bundle of  $n$  objectively measurable characteristics. On a plane of several dimensions on which buyers and sellers locate, the vector of coordinates  $c = (c_1, c_2, \dots, c_n)$  represents any location, where  $c_n$  measures the amount of the  $n^{th}$  characteristic of the land parcel (Rosen 1974). Their perceptions of the amount of characteristics embodied in each land parcel are identical, although they may attach different values  $v_i$  to alternative packages of characteristics (Rosen 1974). When the amount of the characteristic that the seller offers equals the amount that the buyer choosing to locate there demands, then the land transaction takes place and reveals the price of land and the implicit price of the characteristic.

$$p(c) = p(c_1, c_2, \dots, c_n)$$

Each land parcel’s market transaction reveals the price function  $p$  relating prices and characteristics. The price function is the buyer’s (or seller’s) equivalent of hedonic price regressions, obtained as an outcome of comparing the prices of land with different characteristics. For example, the market reveals the price for land parcel  $p_i(c_1, c_2^*, \dots, c_n^*)$  and  $p_j(c_2^*, \dots, c_n^*)$ , and this information reveals the implicit price of characteristic  $c_1$ .

Rosen (1974) clarified that both buyers and sellers base their locational and quantity decisions on maximization behavior. According to the traditional utilitarian theory, maximization behavior of the buyer would mean maximizing personal utility  $u$  subject to

a non-linear budget constraint.<sup>5</sup> In reference to “capability theory,” the maximization behavior of the buyer and seller would mean that they estimate the value  $v_i$  of any characteristics  $c_n$  for the most valuable set of functionings achievable from using characteristic  $c_n$ , which may or may not match their personal set of functionings. Section 1.3 discussed this earlier. For simplicity of mathematical notations, we restrict our discussion to the traditional utilitarian argument of utility maximization and budget constraint, assuming that the hedonic argument for utility  $u$  is equally applicable to the value of functionings  $v_i$ . We dedicate the next few sections to explaining how a tangential intersection of the bid and offer function for the buyer and the seller, respectively, determines prices  $p(c)$ . Rosen (1974) described the offer function of the seller at length, and we discuss it here briefly.

Let  $y$  be the income function of a person. Then,  $y = p(z) + \theta(c)$ , where  $p(z)$  is the price of other commodities with characteristics  $z$  and  $\theta(c)$  is the expenditure that a person (or buyer) would be willing to make for land characteristics  $c$ . The bid function  $\theta(c; u, y)$  is a family of indifference surfaces<sup>6</sup> of alternative combinations of characteristics possible with a given utility and income. It is the amount that a buyer is willing to pay for a set of characteristics with a fixed budget and utility, while  $p(c)$  is the minimum price that he/she must pay in the market. Therefore, the buyer maximizes his/her utility,  $u = u(z, c)$ , when  $\theta(c^*; u^*, y) = p(c^*)$  and  $\theta_{c_n}(c^*; u^*, y) = p_{c_n}(c^*)$ , where  $c^*$  and  $u^*$  are optimum quantities.

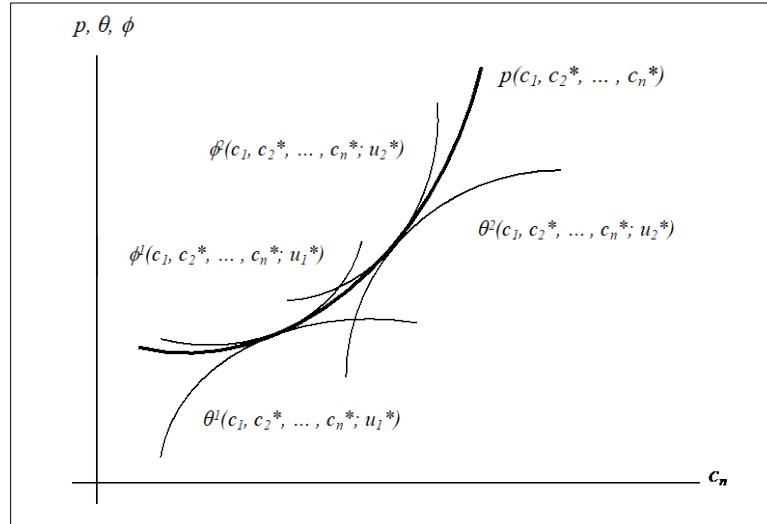
Let  $\phi(c; \pi, \beta)$  be the function of the offer price that the seller is willing to accept for an alternative set of land characteristics  $c$ , at a given profit level  $\pi$  and with factor prices  $\beta$ , while  $p(c)$  is the maximum price that he/she can achieve in the market. The maximization of the seller's profit is equivalent to the maximization of the offer price. Put simply, profit maximization occurs when the offer price equals the market price,  $\phi(c^*; \pi^*, \beta) = p(c^*)$  and  $\phi_{c_n}(c^*; \pi^*, \beta) = p_{c_n}(c^*)$ , where  $c^*$  and  $\pi^*$  are optimum quantities.

At equilibrium, the bid function of the buyer  $\theta(c; u, y)$  matches perfectly the offer function of the seller  $\phi(c; \pi, \beta)$  and the locus of the points of tangential intersection of the two is the envelope of prices  $p(c)$ . Figure 1 represents this graphically, where  $\theta^i$  and  $\phi^i$  represent the bid function and offer function of the  $i^{th}$  buyer and seller and the points connecting the tangential intersection  $\theta^i$  and  $\phi^i$  is the implicit price function  $p_{c_n}(\cdot)$  for characteristic  $c_n$ . Stated differently, the gradient of the market clearing implicit price function  $p(\cdot)$  for each characteristic gives the common gradient of the two functions at the point of tangential coincidence.

<sup>5</sup> For more details of general conditions under a non-linear constraint, refer to Intriligator (1971).

<sup>6</sup> Refer to Alonso (1962) for a further explanation of indifference surfaces in urban economics.

**Figure 1: Joint Envelope of the Bid Price of the Buyers and the Offer Price of the Sellers at Equilibrium**



#### 4.1 Impact of Personal Characteristics on Transaction Value and Distortion of the Equilibrium

As discussed earlier, the market value is a measurable indicator of the highest level of well-being  $v_{max}$  that a landowner can achieve from using land. The underlying assumption here is that the owner-user would be fully capable of converting the land characteristics into the highest-valued set of functionings  $f_{max}(\cdot)$ . However, given that the level of well-being derivable from land is a combination of personal and land characteristics, if the personal characteristics of the landowner are any less than those of the most efficient user, then the value of functionings of the owner may not match the market-determined value of the land. Personal characteristics also include landowners' negotiation power, which, in turn, may depend on their social status, education level, and so on. For example, a "Dalit" landowner, who does not enjoy an equal social status to others in the society, may not be able to demand the same value of land in the market as a non-Dalit owner (empirical discussions follow in section 1.7). Harding, Knight, and Sirmans (2003) and Harding, Rosenthal, and Sirmans (2003) made a similar argument in their earlier studies, in which they found that women have less bargaining power than men in the American housing market (Harding, Rosenthal, and Sirmans 2003).

