The Impact of Economic Transformation and the Credibility of Planning Control on Agricultural Land Values

Der Einfluss von Unsicherheit in der Flächennutzungsplanung auf landwirtschaftliche Bodenpreise

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Abstract

This paper develops a hedonic model of agricultural land prices to investigate the efficacy of planning controls, whose raison d'être is to regulate the conversion of farmland. While development (commercial, industrial and residential) potential of farmland affects agricultural land values in all countries, its impact is potentially more acute in Newly Industrialised Countries where development pressure is strong and planning law is often weakly enforced. In the Malaysian land market, which epitomises this situation, State Authorities have approved a large number of applications to convert land from agriculture to development, such that the market is inclined to behave as if planning control lacks credibility. To investigate the influence of 'development potential' on land legally designated as agricultural in Malaysia, an extensive dataset of over 2,000 land sales has been assembled. Using this database we attempt to estimate the effect – the development rent – on land price, which turns out to be high, exceeding 400% of agricultural value in some cases. From there, we draw some conclusions regarding the efficacy of existing planning controls and the implications of such a high premium.

Key Words

land values; hedonic price model; planning control; development rent; land title; economic transformation

Zusammenfassung

Der Beitrag untersucht, wie sich Bodenpreise und Landnutzungsentscheidungen im wirtschaftlichen Entwicklungsprozess verändern. Das nichtlandwirtschaftliche Nutzungspotenzial von Agrarflächen für Gewerbe, Industrie- und Wohnzwecke beeinflusst den Kaufpreis von Boden allerorten. Dieser Einfluss ist besonders ausgeprägt in Entwicklungsländern, in denen einerseits der Druck zu Flächenumwidmungen ausgeprägt ist und andererseits Instrumente zur Planung und Regulierung von Nutzungswechseln landwirtschaftlicher Flächen fehlen oder nicht konsequent durchgesetzt werden. Am Beispiel von Malaysia wird gezeigt, dass die unscharfe Umsetzung von Regeln, die dem Erhalt landwirtschaftlicher Flächen dienen, zu Spekulationsprämien führen, die auf eine spätere gewerbliche oder bauliche Nutzung derzeitiger Agrarflächen abzielen. Im Einzelfall kann der Preis landwirtschaftlicher Flächen, für die Marktakteure ein Entwicklungspotenzial sehen, bis zum Vierfachen des rein landwirtschaftlichen Wertes betragen.

Schlüsselwörter

Landmarkt, hedonisches Preismodell, Flächennutzungsplanung, ökonomische Entwicklung

1 Introduction

Transformation from an agricultural economy to an industrially-based economy is usually motivated by higher returns in the emerging sectors. Ideally, the process of transformation is assisted by improvements in agricultural yields, notably through a wide-spread boost in farm education and technology. Together with greater access to international trade, these factors ameliorate the effects of land depletion on a country's agricultural capacity. Effective policies are required to ensure that the rate of development on agricultural land is orderly and appropriate. For this purpose, countries commonly rely on land planning controls crafted either to indirectly influence the landowner's potential returns to development or to impose direct constraints on land-use. It follows that by understanding the efficacy of these control instruments, we can

better explain the patterns and rates of change in land-use over time.

For a developing country pursuing vigorous economic transformation, regulatory control over land conversion can be perceived as both an impediment to free choice and a drag on economic progress. In democratic settings, the election of 'development-friendly' policy-makers can be viewed simply as reflecting Society's preferences. Even so, where the Rule of Law is weak and rewards to development strong, interests of lobby groups, corporations and corrupt officials may exacerbate the rate of farmland conversion.[1] In a developing country context where local land-use plans are malleable and enforcement capacity of the authorities wanting, over-development is almost an inevitability.[2] Over time, people learn to expect policy reversals, rent-seeking behaviours and various other forms of market distortions, which together erode the credibility of land institutions and control instruments in a self-fulfilling cycle.

To empirically measure the credibility of land-control instruments, it is common to compare the value of farmland under preservation programs (or other forms of land use control) with farmland free from any land-use restrictions or programs.[3] Conceptually, the market value of farmland that is subject to preservation should reflect the net present value (NPV) of future agricultural returns and very little else, since its development potential should be nullified by the program. However, NICKERSON and LYNCH'S (2001) study of land sales in the U.S. found little evidence of this, a result they attributed to an expectation of policy reversal when sufficient political and economic pressures emerged. In another study of Canadian farmland, COTTELEER et al. (2008) also concluded that development speculation cannot be averted entirely and that its degree largely depends on perceived credibility of the land preservation program's terms. Few, if any, similar studies evaluating the credibility of land-use control in developing countries exist, a research deficit that reflects the challenges in assembling reliable data in sufficient number to support econometric analysis, decentralisation of land records and possible abuses of authority in land matters in the developing country setting.[4]

This paper examines the credibility of land-use conditions on the land title in Malaysia. Although the objective of its introduction by the British in late 19th century was primarily to facilitate land distribution and taxation, the land title remains to this date, the most clear-cut constraint on land-use choices. Its issuance and enforcement have been fundamental in helping the State manage its land resources as a whole and more specifically, allocate land-use supply among various competing needs.

