Wages, Land Prices, and Local Public Goods in Thailand

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Abstract

Using a hedonic pricing model for provincial land prices and provincial wages, we estimate the effects of differences in the availability of local public goods in the provinces of non-urban Thailand for the period from 1996 to 2002. We observe that local public goods can indeed explain differences in provincial wages and land prices. Infrastructure is significantly more important than welfare- related facilities or local school quality. For most local public goods the productivity-increasing effects dominate their utility-enhancing properties.

Keywords: Local public goods, hedonic prices, Thailand.
JEL: H72, H73, R13, R15

1. Introduction

Fiscal decentralization has been a global phenomenon for the last 20 years.[1] Also Thailand instituted, over the past decade, substantial measures to decentralize what had previously been a heavily centralized political and fiscal system (see CUACHON, 2001; ADB, 2001 [Ch. 4]; or WORLD BANK, 2000). Initiated by the 1997 Constitution, which was revoked during the military coup in September 2006, local assemblies and governors were to receive greater discretion over public spending; decisions that had previously been directed by the central government in Bangkok and had only been executed at the provincial level. A wide array of competences in the area of public expenditure, but also some discretion to raise revenues, were to be transferred from the central governmental level to local levels (in particular, to provinces).[2]

[1] For a survey on East Asia, see WORLD BANK (2005a), and on fiscal decentralization in developing countries in general see BIRD and VAILLANCOURT (1998), SMOKE (2001), and WORLD BANK (2005b).

[2] The National Decentralization Act (1999) stipulated that six broad fields of government activity should be devolved to local governments: infrastructure; quality of life; community and social order; investment for trade and tourism; management of natural resources and the environment; and culture,

In addition to encouraging democratic participation, it is hoped that decentralization will improve economic efficiency: politics can be better adjusted to provincial needs, and competitive pressure is put on provincial authorities to make their province an attractive place for living and doing business.[3]

Theoretically, the hope of efficiency gains is rooted in the Tiebout hypothesis: this is the hypothesis that when people and businesses migrate to their most preferred jurisdiction and local politics cater for the needs of residents, the resulting locational equilibrium and the attending provision of local public goods will be efficient. In particular, differences in the availability of local public goods – or in the performance of local politicians – will be reflected ('capitalized') in differences in the local prices.

In this paper, we present an empirical test of this capitalization hypothesis for Thailand. Specifically, we ask: are differences in the availability and the quality of local public goods in the Thai provinces reflected in differences in wages and property values across provinces?

Answering this question will give useful benchmark values for the performance of local authorities in a potentially future decentralized system in Thailand. To our knowledge, no such study has ever been carried out for Thailand. Moreover, regional studies based on hedonic pricing approaches are generally rare for emerging economies and developing countries.

We focus on the non-urban areas of Thailand, which represent the medium- and low-income provinces of the country. Metropolitan Bangkok and its environs are excluded from the sample, as are Chiangmai and Phuket, where tourism plays a large role. While it also covers industrialized regions, our sample encompasses in particular all regions in which agriculture makes up a larger-than-average share of gross provincial product.

The rest of the paper is structured as follows: Section 2 provides a brief overview of fiscal decentralization and its underlying concept of locational equilibrium. Section 3 recalls the canonical model underlying our hedonic pricing study. Section 4 presents the specific situation of Thailand and

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values and local wisdom. The ratio of central to local expenditure should shrink from 80:20 to 65:35. Currently, local governments (including provincial administrative organizations, municipalities and *tambon* organizations) provide about 20 per cent of government goods and services (WEIST, 2004) while spending about 10 per cent of public funds (MOUNTFIELD and WONG, 2005).

[3] As Thailand only began its decentralization process in 1997 (or in 1999, if one takes the National Decentralization Act as the starting point), it is too early for a meaningful assessment. Moreover, at present it is unclear whether the fiscal devolution will be pursued further after the coup d'état in September 2006. Until then, implementation of the decentralization plan was less speedy than initially hoped and replete with organizational difficulties and politically obstructive manoeuvres. Incapacitated by decades of central governance, most provincial and municipal authorities lacked the skills, experience, and perhaps also the courage required to design and implement policies on their own. Moreover, some of the central government's recent policy measures openly ran against the decentralization programme. Both central government and provincial authorities lacked benchmarks to evaluate their performance.

introduces our data set. Our regression results, to be presented in Section 5, confirm that local public goods in Thailand affect local prices in a way that is consistent with theoretical predictions. Moreover, it turns out that for most local public goods the *productivity effect* (by which a higher supply of the good reduces production costs of local firms) is more significant and dominant than their *amenity effect* (where a higher supply increases utility for local residents). Section 6 discusses our observations and concludes.

2. Background: fiscal decentralization

Theory predicts that fiscal decentralization will improve the quality of local public services and, more generally, enhance social welfare (for a survey see LOCKWOOD, 2005). The main arguments underlying this view are as follows:

- If local decision makers are public-spirited and benevolent ('social welfare maximizers'), their better access to relevant information at the local level (where decisions are to be implemented) gives them a comparative advantage in terms of public service provision over the more remote decision makers at the central level. In a less perfect world, with self-interested or corrupt local decision makers, being locally accountable may impose more powerful constraints on improper political behaviour.
- Interjurisdictional competition disciplines governments. When residents or businesses can evade bad policies by moving elsewhere, pressure increases on local governments to provide local public goods efficiently and in accordance with their clientele's needs. In centralized states, where local governments are merely administrative subdivisions, such efficiency-enhancing horizontal competition does not exist.

Decentralization may also produce unwarranted inefficiencies (see e.g. WILSON, 1999):

- Jurisdictions located close to each other generate externalities among themselves. In a centrally administered regime, these externalities could be internalized, but a fiscally devolved system does not have any such mechanism at hand.
- Decentralization triggers inter-regional competition for mobile goods and factors. Its actors are placed in a prisoners' dilemma, leading to under-taxation of mobile factors and inefficient provision of local public services.