Regarding the impact of bargaining power on the overall price of the house  $p(c)$  and on the implicit prices of each characteristic  $p_{c_n}(c_n)$ , Harding, Knight, and Sirmans (2003) confirmed the earlier findings, which is that the best model of bargaining power is as a parallel shift in the hedonic function and that the impact is much weaker on the implicit prices. In the light of these earlier findings, this research discusses the impact of landowners' caste on the transaction value of land, and further research on its impact on each characteristic is pending.

Bargaining implies the distortion of market equilibrium, which means that either the buyer or the seller can influence the transaction price and shift it to his/her advantage. This is contrary to the assumption of an ideal competitive market, in which there are numerous buyers and sellers with equal negotiation power and no one can influence the price or charge any negotiation premium. The transaction price  $p(c)$  after bargaining would be  $p(c) \frac{N_S}{N_B}$ , where  $N_B$  and  $N_S$  is the bargaining power of the buyer and the seller,



respectively, and takes values between zero and one. At equilibrium, the bargaining power of the buyer and that of the seller are equal,  $N_B = N_S$ , and the bid price of the buyer, the offer price of the seller, and the price that the market determines coincide, that is:

$$\theta(c^*; u^*, y) = \phi(c^*; \pi^*, \beta), \text{ and}$$

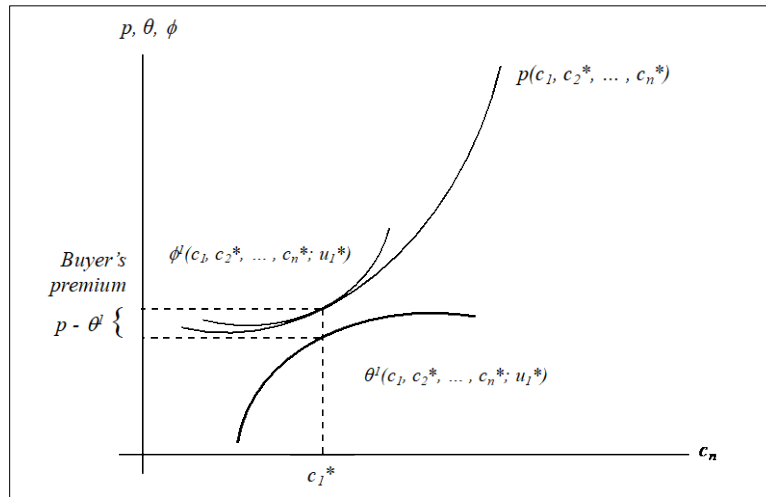
$$p(c^*) \frac{N_S}{N_B} = p(c^*)$$

Case 1: When the negotiation power of the buyer is greater than that of the seller ( $N_B > N_S$ ), then  $\frac{N_S}{N_B} < 1$  and the bid price is lower than the observed market price  $p(c)$ .

$$\theta(c^*; u^*, y) = p(c^*) \frac{N_S}{N_B} \text{ and this is } < p(c^*)$$

The buyer would receive the negotiation premium  $= p(c^*) (1 - \frac{N_S}{N_B})$ , and the transaction would happen at a lower price than the observed market price. The seller would either withdraw from the sale or sell at a lower price than the observed market price. In the extreme scenario, the negotiation power of the buyer may be much greater than that of the seller,  $N_B \gg N_S$ ; then,  $\frac{N_S}{N_B} \rightarrow 0$  and  $\theta(c) \rightarrow 0$ . That is, if the buyer has infinite bargaining power, then he/she will not want to pay any price to the seller.

**Figure 2: Buyer's Premium: The Negotiation Power of the Buyer is Greater than That of the Seller and Transactions Happen at the (Bid) Price, which Is Lower than the Observed Market Price**

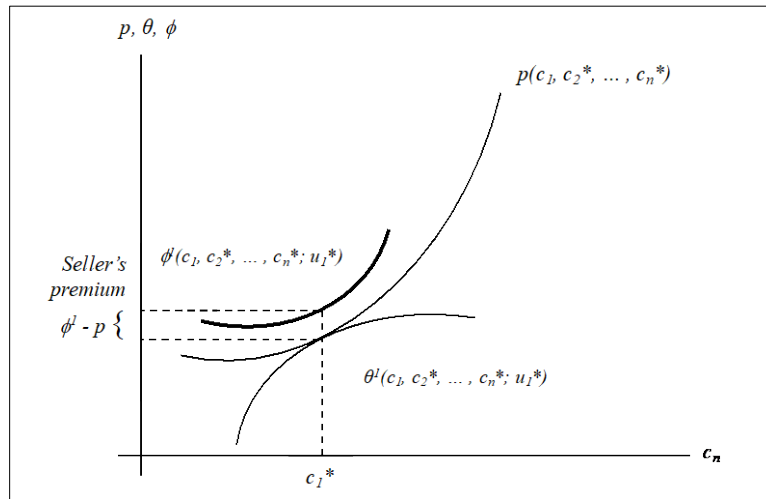


For example, in the case of a public agency's compulsory acquisition of land, the negotiation power of the acquirer/buyer is greater than that of the landowner, given that the outcome is predetermined in favor of the acquirer/buyer. Therefore, the compensation that the acquirer offers to the landowner, which should ideally match the market value, may actually be lower to favor the acquirer/buyer. Consequently, landowners may receive inadequate compensation. Unfair compensation may stimulate the resistance of landowners to the compulsory acquisition process and force them to seek the opportunity for a fair negotiation in the court of law.

Case 2: When the negotiation power of the seller is higher than that of the buyer ( $N_S > N_B$ ), then  $\frac{N_S}{N_B} > 1$  and the offer price is greater than the observed market price  $p(c)$ .