To perform the analysis, we adopt a two-stage approach. First, using a hedonic price model, values of legally-designated agricultural land are estimated as a function of physical and spatial characteristics. The hedonic price regression incorporates the land's best-use potential, either in various agricultural uses (rubber, paddy, oil palm cultivation) or in development. In the second-stage analysis, we use the respective marginal values to predict land values with and without development potential. Findings suggest that a large premium exists, indicating a possible failure of land title conditions to suppress market expectations and control land conversion pressures in Malaysia.

The paper is organised as follows. Section 2 introduces a simple theoretical framework that underlies the empirical investigation and in Section 3 we review the land title conditions in Malaysia and the factors that inhibit their efficacy. In Section 4, a dataset that has been assembled specifically for the investigation, is described and in Section 5 the empirical method (Hedonic Pricing) is briefly reviewed. Results are reported in Section 6 while Section 7 concludes.

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[1] The problem is not endemic to developing countries alone. SOLÉ-OLLÉ and VILADECANS-MARSAL (2012) found that stiffer political competition, as indicated by small margins of victory of the incumbent government, is associated with smaller amounts of new land designated for development.

[2] Poor enforcement capacity is a characteristic of a weak local government, where the laws may be adequate but rarely enforced for fear of vote losses and lack of political will, or due to severe shortage of staff to carry out monitoring, recording and other enforcement activities.

[3] In North America for instance, to stem the farmland conversion trends, many states introduced programs such as easement contracts, agricultural protection zoning, transfer of development rights, preferential taxation, right-to-farm laws, and agricultural districts.

[4] Nonetheless, there are numerous studies on perceptions of land institution's credibility, land-planning failures and land data difficulties in developing countries such as KALABAMU's 2000 paper on Botswana's land reform or FIRMAN'S 2004 paper on Indonesia's urban land planning.

2 Theoretical Background

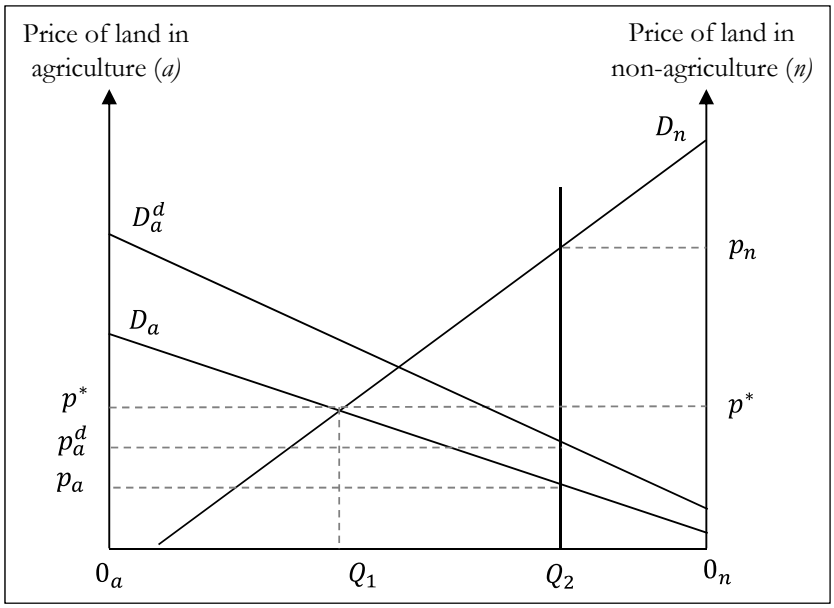
The structural transformation and population growth that developing countries undergo during economic development creates competition for land and the conversion of agricultural land into urban and industrial uses. To prevent inappropriate and uncoordinated development, conversion is regulated by the State via, among other instruments, land use zoning and planning permission. Because the purpose is to regulate rather than prevent industrial and residential development, even land designated as agricultural possesses some development potential and thus commands a price over and above its purely agricultural value. This premium, what we term *development rent*, is positively related to the land's value in non-agricultural use and weak enforcement of official land use zoning, both of which characterise the developing country setting to some extent.[5]

To fix the ideas that underlie our empirical approach consider the model depicted in Figure 1, which for simplicity, describes a land market comprising homogenous units which may either be used for growing food in agriculture (a) or for other purposes in the non-agricultural sector (n).

In the absence of any planning control, the (fixed) land supply ($0_a 0_n$) is allocated among its competing uses according to the (derived) demands for land in and outside agriculture (D_a and D_n, respectively). With reversibility and frictionless trade, a common price of land p^*prevails at which $0_a Q_1$ units of land are farmed and $0_n Q_1$ are used in the non-agricultural sector.

Now consider the effect of land use zoning by some official planning authority that restricts the allocation of land for use in the non-agricultural sector to say $0_n Q_2$ units so that $0_a Q_2$ units are designated as agricultural. By controlling the allocation of land, zoning raises the price of non-agricultural land (p_n) above that of land used in agriculture (p_a). The enforcement of planning restrictions effectively divorces the two markets, which now operate independently of each other; changes in the demand for land in the non-agricultural sector have no bearing on the price of agricultural land and *vice versa*. Owners of agricultural land wishing to sell to developers are prevented from doing so by the planning controls, which restrict land designated as agricultural solely to agricultural uses.