Underlying the arguments in favour of or against decentralization is the concept of *locational equilibrium*: local jurisdictions compete for households and businesses by offering different mixes of local public goods, infrastructure, publicly provided production factors, local amenities, and, possibly, taxes, user charges, or fees. Mobile businesses and households will 'vote with their feet' for their most-preferred bundle of public goods. Theory predicts that locational choices will be reflected

('capitalized') in changes in local prices and, in particular, in local property and housing prices and in local wages:

- An attractive bundle of local public goods will be reflected in a high demand for housing and business property and, thus, by high rents and property values.
- The effect on wages is not so clear: if workers are immobile but firms are mobile, firms will prefer to locate where business conditions are good, i.e., where local authorities provide decent infrastructure, etc. As labour supply is exogenous but labour demand increases with the availability of productivity-enhancing local public goods, wages will be higher in 'successful' jurisdictions. The picture changes when labour is also footloose. Workers will settle where living conditions are good, which drives wages down in locations with good residential qualities. Businesses look for adequate provision of local public factors, driving wages up in business-friendly locations. The aggregate effect on the equilibrium wage depends both on the elasticities of labour supply and demand and on the degree to which local policies are more 'consumer-oriented' (amenities) or more 'business-oriented' (productivity-enhancing).

If wages and land prices reflect the availability of local public goods or factors, they can be instrumented to assess differences and changes in local policies (resulting, for example, from fiscal decentralization). This is done with the so-called *hedonic pricing method*. Provided that a sufficient number of empirical observations across time and space are available, one can statistically identify the isolated price effects for the availability of local public goods and factors.

3. Theoretical model

Our estimations will be based on the canonical public-goods pricing model of ROBACK (1982), BEESON and EBERTS (1989) and GYOURKO and TRACY (1991).[4] Under this model, a frictionless economy with free and costless mobility between a large number of jurisdictions is populated by households and firms. Each of the identical households inelastically supplies one unit of labour, earning him or her a wage *w*. Firms (which are identical too) hire labour to produce a *numéraire* good with a CRS technology. Land is demanded by households for residential purposes and by firms as a factor of production. The rental rate for a unit of land is *r* and assumed to be identical whether used for housing or production purposes. Jurisdictions are characterized by a vector *s* of local (i.e. site-specific) public goods (or amenities).[5]

[4] A structurally similar class of models exists for housing markets in metropolitan areas; see, for example, EPPLE and ZELENITZ (1981) or HOYT (1999) and the references cited therein. These models do not incorporate any wage effects. Here we largely follow BEESON and EBERTS (1989).

[5] The hedonic model assumes that housing and spatial amenities are densely distributed and that households or businesses may locate where there is any combination of attributes. It also assumes that, at any point, the derivative of the price function with respect to a local characteristic does indeed represent the *marginal* willingness to pay for the characteristic of those agents located at that point.

Households choose expenditure for housing and consumption so as to maximize their utility (which may depend on location-specific characteristics). This gives rise to an indirect utility function $V(w,r;s)$ which increases in *w*, decreases in *r*, and, as *s* is thought of as a vector of desirable goods, does not decrease in (any component of) *s*. Free mobility implies that households obtain equal utility everywhere. Hence, a migration equilibrium for households implies that there exists utility level $\overline{v}$ such that:

$$V(w,r;s)=\overline{v}\,. \tag{1}$$

Given CRS technologies, firms are characterized by unit-cost functions that (positively) depend on input prices and, possibly, and in a potentially unclear direction, on location-specific characteristics. Locational equilibrium with free mobility and perfect competition implies that unit costs equal output price, which is one:

$$C(w,r;s)=1. \tag{2}$$

Equations (1) and (2) together determine, for given *s*, equilibrium wage and rental rate. Comparative statics of (1) and (2) yield the following predictions:

$$\begin{aligned}\frac{\partial w}{\partial s}&=\frac{1}{\Delta}\cdot\left(-V_s C_r+C_s V_r\right)\\ \frac{\partial r}{\partial s}&=\frac{1}{\Delta}\cdot\left(-V_w C_s+C_w V_s\right)\end{aligned} \tag{3}$$

where $\Delta=V_w C_r-V_r C_w>0$. Price changes are thus combined out of amenity and productivity effects. Specifically,

- an increase in the level of (a component of) *s* that has no utility value (i.e. $V_s(w,r;s)=0$) but that is productive (i.e. $C_s(w,r;s)<0$) raises wages and rents;
- an increase in the level of (a component of) *s* that has amenity value (i.e. $V_s(w,r;s)>0$) but does not affect production (i.e. $C_s(w,r;s)=0$) lowers wages and increases rents;
- an increase in the level of (a component of) *s* that has both amenity value (i.e. $V_s(w,r;s)>0$) and positive productivity (i.e. $C_s(w,r;s)<0$) increases rents but has an ambiguous effect on wages.

Differentiating (1) with respect to *s*, subsequent division by $(w\cdot V_W)$, and Roy's identity yield:

$$\frac{\partial \ln w}{\partial s}-\frac{h\cdot r}{w}\cdot\frac{\partial \ln r}{\partial s}+\frac{p_s}{w}=0 \tag{4}$$

Under these conditions, a hedonic regression also provides information on non-marginal willingness to pay.

where *h* denotes the amount of land used for housing (hence, (*h r/w*) is the share of land in the individual's budget) and $p_s := \frac{V_s}{V_w}$ is the amount of income that is required to compensate an individual for a change in *s*, i.e. the marginal amenity value of *s*. Similarly, from differentiating (2) with respect to *s* we get

$$\theta_w \cdot \frac{\partial \ln w}{\partial s} + \theta_r \cdot \frac{\partial \ln r}{\partial s} + C_s = 0 \; . \tag{5}$$

Here $\theta_w := \frac{wC_w}{C}$ and $\theta_r := \frac{rC_r}{C}$ denote (from Shephard's Lemma and the fact that *C*=1), the cost shares, respectively, of wages and land in production. Equation (5) can be used to assess the productivity effects of *s*. The goal of the empirical analysis is to estimate $\frac{\partial \ln w}{\partial s}$ and $\frac{\partial \ln r}{\partial s}$ (which should each be understood as partial derivatives).