The seller would receive the negotiation premium  $= p(c^*) (\frac{N_S}{N_B} - 1)$ , and the transaction would happen at a higher price than the observed market price. The buyer would either not enter into buying or would buy at a higher price than the observed market price. In the extreme scenario, the negotiation power of the seller may be much greater than that of the buyer,  $N_S \gg N_B$ ; then,  $\frac{N_S}{N_B} \rightarrow \infty$  and  $\phi(c) \rightarrow \infty$ . That is, if the seller has infinite bargaining power, then he/she will charge a very high premium or hold out the property.

**Figure 3: Seller's Premium: The Negotiation Power of the Seller Is Greater than That of the Buyer and Transactions Happen at the (Offer) Price, which Is Higher than the Observed Market Price**



Harding, Rosenthal, and Sirmans (2003b) used an additive term for bargaining power,  $B$ , in the original hedonic price function to estimate the effect on price, that is:

$p(c) + B$ , where:

$$B = b^{sell} D^{sell} + b^{buy} D^{buy} + e$$

$D$  is the vector of both demographic and non-demographic characteristics of the buyer and the seller;  $b$  is the vector of coefficients that reflect the effect of  $D$  on the bargaining power; and  $e$  captures any idiosyncratic differences in the bargaining power of the seller and the buyer.

Given that the nature of the relationship of personal characteristics with property characteristics and its value is unknown, a sophisticated model would use an interactive term for bargaining power,  $p(c) \frac{N_S}{N_B}$ , alongside an additive term. More discussions on the functional form of the hedonic function appear in the next section.

## 4.2 Choice of Functional Form for the Hedonic Price Function

The hedonic slopes of the land price function are the implicit prices of land attributes, which are instruments for both objective and subjective functionings, as Section 1.2 discussed earlier. Since we do not have any prior notions about the functional form of hedonic functions, we start by discussing the most general form that incorporates all the other functional forms as special cases, that is, the Box–Cox functional form, as the literature has proposed (Halvorsen and Pollakowski 1981; Chattopadhyay 1999):

$$P^{(\theta)} = \beta_0 + \sum_{i=1}^m \beta_i c_i^{(\lambda)} + \frac{1}{2} \sum_{i=1}^m \sum_{j=1}^m \gamma_{ij} c_i^{(\lambda)} c_j^{(\lambda)}$$

where  $P$  is the price;  $\beta$ s are the market-determined parameters;  $c_i$  are the attributes or characteristics of the land and may also include the personal characteristics of the buyer and the seller;  $\gamma_{ij} = \gamma_{ji}$ ; and  $P^{(\theta)}$  and  $c_i^{(\lambda)}$  are Box–Cox transformations:

$$P^{(\theta)} = \frac{P^{(\theta)} - 1}{\theta}, \text{ when } \theta \neq 0$$

$$= \ln P \text{ when } \theta = 0$$

and

$$c_i^{(\lambda)} = \frac{c_i^{(\lambda)} - 1}{\lambda}, \text{ when } \lambda \neq 0$$

$$= \ln c \text{ when } \lambda = 0$$

The Box–Cox function allowed us to estimate the complex functional relationship between the personal and property characteristics and the property value. We estimated the following functional forms and found the log-log relationship to be the most explanatory:

1.  $\theta = 1, \lambda = 1, \gamma_{ij} = 0$ ; *linear*
2.  $\theta = 0, \lambda = 1, \gamma_{ij} = 0$ ; *semi-log*
3.  $\theta = 0, \lambda = 0, \gamma_{ij} = 0$ ; *log-log*
4.  $\gamma_{ij} = 0$ ; *Box-Cox~linear*
5.  $(\theta, \lambda, \gamma_{ij})$  *unrestricted; Box-Cox ~ quadratic*

In the next section, we provide more details of the case of the Bangalore–Mysore Infrastructure Corridor (BMIC) project. Background knowledge of the BMIC project is necessary to allow the reader to develop a better understanding of the data and variables in section 1.6.

## 5. BANGALORE–MYSORE INFRASTRUCTURE CORRIDOR (BMIC) PROJECT

The State Government of Karnataka conceived the initial ideas about the Bangalore–Mysore Infrastructure Corridor (BMIC) three decades ago, in 1988, when it felt the need to provide an expressway between two major cities—Bengaluru and Mysuru (formerly known as Bangalore and Mysore, respectively). After a sequence of events between 1988 and 1995, the state government decided to build the expressway through public–private partnership, which was a newly emerging format in India. In February 1995, the Governor of Massachusetts State (US) visited India and, as an outcome of his meeting with the Chief Minister of Karnataka, H. D. Deve Gowda, a private consortium formed by two US-based companies (VHB and SAB) and one Indian company (Kalyani Group) and the Public Works Department (Government of Karnataka, GoK), signed a memorandum of understanding (High Court of Karnataka 1998). The BMIC project had two main objectives: (i) to develop an expressway connecting two major cities in the state of Karnataka—Bangalore and Mysore; and (ii) to develop growth centers (townships) along this expressway and facilitate spatial distribution of the burgeoning population growth in Bengaluru and Mysore (BMICAPA 2017). The financial model of the project was to leverage from the land value appreciation post-project (Raghuram 2009). From its inception in 1995, the project generated controversies over the acquisition of land, which caused significant delays. However, the project has overcome many legal controversies since 1995 and has been progressing steadily.

The land requirement for the project is 23,846 acres (KPWD 1998). Table 1 presents the distribution of land requirements by administrative divisions (called Taluk<sup>7</sup>). By 2004, the Karnataka Industrial Areas Development Board (KIADB) had notified all land for compulsory acquisition under the Karnataka Industrial Areas Development (KIAD) Act of 1966. It successfully acquired the land for the first phase of the project, and this allowed the construction of a peripheral road around Bengaluru city and a short stretch (12 km) of the expressway, which it opened to the public in June 2006. At this stage of the project, the plan was to develop two townships, but the landowners strongly resisted the acquisition of their land for townships, because they viewed townships as private projects (for more details on the private gains arising from the BMIC project, refer to Raj and Angadi 2018).

**Table 1: Taluka-Wise Land Requirements for the BMIC Project, 1998**

Administrative Division (Taluk)	Area (acres)
Bangalore North	855
Bangalore South	5,089
Ramnagaram	8,170
Channapatna	3,572
Maddur	481
Mandya	667
Srirangapatnam	4,839
Mysore	173
Total	23,846

Source: KPWD (1998).