Figure 1. A simple model of land prices



D_n is demand for land for non-agricultural use
D_a is demand for land for agricultural use
D_n is demand for land for agricultural use under a weak planning control system.

p^* is the common price of land with no planning control
p_n is price of non-agricultural land under planning control system
p_a is price of agricultural land under planning control system
p_a^d is price of agricultural land under a weak planning control system
Source: authors' presentation

In a market where planning controls are weakly enforced or periodically relaxed to satisfy demand for land in the non-agricultural sector, the designation of land by use ceases to be immutable. As a result, demand for agricultural land now embodies an additional speculative element reflecting the possibility that planning permission may be granted in the future, realising a higher non-agricultural value. In the figure, demand for agricultural land shifts to D_a^d and accordingly commands a higher price, p_a^d. So, when planning controls lack credibility a *development rent* ($p_a^d - p_a$) emerges between the market price of agricultural land (which includes its development potential) and its

[5] Note here that the term rent is used in its Ricardian sense (i.e. to denote a surplus value) rather than as a commercial rental payment from tenant to landowner.

agricultural value (which does not). Notice that relaxation of planning control reconnects the markets for agricultural and non-agricultural land to some extent; *ceteris paribus*, higher land values in the non-agricultural sector increase the potential gains should planning permission be granted, thereby increasing demand for agricultural land (and the development rent). Furthermore, the weaker is the control over land use the higher is the probability of realising the non-agricultural value of agricultural land. Hence, *ceteris paribus*, the development rent rises as the enforcement of planning restrictions weakens. It is the size of this development rent that we seek to recover from the statistical analysis in the following sections.

Of course, agricultural land is far from homogenous and differs according to characteristics that affect its productive capacity (e.g. soil type and drainage) and desirability (e.g. accessibility and proximity to market). Adapting the model presented above to allow for this heterogeneity creates a multiplicity of demand functions, each of which delivers a development rent that varies according to the precise set and valance of attributes possessed by the land. In the empirical analysis that follows, we use crop type to proxy for the land's agricultural attributes. Conceptually, these gives rise to a set of crop-specific demand functions, each of which shifts up and down according to the land's proximity to market and other locational characteristics that affects its desirability. Allowing the effect of locational attributes to vary by crop type may be important empirically; proximity to market being more valuable for perishable crops, for example. Given that these locational factors may also impact on the land's value in non-agricultural uses, the demand function for land with development potential is also affected and this in turn affects the size of the development rent.

In sum, by extending the simple pricing model to allow for heterogeneity in terms of land use and locational characteristics, we can see that the development rent – the difference in the value of land with and without development potential – varies according to both its agricultural and locational attributes. In our data where land is categorised by current use (palm oil, rice, rubber and vacant) and whether it is considered to have some development potential, the development rent can be inferred econometrically by a comparison of land possessing identical attributes with and without development potential. In so doing, we are also able to estimate the value of land in various agricultural uses and the impact of locational attributes (namely, road frontage, various measures of market proximity and ownership restrictions) on land value in each land use.

3 Malaysian Regulatory Framework

Malaysia provides an interesting case for a study of land market during economic transformation for at least two reasons. First, as one of the Newly Industrialised Economies in the region, the Malaysian economy experienced rapid structural transformation with its attendant development pressures on the land market.[6] Second, whilst the National Land Code and the system of planning permission are well-established, their institutional efficiency and transparency are often perceived as being poor. As a result, the Malaysian land market can be characterised as one that is subject to strong development pressure and poorly enforced planning controls; two factors that are likely to lead to a divergence in land values according to their development potentials.

As alluded to above, the laws, procedures and guidelines pertaining to land development in Malaysia are extensive. There are over fifty laws and guidelines that govern the property development process (ABDULLAH et al., 2011). The principal forms of land use control are those provided under the National Land Code (NLC) 1965 and the Town and Country Planning Act (TCPA) 1976. Within the former, land title conditions give power to the state to determine and enforce:

i) *Categories of land-use* which states the specific land-use purpose on the title (agriculture, building, commercial or industrial);
ii) *Express conditions* which also appear on the title and indicate additional conditions for use and restrictions on activity (e.g. for Category 2 paddy lands, the title specifies the variety of rice, timing of planting and harvest, irrigation method and number of cropping per year) and;

[6] Malaysia's average GDP growth rate in the decade before the 1998 East Asian currency crisis was 9.21% thanks to the massive structural economic change that focused on developing Malaysia's manufacturing and industrial sector. Malaysia is consistently cited as one of East Asia's Newly Industrialised Economies in various international reports on Asia's economies, for example in the OECD report "Technology and global competition: the challenge for newly industrialising economies" (ERNST and O'CONNOR, 1989). Between 2000 and 2007, the period our dataset is based on, Malaysia`s GDP grew at an average of 5.6% (WORLD BANK).

iii) *Implied conditions*, as laid-out in the NLC, comprise general conditions of land-use (e.g. limits on the extent of building activity on agricultural land).