Linearizing the model, (4) and (5) imply wage and land price regressions as follows:

$$\begin{aligned} \ln w_{it} &= \beta_w . S_{it} + \delta_w . Z_{it} + \varepsilon_{it} \\ \ln r_{it} &= \beta_r . S_{it} + \delta_r . Z_{it} + u_{it} \end{aligned} \tag{6}$$

Equations (6) project wages and land prices in region *i* and at time *t* on site-specific characteristics in the form of local public goods (*s*) and on other location-specific characteristics (*z*).

4. Hedonic prices for local public goods and factors in Thailand

4.1 General remarks

To assess how differences in the availability of local public goods and infrastructure affect local prices, we apply the hedonic pricing method to the non-urban provinces of Thailand in the period from 1996 to 2002. Thailand is administratively divided into three layers: central, provincial, and local. The provincial administration (which is the relevant one for our purposes) is composed of 75 provinces (*changwats*). Bangkok, as the capital city, is a local autonomous body. Provinces are grouped geographically into four regions: Central, North, Northeast, and South. Provincial governors, who are the administrative heads of government, supervise all department personnel and programmes. Although they exercise a small degree of independence, provincial governments are still primarily concerned with executing central government policies. Provinces are further subdivided into districts, sub-districts (*tambon*) and villages, each with their own administrative organization; we do not analyse these finer structures here.

For reasons of non-comparability with other Thai provinces, we exclude Bangkok Metropolitan Area as an outlier. Moreover, non-comparability of data (in particular land prices – see below) led us to exclude other provinces in the Greater Bangkok Area, as well as Chiangmai and Phuket. For the newly created provinces of Amnat Charoen and Nong Bua Lam Phu, data dating back to 1996 are (naturally enough) not available. In total, we analyse data for 65 Thai provinces, which altogether represent more than 85 per cent of the Thai population, territory and economy outside Bangkok. Twenty provinces of our sample lie in the central region, 16 in the northern region, 17 in the northeastern region, and 12 in the southern region.

4.2 Data

We estimate hedonic price equations which have as their dependent variables local wages and property prices. Independent variables come in four categories:

- *Economic and demographic variables:* total per-capita gross provincial product, sectoral shares, and population densities.
- *Infrastructure:* highway, existence of international airports and domestic airports (dummy variable), railway connections (dummy variable).
- *Education:* average student/teacher ratio, number of schools (both local and centrally provided).
- *Welfare and social services:* existence of orphanages, women's houses, homes for disabled persons.

Data sources were not only widely dispersed, but the Asian crisis (which struck many countries in 1997) meant a partial interruption of data collection, such that some data are not available for the year of 1998. We adjusted our estimation strategy correspondingly.

4.2.1 Dependent variables

Wages: Detailed information on the wages of private sector employees of all types across Thai provinces is available on an annual basis from 1996 until 2002 (with the unfortunate exception of 1998). These wages (available on monthly, daily and per piece bases) reflect actual market prices for labour. We use the logarithm of the average nominal wage of all types of private employee. Data sources are the annual editions of the 'Survey of Wages, Earnings and Labour Hours', conducted by the Department of Welfare and Labour Protection in the Ministry of Labour.

Land Prices: Data on market land prices for provinces is not available at present.[6] As proxy variables, we use official land prices that are announced by the Bureau of Property Evaluation at the Treasury Department in the Ministry of Finance once every four years.[7] We use the rounds 1996-1999, 2000-2003, and 2004-2007. Official land valuation takes two forms: block-based valuation, which values groups of lands along roads, streets and pathways, and parcel-based valuation, which is only done within Bangkok and urban provinces in the Greater Bangkok Area (Nonthaburi, Samutprakarn, Nakonpathom, Samutsakorn), Phuket (South), Nakonratchasima (Northeast), and Chiangmai (North). We consider only provinces that assess land prices via block-based valuation. To ensure comparability across provinces, we use land prices in the area of, or in the immediate neighbourhood of, the provincial hall, the administrative centre of a province. Specifically, we consider (the logarithm of) the average of the official prices of all land blocks around the provincial office as the representative (log) land price for a province.[8] Streetwise data were retrieved from provincial yearbooks. To control for possible data collection problems, we also consider the logarithm of the *maximum* price. Differences between the effects on average or on maximum values turn out to be unimportant and so the estimation results for maximum land prices, as the independent variable, are relegated to Appendix 2. Since administrative land values are updated only infrequently, they can be expected to lag substantially behind actual market prices. We therefore interpret the tabled land values for a year *T* as proxy for the actual land prices at date *T-2*. For 2002, land prices are the average of official land price announced for two rounds, namely 2000-2003 and 2004-2007.

4.2.2 Independent variables

Population Density: The data source for population density, measured as the number of inhabitants per square kilometre, is the Thailand Statistical Yearbook (various editions).

Agriculture Share, Manufacturing Share and Tourism Share: We use sectoral shares as percentages of gross provincial product (GPP) for agriculture, manufacturing, and hotel and restaurant (as a proxy for tourism) to account for differences in the industrial structures between provinces. GPP data is obtained from the database of the National Economic and Social Development Board (NESDB).

Highways: The length of highways in metres per capita, obtained directly from a database provided by the Department of Highway (Ministry of Transportation) is used to represent the level of road infrastructure in each province.

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6 In many applications of ROBACK (1982), housing expenditure is used as a proxy for land rents. Such data on the aggregate provincial level are not currently available for Thailand.

7 These official prices are used to assess the value of land for the purpose of taxing land transactions. Official 'tax prices' are (or at least should be) estimated by authorities on the basis of market prices.

8 Hence, we treat land as a homogeneous variable here. As pointed out by SIEG et al. (2002), this is a problematic assumption.

Airport: We use dummy variables for expressing the existence of domestic and international airports in provinces (Have = 1, None = 0). An airport is considered to exist only if it actually hosts aircraft arrivals and departures; idle airports are not counted. Data is taken from the International Air Transport Statistics in the Thailand Statistical Yearbook (various editions).