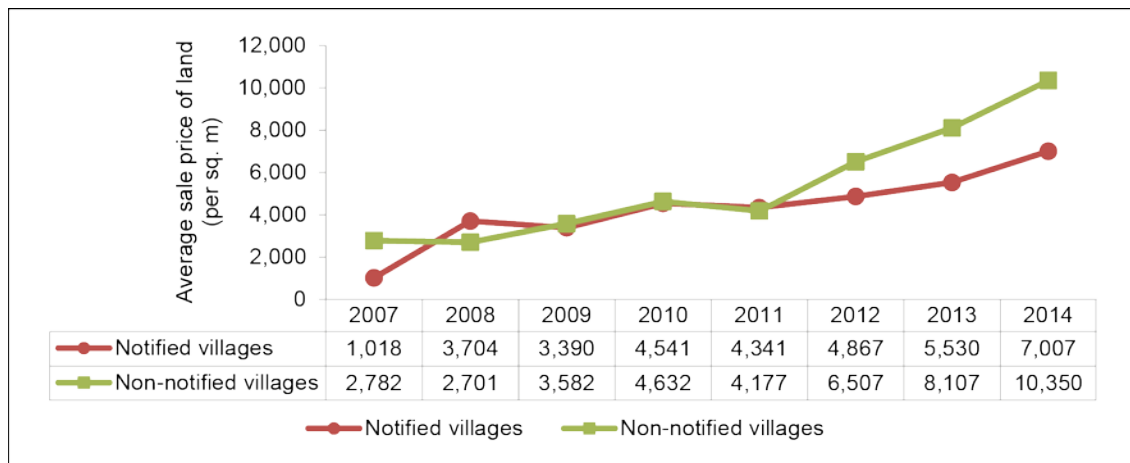
<sup>7</sup> Taluk is an area of land with a city or town that serves as its administrative center, with possible additional towns and usually a number of villages.

The status of landowners to date is that they have received notification of land acquisition but the KIADB has not yet acquired it. The original owners continue to use their land with the restriction of improving their land. To explain the procedure in more detail, under section 28(1) of the KIAD Act, 1966, the State Government issues a preliminary notice for acquisition and the land transfers to it, free from all encumbrances, only after the publication of the final declaration for notification under section 28(4). The state pays compensation only after taking possession of the land. The act does not specify any timeline for these processes, and often the time gap between preliminary notification and actual acquisition is uncertain, as in the case of the BMIC project. According to a report by the Comptroller and Auditor General of India (2017), in 2016–17, approximately 28,720 acres of land received preliminary notification from the KIADB, of which 63% has been pending acquisition for the past five years. After preliminary notification for acquisition of land, the original landowners continue to operate under the legal restrictions that the KIAD Act imposed on improving, selling, or mortgaging land.

Once the state has earmarked the land for acquisition (under preliminary notification), its value starts depreciating. Influential market players see this is an opportunity to procure notified land at reduced prices from desperate landowners. Even though there is a risk of losing land to the acquirers, there is still an opportunity to have the land de-notified (Comptroller and Auditor General of India 2011). By virtue of its power under section 21 of the Karnataka General Clause Act, the State Government has the authority to cancel final notification orders (issued under section 28(4) of the KIAD Act) at any time before the acquiring agency takes possession of the land (Comptroller and Auditor General of India 2011). In the past, the Karnataka State Government has de-notified land on many occasions based on public and political considerations (Comptroller and Auditor General of India 2011). This develops hope of de-notification, and the strategic purchase of notified land is common in Karnataka state. Given that the notification of the land occurred between 1997 and 2004 for the BMIC project and that the project is facing strong resistance from the public and political parties, strategic buying and selling of land is happening in the region. Over the years, many real-estate developments, particularly residential apartments, have evolved in Bengaluru South, along the expressway, and the property values of land in the region have increased significantly. Figure 4 presents the average sale price per square meter for notified and non-notified land in 23 villages around the BMIC project. The price per square meter for non-notified land is higher than that for notified land except in 2008, when the prices were comparable. Post-2012, the price of both notified and non-notified land increased, though the growth rate was significantly greater for non-notified land.

The prolonged period of development has revealed the impact of the change of the use of land from agricultural to non-agricultural, particularly high-rise residential. In addition, landowners have observed the negative impact of acquisition notification on the property value. Accordingly, landowners who have received acquisition notification, but acquisition has not yet taken place, have been demanding compensation for the loss of “hope value” and “blight.” However, the acquirers are reluctant to pay more than the “original” market value of land in its existing use, that is, agriculture. Given the interesting situation described above, the BMIC project allows us to observe a positive impact of the change of use on agricultural land (“hope value”) and the negative impact of acquisition notification (or blight). Additionally, this research estimates the negative impact of landowners’ caste (SC/ST) on the property value, which is reflective of the lower social status and bargaining power of SC/STs.

**Figure 4: Comparing the Average Sale Price of Land (per Square Meter) for Notified and Non-Notified Land in 23 Villages along the BMIC Project in Bengaluru South Region, 2007–14**



Source: Author's calculations based on data from the Sub-Registrar's Office, Bengaluru.

## 6. DATA AND VARIABLES

To develop a comprehensive hedonic model of land value and the above functionings, which together constitute the value, this research relies on two primary sources of information:

1. Firstly, we obtained the land and property sales registration data from the Inspector General of Stamps and Registration, Government of Karnataka, through the registration databases that 45 sub-registrar's offices (SROs) maintain in the Bengaluru region. As of February 2016, the databases digitally recorded 34,799 sale transactions<sup>8</sup> in the Bengaluru region between 2006 and 2015. However, very limited data are available for the years 2006 (114 transactions) and 2015 (127 transactions), and therefore we restricted the period of analysis for this research to 2007–14. The number of transactions ranges from 2364 in 2007 to 4316 in 2014. The maximum of 7004 transactions occurred in the year 2013. In total, this research analyzed 33,424 genuine transactions. Each record contains information on the date of the transaction, sale price, land area, land use, and location. From the transaction data, it was possible to derive four major land use types: agriculture (3,497); vacant land (available for development, 25,206) and petty shops (2); residential use (low-rise houses on the urban periphery, 3,981); and residential use (apartments, 740). We observed land use from the data rather than from the planning regulations, because the proposed plans for the region came into question along with the BMIC project. To explain further, in 1999, the Bangalore–Mysore Infrastructure Corridor Area Planning Authority (BMICAPA) came into being as the planning authority for the BMIC project area (High Court of Karnataka 2003). It prepared the Outline Development Plan for the BMIC planning area and identified the land required for the road, townships, and so on using aerial and land surveys (para 31, High Court of Karnataka 2005). As the project encountered legal controversies, opportunistic sellers and buyers carried out land transactions in the area by speculating on the

<sup>8</sup> Prior to 2006, SROs recorded land transactions manually, and each transaction has a physical file stored at the SRO that registered the property. These records are difficult to access.

future development potential of the land according to the BMICAPA. Given the organic nature of residential development (except apartments), typical of rural areas in India, we can assume that residential improvements of land (except apartments) do not add to the value of land. Thus, the transaction value is essentially the value of the land itself. To extract the value of land from the transaction value of the apartment, it is possible to estimate a hedonic price function on apartment characteristics, such as the built-up area; the number of rooms; car parking; and the undivided share in the land. In summary, the data set contains information on 33,424 sale transactions that took place in 13 notified and 10 non-notified villages between 2007 and 2014. Of the total number of transactions, 29% occurred in the notified villages.