The planning system operates through planning controls and planning guidelines provided in the TCPA. The state and local authorities work to prepare structural and local plans as basis for development decision-making. Planning permission applications (in the form of the project's layout, building, road and drainage, earthwork and landscape plans) must be preceded by an approved land conversion application and not the other way round.

While land title conditions and planning permission serve to manage the supply of land among competing uses, other conditions exist to regulate who can hold ownership interests in land. Most notably, the *Malay Reserve Land* enactments, introduced in the early 20th century, sought to curb the outflow of land to non-Malay owners in Malay-majority areas. Through agrarian reform initiatives undertaken following Independence from Britain, large areas of land were classified as *Group Settlement Areas* under the Land (Group Settlement Areas) Act 1960. The settlers, usually selected from the poorest section of the rural population, are given opportunities to own agricultural and residential land plots in government-managed large-scale plantations, but are subject to strict conditions regulating land use and transfers of ownership.

So while in principle there is a raft of legislation governing land use and its transfer, there are several challenges to agricultural land preservation as the existing system currently operates. Economically, the gap between the rates of return to farming and non-agricultural activities is substantial, making the sale of land to developers a highly attractive option, particularly for small farmers with limited capital and technological resources. State-level governance and outlook also play a role. Development-friendly planning decisions are often adopted not only because they bring new income opportunities to an ageing agricultural population but because they represent an important source of tax revenue for local (State) government. In the absence of other sources of revenue-generation local government has come to rely on land tax and development fees to supplement the Federal-approved infrastructure and building budget.[7] In addition to this, there are certain aspects of the land regulations that can inadvertently force landowners to apply for land-use conversion, for instance where: (a) application is not approved to partition agricultural land plots into separate individually-owned plots (as is common when land is bequeathed to multiple descendants) and; (b) the owners wish to sell the agricultural land plot to a non-Malaysian.[8] These factors and the considerable latitude provided in the NLC to State authorities has unintentionally encouraged change of land-use which in many cases has led to haphazard and pre-mature development of land. Controversies about State's land management have been regularly highlighted in the media. Writing about the 2004-2005 agricultural land conversions approved for a number of property companies to develop housing projects on a specific forest reserve area in Selangor, a well-known law professor and social commentator, SALLEH BUANG wrote in his newspaper column (BUANG, 2005):

"The question that must be asked is this: was the selection of these lucky 35 companies done openly and fairly? Members of the public would certainly like to know more about the identity and background of these lucky corporations that, having received precious bounties from the state, immediately thumbed their corporate noses at the law and began their criminal assault on the frail environment. It is indeed a pity that the NLC has never seen fit to impose a limit on the size of land a state authority can alienate. Everything is left to its discretion."

Such broad powers on land-use decisions given to authorities at the State level are often blamed for severely weakening land title conditions' credibility and effectiveness as a method of land-use management.[9] In addition, where small pockets of agricultural land have often been allowed to be converted for development, the approval often has the effect of encouraging price speculation for other lands in the locality (COUGHLIN and KEANE, 1981) and the erosion of agricultural viability in general, especially

[7] This link between development fees and infrastructure financing has been established in various studies. See BRUECKNER (1997) and CLARKE and EVANS (1999).

[8] The NLC states that partitioning of agricultural land cannot be approved if any resulting plots are less than 0.4 hectares and no agricultural land can be owned by non-Malaysians.

[9] Given limited resources at the district level to cope with changing land markets and information management, long delays in reviewing and gazetting detailed local plans are not uncommon.

where the parcels of land first converted are strategically important for access and water resources.[10]

4 Data

To investigate the value of agricultural land in various uses and the size of development rents a dataset has been constructed from information derived from three official sources. Details of land sales reported in the Property Market Review (PMR) have been combined with spatial data (such as distance to urban centres) obtained from the Malaysian Geographical Information System database and indicators of population pressure recorded in the Malaysian Population census. In all, the dataset comprises economic, geographical and demographic details on 2,222 individual sales of agricultural land in four rapidly developing states in the Central West coast of Peninsular Malaysia between 2001 and 2007.[11]

The PMR records the actual price paid per unit of land (rather than a subjective appraisal of value) on all private sales of agricultural land, so excludes non-competitive transfers such as: land transfers between state and federal ministries or agencies (lease or takings); nominal price or zero-compensation transfers (gifts of land) and; related-party-transactions (such as transfers from a parent company to its subsidiaries). In the PMR, each parcel of land is classified according to its highest and best potential use. Land with purely agricultural value is further differentiated according to current cultivation: oil palm, rice or rubber. Land that is uncultivated because of structural or institutional constraints is categorised as vacant. Together they form the four land types with purely agricultural value (labelled as *palm oil*, *rice, rubber* and *vacant*). Where the respective agricultural land has some development potential, as recorded by the official surveyor inspecting the land, it is classified as 'developable' (*dev*). In the empirical analysis, dummy variables are constructed to identify each of the various land categories.