Train: We use a dummy variable for expressing the existence of train connections within provinces (i.e. a railway station; Have = 1, None = 0).

Education-Related Variables: The education-related variables, such as number of students and teachers, are obtained from the Report of Education and Teacher Survey (various years), conducted jointly by the Ministry of Education and the National Statistics Office. Types of schools taken into account encompass all schools under the supervision of the Office of the National Primary Education Commission (national primary schools), the Department of General Education (national secondary schools), the Department of Education in the Bangkok Metropolitan Administration (as far as is relevant), the Bureau of Local Education Administration (local authorities' schools), and of the Office of the Private Education Commission (private schools). We measure provincial school quality by the average number of students per teacher.

Welfare Facilities: We use separate dummy variables for the existence of facilities catering for children (such as orphanages), for the elderly (e.g. old age homes), for disabled and homeless people (asylums), and for women (again: Have = 1, None = 0). All facilities are under the administration of the Ministry of Human Development and Social Welfare, which also provides the data.

Asian Crisis: Potentially, the Asian crisis might distort all our estimations. When selecting our data, we tried to limit this influence. First, Bangkok, which was by far the worst-hit area during the Thai crisis, is omitted from the estimations. Moreover, for the rest of the country we implicitly assume that all provinces were hit to an equally severe degree, implying that the crisis potentially affects the level of data but not their structural relationships as given by the hedonic equations. Nevertheless, to capture the effects of the Asian crisis and its aftermath we also executed regressions with time dummies for 2000 and 2002; the latter might capture the fact that the Thai economy had not yet returned to its pre-crisis structure in 2002.

Unlike other studies on hedonic prices, we did not include climatic variables or amenities as regressors. Thailand is rather homogeneous with respect to these potential impact factors.[9]

Descriptive statistics for all variables are listed in Appendix 1.

[9] The prevalence of tourist attractions (which are unevenly distributed across provinces) is proxied by the tourism share of GPP.

5. Empirical results

This section reports the effects of various types of local (provincial) public goods, namely infrastructure, education and welfare-related services, on provincial wages and land prices. Using the data listed in the last section, our sample comprises 195 observations (65 provinces for three years). We treat our data as a panel. We estimate the model by the OLS method, the weighted OLS method (to account for potential heteroskedasticity in the regional data), and the weighted OLS with fixed effects (to control for omitted variables). Table 1 provides OLS estimation results, with and without time effects.

Table 1: Effects of local public goods on wage and land price (OLS model)

Dependent Variable	Log(Wage)				Log(Average Land Price)			
	Coefficient	t-statistics	Coefficient	t-statistics	Coefficient	t-statistics	Coefficient	t-statistics
Constant	**3.6768**	*19.95****	**3.8341**	*22.30****	**4.1569**	*5.28****	**4.1865**	*5.18****
Population density	**0.0001**	*1.37*	**0.0001**	*1.55*	**-0.0006**	*-1.39*	**-0.0006**	*-1.42*
Distance from BKK	**-0.1042**	*-3.71****	**-0.1222**	*-4.74****	**0.0208**	*0.17*	**0.0263**	*0.22*
Agriculture share	**0.0023**	*3.26****	**0.0028**	*4.25****	**-0.0030**	*-0.97*	**-0.0030**	*-0.99*
Manufacture share	**0.0020**	*4.13****	**0.0020**	*4.56****	**0.0027**	*1.33*	**0.0027**	*1.31*
Tourism share	**0.0059**	*1.34*	**0.0055**	*1.39*	**0.0306**	*1.64**	**0.0308**	*1.65**
Infrastructure								
Road	**0.0679**	*1.84**	**0.0636**	*1.89**	**-0.4822**	*-3.07****	**-0.4850**	*-3.07****
Train	**0.0291**	*2.13***	**0.0266**	*2.13***	**0.1415**	*2.43***	**0.1419**	*2.42***
International airport	**-0.0092**	*-0.24*	**-0.0025**	*-0.07*	**-0.0864**	*-0.53*	**-0.0837**	*-0.51*
Domestic airport	**-0.0117**	*-0.80*	**0.0000**	*0.00*	**0.1311**	*2.09***	**0.1266**	*1.98***
Education								
National primary school	**-0.0252**	*-0.24*	**0.0633**	*0.64*	**-0.3240**	*-0.72*	**-0.3990**	*-0.85*
Local school	**-0.0708**	*-2.24***	**-0.0301**	*-1.01*	**-0.0030**	*-0.02*	**-0.0059**	*-0.04*
Private school	**0.1732**	*2.14***	**0.0686**	*0.90*	**0.2167**	*0.63*	**0.2338**	*0.66*
National secondary school	**-0.0188**	*-0.27*	**-0.0964**	*-1.50*	**-0.1538**	*-0.52*	**-0.1390**	*-0.46*
Welfare facilities								
Children	**0.0437**	*2.19***	**0.0335**	*1.83**	**0.1177**	*1.38*	**0.1235**	*1.43*
Disabled	**-0.0231**	*-1.17*	**-0.0279**	*-1.54*	**0.0657**	*0.78*	**0.0679**	*0.80*
Elderly	**0.0068**	*0.45*	**0.0051**	*0.38*	**0.0199**	*0.31*	**0.0212**	*0.33*
Homeless	**-0.0021**	*-0.10*	**0.0038**	*0.20*	**-0.1354**	*-1.55*	**-0.1361**	*-1.55*
Women	**0.0477**	*2.09***	**0.0436**	*2.09***	**-0.0413**	*-0.42*	**-0.0411**	*-0.42*
Yr2000-Dummy			**-0.0792**	*-5.99****			**0.0115**	*0.19*
Yr2002-Dummy			**-0.0563**	*-4.32****			**0.0387**	*0.63*
No. of observations	195		195		195		195	
Adjusted R^2	0.3930		0.4944		0.1778		0.1704	
Log likelihood	237.23		256.16		-45.762		-45.518	
F-statistic	7.9793		10.4853		3.3309		2.9930	

Note: ***, **, and * indicate significance at the 1% level, the 5% level, and the 10 % level, respectively.