2. Information on the personal characteristics, such as the caste, of the buyer and seller are not available along with the transaction data; therefore, we relied on village-level information (as opposed to personal information) to estimate the impact of the caste on property values. We also observed locational parameters at the village level and assumed that they remain the same for all the observations in that village but vary across villages. These parameters include the total geographical area of the village; area under irrigation; non-agricultural area; primary manufacturing activity in the village; infrastructure facilities, such as some public and private health care centers; education facilities; availability of drinking water taps; and drainage availability. We relied on census data for information on the caste and locational characteristics discussed above. Given that India collects census data every ten years, we projected the population (total, scheduled caste (SC), and scheduled tribe (ST)) for the years 2006–2015 using data from the years 2001 and 2011. We assumed that the data on locational parameters from the census for the year 2011 were consistent during the period 2006–15. Table 2 summarizes the village-level characteristics of notified and non-notified villages.

In general, the proportion of land under irrigation in non-notified villages is larger than that in notified villages except in Naganayananahalli (where 41.19% of the land is irrigated) or Badamanavartheekaval (where 24% of the land is irrigated). An important observation from the characteristics of villages is that, in notified villages, a relatively larger proportion of land than in non-notified villages is under non-agricultural use. For example, Gonipura has about 40% of land under non-agricultural use. We may highlight here that non-agricultural use excludes land under forests or grazing or fallow land and that this land is used for productive purposes other than agriculture. The demographics of these villages suggest that the proportion of the scheduled caste (SC) population is around one-fifth or more in six out of the total 13 villages notified for acquisition as compared with four out of 10 in the non-notified villages. The scheduled tribe (ST) population in Naganayakanahalli (a notified village) is as high as 85%. Rachanamadu, another notified village, has a 30% ST population. These are substantially larger than the SC/ST population in non-notified villages. The infrastructure facilities are comparable across these villages. In terms of public health care facilities, based on the Census 2011, many notified villages are better endowed than non-notified villages. However, the endowment of private health care facilities is better in non-notified villages than in notified villages. A key message from the above discussion is that the evidence is contrary to the argument of the acquiring authority that most of the land in the notified village is less productive and houses less marginalized communities.

**Table 2: Village-Level Characteristics**

S. No.	Village Name	Area Irrigated (% Total Geographic Area)	Area under Non-agricultural Uses (% Total Geographic Area)	Public Health Facility (No. of Health Workers per 1,000 Persons)	Private Health Facility (No. of Health Workers per 1,000 Persons)	SC Population (% of Total Population)	ST Population (% of Total Population)
Notified for acquisition							
1	Badamanavarthekeval	24.10%	14.80%	0.479	0.479	37.96%	3.25%
2	Chinnakurchi	10.28%	16.20%	0	0	14.28%	0.00%
3	Dodderi	9.30%	0.00%	0	1.427	38.95%	2.66%
4	Gangasandra	13.12%	3.65%	0	0	23.18%	0.74%
5	Gonipura	1.80%	40.55%	2.118	0	13.89%	0.21%
6	Hampapura	2.80%	22.36%	0	0	18.46%	0.00%
7	Kengeri	10.43%	0.00%	10.153	0	5.19%	1.52%
8	Kolur	14.32%	10.99%	1.008	0	28.71%	0.45%
9	Kumbalagodu	6.94%	0.00%	6.4289	0	21.43%	1.71%
10	Naganayakanahalli	41.19%	5.37%	0	0	2.09%	85.12%
11	Rachanamadu	2.93%	0.00%	0	0	19.58%	29.97%
12	Thippur	2.35%	33.64%	0	0	16.35%	0.62%
13	Uttari	3.89%	6.33%	0	1.379	4.41%	7.44%
Not notified for acquisition							
14	Doddabele	13.90%	0.00%	0	0.742	25.64%	1.56%
15	Gangondanahalli	28.68%	0.42%	0	0.610	12.43%	13.30%
16	Kachohalli	26.47%	10.19%	0	0.245	19.08%	1.85%
17	Kommaghatta	29.89%	0.00%	0	1.291	12.25%	21.29%
18	Lakshmipura	23.92%	10.17%	0.525	0	28.62%	3.56%
19	Madavara	28.17%	20.22%	0	0.490	9.78%	2.25%
20	Mallasandra	3.12%	0.00%	0	2.060	6.64%	0.86%
21	Manganahalli	20.10%	9.04%	0	0.752	14.01%	0.87%
22	Uttarahalli – Manavarthekeval	0.00%	31.73%	0	0	12.51%	0.00%
23	Vaddarapalya	33.43%	10.16%	1.155	0	32.35%	3.47%
Total		19.47%	7.14%	0.576	0.614	19.92%	5.04%

Source: Author's calculations based on census data from 2001 and 2011.

Table 3 presents the descriptive statistics for the variables considered in the model and their expected relationship (sign) with the value of land. Of the total 33,424 transactions in 23 selected villages, 63% were in villages for which the nearest town is Bruhat Bengaluru Mahanagara Palike (BBMP), translated into English as Greater Bengaluru Municipal Corporation. Other villages, though within Bengaluru, are closer to Nelamangala town. Nearness to BBMP means better accessibility to urban facilities and therefore the expectation of a positive impact on property values.

These villages are in a region where sericulture is a major economic activity, which has led to the development of the textile industry. In terms of the manufacturing activities in these villages, 34% of villages noted textiles as the primary manufacturing activity in the Census 2011. Around 27% and 16% of villages identified medicine and brick manufacturing, respectively, as the primary manufacturing activity. In terms of the impact of land values, the expectation is that these higher-level uses (as compared with agriculture) will have a positive impact on land values.



## 7. ESTIMATION RESULTS

We conducted the analysis in two steps. Since the value of the apartment is not equivalent to the value of the land, the first step estimates a hedonic price function for the apartment sale value as a function of the apartment characteristics and the apartment's undivided share of land. The second step involves the estimation of hedonic functions for land sales.