Variable definitions and descriptive statistics are provided in Table 1. The dependent variable in the empirical model is (the natural log of) the real price per hectare of land in Ringgit Malaysia (RM), *rprice*.[12] Parcels of land sold with road frontage (*rdfnt*) as opposed to interior plots are identified as such in the PMR. Road frontage is hypothesised to give positive value to a plot's price, irrespective of its potential use.[13]

Each parcel of land in the database is spatially referenced using GIS mapping to enable computation of a straight-line distance in kilometres to the nearest urban centre (*distown).* Since proximity to market is likely to enhance land value, *distown* is expected to be negatively related to price regardless of its future economic potential. Using administrative maps from the Department of Survey and Mapping Malaysia, it was also possible to identify parcels of Malay Reserve Land or in Group Settlement Areas, (*mrl* and *gsa*, respectively) both of which are expected to lower land value because of the smaller pool of buyers that are eligible to own such land.

Demographic shifts are likely to signal growing non-agricultural demand for agricultural land. Using district-based information in the National Population Census of 1991 and 2000, two variables have been constructed to indicate population pressure: population growth (*popgro)*, and population density (*popden)* both of which are hypothesised to be positively associated with land prices.

Descriptive statistics in Table 1 show that developable agricultural land represents 23% of the data and tends to be priced six to nine times higher than the rest of the sample. The parcels are often found in fast-growing districts with relatively high population density that are located closer (31.67 km) to urban centres. Close to half of them have road frontage, compared to only 12% in non-developable categories. Oil palm and rubber parcels are typically located in remote districts (distances to nearest major town are 47.15 and 39.42 km, respectively) with sparse populations and low rates of population growth (1.2% and 1.27%, respectively).

[10] Speculative demand and supply by the private developers and loop-holes in the planning, as well as land approval system were identified as major contributors to overhang and oversupply of property assets (see RAMELI et al., 2006). In the Property Market Report, property'overhang' generally means property unsold for more than 9 months.

[11] The four states are Selangor, Perak, Negri Sembilan and Melaka.

[12] All sale values are deflated using year 2000 constant prices based on the yearly Consumer Price Index (CPI).

[13] Another important determinant of land value, which is parcel size, is not included in the model because the Property Market Report (PMR), from which the sales details are extracted, does not indicate physical size of the land sold.

Table 1. Summary statistics (N=2,222)

Mean values	Development (n=506)	Oil palm (n=462)	Rubber (n=623)	Rice (n=94)	Vacant (n=537)
Price/hectare (RM)	328,827	54,365	48,466	36,361	50,985
rdfnt (%)	48	13	12	11	12
gsa(%)	0.4	31	35	56	17
mrl (%)	26	8	24	37	24
distown (km)	31.67	47.15	39.42	59.91	41.14
Popden (person/km sq.)	409.76	148.55	158.23	183.88	216.70
popgro (%)	3.67	1.20	1.27	1.01	1.95

Source: authors' calculation

Oil palm and rubber planting are typically undertaken either as large commercial projects or as part of agrarian schemes, hence their locations in vast areas of undeveloped land. Parcels of rice land are most likely to be found in Group Settlement Areas and on Malay Reserve Land, whereas vacant land tends to be found nearer to centres of economic activity and human dwellings.

5 Methodology

In the theoretical section, we argued that planning controls that lack credibility have the effect of creating a wedge between the market price of the agricultural land and its pure agricultural value. This difference in price represents a development rent which this empirical section seeks to estimate. In achieving this objective, our first step is to estimate an econometric model that will provide marginal values of various land attributes for each category of land. We then use the marginal values derived to predict the price of comparable parcels with and without development potential.

5.1 Hedonic Land Price Model

Being a heterogeneous good, land is described by a set of utility-bearing attributes, which ROSEN (1974) calls a "tied package of characteristics". It follows that the sum of the attributes' values will give the land its price. This approach to land valuation is known as the Hedonic Pricing Model (HPM) and is a tool that has been widely employed in land economics to investigate the value of key attributes, most notably the influence of urbanisation (SHONKWILER and REYNOLDS, 1986; BOCKSTAEL, 1996; SHI et al., 1997; HARDIE et al., 2001; TOWE et al., 2005; MADDISON, 2000). Studies on the effect of proximity to urban hubs on farmland prices such as by CAVAILHÈS and WAVESKY (2003) show that the price of farmland typically declines with distance reflecting a decrease in its conversion value. The model has been extended to evaluate the effect of changes in land value arising from irrigation, pollution control, climatic change (MADDISON, 2000), land taxation (HUSHAK and SADR, 1979; PARDEW et al., 1986) and soil quality (OLTMANS et al., 1988; PALMQUIST and DANIELSON, 1989; ROKA and PALMQUIST, 1997; HUANG et al., 2006).

The basic hedonic price model adopts a linear functional form written as:

$$(1) \quad P_i = \alpha_0 + \sum_{k=1}^{K} \beta_k X_{ik} + \sum_{n=1}^{N} \beta_k Y_{ik} + \varepsilon_i$$

where the model contains $k = 1,2,\dots,K$ continuous variables (*popden*, *popgro* and *distown*) and $n = 1,2,\dots,N$ dummy variables (*rdfront*, *gsa*, *mrl*) representing different attributes of the i^{th} parcel of land; β_k and β_n are coefficients to be estimated by the data and ε_i is a normally distributed error term.