For the effects of local public goods on wages, our estimations yield the following findings. Differences in provincial wages across Thailand can, to a considerable extent, be explained by differences in the distance from Bangkok and by economic characteristics such as the share of

agriculture and the share of manufacturing in GPP. Population density affects wages positively but the effect is hardly noticeable and so proves insignificant. The positive sign may more or less reflect the existence of an agglomeration effect, while insignificance might result from this being neutralized by a negative congestion effect. Highways, railway connections and local private schools, as well as welfare facilities for children and women, affect provincial wages positively and with statistical significance.[10] International airports do not play any role. The effect of local school quality on local wages – which, contrary to intuition, is negative for private schools – becomes insignificant when we incorporate dummies for the years 2000 and 2002.

Turning to the estimations for land prices, the province's share of tourism in GPP affects the land price positively, reflecting the higher private demand for land by a generally well moneyed tourism industry. The effects of local public goods on land prices are weaker than on wages. Interestingly, only infrastructure-related independent variables, namely the existence of train connections and domestic airports, have statistically significant positive effects on land prices. These positive results confirm the pecuniary externalities of those local public goods. However, we cannot obtain a similar result for road infrastructure. The highly significant negative sign of its coefficient may be caused by congestion effects of highways, but this is rather speculative. In addition, we cannot identify any effect of education and welfare-related variables on land prices under the OLS model.

By choice of the objects, all local public goods in our data set can be expected to exhibit non-negative amenity effects as well as non-negative productivity effects. Hence, both $V_s \geq 0$ and $C_s \leq 0$ can be expected to hold in equations (3), leaving the overall price effects in (3) *a priori* unclear theoretically. However, our estimates allow some rough inferences on the qualitative properties of specific local public goods for Thailand. For example, as domestic airports show no significant wage effect but strong positive effects on land prices, their amenity effect must be strictly positive and dominate their productivity effect. Conversely, for road and railway infrastructure, the positive productivity effects must be large and dominate the amenity effects. Finally, and perhaps surprisingly, for child- and women-related welfare facilities the productivity effect must also be positive; here, one might have expected at most an amenity effect. Table 2 reports estimation results for the weighted OLS method, executed to get around the heteroskedasticity problem caused by the differences among the groups.

[10] As we measure school quality inversely by students-per-teacher ratios, negative coefficients in the regression indicate positive price effect of school quality.

Table 2: Effects of local public goods on wage and land price (weighted OLS model)

Dependent Variable	Log(Wage)				Log(Average Land Price)			
	Coefficient	t-statistics	Coefficient	t-statistics	Coefficient	t-statistics	Coefficient	t-statistics
Constant	**3.6713**	*20.073****	**3.8458**	*22.359****	**4.3382**	*5.868****	**4.3992**	*5.816****
Population density	**0.0001**	*1.343*	**0.0001**	*1.487*	**-0.0008**	*-2.034***	**-0.0008**	*-2.079***
Distance from BKK	**-0.0972**	*-3.519****	**-0.1185**	*-4.591****	**-0.0597**	*-0.510*	**-0.0554**	*-0.469*
Agriculture share	**0.0025**	*3.735****	**0.0028**	*4.462****	**-0.0028**	*-0.863*	**-0.0029**	*-0.889*
Manufacture share	**0.0020**	*4.319****	**0.0020**	*4.619****	**0.0017**	*0.841*	**0.0016**	*0.807*
Tourism share	**0.0062**	*1.531*	**0.0061**	*1.582*	**0.0218**	*1.161*	**0.0219**	*1.160*
Infrastructure								
Road	**0.0690**	*1.839**	**0.0642**	*1.886**	**-0.4811**	*-3.294****	**-0.4846**	*-3.304****
Train	**0.0322**	*2.383***	**0.0280**	*2.252***	**0.1386**	*2.433***	**0.1395**	*2.437***
International airport	**0.0001**	*0.002*	**0.0049**	*0.143*	**-0.0632**	*-0.379*	**-0.0578**	*-0.345*
Domestic airport	**-0.0192**	*-1.346*	**-0.0031**	*-0.235*	**0.1575**	*2.502***	**0.1527**	*2.393***
Education								
National primary school	**-0.0298**	*-0.279*	**0.0529**	*0.524*	**-0.2047**	*-0.478*	**-0.2950**	*-0.661*
Local school	**-0.0669**	*-2.299***	**-0.0278**	*-0.971*	**0.0179**	*0.126*	**0.0148**	*0.101*
Private school	**0.1493**	*1.883***	**0.0559**	*0.740*	**0.1263**	*0.371*	**0.1413**	*0.403*
National secondary school	**-0.0050**	*-0.073*	**-0.0932**	*-1.453*	**-0.1473**	*-0.516*	**-0.1370**	*-0.470*
Welfare facilities								
Children	**0.0356**	*1.815***	**0.0289**	*1.590*	**0.1504**	*1.869**	**0.1572**	*1.936*
Disabled	**-0.0198**	*-0.991*	**-0.0261**	*-1.432*	**0.0556**	*0.721*	**0.0577**	*0.744*
Elderly	**0.0092**	*0.638*	**0.0063**	*0.467*	**0.0240**	*0.390*	**0.0256**	*0.414*
Homeless	**-0.0002**	*-0.010*	**0.0048**	*0.254*	**-0.1323**	*-1.624**	**-0.1328**	*-1.623**
Women	**0.0512**	*2.253***	**0.0433**	*2.080***	**-0.0784**	*-0.813*	**-0.0793**	*-0.818*
Yr2000-Dummy			**-0.0774**	*-5.874****			**0.0108**	*0.181*
Yr2002-Dummy			**-0.0542**	*-4.168****			**0.0437**	*0.738*
No. of observations	195		195		195		195	
Adjusted R^2	0.9680		0.9122		0.7425		0.7453	
Log likelihood	240.08		256.93		-41.768		-41.391	
F-statistic	327.39		101.87		32.080		29.395	

Note: ***, **, and * indicate significance at the 1% level, the 5% level, and the 10 % level, respectively.