**Table 3: Descriptive Statistics**

S. No.	Variables	(1) Expected Sign	(2) Mean (Std Dev.)
	Market value (dependent variable)		878,664.500 (3,002,183)
1	Area of land transacted (sq. m)	+	337.466 (2,102.007)
2	Non-agricultural area (share of total geographical area)	+	0.071 (0.071)
3	SC population (share of total population)	–	0.199 (0.109)
4	ST population (share of total population)	–	0.050 (0.063)
5	Dummy for primary manufacturing activity (bricks)	+	0.161 (0.367)
6	Dummy for primary manufacturing activity (medicine)	+	0.270 (0.444)
7	Dummy for notified for acquisition	–	0.290 (0.454)
8	Dummy for nearest town being BBMP	+	0.632 (0.482)
9	Dummy for residential land use (apartment)	+	0.022 (0.147)
10	Dummy for residential land use (house)	+	0.119 (0.324)
11	Dummy for vacant land	+	0.754 (0.431)
12	Percentage of area under irrigation (as a share of the total geographical area of the village) × transacted property being in agricultural use (dummy)	+	0.018 (0.062)
13	Dummy for the year of transaction—2008	+	0.071 (0.256)
14	Dummy for the year of transaction—2009	+	0.067 (0.251)
15	Dummy for the year of transaction—2010	+	0.084 (0.278)
16	Dummy for the year of transaction—2011	+	0.151 (0.358)
17	Dummy for the year of transaction—2012	+	0.204 (0.403)
18	Dummy for the year of transaction—2013	+	0.210 (0.407)
19	Dummy for the year of transaction—2014	+	0.129 (0.335)
Total observations—33,424			

Village-level parameters—variables 2 to 8.

Property-level parameters—variable 1 and variables 9 to 19.

Source: Author.

## 7.1 Hedonic Function for the Apartment Sale Value

We assumed that the relevant value for consideration in our analysis is the value of the apartment's "undivided share of land"<sup>9</sup> rather than the value of the apartment. We then used the estimated function to predict the value of an undivided share of land for all the observations related to apartment sales in the data. This allowed us to estimate the hedonic price function for land for all the apartment sales, as Table 4 shows. All the variables have the expected signs. The elasticity of an undivided share of land is 0.45, implying that a 1% increase in the undivided share of land for an apartment increases the value by 0.45%.

**Table 4: Hedonic Function for the Market Value of Apartments**

Variables	Market Value of Apartments (log)
Undivided share of land (log)	0.451*** (0.041)
Number of bedrooms	0.192*** (0.018)
Number of car parking slots	0.174*** (0.013)
Dummy for floor being greater than 4	0.044*** (0.009)
Dummy for the year of transaction—2011	0.038** (0.016)
Dummy for the year of transaction—2012	0.119*** (0.015)
Dummy for the year of transaction—2013	0.152*** (0.016)
Dummy for the year of transaction—2014	0.499*** (0.026)
Constant	11.044*** (0.236)
Observations	739
R-squared	0.750

Note: Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05.

Source: Author.

We used Table 4 to predict the value of an undivided share of land for those transactions that have identified the nature of the transaction as "apartment." The predicted value replaces the transaction value of the apartment in the data for the estimation of the hedonic function for land sales.

<sup>9</sup> We define the undivided share of land as the proportionate share of land for each apartment in the land area of the entire apartment complex project. We calculate this as the built-up area (or saleable floor area) of each apartment divided by the total built-up area (or saleable floor area) of the project multiplied by the total land area of the project.

## 7.2 Hedonic Function for Land Values

From running five versions of hedonic functions—linear; log-linear; log-log; linear Box–Cox; and generalized Box–Cox—we found that the transformation coefficients of the Box–Cox functions were not very different from zero and the likelihood ratio test statistics were close to  $\tau = 0$ . Therefore, there was merit in using a log-log model for computing the implicit prices. However, the Breusch–Pagan test for the linear, log-linear, and log-log models indicated that the variance was inconsistent and that there was heteroskedasticity. Nevertheless, the problem of heteroskedasticity did not cause bias in the OLS estimates of the coefficients, even though it tended to underestimate the standard errors. In addition, the  $R^2$  for the log-log model was reasonable, and we used this functional form to estimate the results and implicit prices.

Table 6 presents the implicit prices for various functionings obtained from the log-log model.

The results indicate that the transaction value at means, for a given year, is 31% lower for land that has received notification for acquisition than for land in villages that has not, all things being equal. As mentioned earlier, blight due to the notification has been observable because of the long gap in time between notification and acquisition, during which land transactions take place. Notice for acquisition causes blight even though the amount of compensation in the initial offer for each land parcel undergoes a few revisions before the formal land acquisition and the settlement of compensation.

As for the size of land transacted, a 1% increase in the land area increases the transaction value by 0.77% (Table 5). Given that these are largely agrarian settlements, irrigated land fetches a higher value than rainfed or unirrigated land. The sign for the coefficient of a share of the irrigated area in the total agricultural area is positive and significant. A larger share of economic activities that are non-agricultural in a village increases the general level of the land value in the village. The positive coefficient of a share of non-agricultural land in the total area of the village confirms this hypothesis. With the manufacturing activities, villages that have engaged in brick manufacturing have a higher value of land than others, as the positive and significant coefficient for BRICKS indicates. These are the villages that are closer to the BBMP and where large-scale apartment building activity has commenced, particularly since 2011, with the completion of the ring road component of the expressway. Landowners have sold their land at higher values as the demand for brick manufacturing to meet the demand for apartment construction activity in the village has increased. The potential for economic activities also has a significant impact on the land values. The main economic activity in most villages before 2006/2007 was agriculture. The construction activities that began particularly after the completion of the road in 2011 led some landowners to sell their agricultural land to brick manufacturers in many of the notified villages. The prospect of losing land had extenuated this situation, and the value that the landowners realized for land for brick manufacturing activity was higher than that for agricultural activity. Furthermore, land in villages that have become part of the BBMP is valued higher. This reflects the premium attached to being part of the metropolitan Bengaluru and receiving services from the Greater Bengaluru Municipal Corporation.