One aspect in HPM modelling concerns the most appropriate functional forms of the relationships in (1) since they are not pre-specified by theory. This uncertainty is usually resolved either by comparing performance of a standard model in various functional specifications (HALVORSEN and POLLAKOWSKI, 1981, and LINNEMAN, 1980) or by applying statistical methods like the Box-Cox procedure. Application of the latter to our data supports a double-log specification in which both the dependent and continuous explanatory variables enter the model in natural logarithms.[14]

To allow the marginal value of the attributes of land to vary according to land type, equation (1) is interacted with a vector of dummy variables Z containing indicators for each of the five land types (palm oil, rice, rubber vacant and developable) to which the

[14] Note that logs are not applied to the variable *popgro*, which is already rate of growth.

Table 2. Estimated (semi-) elasticities by land type

VARIABLE	Development	Oil Palm	Rice	Rubber	Vacant
rdfnt	0.27*** (0.048)	0.35*** (0.061)	0.44** (0.164)	0.49*** (0.047)	0.41*** (0.072)
popgro	0.07*** (0.007)	0.13*** (0.028)	0.21*** (0.033)	0.13*** (0.025)	0.07*** (0.009)
lpopden	0.13*** (0.034)	0.12** (0.042)	-0.02 (0.102)	0.16*** (0.032)	0.15*** (0.030)
ldistown	0.09* (0.039)	-0.20*** (0.057)	-0.19* (0.086)	-0.09 (0.049)	-0.16*** (0.050)
gsa	-0.70*** (0.167)	-0.20*** (0.056)	-0.06 (0.089)	-0.10* (0.044)	-0.27*** (0.075)
mrl	-0.26*** (0.051)	-0.36*** (0.075)	-0.07 (0.073)	-0.13** (0.045)	-0.13* (0.055)
Observations: 2222		R^2 : 0.7387		Adjusted R^2 : 0.7331	

Dependent variable is log of real price per hectare.
Robust standard errors in parentheses (*** p<0.001, ** p<0.01, * p<0.05).
Source: authors' calculation

i^{th} parcel of land belongs. This gives rise to the final form of the model that is estimated:

(2) $\log(P_i) = \alpha_0 Z + \sum_{k=1}^{K} \beta_k Z \log(X_{ik}) + \sum_{n=1}^{N} \beta_k Z Y_{ik} + \varepsilon_i$

In this final form of the model, β_k represent the elasticities and β_n the semi-elasticities of land price with respect to each attribute in each land type.[15]

5.2 Estimation of Development Rent

Using the estimated model the conditional mean price per unit of land is predicted for each land type. Note that equation (2) expresses land price in natural logs, so predicted land values are exponentiated to obtain the predictions in terms of real prices (RM per hectare). Since this transformation is non-linear, the mean of predicted log prices is not the log of the mean of predicted prices, i.e. $E[\log(P)] \neq \log(E[P])$. However, it can be shown that predicted values can be obtained using the adjustment,

$$\hat{P}_i = \exp[log\hat{P}_i] \times \exp[\hat{\sigma}^2/2]$$

where $\hat{\sigma}^2$ is the estimated variance of the residuals in (2).[16] Using this adjustment we calculate the expected price of the baseline parcel in each of the five land-use categories, which can then be compared to that for developable land to obtain estimates of the 'development rent' (i.e. the difference in price between agricultural land with and without potential) for land in each cultivation type. Results are presented in the following section.

6 Results

6.1 Marginal Value of Land Attributes

Using the 2,222 observations at our disposal, equation (2) is estimated using pooled ordinary least squares. Table 2 reports the estimates of β_k and β_n the elasticities and semi-elasticities of land prices in each land category.

The signs and significance of the coefficients generally conform to expectations. Specifically, we find that road-frontage is positively related to land prices in all land types. The effect is strong, increasing the value of the property by between 27 and 49% per hectare. While the semi-elasticity is smallest for developable land (possibly reflecting that existing infrastructure is relatively less important for land that may potentially undergo radical re-development) and largest for rubber (where, due to its remote location, road frontage may be all the more important) it should be borne in mind that because developable land commands a price over six times that in agricultural use, the cash premium for road frontage on developable land is actually considerably higher than that on agricultural land.

Results also confirm the positive effect of demographic factors on land prices. Estimates suggest that a one percentage point increase in population growth (from say 2 to 3%) increases land prices by 7% in developable and vacant land and by 21% for rice land

[15] Year dummies are also included to account for any changes in the macro-economic environment and allowed to interact with land type.

[16] See WOOLDRIDGE (2009: 210-211) for details.