By and large, the results in Table 2 are consistent with those in Table 1. For wages, we confirm the significantly positive effects of highways, railway connections, local school quality and some types of welfare facilities. However, only the existence of train connections and domestic airports has statistically significant and positive effects on land prices.

Similar results are obtained when using the weighted OLS method with fixed effects. These results are reported in Table 3.

Table 3: Effects of local public goods on wage and land price (weighted OLS with fixed effect model)

Dependent variable	Log(Wage)				Log(Average Land Price)			
	Coefficient	t-statistics	Coefficient	t-statistics	Coefficient	t-statistics	Coefficient	t-statistics
Population density	**5.85E-05**	*0.600*	**9.19E-05**	*0.990*	**-0.0008**	*-2.036***	**-0.0009**	*-2.112***
Distance from BKK	**-0.1061**	*-2.595****	**-0.1051**	*-2.656****	**0.1205**	*0.640*	**0.1208**	*0.639*
Agriculture share	**-0.0012**	*-1.160*	**0.0005**	*0.444*	**-0.0029**	*-0.600*	**-0.0038**	*-0.745*
Manufacture share	**0.0009**	*1.730**	**0.0013**	*2.542***	**0.0017**	*0.748*	**0.0014**	*0.613*
Tourism share	**0.0012**	*0.304*	**0.0023**	*0.566*	**0.0149**	*0.754*	**0.0141**	*0.714*
Infrastructure								
Road	**0.0849**	*2.132***	**0.0718**	*1.900**	**-0.5118**	*-3.055****	**-0.5084**	*-3.023****
Train	**0.0137**	*1.022*	**0.0184**	*1.431*	**0.1419**	*2.386***	**0.1399**	*2.342***
International airport	**-0.0181**	*-0.540*	**-0.0111**	*-0.330*	**-0.0777**	*-0.464*	**-0.0759**	*-0.450*
Domestic airport	**-0.0125**	*-0.945*	**-0.0011**	*-0.084*	**0.1675**	*2.616***	**0.1619**	*2.499***
Education								
National primary school	**-0.0699**	*-0.665*	**0.0039**	*0.038*	**-0.2685**	*-0.603*	**-0.3851**	*-0.827*
Local school	**-0.0872**	*-3.096****	**-0.0523**	*-1.762**	**-0.0134**	*-0.091*	**-0.0239**	*-0.156*
Private school	**0.3016**	*3.749****	**0.1849**	*2.222***	**0.2418**	*0.659*	**0.2974**	*0.763*
National secondary school	**-0.0076**	*-0.119*	**-0.0763**	*-1.197*	**-0.1712**	*-0.590*	**-0.1515**	*-0.510*
Welfare facilities								
Children	**0.0228**	*1.228*	**0.0233**	*1.298*	**0.1396**	*1.715**	**0.1462**	*1.786**
Disabled	**0.0060**	*0.285*	**-0.0079**	*-0.397*	**0.0680**	*0.813*	**0.0744**	*0.879*
Elderly	**0.0080**	*0.585*	**0.0058**	*0.434*	**0.0267**	*0.429*	**0.0279**	*0.447*
Homeless	**0.0137**	*0.688*	**0.0112**	*0.594*	**-0.1380**	*-1.669**	**-0.1370**	*-1.652**
Women	**0.0485**	*2.246***	**0.0452**	*2.164***	**-0.0567**	*-0.568*	**-0.0574**	*-0.572*
Yr2000-Dummy			**-0.0615**	*-4.438****			**0.0227**	*0.358*
Yr2002-Dummy			**-0.0406**	*-3.032****			**0.0540**	*0.877*
Fixed effect								
CENTRAL	**3.6970**		**3.7907**		**3.9853**		**4.0481**	
NORTH	**3.6624**		**3.7564**		**3.8271**		**3.8862**	
NORTHEAST	**3.6609**		**3.7549**		**3.8332**		**3.8950**	
SOUTH	**3.7955**		**3.8399**		**3.8380**		**3.9270**	
No. of observations	195		195		195		195	
Adjusted R^2	0.9792		0.9123		0.7472		0.7514	
Log likelihood	254.16		213.16		-40.500		-40.014	
F-statistic	436.00		88.808		28.313		26.504	

Note: ***, **, and * indicate significance at the 1% level, the 5% level, and the 10 % level, respectively.

As before, we observe significant time effects both for 2000 and 2002, suggesting that the Asian crisis and its aftermath have indeed had strong impacts on local prices in Thailand.

6. Conclusions and outlook

Based on our empirical results, we can derive a couple of preliminary policy implications.

Differences in local prices in non-urban Thailand do indeed reflect differences in the availability of local public goods. Given that these results were obtained for a period where decisions on local public

good provision were, by and large, made by the central government (1996-2002), fiscal decentralization in Thailand, if pursued further to become fully effective, is likely to accentuate this trend. Our results indicate that economic tools like the hedonic pricing model are highly applicable for monitoring and assessing these developments.

It has long been an aim of Thai governments to reduce the substantial inter-regional income differentials in the country. As shown in SUWANRADA (2005), inter-provincial disparities in Thailand in terms of per capita GPP are extremely high and still growing.[11] To the extent that fiscal decentralization will increase inter-provincial differences in the supply of local public goods, price differences are bound to increase as well, with strong implications for income inequality and inter-regional redistribution in Thailand. Granting provinces discretion over public goods supplies which, as our observations indicate, would then considerably impact on provincial prices and levels of well-being, may exacerbate income inequality among provinces and, in particular, between the relatively prosperous areas around Bangkok and the poor rural regions.

Our observations also have implications for local public finances in Thailand. At present, taxes imposed by the central administration in Thailand are mainly levied on income (individual and corporate income) and consumption (VAT, excise taxes, Special Business Tax, and tariffs) while local governments' sources of tax revenue are mostly property and hotel usage.[12] Our results indicate that local wages respond more sensitively to differences in local infrastructure than land prices. Most local public goods (except for schools) have, however, traditionally been provided by the national government in Thailand and have thus been financed to a considerable degree by the national wage tax. As wage earners seem to be both the beneficiaries and the financiers of local public goods, the Thai tax system *in this respect* seems to follow the benefit principle of taxation.[13] Local public goods contribute to their own financing: by increasing wages, they expand the tax base from which they are financed.