**Table 5: Results from the Estimated Hedonic Models**

S. No.	Variables	Log-Log
1	Area of land transacted (sq. m)	0.769*** (0.00348)
2	Non-agricultural area (share of total geographical area)	2.648*** (0.0447)
3	SC population (share of total population)	-1.257*** (0.0323)
4	ST population (share of total population)	-0.699*** (0.0517)
5	Dummy for primary manufacturing activity (bricks)	0.479*** (0.0108)
6	Dummy for primary manufacturing activity (medicine)	0.329*** (0.0109)
7	Dummy for notified for acquisition	-0.374*** (0.00877)
8	Dummy for nearest town being BBMP	0.609*** (0.00810)
9	Dummy for residential land use (apartment)	1.357*** (0.0265)
10	Dummy for residential land use (house)	1.071*** (0.0205)
11	Dummy for vacant land	0.499*** (0.0193)
12	Interactive term: Percentage of area under irrigation (share of the total geographic area)* Transacted property being in agricultural use (dummy)	1.541*** (0.0882)
13	Dummy for the year of transaction—2008	0.122*** (0.0130)
14	Dummy for the year of transaction—2009	0.204*** (0.0133)
15	Dummy for the year of transaction—2010	0.103*** (0.0131)
16	Dummy for the year of transaction—2011	0.209*** (0.0116)
17	Dummy for the year of transaction—2012	0.476*** (0.0113)
18	Dummy for the year of transaction—2013	0.645*** (0.0114)
19	Dummy for the year of transaction—2014	0.911*** (0.0125)
	Constant	8.031*** (0.0297)
	Observations	33,424
	R-squared	0.805
	Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.	

Note: Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Source: Author.

**Table 6: Implicit Prices (in Rupees) Based on the Log-Log Functional Form**

S. No.	Variables	Marginal Effect
	Market value (dependent variable)	
1	Area of land transacted (sq. m)	2,002
2	Non-agricultural area (share of total geographical area)	2,326,704
3	SC population (share of total population)	1,104,481
4	ST population (share of total population)	−614,186
5	Dummy for primary manufacturing activity (bricks)	420,880
6	Dummy for primary manufacturing activity (medicine)	289,081
7	Dummy for notified for acquisition	−328,621
8	Dummy for nearest town being BBMP	535,107
9	Dummy for residential land use (apartment)	1,192,348
10	Dummy for residential land use (house)	941,050
11	Dummy for vacant land	438,454
12	Interactive term: percentage of area under irrigation (share of the total geographic area)* Transacted property being in agricultural use (dummy)	1,354,022
13	Dummy for the year of transaction—2008	107,197
14	Dummy for the year of transaction—2009	179,248
15	Dummy for the year of transaction—2010	90,502
16	Dummy for the year of transaction—2011	183,641
17	Dummy for the year of transaction—2012	418,244
18	Dummy for the year of transaction—2013	566,739
19	Dummy for the year of transaction—2014	800,463
Total observations—33,424		

Source: Author.

The negative effect on the sale value worsens in the case of land belonging to the scheduled caste (SC) and scheduled tribe (ST) population. The negative signs for the variables percentage of SC population and percentage of ST population indicate a lower value for SC/ST-owned land. A higher percentage of SC and ST population in the village (indicating higher land ownership among these socially marginalized groups) is associated with lower land values, confirming that the legal restrictions on the sale of SC/ST-owned land to persons who are not SC/ST have lowered the value of their land. The reduced land values for SC/STs may be a combined effect of legal restrictions on the sale of SC/ST land to non-SC/ST buyers and the lower social status and negotiation power of SC/ST owners.

As explained earlier, all the land was originally in agricultural use until the formation of the BMIC area planning authority. While some land parcels remained in agricultural use, others underwent improvements to host more valuable uses, like high-rise residential. The magnitude of the coefficient for apartment use is the highest, followed by residential low-rise or houses and vacant sites. Thus, the “hope value” of land is observable and the owners of notified land expect compensation in accordance with the improved values that capture the potential for the development of agricultural land for other, better uses.

### 7.3 Discussion

Table 7 presents the estimated impact of acquisition notification (or blight) and improvement in the development potential (or hope value) on the transaction value for land. The results indicate that the value of notified land is 31% lower than that of non-notified land in any given year. The reduction in value is the difference in the predicted value of “notified” and “non-notified” land at means in the same year, which the table expresses as the percentage of value of “non-notified” land.

**Table 7: Blight and Hope Value Calculated as the Percentage Change in Land Value at Means in the Same Year**

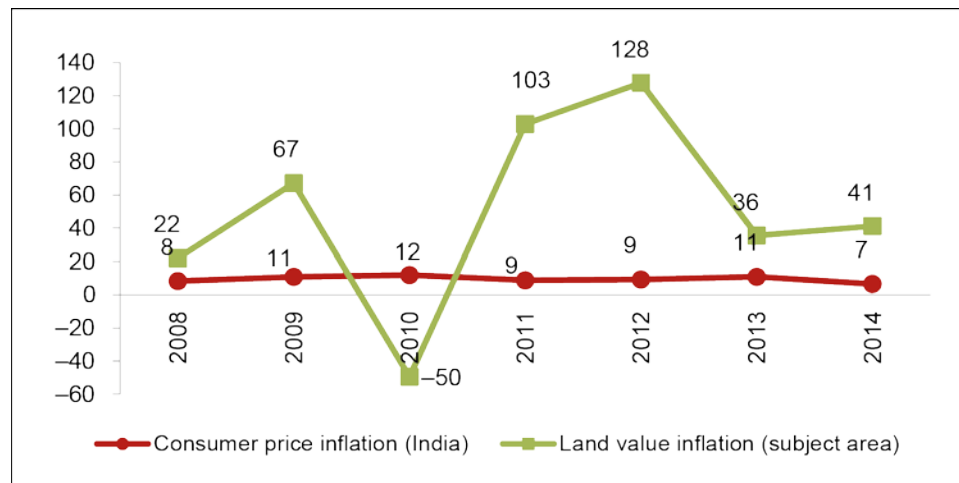
Use of Land Parcel	Village-Level Activities	Change in Land Value
Agriculture	Agriculture (notified for acquisition)	–31% (blight)
Hope value		
Agriculture	Agriculture + medicine manufacturing	39%
Agriculture	Agriculture + brick manufacturing	61%
Vacant land (developed)	Agriculture	65%
Vacant land (developed)	Agriculture + medicine manufacturing	129%
Vacant land (developed)	Agriculture + brick manufacturing	166%
Residential (peri-urban housing)	Agriculture	192%
Residential (peri-urban housing)	Agriculture + medicine manufacturing	306%
Residential (peri-urban housing)	Agriculture + brick manufacturing	371%
Residential (apartment)	Agriculture	288%
Residential (apartment)	Agriculture + medicine manufacturing	440%
Residential (apartment)	Agriculture + brick manufacturing	527%

Source: Author's calculations.