Table 3. Predicted land values (RM per hectare)

Land Type	Baseline	Road frontage	GSA status	MRL status	Urban Fringe	Remote Rural Area
Developable	229,297	300,130	113,318	175,468	331,892	234,593
Oil palm	62,254	87,969	51,193	43,274	100,370	59,029
Rubber	52,631	86,230	47,393	46,004	98,049	51,444
Vacant	49,558	74,435	37,512	43,357	81,811	47,453
Rice	44,796	69,380	41,936	41,824	79,292	42,562

Source: authors' calculation

ceteris paribus, the large proportionate effect on the latter arguably reflecting the importance of local demand for a staple foods such as rice. One interesting and unexpected result concerns the effect of proximity to an urban centre uncovered by the regression: yet agricultural land is negatively related to distance, developable land is positively related. While the positive elasticity on developable land is borderline significant, as it stands, the result suggests that developable land further away from urban centres commands a premium. Whether development-motivated buyers of agricultural land are expressing a preference for virgin land well away from the congestion and pollution associated with many of Malaysia's urban centres is unclear but the concentration of heavy industry and manufacturing in urban centres is as much a feature of the Malaysian cityscape as apartment blocks and shopping malls. In any event, the results indicate that developable land is not necessarily confined to the urban fringe.

As expected, the additional restrictions on use and ownership of agricultural land in Group Settlement Areas (*gsa*) and Malay Reserve Land (*mrl*) lowers the value of agricultural land. The negative impact is most acute for land with development potential but also for oil palm where *gsa* designation lowers the value by 20% and *mrl* designation by 36%.[17] In contrast, these designations have no statistically significant effect on the price of rice land since rice is most typically grown on restricted land. Malay Reserve Land status, *mrl,* causes relatively smaller price discounts across the board all else constant, reflecting that *mrl* designation only limits the persons or entities that can own the land but is silent on how the land should be utilised.

In summary, the hedonic model of land prices that is estimated yields results that are intuitive and consistent with *a priori* expectations, such that the value of land is positively affected by factors such as proximity, size and growth of urban centres and most importantly accessibility. We also find land values are negatively affected by restrictions on ownership. Importantly, the relative impacts of these attributes vary by land type, suggesting that the size of the development rent will differ accordingly, and it is to this that our attention now turns.

6.2 Predicted Land Values and the Development Rent

In this section, we use the estimated model to predict agricultural land values and by extension, the development rent - the premium for land with development potential. To facilitate comparison we consider a number of hypothetical cases whose predicted land values are reported in Table 3. The baseline represents land without road frontage (*rdfnt*= 0) or restrictions on ownership (*gsa*= 0 and *mrl*= 0) and all other attributes are evaluated at their mean values. The next three columns represent the baseline scenario augmented with road frontage, GSA and MRL ownership restrictions, respectively. The last two columns represent predicted land values for a typical plot of land on the urban fringe characterised by road frontage, close to a city in a district that is populous and with growing population (*rdfnt*= 1; *gsa*= 0; *mrl*= 0; *popgro*= 2.44%; *popden*= 255 person/km^2 ; *distown*= 33 km) and a remote plot deep in the rural interior of the country (*rdfnt*= 0; *gsa*= 0; *mrl*= 0; *popgro*= 1.44%; *popden*= 155 person/km^2 ; *distown* = 43 km).

Referring to the table it is clear that the predicted value of land varies enormously by both attribute and land type. Among land with solely agricultural value, oil palm land commands the highest prices and rice land the lowest. Using the baseline case, oil palm commands a predicted value of RM62,254, some 18% above rubber land (RM52,631), 26% above land categorised as vacant (RM49,558) and 39% higher than rice land (RM44,796). Land at the urban fringe, which we can think of as representing the most desirable land, is indeed predicted to be the most expensive

[17] By caveat note that the semi-elasticity of 70% for developable land sold subject to Group Settlement restrictions is based upon only two sales.

irrespective of its type. Interestingly, while land value almost doubles from the baseline in all agricultural categories, the premium for developable land on the urban fringe is much less than this as a proportion of baseline developable land, arguably reflecting the preference for green-field sites discussed above. In absolute terms however, developable land at the urban fringe commands the highest price of all: three times higher than land with solely agricultural value situated at the urban fringe and 42% higher than developable land in remote rural locations.