The implications for the planned devolution of public revenues in Thailand's fiscal decentralization programme are unclear. With mobile tax bases, local benefit taxation (which would, in our context, require levying local wage taxes to finance local public goods) is generally considered suboptimal (OATES, 1996). Rather, local revenues should be restricted to locally immobile tax bases and, in the event of revenues falling short of budgetary needs, augmented by centrally administered matching

[11] About 90% of per capita GPP differences among provinces are due to differences among regions (Central, North, Northeast, South). Inter-provincial differences *within* regions are comparatively small, but growing.

[12] In addition, local governments share some consumption tax base with national government (surcharge tax). The national government also allocates a portion of revenue from some kinds of national tax, such as VAT, alcohol and tobacco tax, and vehicle tax, to local governments, based on their population sizes.

[13] Two caveats should be added to this assertion. First, as we are using tax (=administered) prices for land, we cannot say much about the response of actual market prices to changes in public good supply. Second, we entirely disregard capital income.

grants. On the other hand, our observation that local public provision in Thailand seems to be reflected in increasing wages indicates that a local wage tax might indeed be a promising tool for local government finance.[14]

Our results suggest that infrastructure (roads, airports, railways) have stronger price effects than school quality and, in particular, than welfare facilities, with the notable exception of child- and women-related institutions. The larger impact of infrastructure may reflect the status of Thailand as an emerging economy where 'brick-and-mortar' goods still matter more than redistributive 'luxuries'. Moreover, among the brick-and-mortar goods, railways and roads have significant productivity effects while the consumptive value dominates in the case of domestic airports.

Finally, let us indicate some directions for future research:

- Our data set of local public goods and local factor prices for non-urban Thailand may be used in various other projects. If Thailand continues to follow the path of decentralization, information on the structure and volume of local public revenues would be an important addition to this data set. Also, the expenditure side still lacks several important aspects (such as health-related goods and facilities). Finally, variables relating to the political economy of public finance ought to be incorporated.
- Our estimates could still be refined, and some econometric problems have not yet been addressed. For instance, inter-provincial externalities and spillovers (which can be expected to prevail for many types of traffic-related infrastructure) have not so far been captured. In order to deal satisfactorily with this issue, the data set needs to be considerably enriched.

Our observations suggest that a longer-term research goal, namely to assess the effects of changes in Thailand's fiscal constitution (whose future is, at the time of writing in fall 2006, quite unclear), can indeed be pursued with our data set and with the standard toolbox of economic theory. A possible next step would be to identify whether the National Decentralization Act has indeed triggered changes in the public finance of Thai provinces and, if so, to what effect.

[14] MIESKOWSKI and ZODROW (1989) call Tiebout's view of local public finance the 'benefit tax' view, to which they contrast the 'new view', in which the property tax is a distortionary tax on mobile(!) capital. The effects of capitalization on Tiebout's hypothesis are not yet fully understood (CAPLAN, 2001).

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Appendix 1: Descriptive statistics of all variables

Variables	Area	Mean	Maximum	Minimum	Std. Dev.
Wage	Central area	3.696	3.917	3.552	0.088
(Baht/month,	Northern area	3.585	3.881	3.338	0.087
Log, numeric)	Northeastern area	3.568	3.749	3.422	0.078
	Southern area	3.647	3.773	3.512	0.063
Average land price	Central area	4.013	4.574	3.149	0.286
(Baht/Wa^2,[†]	Northern area	3.867	4.560	2.942	0.364
Log, numeric)	Northeastern area	3.996	4.681	3.028	0.365
	Southern area	3.948	4.695	2.633	0.418
Maximum land price	Central area	4.313	4.845	3.380	0.301
(Baht/Wa^2,[†]	Northern area	4.227	4.903	3.477	0.372
Log, numeric)	Northeastern area	4.302	5.000	3.301	0.394
	Southern area	4.290	4.903	3.000	0.475
Agricultural share of GPP	Central area	14.470	41.340	1.450	9.763
(%, numeric)	Northern area	21.381	36.550	5.340	7.431
	Northeastern area	21.761	31.790	11.290	4.492
	Southern area	41.207	55.270	21.920	8.759
Manufacturing share	Central area	33.527	84.270	3.350	24.082
of GPP	Northern area	12.009	73.370	2.600	14.762
(%, numeric)	Northeastern area	8.818	31.110	3.060	5.720
	Southern area	10.439	29.280	4.340	6.261
Hotel and restaurant share	Central area	1.369	8.500	0.000	1.602
of GPP	Northern area	0.841	2.800	0.020	0.743
(%, numeric)	Northeastern area	0.909	5.240	0.140	1.055
	Southern area	1.983	8.500	0.150	2.305
Population density	Central area	176.5	498.0	39.0	121.0
(persons/km^2, numeric)	Northern area	75.8	132.0	18.0	30.1
	Northeastern area	130.4	178.0	55.0	33.3
	Southern area	118.4	324.0	45.0	70.3
Distance from Bangkok	Central area	145.5	315.0	46.0	73.0
(km, numeric)	Northern area	507.3	924.0	219.0	196.8
	Northeastern area	545.2	780.0	342.0	114.6
	Southern area	846.3	1149.0	463.0	204.6
Highway per population	Central area	1.0073	1.9042	0.1340	0.4121
(metres/capita, numeric)	Northern area	1.4702	2.7017	0.8306	0.5438
	Northeastern area	0.9461	8.4490	0.2939	1.1172
	Southern area	1.0691	1.9921	0.5436	0.4057
Train connection	Central area	0.7000	1.0000	0.0000	0.4621
(dummy variable)	Northern area	0.5000	1.0000	0.0000	0.5053
	Northeastern area	0.5294	1.0000	0.0000	0.5041
	Southern area	0.5833	1.0000	0.0000	0.5000
Domestic airport	Central area	0.100	1.000	0.000	0.303
(dummy variable)	Northern area	0.479	1.000	0.000	0.505
	Northeastern area	0.471	1.000	0.000	0.504
	Southern area	0.556	1.000	0.000	0.504
International airport	Central area	0.050	1.000	0.000	0.220
(dummy variable)	Northern area	0.021	1.000	0.000	0.144
	Northeastern area	0.000	0.000	0.000	0.000
	Southern area	0.083	1.000	0.000	0.280