As discussed earlier, the development potential of land is observable through the improvement in the use of land either at the property level or at the village level. Taking the base value of non-notified land in agricultural use, in an agricultural village, the hope value ranges between 39% and 527%, depending on the use of the land and the village-level activities. For example, the value of agricultural land is 39% higher if it is in a village that manufactures medicine as opposed to an agricultural village. Similarly, brick-manufacturing activities improve the land value by 61%. While these are village-level activities that improve the average value of land in the region, at the property level, the agricultural land value improves by 65% if the development takes place as a plot; 192% if conversion to residential use (houses) occurs; and 288% for apartment use.

As Figure 5 shows, the inflation in land value (in the subject area) has been much higher than the consumer price inflation in India, except in the year 2010.

**Figure 5: Comparing Inflation in Land Values (around the BMIC Project) and the General Consumer Price (India), 2008–14 (%)**



Source: Author's calculation based on inflation data from the World Bank (2019) and land transaction data from the Sub-Registrar's Office, Bengaluru.

While land is a store of value, it additionally serves consumption requirements, unlike other asset classes. Regarding compensation for the compulsory acquisition of land, it is important that estimations of the market value of land appropriately capture its rapid value appreciation over time, as in the case of the BMIC project. Table 8 presents a comparative structure of the estimated value of compensation for compulsorily acquired land if the compensation is based on (i) the KIAD Act of 1966, which refers to the Land Acquisition Act 1894 for compensation determination; (ii) the new, improved act of *Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation, and Resettlement Act, 2013*; and (iii) whether the compensation includes the value of functionings (blight and hope value):

**Table 8: Toward Fair Compensation**

Components of Compensation	Fair Market Value (KIAD Act and Land Acquisition Act of 1894)	Compensation Based on the Land Acquisition Act 2015	Compensation for Loss of Functioning
Market value of land in current use	P	P	P
Blight	–	–	0.31P
Hope value	–	–	0.39P to 5.27P
Solatium	0.3P	P to 3P	–
Total	1.3P	2P to 4P	1.7P to 6.58P

Source: Author.

Table 8 raises an important point regarding the appropriateness of the current and proposed compensation mechanisms, which at times may inadequately compensate for the loss of “hope value” and “blight,” which the market value of land estimations using conventional valuation methods do not capture accurately. Compensation for loss of hope value and blight would raise the amount to between 1.7 times and 6.58 times the original agricultural value of the land. In terms of the financial feasibility of

the acquirer and private developer, Raj and Angadi (2018) found that the BMIC project generated an internal rate of return (IRR) of 135% for the developer, and this was 6.5 times higher than the originally agreed IRR of 17.5%. This increase is largely attributable to the appreciation of land value. Thus, in the case of the BMIC project, it ensures the profitability for the developer even after compensating the affected landowners for hope value and blight.

The economic value of the functionings estimated above is contextual to data from Bengaluru, around the BMIC project area. While the behavior of the land market in other metropolitan cities in India may be comparable to that in Bengaluru, region-specific data are necessary for an accurate estimate of the economic value of hope value and blight. The generalizability of these findings is debatable at this stage, and further research should include a range of types and scales of projects across multiple cities, if data are available. With appropriate modifications, researchers can adopt a similar approach to the assessment of hope value and blight in other countries.

Recognition of loss of functionings associated with land would be useful in designing the mechanism for compensation. We may, however, highlight here that we were only able to compute the value of those functionings that the market measures objectively in this research. In addition, there are subjective functionings that landowners lose in the compulsory acquisition. However, the lack of data on household characteristics precluded us from estimating the value of these functionings, even though there is a possibility of many of them being valuable.

## 8. CONCLUSION

Compulsory land acquisition is a contentious issue between landowners and acquirers, and policy makers and economists have debated it widely regarding various concerns but mostly inadequacy of compensation for the affected landowners. Despite the underlying principal of the legal framework being “just” or “fair” compensation for the affected landowners, in practice, “fair” compensation narrowly equates to the “market value” of land. While the market value of land is a good measure of the monetary losses of the affected landowners, it does not cover the full range of financial and non-financial losses associated with the compulsory acquisition of land.

The three questions that this research investigated are: (i) What has been the impact of the improvement of land use on its value? (ii) What has been the impact of a land acquisition notice on the value of land? (iii) Are the effects on different social groups different? We answered these questions using the hedonic price approach. The research did not impose a functional form for the estimation of the hedonic model, and it estimated a range of functional forms. The estimated models and their performance statistics indicate that functionings combine in a log-log form to determine the value of land.

Using empirical data on property transactions conducted in the Bengaluru Mysore Infrastructure Corridor (BMIC) project area and registered with sub-registrar offices in Bengaluru, India, during the period 2006–15, this research estimated the appreciation in land value due to an improvement in land use from agriculture to residential. The results indicated that the value of agricultural land may improve by between 39% and 527%. Additionally, the study found that, once a property has received notification for acquisition, its value depreciates by almost 31%. Together, these compensable financial losses, that is, “hope value” and “blight,” amount to nearly 0.92 to 5.58 times the value of land. The potential for the development of land changes with micro-level factors, such as the distance from the city center; therefore, the estimates of “hope value”



and “blight” vary across regions depending on the local land market conditions. Raj and Angadi (2018) found that the benefit that the private developer generated or the internal rate of return (IRR) that the NICE consortium generated was 650% higher than the approved IRR of 17.5%. This is attributable to the accrual of unaccounted benefits stemming from land value appreciation (or hope value) after the project launch. In addition, there is caste-based discrimination in the land market, and ownership of land is especially important for social equality and empowerment of the weaker segments. These results indicate that the KIAD Act of 1966, under which land acquisition took place, clearly under-compensated the landowners.

While the new Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation, and Resettlement Act, 2013, in India has revised the compensation upward to two to four times the market value of land, situations of under-compensation could still occur in some circumstances. A more logical estimation of these factors, such as one based on losses like “hope value” and “blight,” would have reduced the chances of over- or underestimation of compensation. The discussion in this paper paved the way for designing a fairer mechanism of compensation as a combination of monetary and non-monetary strategies, which together satisfactorily reconstruct or replace all the financial and non-financial functions of land for each affected landowner.

The findings from this research are a useful guide for designing a fairer compensation mechanism that encapsulates these losses, which are definite yet not compensable unless negotiated in the court. We may, however, highlight that this research estimated the value of losses in the context of the BMIC project in Bengaluru, and a similar contextual approach would be necessary for the appropriate estimation of the hope value, blight, and impact on value due to social and demographic characteristics.

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