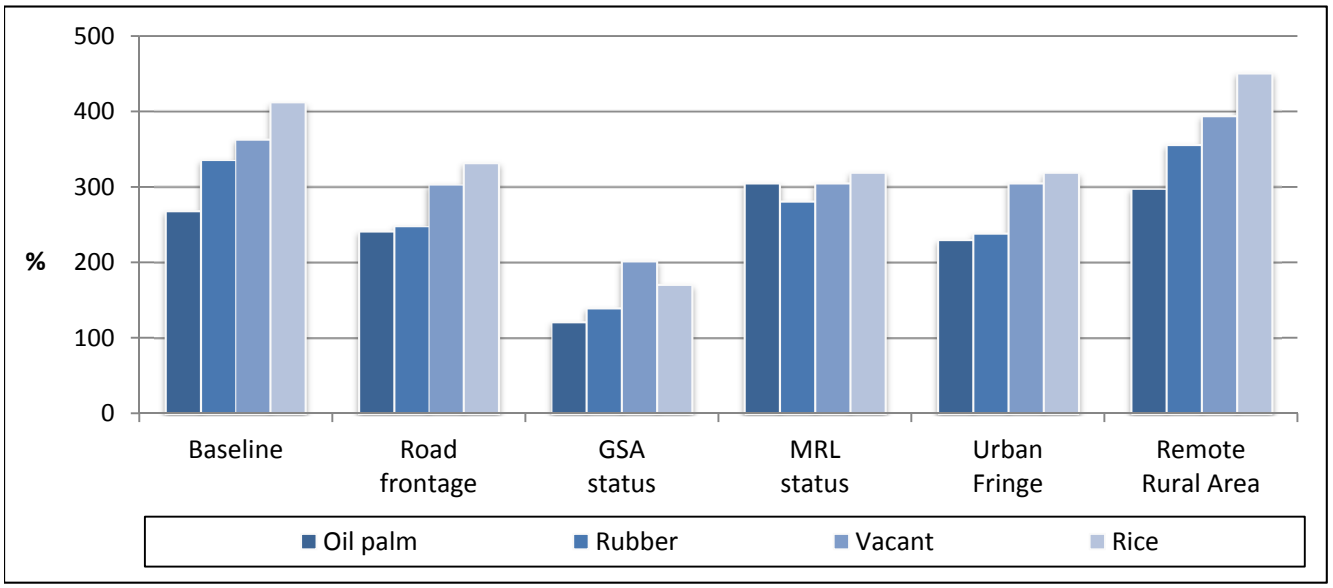
Of course, the most striking feature of the results in Table 3 is the high price of developable land compared to equivalent land with purely agricultural potential. For example, at RM229,297 per hectare, developable land in the baseline scenario commands a price in excess of four times the average value of similar land without development potential. It is this premium – the development rent – that is of primary interest here. Using results from Table 3 the development rents implied by the model are presented in Figure 2. Each bar in the figure represents the value of developable land expressed as a percentage of the value of comparable land with solely agricultural value. A few points are noteworthy:

1. As predicted by theory, the size of development rent varies by both agricultural and locational characteristics.
2. Taken over both attribute and land type, development rents are large, ranging between 121% and 451% in the scenarios examined.
3. Development rents are generally highest for rice land (since pure rice land is cheap) and lowest for palm oil land (palm oil land being the most expensive). MRL designation appears to flatten this common pattern suggesting that this restriction on ownership makes development equally (un)attractive irrespective of land type.
4. Development rents are generally higher in remote rural locations i.e. 4.7 times the average value of lands without development potential with the same characteristics. This is an indication that relative desirability of farmland with and without development potential is most acute in such locations.

7 Conclusion

Utilising a hedonic pricing model, this paper presents estimates of the marginal value of different physical and spatial characteristics for land of various types. We then estimate the market value of like-for-like parcels of land with different land-use potentials, which in turn allows us to analyse empirically the premium that is paid for farmland in Malaysia that is legally designated for agriculture, but is assessed as having some development potential. Theory suggests that where legal restrictions (such as the designation of use by land title) lack credibility, a premium for agricultural land with development potential will emerge. This price wedge, the development rent, rises where planning restrictions are weakly enforced and demand for land for non-agricultural purposes is strong; both of which epitomise the Malaysian setting. Results suggest that the premium is large, varies by

Figure 2. Predicted development rents as percentage of price for land with pure agricultural potential



Source: authors' presentation

land type and locational attributes and can exceed agricultural value by as much as 450%.

While conversion of farmland is a natural outcome of economic development, the magnitude of development rent is a cause for concern if, as is commonly perceived, it reflects factors that have led to *ad hoc* and inappropriate development of agricultural land. The paper identifies some of the factors that potentially undermine the efficacy of land title conditions in Malaysia. These include legal requirements that unintentionally lead or encourage land conversion, the 'politics of development' in rural areas and the lack of adherence to structural and local plans for land-use. More importantly, and as with any regulatory measure that is enforced by a decentralised bureaucracy the land title instrument possesses considerable potential for rent seeking, particularly if suitable administrative transparency and accountability are not firmly in place.

So, do we need to worry? Well, probably yes, if giving *ad hoc* approvals for land-conversion leads to inappropriate development in green-field areas; and all the more so if, as is so often the case, these pockets of converted farmland encourage premature development speculation in the surrounding locality while simultaneously eroding the critical mass and profitability of extant agricultural systems. The recent food crisis in 2006-2007 has shown that there is real value in protecting agricultural land resources as part of a broader set of objectives to plan for food production, particularly so in developing countries. It is, therefore, important that more empirical studies are conducted in the future on land regulation instruments and their effect on the market and pattern of land-use in order to help inform programs aimed to optimise land use for agriculture. Whilst land planning controls continue to be indispensable for maintaining agricultural land supply, policy-makers must also recognise that success of land preservation programs depends to a large degree on the effective delivery of other agricultural support initiatives to raise and stabilise farm income, for instance crop insurance, farm mechanisation, input subsidies, widening market access, all of which are currently either missing or insufficient in developing country's agriculture.

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