Variables	Area	Mean	Maximum	Minimum	Std. dev.
Facilities for children	Central area	0.200	1.000	0.000	0.403
(dummy variable)	Northern area	0.000	0.000	0.000	0.000
	Northeastern area	0.235	1.000	0.000	0.428
	Southern area	0.333	1.000	0.000	0.478
Facilities for the elderly	Central area	0.250	1.000	0.000	0.437
(dummy variable)	Northern area	0.125	1.000	0.000	0.334
	Northeastern area	0.176	1.000	0.000	0.385
	Southern area	0.250	1.000	0.000	0.439
Facilities for the disabled	Central area	0.200	1.000	0.000	0.403
(dummy variable)	Northern area	0.000	0.000	0.000	0.000
	Northeastern area	0.235	1.000	0.000	0.428
	Southern area	0.000	0.000	0.000	0.000
Facilities for the homeless	Central area	0.200	1.000	0.000	0.403
(dummy variable)	Northern area	0.063	1.000	0.000	0.245
	Northeastern area	0.118	1.000	0.000	0.325
	Southern area	0.000	0.000	0.000	0.000
Facilities for women	Central area	0.0500	1.0000	0.0000	0.2198
(dummy variable)	Northern area	0.1875	1.0000	0.0000	0.3944
	Northeastern area	0.1176	1.0000	0.0000	0.3254
	Southern area	0.1667	1.0000	0.0000	0.3780
National primary school	Central area	1.259	1.432	1.105	0.074
(students/teacher,	Northern area	1.234	1.384	1.142	0.058
Log, numeric)	Northeastern area	1.282	1.358	1.216	0.035
	Southern area	1.305	1.398	1.157	0.052
Local schools	Central area	1.370	1.706	1.139	0.088
(students/teacher,	Northern area	1.362	1.935	1.162	0.120
Log, numeric)	Northeastern area	1.344	1.664	1.127	0.081
	Southern area	1.276	1.512	-1.712	0.515
Private schools	Central area	1.326	1.545	1.224	0.068
(students/teacher,	Northern area	1.350	1.735	1.185	0.085
Log, numeric)	Northeastern area	1.374	1.495	1.255	0.051
	Southern area	1.279	1.449	0.475	0.151
National secondary schools	Central area	1.363	1.467	1.262	0.046
(students/teacher,	Northern area	1.342	1.459	1.161	0.070
Log, numeric)	Northeastern area	1.361	1.939	1.069	0.111
	Southern area	1.334	1.577	0.915	0.112

† 1 Wa = 2 metres.

Appendix 2: Estimates using the maximum land price as dependent variable

Dependent variable	OLS			Weighted OLS			Weighted OLS with fixed effect		
	Coefficient	t-statistics		Coefficient	t-statistics		Coefficient	t-statistics	
Constant	**4.3096**	4.931	***	**4.6924**	*5.792*	***			
Population density	**-0.0007**	-1.469		**-0.0009**	*-2.229*	**	**-0.0009**	*-2.203*	**
Distance from BKK	**0.1267**	0.966		**0.0581**	*0.469*		**0.2003**	*1.012*	
Agriculture share	**-0.0032**	-0.953		**-0.0036**	*-1.007*		**-0.0049**	*-0.922*	
Manufacture share	**0.0035**	1.608	*	**0.0018**	*0.866*		**0.0012**	*0.512*	
Tourism share	**0.0388**	1.917	*	**0.0279**	*1.375*		**0.0238**	*1.109*	
Road	**-0.4786**	-2.796	***	**-0.4589**	*-2.898*	***	**-0.5325**	*-2.905*	***
Train	**0.1302**	2.052	**	**0.1208**	*1.988*	**	**0.1189**	*1.871*	*
International airport	**0.0234**	0.131		**0.1191**	*0.663*		**0.0993**	*0.548*	
Domestic airport	**0.0858**	1.241		**0.0717**	*1.023*		**0.0749**	*1.052*	
National primary school	**-0.6512**	-1.285		**-0.6409**	*-1.376*		**-0.5981**	*-1.222*	
Local school	**-0.0400**	-0.265		**-0.0049**	*-0.031*		**-0.0603**	*-0.361*	
Private school	**0.5197**	1.346		**0.3609**	*0.983*		**0.5102**	*1.257*	
National secondary school	**-0.2118**	-0.646		**-0.2007**	*-0.615*		**-0.1585**	*-0.477*	
Children	**0.1553**	1.665		**0.2369**	*2.675*	***	**0.2282**	*2.546*	***
Disabled	**0.0584**	0.634		**0.0206**	*0.246*		**0.0608**	*0.664*	
Elderly	**0.0480**	0.690		**0.0876**	*1.327*		**0.0925**	*1.381*	
Homeless	**-0.1415**	-1.487		**-0.1099**	*-1.260*		**-0.1096**	*-1.235*	
Women	**-0.1424**	-1.343		**-0.1819**	*-1.734*	*	**-0.1871**	*-1.722*	*
Yr2000	**0.0514**	0.765		**0.0553**	*0.870*		**0.0678**	*1.009*	
Yr2002	**0.1030**	1.552		**0.1101**	*1.739*	***	**0.1178**	*1.793*	*
Fixed Effect									
CENTRAL							**4.1986**		
NORTH							**4.1232**		
NORTHEAST							**4.0493**		
SOUTH							**4.1267**		
No. of observations	195			195			195		
Adjusted R^2	0.2308			0.7867			0.7762		
Log likelihood	-60.909			-54.004			-53.234		
F-statistic	2.6115			36.779			30.263		

Note: ***, **, and * indicate significance at the 1% level, the 5% level, and the 10 % level, respectively.